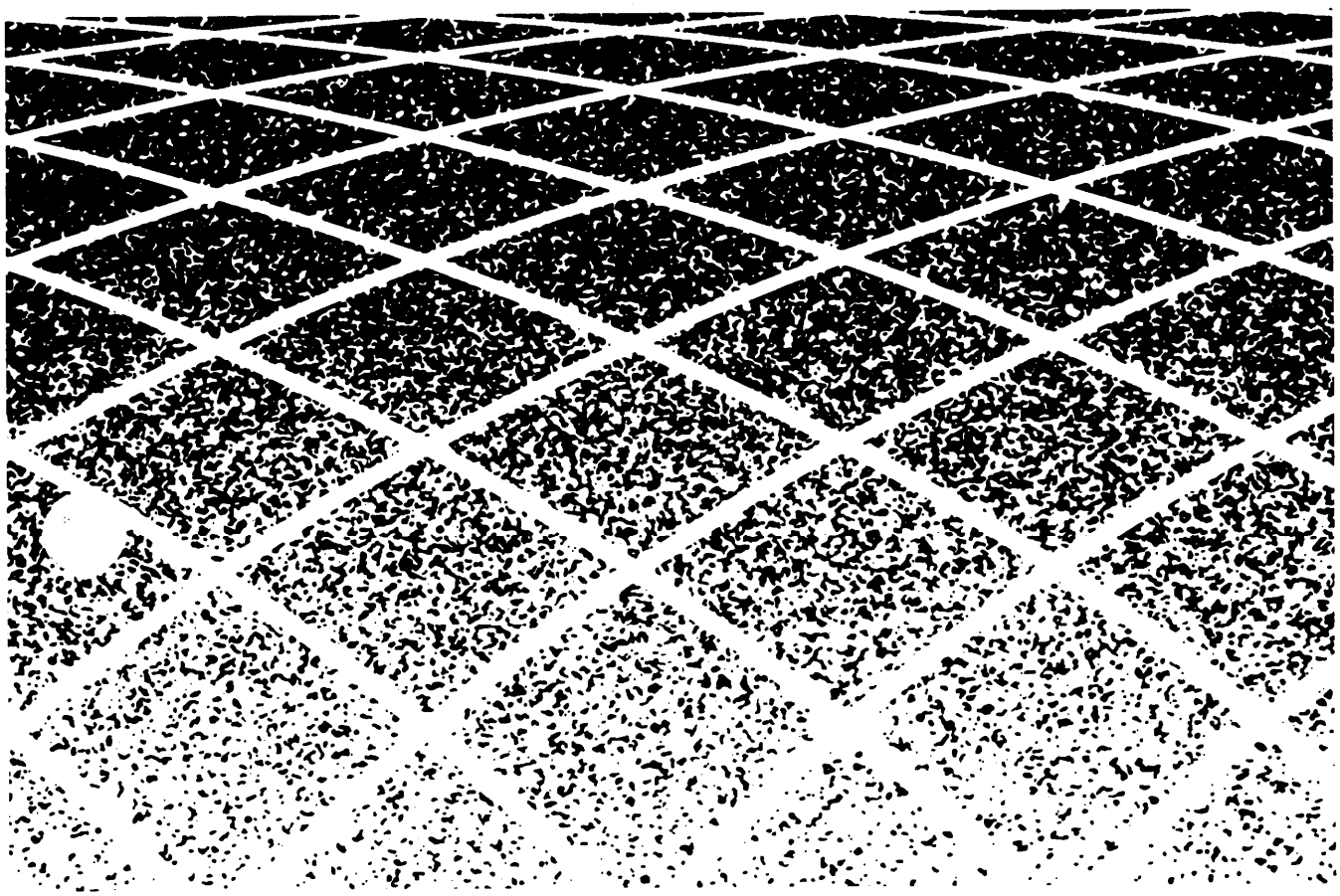
AT&T 555-610-140
Issue 1
August 1991

MERLIN LEGEND™ Communications System

Installation, Programming, & Maintenance



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Issue 1
August 1991

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.

Federal Communications Commission (FCC) and Canadian Department Of Communications (DOC) Information

For important FCC and DOC interference, registration, and repair information, see "Customer Support Information" in this book.

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Support Telephone Number

AT&T provides a toll-free customer Helpline (1-800-628-2888)24 hours a day (U.S.A. only). Call the Helpline, or your authorized dealer, if you need assistance when installing, programming, or using your system.

ERRATA

MERLIN LEGEND™ Communications System
Installation, Programming, and Maintenance
555-610-140

Ignore all references to the *small* processor module. The MERLIN LEGEND™ Communications System offers only one processor module. This processor module is referred to as a *large* processor module in this document.

Ignore references to the "small" processor module on the following pages:

Page 1-6, Processor Module.

Page 1-35, System Capacities, first, fourth, and sixth paragraphs.

Pages 1-36 - 1-37, Table 1-8, System Capacities.

Pages 1-38 - 1-40, Table 1-9, Feature Capacities.

Page 2-6, Backboard Requirements.

Page 3-10, Install the Feature Module in the Processor Module, first paragraph.

Appendix C - Page C-1
Ordering Codes Table: The *following Price Element Codes (PECs) am not valid:*
Small (Analog) - 6141-CUA
Small (Digital) - 6141-CUD

Appendix C - Page C-2
Ordering Codes Table: *The following Price Element Codes (PECs) are not valid:*
Small (Analog) - 6141-24D
Upgrade from Small to Large 6140-USLA

October 1, 1991

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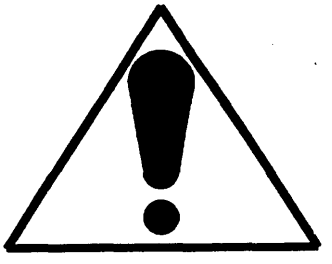
CUSTOMER WARNING

This manual is designed for use **by qualified service technicians only.** Technician qualification includes completion of an AT&T hands-on instructor-led course covering installation and maintenance for this product. Installation or maintenance of this product by anyone other than a qualified service technician may void the warranty. **Hazardous electrical voltages are present inside this product**



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, basic safety precautions should always be followed to reduce the risk of fire, electric 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 telephone jacks 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 (511A) control unit.
- Use only AT&T-recommended/approved MERLIN LEGEND Communications System accessories.
- If equipment connected to the analog station modules (008/408/408 GS/LS) or to the MLX telephone module (008 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 electric shock.
- The MERLIN LEGEND Communications System is equipped with a three-wire grounding-type plug, a plug having 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 electric shock. Never spill liquid of any kind on this product.
- Unplug this product from the wall outlet before cleaning. Do not use liquid or aerosol cleaners on this product. Use a damp cloth for cleaning.

Customer Support Information

Support Telephone Number

AT&T provides a toll-free customer Helpline (1-800-628-2888)24 hours a day (U.S.A. only). Call the Helpline, or your authorized dealer, if you need assistance when installing, programming, or using your system.

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 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 applicable aux appareils numériques de la classe A prescrites dans le Règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

FCC Notification and Repair Information

This equipment is registered with the FCC in accordance with Part 68 of its rules. In compliance with those rules, you are advised of the following:

- **Means of Connection.** Connection of this equipment to the telephone network shall be through a standard network interface jack: USOC RJ11C, RJ14C, RJ21X. Connection to E&M tie trunks requires a USOC RJ2GX. Connection to off-premises stations requires a USOC RJ11C or RJ14C. Connection to 1.544 Mbs digital facilities must be through a USOC RJ48C or RJ48X. Connection to DID requires a RJ11C, RJ14C or RJ21X. These USOCs must be ordered from your telephone company. 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 is as follows:
    If this equipment is to be used as Key System, report the following number AS593M-72914-KF-E and if the system provides both manual and automatic selection of incoming/ outgoing access to the network, report AS593M-72682-MF-E. The ringer equivalence number for both systems is 1.5A.
  - For tie-line connection, provide the telephone company the facility interface code (FIC) of TL31M and the service order code (SOC) 9.0F.
  - For connection to off-premises stations, report the FIC OL13C and SOC 9.0F.
  - If this equipment is to be connected to digital service (1.544 Mbs), the FIC is 04DU9-B for D4 framing format or 04DU9-C for extended framing format, and SOC 6.0P.
  - If this equipment is to be connected to DID facilities, the FIC is 02RV2-T, and the SOC is 9.0F.
  - The quantities and USOC numbers of the jacks required for each jack provide the sequence in which lines are to be connected: the type lines, the FIC, and REN by position when applicable.

You must also notify your local telephone company if and when this equipment is permanently disconnected from the line(s).

The REN is used to determine the quantity of devices which maybe connected to the telephone line. Excessive REN's on the telephone line may result in the devices not ringing in response to an incoming call. In most, but not all, areas the sum of the REN's should not exceed five (5.0). To be certain of the number of devices that maybe connected to the line, as determined by the total REN's, contact the telephone company to determine the maximum REN for the calling area.

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 by others who maybe authorized by the FCC. In the event repairs are needed on this equipment, please contact the National Service Assistance Center (NSAC) at 1-800-628-2888, or your authorized AT&T dealer.
- **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.

  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 the off-peak hours, such as early morning or late evening.

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 maybe particularly important in rural areas.

CAUTION: Users should not attempt to make such connections themselves, but should contact the appropriate electric 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 réparatione

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 etre installé en suivant une méthode acceptée de raccordement. Dans certains cas, les fils intérieurs de l'enterprise utilisés pour un service individuel à ligne unique peuvent être prolongés au moyen d'un dispositif homologué de raccordement (cordon prolongateur téléphonique interne). L'abonné ne doit pas oublier qu'il est possible que la conformité aux conditions énoncées ci-dessus n'empêchent pas la dégradation du service dans certaines situations. Actuellement, les entreprises de télécommunication ne permettent pas que l'on raccorde leur matériel à des jacks d'abonné, sauf dans les cas précis prévus pas les tarifs particuliers de ces entreprises.

Les réparations de matériel homologué doivent être effectuées pas 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 importance 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 surchage, 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 constitutée 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

Ministerè des Communications du Canada emplacement de l'étiquette

Security of Your System—Preventing Toll Fraud

As a customer of a new telephone system, you should be aware that there exists 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 remote access features.

The Remote Access feature of your system, if you choose to utilize it, permits off-premises callers to access the system from a remote telephone by using an 800 number or a 7- or 10- digit telephone number. The system returns an acknowledgement signaling the user to key in his or her authorization code, which is selected and administered by the system manager. After the authorization code is accepted, the system returns dial tone to the user. If you do not program specific egress 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 wiIl 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 (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 authorization 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 authorization codes, which are less likely to be easily broken.
- Deactivate all unassigned codes promptly.
- Ensure that Remote Access users are aware of their responsibility to keep the telephone number and any authorization codes secure.
- When possible, restrict the off-network capability of off-premises callers, via use of Call Restrictions and Disallowed List capabilities.
- 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 Forward to persons on a “need-to-have” basis.

Limited Warranty and Limitation of Liability

Limited Warranty

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. A written explanation of AT&T's types of maintenance coverage maybe obtained from AT&T by calling 1-800-247-7000. 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 this 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.

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About This Book

This book provides technical information about the operation and installation of the communications system. It is intended for qualified technicians who install, maintain, and repair the communications system.

Related Documentation

The following books are available to help you set up, use, and maintain the communications system:

- reference
- setup and modification
- telephone user support
- operator guides
- miscellaneous

How to Order Books

The books needed for operating the communications system were supplied with the system. You can order additional copies of these and other books listed below from the AT&T Customer Information Center:

- Within the continental United States, call 1-800-432-6600.
- In Canada, call 1-800-255-1242.

MERLIN LEGEND Communications System Book Title	**Order Number**
System Reference	
System Reference	555-610-110
System Setup and Modification	
Key System Planning Forms only	555-610-116
Key System Planning and Key System Planning Forms	555-610-112
PBX System Planning Forms only	555-610-117
PBX System Planning and PBX System Planning Forms	555-610-113
Data Planning Forms only	555-610-118
Data Guide and Data Planning Forms	555-610-114
System Programming.	555-610-111

MERLIN LEGEND Communications System Book Title	**Order Number**
Telephone User Support	
Analog Multiline Telephones User's Guide	555-610-120
MLX-10D,™ MLX-28D,™ and MLX-20L™ Digital Display Telephones User's Guide	555-610-122
MLX-10™ Digital Non-Display Telephone User's Guide	555-610-123
MLX-10™ and MLX-10D™ User Cards	555-610-124
MLX-28D™ and MLX-20L™ User Cards	555-610-125
Single-Line Telephones User's Guide	555-610-121
Operator Guides	
Analog Direct-Line Consoles Operator's Guide	555-610-131
Digital/ISDN Direct-Line Consoles Operator's Guide	555-610-132
Digital/ISDN Queued Call Console Operator's Guide	555-610-133
Miscellaneous	
Calling Group Supervisor's Guide	555-610-130

Additional Ordering Information

For information on ordering replacement parts, accessories, and other equipment that is compatible with the system, see Appendix A in *System Reference.*

Product Safety Labels

Throughout this book, hazardous situations are indicated by an exclamation point inside a triangle, along with 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 will or can cause minor personal injury or property damage if the hazard is not avoided.

How to Comment on This Book

We welcome your feedback on this book. Please use the feedback form that follows. If the form is missing, send your comments to A. Sherwood, AT&T, 99 Jefferson Road, Rm. #2A25, Parsippany, NJ 07054.

System Description 1

The MERLIN LEGEND™ Communications System is an advanced digital switching system that integrates voice and data communications features. Voice features combine traditional telephone features, such as Transfer and Hold, with advanced features, such as Group Coverage and Park. Data features provide switched data connections that enable the transmission of voice and data over the same system wiring.

Modes of Operation

The system is designed for customers in the 10- to 100-station range. It can be configured to operate in one of three modes:

- Hybrid/PBX
- Key
- Behind Switch

Hybrid/PBX Mode

The Hybrid/PBX mode handles a large volume of calls and users and provides the most flexibility of the three modes. Outside facilities consist of loop-start trunks, ground-start trunks, direct inward dialing (DID) trunks, tie trunks, and Digital Signal 1 (DS1) facilities. The trunks can be grouped in pools for shared use. In addition, trunks can be assigned to line buttons on multiline telephones for users who need a personal line.

Users access inside lines and outside trunks via system access buttons. To make an outside call, the user enters a dial-out code (usually a 9), and the system automatically selects an available trunk. The Automatic Route Selection feature determines which trunk should be used for each type of outgoing call.

Incoming calls can be handled by a direct-line console (DLC) or a queued call console (QCC), or by a combination of both console types.

Key Mode

In the Key mode, each outside line appears on a button on one or more multiline telephones. The line buttons allow users to see activity on other telephones, join conversations, place calls, or receive calls. Separate intercom buttons are used to make and receive internal calls.

A Key system automatically assigns the first eight outside lines to all telephones. This arrangement can be customized through system programming by assigning lines to individual telephones or to selected groups of telephones.

Behind Switch Mode

In the Behind Switch mode, the system is connected to a Hybrid/PBX or Centrex system. This other system (called the host) provides the interface to outside lines and some features.

A Behind Switch system assigns only one line (called a prime line) to each telephone. Outside lines to telephones or groups of telephones are assigned through system programming. In the Behind Switch mode, people can use the special features of both the MERLIN LEGEND Communications System and the host system.

System Components

The system consists of required and optional components:

- required components
  - control unit
  - telephones
- optional components
  - adjuncts
  - adapters
  - applications

These components are described in the following pages.

Control Unit

The control unit (CU) connects central office (CO) lines with telephones and adjuncts such as answering machines and fax machines. The CU consists of the following components:

- control unit housing
- carrier(s)
- power supply module (one per carrier)
- processor module
- line/trunk and station modules

Control Unit Housing

The control unit is housed in a plastic cabinet for protection. The size of the housing increases as expansion carriers are added to the CU. Figure 1 shows how the control unit housing fits around the CU.

Carriers

The basic and expansion carriers each have seven slots to hold modules (see Figure 2). The basic carrier contains a power supply module, the processor module (slot 00), and line/trunk and station modules (slots 01–05).

Up to two expansion carriers can be added to the right side of the basic carrier to increase the capacity of the system. Like the basic carrier, the leftmost and widest slot of the expansion carrier holds a power supply module; the remaining six slots hold line/trunk and station modules.

Besides the slots, both basic and expansion carriers have a backplane with an input/output (I/O) bus that provides the interfaces with the modules.

Power Supply Modules

The power supply module provides power to the carrier, to each telephone, and to adjuncts—except for adjuncts such as answering machines and fax machines that have their own power supplies. Each carrier requires its own power supply module, which goes into the first slot on the carrier.

The power supply module converts 117-VAC line voltage to these outputs: +5 VDC, -5 VDC, and -48 VDC. All modules use +5 VDC and -5 VDC for logic and analog transmission circuits. Most line/trunk and station modules use -48 VDC for power to the stations. The direct inward dialing (DID) and off-premises telephone (OPT) line/trunk and station modules also provide -48 VDC on the tip/ring (T/R) interface to the CO or OPT station. The 012 basic telephone module provides 21 VDC to single-line telephones and equipment.

When single-line telephones are connected to a 012, 800 DID, or 008 OPT module, a 129B Frequency Generator (ring generator) must be installed in the power supply module of each carrier that houses one or more of these modules.

A green light on the power supply module remains on as long as the module is receiving power. The power supply module also has an on/off switch and a modular telephone jack for connecting an auxiliary power unit as needed (see Figure 3).

Processor Module

Placed in slot 00 of the basic carrier, the processor module controls system features and programming via the processor and memory boards and the feature module. The processor module comes in small and large versions. The small processor module supports up to 24 CO or tie lines/trunks and 56 stations. The large processor module supports up to 80 CO or tie lines/trunks and 144 stations.

The main board contains the 68000 microprocessor, a built-in 1200-baud data modem, built-in diagnostics, RAM, a real-time clock, and interrupt circuitry, and interfaces to the other modules through the I/O bus on the carrier backplane.

The processor module has two modular RS-232 jacks: one for Station Message Detail Recording (SMDR) and the other for system programming and maintenance via a personal computer (see Figure 3).

A NiCad battery in the processor module provides backup power for the real-time clock and nonvolatile RAM in case of power failure or system shutdown. The battery provides RAM data retention for 12 to 30 days. The trickle-charge circuit can recharge the battery to 50 percent of capacity from a discharged state in 48 hours. The minimum battery life is five years.

Line/Trunk and Station Modules

The line/trunk and station modules have jacks for connecting the CO lines/trunks and the station lines to the CU. The station lines connect to telephones and adjuncts.

Depending on the mode of operation chosen, the outside lines that extend from the CO are called either trunks or lines. "Trunks" is used for the Hybrid/PBX mode and in the phrase “tie trunks.” “Lines” is used for Key or Behind Switch modes.

There are different types of lines/trunks for the different functions of each mode. A Key or Behind Switch system can use

- loop-start (LS) lines
- tie trunks
- a DS1 facility programmed for either T1 or Integrated Services Digital Network Primary Rate Interface (ISDN-PRI) operation
- a ground-start (GS) line only when registered under the MF FCC classification

A Hybrid/PBX system can use

- loop-start trunks
- ground-start trunks
- tie trunks
- direct inward dialing (DID) trunks
- a DS1 facility programmed for either T1 or ISDN-PRI operation

The names of modules consist of a number identifying the number of lines/trunks and/or stations that can be connected to the module, followed by the types of lines and/or telephones it supports. For example, the 408 GS/LS module provides four line jacks and eight station jacks and supports ground-start or loop-start lines.

The system supports 13 types of line/trunk and station modules (see Figure 4). Table 1-1 lists the specifications for each type of module.

See Appendix A for wiring diagrams.

Table 1-1 Line/Trunk and Station Modules

Module	Line/ Trunk Type	Station Type	Specifications
008	N/A	Analog multiline telephone; CMS; analog data via a modem	**Capacity:** 8 analog stations **Signaling:** analog multiline telephone protocol (40 kbps) **Loop range:** 1000 feet in-building or in-range out-of-building, with analog IROB protectors, service only
008 MLX	N/A	MLX telephone; digital data device (such as ISDN 7500B Data Module)	**Capacity:** 8 digital stations, each with one or two endpoints (each endpoint is assigned an individual extension number), including the following station types: ■ digital voice only ■ digital voice with Voice Announce to Busy feature ■ digital voice and digital data (via the ISDN 7500B Data Module) ■ digital voice and MFM ■ digital data only (ISDN 7500B Data Module) **Signaling:** ISDN-BRI S/T protocol (two 64-kbps B channels, one 16-kbps D channel) on a passive bus **Power:** 4-VDC phantom power to telephone; 48 VDC over a separate pair (7-8) to an operator DSS console **Loop range:** 1000 feet, in-building and in-range out-of-building, with MLX IROB protectors, service only

Table 1-1 Continued

Module	Line/ Trunk Type	Station Type	Specifications
008 OPT	N/A	On-premises or off-premises single-line telephone	**Capacity:** 8 T/R stations* on 2-way voice transmission path with support for telephones with message-waiting LEDs; 2 TTRs **Notice to telephone company:** meets FCC Class C **Ringing current:** 105-Vrms, 30-Hz sinusoidal ringing superimposed on -48 VDC; a ring generator must be installed in the power supply module of each carrier that has a 008 OPT module. **REN:** ≥ 1.0 per port **Disconnect signal:** 900 ms (T/R short for answering machines, G3 fax, etc.) **Switchhook flash detection:** 300—1200 ms **Loop resistance:** serves 2-wire loops to 1300 ohms, including stations

***** The system software recognizes the OPT module as a 012 module; thus, the overall station capacity is reduced by four stations for every OPT module.

Table 1-1 Continued

Module	Line/ Trunk Type	Station Type	Specifications
012	N/A	Single-line telephone; MERLIN Attendant; MERLIN MAIL™ Voice Messaging System; T/R adjunct (such as an answering or a fax machine); analog data device (such as a modem)	**Capacity:** 12 T/R stations on 2-way voice transmission path with support for telephones with message-waiting LEDs; 2 TTRs **Power:** 21-VDC, 600-ohm battery source **Ringing current:** 105-Vrms, 30-Hz sinusoidal ringing super-imposed on -48 VDC; a ring generator must be installed in the power supply module of each carrier that has a 012 module. **REN:** ≥ 1.0 per port **Disconnect signal:** 900 ms (T/R short for answering machines, G3 fax, etc.) **Switchhook flash detection:** 300—1200 ms
1OOD	T1 or PRI	N/A	**Capacity:** 24 lines/trunks for voice and analog data or 23 lines/trunks for voice and data with 1-channel used for signaling **Mode:** multiplexes 23 or 24 lines/trunks into 1 facility and demultiplexes one facility into 23 or 24 lines/trunks **Speed:** up to 64 kbps **Signaling:** DS1 over 4-wire; T1 uses RBS or CCS; PRI has ISDN-PRI (23 B + D)

Table 1-1 Continued

Module	Line/ Trunk Type	Station Type	Specifications
400†	LS and TTR	PFT telephone	**Capacity:** 4 lines/trunks, 4 TTRs, 1 PFT telephone **Signaling:** LS
400EM	Tie trunk	N/A	**Capacity:** 4 tie trunks **Method of Completion: automatic-start,** immediate-start, wink-start, or delay-dial-start **Signaling:** E&M type 1S, type 1C, type 5
400 GS/ LS/TTR	LS or GS and TTR	PFT telephone; button needed for GS PFT telephone	**Capacity:** 4 lines/trunks, 4 TTRs, 1 PFT telephone **Signaling:** LS or GS, optioned per port
408†	LS	Analog multiline telephone; CMS; PFT telephone	**Capacity:** 4 lines/trunks, 8 stations, 1 PFT telephone **Station signaling:** analog multiline telephone (40 kbps) **Signaling:** LS line/trunk: analog voice **Loop range:** 1000 feet, in-building and in-range out-of-building, with analog IROB protectors, service only

† Although these MERLIN II modules are supported in the MERLIN LEGEND Communications System, the 400 GS/LS and 408 GS/LS are the recommended modules.

Table 1-1 Continued

Module	Line/ Trunk Type	Station Type	Specifications
408 GS/LS	LS or GS	Analog multiline telephone; CMS; PFT telephone	**Capacity:** 4 lines/trunks, 8 stations, 1 PFT telephone **Station signal:** analog multiline telephone (40 kbps) **Line/trunk signaling:** LS or GS line/trunk, optioned per port voice **Loop range:** 1000 feet, in-building and in-range out-of-building, with analog IROB protectors, service only
800‡	LS	PFT telephone	**Capacity:** 8 lines/trunks, 2 PFT telephones **Signaling:** LS
800 DID	DID	N/A	**Capacity:** 8 lines/trunks, 2 TTRs **Protocol:** incoming calls only; 2-way (1-pair) fixed impedance to DID trunks; no outgoing calls **Signaling:** loop-reverse battery wink-start or immediate-start; accepts touch-tone dialing
800 GS/LS	LS or GS	PFT telephone; button needed for GS PFT telephone	**Capacity:** 8 lines/trunks, 2 PFT telephones **Signaling:** LS or GS

‡ Although this MERLIN II module is supported in the MERLIN LEGEND Communications System, the 800 GS/LS is the recommended module.

Loop-Start Lines/Trunks

LS lines/trunks are the standard for home and small business Key systems. They are less expensive in some areas but have certain limitations:

- They do not protect against "glare." (Glare occurs when a person tries to make an outside call on a line/trunk at the

Loop-Start Lines/Trunks

LS lines/trunks are the standard for home and small business Key systems. They are less expensive in some areas but have certain limitations:

- They do not protect against "glare." (Glare occurs when a person tries to make an outside call on a line/trunk at the same time an incoming call is being received on that line/trunk.)
- They have higher cable losses than GS lines/trunks
- They cannot assure secure toll restriction.

Ground-Start Lines/Trunks

GS lines/trunks are outside lines/trunks used by some businesses (such as hotels or motels) because the improved signaling of GS allows more secure toll restriction.

In addition, GS lines/trunks prevent glare and provide cable losses less than or equal to 4.5 dB.

The following types of outside lines/trunks come in either GS or LS form:

- basic lines
- WATS (wide area telecommunications service)
- 800 service (In-WATS)
- foreign exchange (FX)

Tie Trunks

Tie trunks provide private communication between two systems. Tie trunks “tie” the two systems together, making it seem that all the telephones are on the same system. (See "Networking Capabilities" in this chapter for more information on how tie trunks connect to other systems.)

Tie trunks provide efficient communication between systems at different locations. These locations can be different floors of the same building, different buildings in the same campus, or different cities or states.

Tie trunks can be added to the system via the 400EM module. The 400EM module has four ports that must be programmed individually by selecting trunk options and setting the DIP (dual in-line package) switches, located on the front of the module, for different signaling modes and types (see Figure 72).

The following tie-trunk options need to be programmed:

- **Direction**
  - Two-way (factory setting). Calls can be made in either direction.
  - Outgoing only. Calls can be dialed but not received (no ringing).
  - Incoming only. Calls can be received but not dialed (no dialing).
- **Signaling Type** can be any of the following types, programmed via the 400EM module. The type of signal can be set separately for incoming and outgoing calls; for example, a tie trunk can be wink-start for incoming calls and delay-dial-start for outgoing calls.

- Wink-start (factory setting). The originating end of the tie trunk transmits an off-hook signal and waits for the remote end to send back a signal (a wink) indicating that it is ready to receive dialing information.
- Immediate-start. No start signal is necessary, and dialing can begin immediately after the tie trunk is seized.
- Delay-dial-start. The originating end of the tie trunk transmits an off-hook signal and waits for the remote end to send an off-hook signal followed by an on-hook signal.
- Automatic-start. Incoming calls are routed directly to another station without a start signal. In other words, when you pick up the handset, the signal rings immediately at the other end. This is also called an automatic-ringdown tie trunk.

Wink-start, immediate-start, and delay-dial-start are also called dial-repeating tie trunks.

- **E&M Signal**
  - Type 1 standard (factory setting)
  - Type 1 compatible
  - Type 5
- **Dial Mode** determines the incoming and outgoing dial. modes:
  - rotary (factory setting)
  - touch-tone

    Note: If the 400EM module is administered for touch-tone dialing and there are no modules in the system that provide touch-tone receivers (TTRs) (012, 008 OPT, 400, 400 GS/LS/TTR, or 800 DID), a 400 GS/LS/TTR module must be installed.

- **Dial Tone** determines whether the system returns a dial tone to the remote end of the line:
  - yes (factory setting)—a dial tone is sent to the remote end
  - no—a dial tone is not sent to the remote end
- **Answer Supervision Time** sets a time limit in milliseconds (ms) for the remote station to signal the calling station:
  - 300 ms (factory setting)
  - 20–4800 ms (increments of 20 ms)
- **Disconnect Time** sets a time limit in milliseconds for the release of the E or M lead:
  - 300 ms (factory setting)
  - 140–2400 ms (increments of 10 ms)

Direct Inward Dialing Trunks

Direct inward dialing (DID) trunks allow incoming calls to reach specific individuals or facilities in the system without the assistance of a system operator. DID trunks are available only in the Hybrid/PBX mode. They are connected to the system on an 800 DID module.

With DID service, the customer reserves blocks of DID numbers from the local telephone company. The DID number should correspond to the extension number for an individual or a calling group, or to the code for Remote Access or pool dial-out.

CAUTION:
DID numbers that correspond to pool dial-out codes (or facility access codes) can be used to avoid toll restriction, leading to toll abuse and/or fraud (see “Security of Your System” under “Customer Support Information" in the front of this book).

Because DID trunks allow calls to come directly to a telephone extension, they cannot be pooled. The CO passes the necessary digits to the system, which delivers the call directly to the dialed extension.

The system can receive 1- to 4-digit extension numbers over the DID trunks. The number of digits received on a specific DID trunk is always the same for that trunk; however, different DID trunks can receive different numbers of digits.

If the extension numbers used in the system are fewer than four digits but the CO sends four, the system can be programmed to ignore the leading digit(s). For example, if the DID number sent by the CO is 2157, the extension numbers the system can access are 57, 157, or 2157. System programming determines the proper extension number to connect.

The system also can be programmed to match more digits than are received from the CO. Additional leading digits are taken from the 4-digit trunk number, as programmed. For example, if the system is setup to match three digits and the CO sends only two, programming determines which DID trunk number prefix to add to complete the match and connect the call.

No routing of calls is made until the designated number of digits is received. Incoming DID numbers that don't match a valid extension are either directed to a predesignated extension, such as the system operator, or the system sends back a reorder tone (fast busy).

Options are assigned to blocks of DID trunks. A maximum of two blocks of DID trunks is allowed. Each block can be configured to match the system numbering plan. For example, the system could have both 3- and 4-digit extension numbers. Trunk block 1 contains the options needed to reach the 3-digit numbers, and trunk block 2 contains the options needed to reach the 4-digit numbers (see Appendix K).

The options for each DID trunk group are as follows:

- **Type**
  - wink-start (factory setting)
  - immediate-start
- **Expected Digits**
  - 3 (factory setting)
  - 1–4
- **Delete Digits**
  - 0 (factory setting)
  - 0–4
- **Add Digits**
  - 0 (factory setting)
  - 1- to 4-digit number (1 to 9999)
- **Signaling**
  - rotary (factory setting)
  - touch-tone
- **Invalid Destination**
  - backup position (factory setting)
  - return to fast busy

100D Module

The 100D module is the interface that connects a DS1 facility to the system. It can be configured for T1 or Integrated Services Digital Network Primary Rate Interface (ISDN-PRI) service (see "DS1 Capabilities" later in this chapter).

Touch-Tone Receivers

The 800 DID, 008 OPT, and 012 modules each provide two TTRs. Normally these TTRs are sufficient to handle calls originated on the 012 or 008 OPT module or received on the 800 DID module. However, additional TTRs maybe needed to support the following services:

- tie trunks and DS1 emulated tie trunks set for Dual-Tone Multifrequency (DTMF) signaling
- Remote Access
- Account Code Entry
- AUDIX Voice Power (AVP)—IS II or Integrated Voice Power Automated Attendant (IVP AA)—IS II applications

If more TTRs are needed to support these services, 400 or 400 GS/LS/TTR modules can be added (each module provides four TTRs). Table 1-2 shows the estimated number of TTRs needed in the system, depending on the call volume and the types of services.

Table 1-2 Touch-Tone Receiver Requirements

Calls/hr	Total Number of TTRs Required*		
	No Account Codes or Applcation	Account Codes or AVP/AA (or equiv)	Account Codes and AVP/AA (or equiv)
110	2	4	6
180	4	6	8
350	4	8	10
420	6	8	10
610	6	10	12
710	8	10	14

* System is assumed to already have basic phones, Remote Access, and tie trunks.

Reusable MERLIN® II Modules

Table 1-3 shows the MERLIN II line/trunk and station modules that are usable in the MERLIN LEGEND Communications System. Limitations are noted in the comments column.

Table 1-3 Reusable MERLIN II Line/Trunk and Station Modules

Type	Apparatus Code	Comments
008	517A3	Fully compatible
	517B3	Fully compatible
012	517A13	Compatible but does not support the downlink disconnect needed for voice-mail; does not meet Megacom® transmission requirements
	517B13	Compatible but does not support the downlink disconnect needed for voice-mail; does not meet Megacom transmission requirements
	517C13	Compatible but does not meet Megacom transmission requirements
	517D13	Compatible but can be used for Megacom only when the customer does not have to meet EIA transmission standards
	517E13	Fully compatible
100D	517A15	Outgoing Call Management only
	517B15	Supports only tie-trunk emulation

Table 1-3 Continued

Type	Apparatus Code	Comments
400	517A12	No lightning protection; 146A surge protector required
	517B12	Fully compatible
400EM	517A14	Fully compatible
408	517A1	No lightning protection; 146A surge protector required
	517B1	Fully compatible
	517C1	Fully compatible
800	517A4	No lightning protection; 146A surge protector required
	517B4	Fully compatible

Reusable MERLIN II Hardware

Table 1-4 shows the MERLIN II hardware components that can be used in the MERLIN LEGEND Communications System. Limitations are noted in the Comments column.

Table 1-4 Reusable MERLIN II Hardware

Type	Apparatus Code or PEC	Comments
Power supply module	391A	No surge protection; 147A protector recommended
	391AA	For Canadian use; no auxiliary power jack
	391A1	Fully compatible
Basic carrier	403A	Compatible but must order system cover separately (part 16A); required spring clips for the system cover are provided with the MERLIN LEGEND Communications System upgrade package
	403C	For Canadian use; system cover and spring clips needed; the clips are provided with the MERLIN LEGEND Communications System upgrade package
	403E	Fully compatible

Table 1-4 Continued

Type	Apparatus Code or PEC	Comments
Expansion carrier	403B	Compatible but must order system cover separately (part 17A)
	403D	For Canadian use; system cover and spring clips needed; the clips are provided with the MERLIN LEGEND Communications System upgrade package
	403F	Fully compatible
Frequency generator (ring generator)	129B	Fully compatible
Auxiliary power	335A	Compatible but can be used only when the unit loads do not exceed the 335A's capacity an Auxiliary Power Unit 9024 is recommended
Music coupler	61398	Fully compatible

Telephones and Consoles

Several different analog and single-line telephones work with the system; however, the only digital telephones that work with the system are the digital/ISDN (MLX) telephones.

WARNING

An analog or digital multiline telephone located in a different building but within 1000 feet of the CU requires an IROB (in-range out-of-building) protector at each building entrance.

See Appendix C for ordering information on these telephones.

MLX Telephones

There are four new telephones in the MLX telephone line, all of which support ISDN capabilities:

- MLX-20L™ telephone
- MLX-28D™ telephone
- MLX-10D™ telephone
- MLX-10™ telephone

Some features are common to all MLX telephones:

- programmable line and feature buttons with two associated lights (red and green)

  Note: An MLX-20L telephone used as a QCC has no programmable buttons.
- dedicated feature buttons (four have a red or green light)
- red message-waiting light
- built-in speakerphone
- volume control for speakerphone, handset, and ringer

- user reference card tray with feature and programming codes and directory lists
- optional interns Multi-Function Module (MFM) to connect to tip/ring (T/R) equipment and alerting devices (described in Chapter 3)

  Note: An MLX-20L telephone used as a QCC cannot have an MFM in it.
- two-position adjustable desk stand
- four-pair modular line cord

MLX telephones with display have two additional features:

- LCD display
- display-associated keys

A list of features specific to each telephone model in the MLX telephone family follows.

MLX-20L Telephone (see Figure 5)

- can be used for system programming and as a DLC or a QCC operator console
- 20 line and feature buttons
- display (7 lines x 24 characters)
- 14 display-associated buttons
- accommodates one or two Direct Station Selectors (DSSs)

MLX-28D Telephone (see Figure 6)

- can be used as a DLC operator console
- 28 line and feature buttons
- display (2 lines x 24 characters)

- 8 display-associated buttons
- accommodates one or two Direct Station Selectors (DSSs)

MLX-10D Telephone (see Figure 7)

- 10 line and feature buttons
- desktop or wall-mount
- display (2 lines x 24 characters)
- 8 display-associated buttons

MLX-10 Telephone (see Figure 8)

- 10 line and feature buttons
- desktop or wall-mount

Analog Multiline Telephones

In addition to the MLX telephones, the analog multiline telephones in Table 1-5 can be connected to the system.

Table 1-5 Analog Multiline Telephones

Model	Description
5-button*	5-button telephone with membrane. No adjuncts are supported with this telephone.
10-button*	10-button telephone with membrane
34-button*	34-button basic telephone with membrane
34-button Deluxe*	Deluxe 34-button telephone with membrane

* Vintage telephone; no longer available for sale or lease

Table 1-5 Continued

Model	Description
10-button HFAI*	10-button hands-free-answer telephone. No adjuncts are supported.
34-button BIS*	34-button telephone with built-in speakerphone
34-button BIS/DIS*	34-button telephone with 16-character display and built-in speakerphone
BIS-10	10-button telephone with built-in speakerphone
BIS-22	22-button telephone with built-in speakerphone
BIS-22D	22-button telephone with 16-character display and built-in speakerphone
BIS-34	34-button telephone with built-in speakerphone
BIS-34D	34-button telephone with 16-character display and built-in speakerphone
MLC-5 Cordless	Cordless 5-button telephone

* Vintage telephone; no longer available for sale or lease

Single-Line Telephones

The system supports the single-line analog telephones listed in Table 1-6.

Note: 2500MM or 500MM telephones should be used for PFT telephones. If the telephones are to be connected to GS lines/trunks, a GS button (KS 23566L1, PEC 31021) must be added to each PFT station. If rotary lines/trunks are used, PFT telephones must be rotary telephones.

Table 1-6 Single-Line Telephones

Model	Description
2500MMGB	Basic desk telephone
2554MMGJ	Basic wall telephone
2500YMGK	Basic desk telephone with message-waiting light and Recall button. Recall button is used instead of the switchhook for features that require a switchhook flash, such as Transfer and Hold.
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-waiting light and Recall and Disconnect buttons. No adjuncts are supported.

* Vintage telephone; no longer available for sale or lease

Table 1-6 Continued

Model	Description
7102A	Basic desk telephone with message-waiting light and Recall button. No adjuncts are supported. Can be used for PFT stations.
CS6402U01A*	Basic desk telephone, Feature Phone Model 420. Has built-in speakerphone, memory, and redial.
2500MMGJ	Basic desk telephone
2500MMGK	Basic desk telephone with the following limitation: Timed Recall button action (similar to a switchhook flash) will invoke the Hold and Transfer feature.
500MM 554BMPA 500SM	Basic telephones with the following limitations: Since these sets are equipped with rotary dials, no system features requiring * and # can be used. Telephones equipped with neon message-waiting lights are not supported.

***** Vintage telephone; no longer available for sale or lease.

Telephones and Adjuncts Not Supported

CAUTION:
The following telephones and adjuncts cannot be used with the system. Connecting them can damage the telephones, adjuncts, and system.

Table 1-7 Telephones and Adjuncts Not Supported

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 that are supported on the MERLIN II communications system.
MET telephones	Multibutton electronic telephones (MET) and adjuncts that are used with the Dimension® PBX and Horizon® systems.
Single-line telephones	with neon message-waiting light
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

System Operator Consoles

System operator consoles are telephones that are programmed for call handling and other operator duties.

Two configurations of operator consoles can be used—direct-line console (DLC) and queued call console (QCC). In a DLC configuration, lines/trunks are assigned to individual buttons and the console can have several calls ringing at the same time. In a QCC configuration, incoming calls are held in a queue and calls are directed to, a QCC as a position becomes available. Only one call rings at a time.

The following telephones can function as DLCs:

- MLX-20L telephone*
- MLX-28D telephone*
- MERLIN II System Display Console with built-in DSS
- BIS-34D
- BIS-34
- BIS-22D

Note: In a Hybrid/PBX system, only the MLX-20L telephone can function as a QCC.

DLCS are connected either to an analog station jack on a 008 or 408 analog multiline telephone module or to a digital station jack on a 008 MLX module. QCCs must be connected to a digital station jack on a 008 MLX module. The QCC system operator console must be connected to the first jack on the first 008 MLX module.

* One or two DSS adjuncts can be added to provide 50 or 100 additional extension buttons.

Adjuncts

Adjuncts are pieces of equipment that connect directly to the CU or to a telephone through an adapter (see “Adapters” below). Answering machines, credit card verification terminals, and external alerts are examples of adjuncts. For more information on adjuncts, see Appendix B.

Adapters

Adapters enable a proper connection of equipment or, in the case of the channel service unit (CSU), of a DS1 facility to the CSU. Some adapters connect directly to the CU (system adapters) while others connect to telephones (telephone adapters). See Chapters 3 and 6 for the installation procedures for these adapters:

- system adapters
  - ESF T1 CSU
  - 551 T1 L1 CSU
  - Universal Paging Access Module (UPAM)
- telephone adapters
  - Multi-Function Module (MFM) for digital telephones
  - General Purpose Adapter (GPA) for analog telephones
  - ISDN 7500B Data Module for connecting digital data equipment either directly to the CU or to an MLX telephone (for simultaneous voice and data transmission)
  - modem for connecting digital equipment, such as a personal computer (PC), to a tip/ring (T/R) interface
  - Supplemental Alert Adapter (SAA) for connecting alerts (such as horns or strobes) to an analog multiline telephone

System Capacities

The system comes in two sizes, large and small. The large system supports up to 80 central office (CO) lines/trunks and 144 stations, such as telephones and fax machines, and the small system supports up to 24 CO lines/trunks and 56 stations. The size of the system is determined by its memory capacity—that is, the processor module (including the feature module) located in the control unit (CU).

The large system has a total capacity of 224 jacks (80 CO lines/trunks plus 144 stations); however, each MLX module station jack supports two logical endpoints (station devices that can operate simultaneously and independently). For example, an MLX telephone with a Multi-Function Module (MFM) plugs into only one station jack, but the jack supports the telephone and the equipment connected to the MFM (such as a fax machine or an answering machine).

In a similar way, although the 100D module has only one jack, it can serve up to 24 endpoints (emulated lines/trunks or ISDN-PRI lines/trunks).

Thus, the large system can be configured to connect up to 80 lines/trunks and 255 station endpoints, a total of 335 endpoints.

Note: The system has a time-slot capacity of 216. If more than 216 endpoints are in use at the same time, blocking can occur.

Table 1-8 lists the capacities of the system's hardware and software components for both small and large systems.

Table 1-8 System Capacities

Components	Small	Large
Carriers*		
■ Total	3	3
■ Line/trunk and station module slots/basic carrier	5	5
■ Line/trunk and station module slots/expansion carrier	6	6
■ Maximum slots available for modules	17	17
DS1 Modules	1	3
Endpoints (devices)	56	255
Lines/Trunks	24	80
Operator Consoles		
■ DLCs:		
▪ MLX†	6	8
▪ Analog multiline‡	8	8
■ QCCs§	4	4
■ DSSs**	12	16
■ Combination of DLCs and QCCs	8	8
■ Number of consoles per module	2	2

* The basic carrier contains a power supply module, processor module, and five slots for line/trunk and station modules. Each expansion carrier contains a power supply module and six slots for line/trunk and station modules.

† MLX-20L or MLX-28D telephone, two per MLX module

‡ MERLIN II System Display Console or 34- or 22-button analog multiline telephone with display; two per analog multiline module

§ MLX-20L telephone; two per MLX module

** Two per MLX module (built into MERLIN II System Display Console)

Table 1-8 Continued

Components	Small	Large
Ports (not achievable simultaneously)		
■ Total (lines/trunks plus stations)	80	224
■ Voice and data stations	56	144
■ Voice Announce to Busy	28	127
■ Voice-mail interface	20*	20*
■ Data via ISDN 7500B Data Module	24	127
■ Paging	3	3
■ Delay announcements	32	32
System programming equipment†		
■ MLX-20L	1	1
■ RS-232 jack (for connection of PC with SPM)	1	1
■ Modem	1	1
Telephones		
■ Single-line	56	144
■ Analog multiline		
▪ Without Voice Announce to Busy	56	136
▪ Without Voice Announce to Busy	28	127
■ MLX-20L	16‡	481‡
■ MLX with ISDN 7500B Data Module or MFM	24	127
■ Power failure transfers	6	20
Two-party conversations	40	108
Traffic (CCS/hr/station)**	7.0	6.0
Voice-mail systems	1	1

* Although system software supports up to 24 voice-mail interface (VMI) ports, all the VMI ports must be in the same calling group, and the maximum number of stations in a calling group is 20.

† Remote access overrides on-site programming except during backup or restore

‡ Total includes the MLX-20L telephone used for system programming

§ One per four GS/LS line/trunk jacks

** Assuming 20 percent internal traffic

Table 1-9 lists the capacities for features.

Table 1-9 Feature Capacities

Feature	Description	Maximum
Allowed Lists	Number of lists	8
	Entries per list	10
	Digits per entry	7
ARS	Number of ARS patterns	18
	Subpatterns per pattern	2
	Routes per subpattern	6
	Number of fully programmable ARS tables	16
	Entries per table	100
	Entries across all tables	1600
	Default tables	4
Callback	Number of calls in queue	64
Calling Groups	Number of groups	32
	Members per group*	20
	Groups per member	1
	Delay announcements per system	32
	Delay announcements per group	1
	Groups per delay announcement	32
	External alerts per group	1
	Coverage groups per group	1
Coverage Groups	Number of groups	30
	Senders per group	56 (small) 144 (large)
	Groups per sender	1
	Receiver buttons per group	8
	Groups per QCC receiver	30

* QCCs cannot be members.

Table 1-9 Continued

Feature	Description	Maximum
Data Hunt Groups	Number of groups	32
	Members per group	20
	Groups per member	1
DID	Number of blocks	2
	Number of trunks	24 (small) 80 (large)
Directories	System Directory	
	■ Number per system	1
	■ Listings per directory	40 (small) 130 (large)
	Extension Directory	
	■ Number per system	1
	■ Listings per directory	56 (small) 144 (large)
	Personal Directory	
	■ Number per system	16 (small) 48 (large)
	■ Listings per directory	50
Disallowed Lists	Number of lists	8
	Entries per list	10
	Digits per entry	11
Fax	Number of fax machines	16*
Night Service	Groups	8
	Members per group	56 (small) 144 (large)
	Groups per member	8
	Emergency Allowed List entries	10

* System can support more than 16 fax machines, but those machines in excess of 16 cannot use the fax message-waiting feature.

Table 1-9 Continued

Category	Description	Maximum
Park Codes	Number of codes	8
Personal Lines	Number of station endpoints	56 (small) 64 (large)
Personal Speed Dial Numbers	Number of entries per telephone	24
	Number of entries per system	880 (small) 1200 (large)
	Digits per entry	28
Pickup	Number of groups	30
	Members per group	15
	Groups per member	1
Pools (trunk groups)	Number of pools	11
	Number of trunks in a pool	24 (small) 80 (large)
Pool Buttons	Number of station endpoints	56 (small) 64 (large)
Remote Access	Number of barrier codes	16
	Digits per code	4
Shared System Access Buttons	Number of shared buttons per SA	16
System Speed Dial	Number of entries per system (up to 40 digits each)	40 (small) 130 (large)

Data Capabilities

The system can provide data connections between two digital data modules (ISDN 7500B Data Modules), between two analog modems, or between an analog modem and a digital data module. The system provides access to an in-house host computer or to a data station on a network.

Data facilities include

- digital data endpoints—RS-232 interfaces via ISDN 7500B Data Modules
- analog data endpoints—tip/ring modem interfaces
- local host computer and workstation on local area network (LAN) access (only via an RS-232 interface)
- DS1 facility interface (analog data via T1 or ISDN-PRI, or digital data via ISDN-PRI)

Networking Capabilities

The system can connect to another system via the two CUs or via the tie trunks.

Control Unit to Control Unit

This system's CU can connect to another system's CU in three ways:

- from an off-premises telephone (OPT) line to an LS line/trunk (or vice versa) via analog facilities
- via an analog tie trunk (400EM module)
- via a digital tie trunk using emulated E&M in the T1 mode on a 100D module. A back-to-back connection from one DS1 facility to the other can be used when the total cable distance is fewer than 1300 feet.

OPT/LS Connection

A 008 OPT module on system A's CU can be connected to an LS port on system B's CU. This enables the user on system B to access all the stations and facilities on system A. If system B has Remote Access, the user on system A can directly access stations and facilities on system B without operator intervention. Conversely, an LS port on system A can be connected to an OPT port on system B.

Note: If the systems are on the same premises, the connection can be made to any T/R port.

With the OPT/LS connection, glare is more frequent as the volume of calls increases. (Glare occurs when a user tries to make an outside call on a line/trunk at the same time an incoming call is being received on that line/trunk.) In addition, if system B (the LS interface) does not have Remote Access, only the station(s) assigned to the LS facility on system B can be accessed by system A.

Analog Tie-Trunk Connection

In an analog tie-trunk connection, the system A's 400EM module is connected to system B's CU. On premises, this module can be connected directly to system B if system B has similar tie-trunk facilities.

For off-premises connection, the 400EM module can be connected via the telephone company's facilities to system B.

The analog tie-trunk connection can be programmed for two-way traffic or for one-way traffic (incoming or outgoing). The one-way mode prevents blocked calls caused by glare.

Digital Tie-Trunk Connection

The digital tie-trunk connection joins the DS1 facility (the 100D module) on system A to system B's DS1 facility. If system B is on premises, the connection is back-to-back. To reach a remote system, the DS1 facility connects via a channel service unit (CSU) to the telephone company's facilities.

Tie-Trunk Networks

The following tie-trunk networks can be used with the system.

Nontandem

The nontandem network is used primarily to connect station lines at both ends; it does not connect to another tie trunk (see Figure 9).

Tandem

The tandem network has a station on one system connected to a station on a third system via a tie-trunk connection in a second system. The tandem network can also be used to connect to an external facility in the third system, but the grade of service will be fair to poor if one or both tie trunks are analog (see Figure 9).

Intertandem

The intertandem network has a tandem tie trunk connected to tie trunks at both ends. It is not recommended for analog tie trunks (see Figure 9).

Functional Units

The functional units are the processor module, which controls the operation of the system and its features; the line/trunk and station modules, which connect the central office (CO) lines/trunks to the stations; the power supply module, which supplies power to the control unit; and the carrier with its backplane assembly, which contains the input/output (I/O) bus and the time-division multiplex (TDM) bus. All the modules are electrically connected to the backplane, which provides common circuitry for the I/O bus, the TDM bus, and power distribution. (See Figure 10 for a functional block diagram of the system architecture.)

The processor module is connected to intelligent ports on the line/trunk and station modules, through the I/O bus, by the digital switch element (DSE) on each line/trunk and station module. The TDM bus also is connected to the DSE of each line/trunk and station module. The two busses are described below:

- **Input/Output Bus.** The I/O bus contains a 16-bit address bus and an 8-bit data bus. The address bus selects the module that receives instructions from the 68000 microprocessor in the processor module. The microprocessor provides instructions to the port processors and DSEs through the 8-bit data bus.
- **Time-Division Multiplex Bus.** The TDM bus connects the DSEs to allow voice or data to flow in and out of the system. The TDM bus is parallel, 8 bits wide, and runs at 2.048 MHz (256 time slots x 8 kHz = 2.048 MHz). Each TDM cycle has 256 time slots for voice, data, tones, and clocks. The frame repetition rate is 8 kHz, providing a 64-kbps channel on each time slot (8-bit bus x 8 kHz = 64 kbps).

The built-in data modem connects to the TDM bus; this permits access from a local or remote PC or workstation equipped with a 1200-bps modem. The TDM bus connects with the built-in diagnostics that enable the processor to read and write to dedicated TDM test slots.

Voice signals on the TDM bus are encoded in Mu-Law 255 pulse code modulation (PCM) format for domestic use. The system provides a circuit-switched connection for transmission of digital data signals up to 64 kbps. See “Signal Processing” on the next page.

Signal Processing

Because the system is internally a digital system that must interact with both analog and digital devices, it must accurately translate analog signals. Doing this involves signal conversion, quantizing, commanding, and switching.

Signal Conversion

The first step in analog-to-digital (A/D) conversion is to sample the analog signal and convert the signal into a series of amplitude steps. This is called pulse amplitude modulation (PAM).

PAM samples the height of the analog waveform 8000 times per second, or more than twice the frequency of the input signal bandwidth (for analog voice the bandwidth is 3300 Hz). Because the analog signal is sampled at more than twice its bandwidth, both the amplitude and frequency content of the original analog signal are preserved. The amplitude of each PAM sample is then digitally encoded and transmitted by using a process called pulse code modulation (PCM).

PCM uses PAM as its starting point but goes further by digitizing the PAM signal for transmission via the digital switch. PCM converts the height of each PAM pulse to an 8-bit digital signal for transmission.

PCM digitizes the PAM information by comparing each PAM sample to a point on a chart. Each point has a distinct 8-digit binary code. Therefore, it is the binary code (digital), not the amplitude pulse (analog), that is transmitted in PCM. At the destination, the PAM signal is reconstructed from the PCM signal via a digital-to-analog (D/A) converter. The D/A converter also completes the reconstruction of the analog signal from the stream of PAM signals.

The digitally encoded signals are routed from one interface port to another interface port by assigning source and destination to specific time slots on the TDM bus. In this way, signals can be transmitted to one or several destinations and reconstructed at the original amplitude. The result is no signal loss during switching and transmission from one point to another.

Quantizing

The process of converting PAM samples into discrete PCM values is called quantizing. In the case of voice-grade signals, eight bits are commonly used to encode one PAM sample. Quantizing with eight bits allows 256 unique values to represent the range of amplitudes in the analog signal being sampled.

Quantizing causes distortion due in part to the “rounding off” of PAM samples into discrete PCM values. This distortion can be minimized by increasing the number of bits used to encode each PAM sample or by increasing the sampling rate. Using 8-bit coded samples taken at an 8-kHz rate results in toll-grade transmission quality.

Companding

Distortion also occurs in quantizing because equal consideration is given to all amplitude levels. Linear quantizing divides the amplitude range into equal segments, which results in unnecessary quality at levels where voice signals are unlikely to occur and not enough quality where they do occur. Commanding eliminates this distortion by using a nonlinear scale that has smaller divisions and more accuracy in areas of the scale where voice signals are most likely to occur.

Mu-Law 255

Mu-Law 255 is a commanding scheme that uses a compression ratio compatible with modern channel bank equipment. The scale is divided into 16 intervals, with each interval having 16 levels. Therefore, the scale has 256 discrete values. But since Mu-Law 255 has a negative and a positive zero, it really has only 255 discrete values. This commanding scheme is used in the United States and Japan.

Digital Switching

The TDM bus allows many users to communicate over a common electrical connection because it is physically distributed across the backplane of the CU and connects all line/trunk and station modules.

The TDM bus has specific time slots for various functions. For example, during a conversation between station A and station B, a time slot is resewed for station A to transmit on and for station B to receive on. An analog station can transmit on time slot 150 and receive on time slot 160. Because the TDM bus cycles 8000 times per second, the conversation is continuous.

The TDM bus carries tones and control signals to stations via time slots 0 to 39. Unlike other bus configurations, the stations on the TDM bus receive all transmissions. If a station is not assigned to any of the time slots, the station ignores the data.

The digital switch element (DSE) is a digital switch for voice and data. It also performs the operations for commanding schemes such as Mu-Law and A-Law. Each module has a DSE to interface codecs or digital transceivers to the TDM bus. The actual digital switching occurs when the DSE is programmed by the system I/O bus to transmit data on or receive data from the TDM bus in specific time slots. For example, the digital station can send data on time slot 200 and receive data on time slot 220.

This process also involves time slot interchanging so that an available slot in the TDM cycle can be filled with a transmit or receive slot. The DSE allows up to 16 time slots to be conference and sent out to a single station port.

Tie-Trunk Signaling

Tie trunks transmit via three different signaling formats, each made up of a specific mode and a specific type.

The DIP switches on the 400EM module select the signaling modes needed for tie-trunk transmission (see Figure 72); the signaling type is selected during system programming.

Signaling Modes

There are two signaling modes:

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

In the simplex mode, protective resistance is always included in the circuit. The E&M mode can be either protected or unprotected from high-voltage transients or fluctuations. In the protected mode, a resistance is added to the leads to reduce current peaks. The protected mode is used when there is no network interface to protect the circuit from outside interference.

The unprotected mode must be used for an E&M type 1 standard interface (see below) to meet the specified voltage-drop criteria. This mode is used when there is a network interface.

CAUTION:
The protected mode must be used whenever the E&M leads extend out-of-building and are not connected to the network interface.

Signaling Types

Three different signaling types combine with the signaling modes. Together these create the proper signaling format for each system.

- **Type 1 standard.** This is the factory-set type, which is used to connect two systems through two intermediate COs. The switches must be set for E&M mode.
- **Type 1 compatible.** This type is used to connect directly without intermediate COs. One system is set to type 1 standard, the other to type 1 compatible. The switches must be set for E&M mode.
- **Type 5 simplex.** This type is used to connect similar systems or systems with compatible signaling that are located in the same building or on the same business campus.

The choice of a tie-trunk signaling format depends on the particular application and the two systems being connected, including whether or not the tie-trunk signals pass through CO lines or over customer-owned cable. Table 1-10 shows how to determine tie-trunk compatibility between the MERLIN LEGEND Communications System and other systems.

Table 1-10 Tie-Trunk Compatibility

Installation Situation		Preferred Signaling Format			
From MERLIN LEGEND Communications System		MERLIN LEGEND Communications System		Far End	
To	Location	Signaling Mode and Type	Protected or Unprotected	Signaling Mode and Type	Protected or Unprotected
MERLIN LEGEND or MERLIN II	Same site or inter-building	Simplex; type 5	N/A	Simplex; type 5	N/A
System 25 or System 75	Same site or inter-building	Simplex; type 5	N/A	Simplex; type 5	N/A
System 85	Sane site or inter-building	Simplex; type 5	N/A	Simplex; type 5	N/A
Dimension PBX	Same site	E&M; type 1; compatible	Unprotected	E&M; type 1; standard	Unprotected
Dimension PBX	Inter-building	E&M; type 1; compatible	Protected	E&M; type 1; standard	Protected
Other	Same site	E&M; type 1; compatible	Unprotected	E&M; type 1; standard	Unprotected
Other	Inter-building	E&M; type 1; compatible	Protected	E&M; type 1; standard	Requires a protection unit
Network Interface	N/A	E&M; type 1; standard	Unprotected	N/A	N/A

DS1 Capabilities

A Digital Signal One (DS1) facility is a transmission system that transports digital signals in the DS1 format. The interface that allows the connection of DS1 facilities to the system is the 100D module. Through this module voice and data calls can be placed on or received by a DS1 facility.

Twenty-four Digital Signal Zero (DS0) channels, each operating at 64 kbps, plus framing bits, are multiplexed, forming a DS1 signal of 1.544 Mbps. Each DS0 channel within the DS1 signal corresponds to a logical endpoint. Even though there is only one physical jack, the 100D module supports up to 24 logical endpoints or ports (one for each channel).

In DS1 format, calls to other digital PBXs or COs remain digital, and signals do not need to be converted to analog for acceptance by the connecting trunk. In addition, the 100D module can be configured to work with T1 or Integrated Services Digital Network Primary Rate Interface (ISDN-PRI) service.

To connect the 100D module to an outside DS1 facility, a channel service unit (CSU) is used. The CSU regulates the transmission into and out of the 100D module so that the module matches the transmission of the outside facility.

Both ends of the DS1 facility must be able to “speak the same language.” To ensure this, the following options are set during system programming to match the transmission of the outside DS1 facility:

- type of service (T1 or ISDN-PRI)
- framing format
- line coding
- line compensation

- clock synchronization
- signaling mode (for T1 service only)

The appropriate setting for each option is determined by the transmission facility to which the module is connected. Each option is discussed below.

Type of Service

The system supports two types of service for DS1 facilities: T1 and ISDN-PRI. The 100D module can be programmed to operate in either type of service. T1 service transmits and receives voice and analog data; ISDN-PRI transmits and receives voice and analog and digital data.

The following AT&T Switched Network (ASN) services are provided through a T1 or ISDN-PRI line/trunk:

- Megacom WATS service for domestic long-distance outward voice calls; ISDN-PRI does not support international dialing for Megacom WATS service.
- Megacom 800 service for domestic toll-free incoming voice calls. T1 service supports Megacom 800 with or without Dialed Number Identification Service (DNIS), while ISDN-PRI supports it only without DNIS. Also, ISDN-PRI does not support international dialing for Megacom 800 service.
- Software Defined Network (SDN) for voice and circuit-switched data calls (up to 56 kbps). SDN lets businesses use portions of the ASN in concert with their dedicated private line networks. However, the system does not support “uniform dialing plan,” which is necessary for complete integration with SDN. Also, ISDN-PRI service does not support international dialing for SDN.
- MultiQuest® service for domestic toll incoming voice calls (900 number). T1 supports MultiQuest service with or without DNIS, while ISDN-PRI supports it only without DNIS.

Any combination of these ASN services can be used in T1 or ISDN-PRI.

In addition to these ASN services, T1 also supports Shared Access for Switched Services (SASS). SASS allows both Megacom WATS and Megacom 800 services to be offered over the same line/trunk facilities, eliminating the need to have separate incoming and outgoing line/trunk groups.

Like T1, ISDN-PRI also supports Megacom WATS and Megacom 800 services on a shared line/trunk, but only on a call-by-call basis. Besides this, ISDN-PRI provides Accunet® Switched Digital Service for 56-kbps, 64-kbps restricted, and 64-kbps clear circuit-switched data calls. However, Accunet Switched Digital Service is not supported for international dialing.

T1

T1 is the factory setting and is selected for the DS1 facility to allow each of the 24 channels to be programmed to emulate tie, LS, or GS lines/trunks in any combination. This means that a single 100D module can take the place of 24 regular outside lines.

If common-channel signaling is selected, 23 channels are available for emulation and the 24th channel carries formatting signals.

ISDN-PRI

ISDN-PRI is a standard format for ISDN service. Some of the benefits of ISDN-PRI service are

- **Speed.** Data calls to outside destinations can be established on the same B channels used for voice calls if the service allows. Modems and dedicated, conditioned lines/trunks are not needed.

- **AT&T's INFO2 automatic number identification (ANI) service.** Customers who subscribe to this service can identify an incoming call on an lSDN-PRl line/trunk by either telephone number or billing number.

  Note: The availability of the caller identification information may be limited by local-serving (caller's) jurisdiction, availability, or CO equipment.

- **Dynamic B-channel assignment.** An individual B channel can be removed from service without blocking calls to or from any other B channels.
- **Improved toll restriction.** The ways that toll restriction can be bypassed are limited on ISDN-PRI lines/trunks.
- **Reliable indication of far-end disconnect.**
- **Improved SMDR reports.** Call timing for SMDR reports is improved since lengths of times recorded are closer to the actual billed duration.

Framing Format

To identify the DS0 channels, the DS1 signal is segmented into blocks of 193 bits, called frames. A frame consists of 24 eight-bit words (one for each channel) plus a framing bit at the beginning of each frame: 24 words x 8 bits = 192 bits. Thus, a framing bit appears in every 193rd bit position of the 1.544-Mbps DS1 signal.

Frames repeat at a rate of 8000 per second, with each frame repeating DS0 channels 1 through 24 sequentially.

Two methods of framing can be used by a 100D module, but the framing format chosen must match the framing at the far end:

- **D4 Framing Format.** The system is factory set for the most common framing format, D4 framing. A D4 frame consists of 24 eight-bit time slots and one framing bit. To synchronize the

signals, the receiving equipment uses the framing information to identify the start of each frame and to identify which frames contain signaling information. The framing information repeats once every 12 frames; these 12 frames form the D4 superframe. This framing format is used by most DS1 equipment.

- **ESF Framing Format.** The extended superframe (ESF) format extends the 12-frame D4 superframe to a 24-frame superframe, hence its name. The 24 framing bits include a cyclic redundancy check (CRC) for the entire extended superframe and a facility data link for maintenance. The ESF can detect more errors than D4 framing; however, ESF is not used universally by DS1 equipment.

Line Coding

The DS1 signal consists of a continuous bit stream of ones and zeros, encoded into bipolar pulses for transmission. Only the ones create a pulse; the zeros represent the absence of a pulse. The pulses of the ones alternate between positive and negative. This type of line coding is called bipolar or alternate mark inversion (AMI). The line-coding formats guarantee that the "ones-density" requirement is met to achieve clock recovery.

To meet the ones-density requirement, either zero code suppression (ZCS) or bipolar 8 zero substitution (B8ZS) line coding is used. The factory-set line coding is ZCS.

ZCS

ZCS line coding monitors each DS0 channel and prevents strings of eight or more zeros. Upon detecting eight consecutive zeros in a channel octet, ZCS line coding forcibly changes the seventh zero (second least significant bit) to a one.

With ZCS line coding, any bit that is overwritten has no noticeable effect on voice and voice-grade data. However, the ZCS line-coding format can cause errors in digital data transmission.

B8ZS

B8ZS line coding encodes an all-zero channel octet into a unique binary sequence with a "bipolar violation" in bit positions 4 and 7. Normally, for bipolar (AMI) transmission, ones are encoded alternately as a positive then negative, or negative then positive, pulse. If two positive or two negative pulses are received in succession, a bipolar violation occurs.

Ordinarily bipolar violations are caused by noise hits on the signal. However, B8ZS line coding allows the 8-bit strings to be detected at the receiving end and converted back into the original sequence.

B8ZS line coding is preferred over ZCS because it does not cause errors in data transmission.

B8ZS violations are passed by the ESF T1 CSU but not by other CSUs. The CSU is a hardware component needed when two endpoints are located in different buildings or when the distance between the two endpoints makes office or line repeaters necessary. The CSU is located on the customer's premises and is used to connect the system to DS1 network facilities (see "Install the Channel Service Unit" in Chapter 3, "Installation").

Line Compensation

Line compensation adjusts for the amount of cable loss in decibels (dBs), based on the length of cable between the 100D module and the CSU or other far-end connection point. The factory setting is a value of 1, which allows a maximum loss of 0.6 dB. The other possible settings are shown in Table 1-11.

Table 1-11 Line Compensation Settings

Setting	dB Loss	Cable Feet
1	-0.6	0-133
2	-1.2	133-266
3	-1.8	266-399
4	-2.4	399-533
5	-3.0	533-655

Clock Synchronization

Clock synchronization is an arrangement where digital facilities operate from a common clock. Whenever digital signals are transmitted over a communications link, the receiving end must be synchronized with the transmitting end to receive the digital signals.

The system synchronizes itself to the network by extracting the timing signal from the incoming digital stream. If the system has more than one 100D module, the module that provides the primary synchronization for the other 100D modules and for the TDM bus must be identified during system programming. The factory setting is the first 100D module in the carrier. This can be changed to the second or third module.

Backup synchronization in the event of a maintenance failure can be provided by programming the second and third installed modules as secondary and tertiary synchronization.

In addition, the source of synchronization can be factory set to "loop clock reference source" (the clock is synchronized to the external endpoint) or set to "local clock reference source" (the clock is free running). This setting must be made for the primary, secondary, and tertiary synchronization modules.

Signaling Mode

Signaling is the process of communicating channel-state information (such as dialing) from endpoint to endpoint. Two types of signaling can be used in T1 transmission: robbed-bit signaling (RBS) and common-channel signaling (CCS).

Choosing a signaling mode pertains only to T1 service; ISDN-PRI always uses common-channel signaling (23 B channels and 1 D channel).

Robbed-Bit Signaling

RBS replaces ("robs") the least significant bit of every sixth frame of each DS0 channel with signaling information. (RBS is also called in-band signaling, since signaling information is embedded in the least significant bit of every sixth 8-bit word.)

RBS is appropriate for voice and voice-grade data (up to 1200 baud), but facilities using RBS cannot accurately transmit digital data because digital data uses high-speed data rates, such as 64 kbps. Therefore, the channel is limited to voice and analog voice-band data applications.

Common-Channel Signaling

CCS is an out-of-band signaling format that places the signaling bits for channels 1 through 23 into the 8-bit word of the 24th channel. This restricts DS1from using the 24th channel for voice or data transmissions.

D4 framing does not preclude the use of CCS, but CCS is not compatible with D4 channel banks because the D4 channel banks recognize only RBS. Coupled with B8ZS coding, CCS can support digital data up to 64 kbps per channel.

Recommended Framing and Signaling Formats

ESF framing should be used to take advantage of its improved maintenance, diagnostic, and testing capabilities (the ESF T1 CSU is required to interface with the network). If the transmission between two systems is voice-only, RBS should be used for all 24 communication paths. For voice transmission, both ZCS and B8ZS line coding can be used to satisfy the ones-density requirement; the preferred line-coding format is B8ZS, which is needed for 64-kbps digital data.

The framing and signaling formats depend on the network and interconnection devices (CSUs) used. For example, many CSUs support only ZCS line coding.

Notes:

- Digital data up to 64 kbps is possible only in ISDN-PRI mode. Also, ESF framing mode, CCS signaling, and B8ZS line coding are required.
- An ESF T1 CSU must be used for interbuilding DS1 connections.

Preparation

2

Certain hardware placement and connection requirements must be met before installation. This chapter tells you how to meet these requirements to ensure proper operation.

To verify that the requirements have been met, you must have the following information about the system:

- location of the control unit (CU), wiring fields, network interface, and power for the system
- type and number of central office (CO) facilities provided by the local telephone company
- hardware requirements for the CU, wiring fields, telephones, data equipment, and optional equipment
- location of the telephones, data equipment, and optional equipment
- types and placement of CU modules
- jack assignments for lines, trunks, and stations
- requirements for voice and data features

Planning Forms

First, review the completed planning forms, service order forms, and floor plan. If you do not have these forms, contact the customer's AT&T representative, the Customer Service Center (CSC), or the authorized AT&T dealer. The planning forms are listed in Tables 2-1, 2-2, and 2-3. Not all of them are necessary for each system.

Table 2-1 Required Planning Forms

Form No.	Description
Form 1	System Planning
Form 2a	System Numbering—Station Jacks
Form 2b	System Numbering—Digital/ISDN Station Adjuncts
Form 2c	System Numbering—Line/Trunk Jacks
Form 2d	System Numbering—Special Renumbers
Form 3b	Outside Trunks—Pools (PBX only)
Form 4a	Analog Multiline Telephone
Form 4b	Digital/ISDN (MLX) Telephone
Form 4c	Tip/Ring Equipment
Form 5a	Direct-Line Console (DLC)—Analog
Form 5b	Direct-Line Console (DLC)—Digital/ISDN
Form 5c	Queued Call Console (QCC) (PBX only)

Table 2-2 Required Planning Forms for 100D, 400EM, or 800 DID Modules

Form No.	Description
Form 3a	Outside Trunks—Remote Access
Form 3c	Outside Trunks—DS1 Facility (100D Module)
Form 3d	Outside Trunks—Tie
Form 3e	Outside Trunks—DID (PBX only)

Table 2-3 Optional Planning Forms

Form No.	Description
Form 6a	Optional Operator Features
Form 6b	Call Pickup Groups
Form 6c	Group Paging
Form 6d	Group Coverage
Form 6e	Group Calling
Form 6f	System Features
Form 6g	Allowed Lists
Form 6h	Disallowed Lists
Form 7a	Night Service—Group Assignment
Form 7b	Night Service—Outward Restriction

Table 2-3 Continued

Form No.	Description
Form 7c	Night Service—Time Set
Form 8a	Label Form—Lines/Trunks
Form 8b	Label Form—Stations and Calling Groups
Form 8c	Label Form—Posted Message
Form 8d	System Speed Dial and System Directory
Form 9a	Automatic Route Selection Worksheet (PBX only)
Form 9b	Automatic Route Selection Tables (PBX only)
Form 9c	Automatic Route Selection Default and Special Numbers Tables (PBX only)

Environment

The CU requires the following environmental conditions.

Table 2-4 Environmental Requirements

Operating Temperatures	40°–104°F; 4°–40°C Optimum temperature 60°F
Humidity	20% – 80%
Airborne Contamination	Do not expose the CU to moisture, corrosive gases, dust, chemicals, spray paint, or similar material.
Ventilation	■ Allow at least 1" on the right and left sides of the CU and 12" above and below the CU to prevent overheating. ■ Do not place the CU near extreme heat (furnaces, heaters, attics, or direct sunlight).
Electrical Fields	Do not expose the CU to devices that generate electrical currents that cause 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.

Space and Location

The customer must provide a backboard on which to mount the CU. The backboard should be wire enough to accommodate additional carriers if system growth is anticipated. Attach the backboard to the wall, allowing enough room on either side of the CU for necessary wiring fields.

Backboard Requirements

- Dimensions
  - without SYSTIMAX wiring
    - — small system: 4’W x 3’H x 3/4"D
    - — large system: 6’W x 3’H x 3/4"D
  - with SYSTIMAX wiring
    - — small system: 5’W x 4’H x 3/4"D
    - — large system: 7’W x 4’H x 3/4"D
- Material
  - 3/4" plywood
  - Check with local building code enforcement agency to see if fire-retardant material must be used.

- Mounting Hardware
  - For a wood mounting surface, use woodscrews.
  - For a brick, cinder block, or concrete mounting surface, use masonry anchors.
  - For a plaster or plasterboard mounting surface, use toggle bolts.
  - For a sheet-metal mounting surface, use sheet-metal screws and attach them to structural members.

  Note: The combined pullout force of the backboard should beat least 650 lbs.

Control Unit Requirements

- Dimensions
  - Basic carrier—14”W x 23”H x 12”D
  - Basic carrier and one expansion carrier—25” W x 23” H x 12”D
  - Basic carrier and two expansion carriers—37” W x 23” H x 12” D
- Location
  - Within 5 feet of AC power outlet that is not switch controlled
  - Within 25 feet of the network interface
  - Within 1000 cable feet of telephones

Power and Grounding

Proper power and grounding are essential for correct and safe functioning of the system.

Power Requirements

The customer should provide a load center of appropriate current rating equipped with 120-VAC, 15-amp circuit breaker(s). Each breaker must protect one dedicated quad AC outlet or two dedicated duplex AC outlets.

One outlet must have an attached ground bar connected by a #6 AWG copper wire to an approved ground. This ground bar is the system's single-point ground (see Figure 11).

Table 2-5 contains the AC power requirements and specifications for the CU.

Table 2-5 AC Power Requirements

Parameter	Value	Unit
Nominal voltage	117	VAC
Voltage range*	99-129	VAC
Frequency	60 ± 5%	Hz
Maximum current	3 per power supply	amps
Power consumption	225 per power supply	watts

* The system will bridge a 40-ms AC power supply outage without DC voltages being affected.

Each carrier requires one outlet receptacle. Additional AC outlets may be required for auxiliary equipment. All AC outlets must be connected to the same load center and must have the ground wire connected to the single-point ground bar on the first AC outlet (see Figure 11).

If a printer or a PC is installed with the system, it must be plugged into the same AC branch as the power supply module of the basic carrier. If the printer or the PC is 50 or more feet from the CU, asynchronous data units (ADUs) must be installed. (See Chapter 3, “Installation,” for procedures for Station Message Detail Recording (SMDR) printer and PC installations.)

CAUTION:
The AC outlet for the CU should not be switch controlled. Plugging the CU into an outlet that can be turned on and off by a switch invites accidental disconnection of the system. The AC outlet must be properly wired (see “AC Outlet Tests” below).

AC Outlet Tests

The system must be connected to a properly grounded AC outlet. The two methods recommended for verifying proper grounding at the AC outlet are described in the following pages. See Table 2-5 for AC power requirements.

If the AC outlet test detects any of the following faults, have them corrected before installing the CU:

- open ground
- reversed polarity
- open hot
- open neutral
- hot and ground reversed
- hot on neutral with hot open

WARNING:
Hazardous voltages are present during the following tests. Use care when working with AC power line voltages.

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

1. Plug the circuit tester into the outlet to be tested. If the circuit is properly grounded, the yellow and white lights on the tester will go on.
2. Unplug the circuit tester.

Using a Volt-Ohm Milliammeter (VOM)

1. Set the VOM to the scale on which you can read 130 VAC.
2. Measure the AC outlet voltages (see Figure 11):
   - Phase to ground should be 110 to 125 VAC.
   - Neutral to ground should be less than 2.5 VAC.
   - Phase to neutral should be 110 to 125 VAC.

If the voltage readings do not measure the values required, the AC outlet is improperly wired.

WARNING:
If the AC outlet test shows an improper ground, ***do not install the system.*** *Advise the customer to have a licensed electrician correct the problem.*

Grounding Requirements

Proper grounding (see Figure 12) of the installation site safeguards system functioning by protecting the system from

- lightning
- power surges
- power crosses on CO lines/trunks
- electrostatic discharge (ESD)

The telephone company is responsible for providing protection of CO lines/trunks at the entrance to the site. The protection should consist of

- carbon blocks or gas discharge tubes connected to an approved ground
- adequate bonding of the CO line/trunk protector ground and the power company ground

The CU, the CO line 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 the ground point for the CO line protector to be bonded to the AC power ground. The AC outlet and the single-point ground bar must be properly grounded.

Each power supply module in the CU must be connected to the single-point ground bar by a #12 AWG or a #14 AWG solid copper wire. The wire run should not exceed 25 feet. (See "Provide Proper Grounding" in Chapter 3, "Installation.")

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 below.

Approved grounds (listed from most to least preferred) are

- building steel
- acceptable water pipe-must be a metal, underground water pipe at least 1/2 inch in diameter, in direct contact with the earth for at least 10 feet. It must be electrically continuous (or made electrically continuous by bonding around insulated joints, plastic pipe, or plastic water meters) to the point where the protector ground is connected. 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:
  - metal underground gas piping system—an electrically continuous metal underground gas piping system that is uninterrupted with insulating sections or joints, and without an outer nonconductive coating
  - other local metal underground systems or structures—local underground structures such as tanks and piping systems

- rod and pipe electrodes—a 5/8-inch (solid rod) or 3/4-inch (conduit or pipe) electrode driven to a minimum depth of 8 feet
- plate electrode—a minimum of 2 square feet of metallic surface exposed to the exterior soil

- concrete encased ground—must be an electrode, consisting of at least 20 feet of one or more steel reinforcing rods at least 1/2 inch in diameter, or 20 feet of bare copper conductor not smaller than #4 AWG encased in 2 inches 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—consists of at least 20 feet 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 feet below the earth's surface.

Power Surge and Lightning Protection

For most surges, the following standard grounding requirements provide adequate lightning and power surge protection:

- properly wired/grounded/bonded CO line protectors
- properly wired/grounded AC outlet
- properly grounded single-point ground bar
- properly wired connection between single-point ground and power supply modules

Additional Protection

The 391A1 power supply module and the line/trunk and station modules have built-in AC line protection. This built-in protection handles almost all situations.

Occasionally, additional protection may be needed if the customer is located in a heavy lightning area. A 147A protector can be connected to the system to limit surges from the AC lines and CO lines. One 147A protector provides protection for four CO lines. Up to three 146A protectors can be added to the 147A to provide protection for a maximum of sixteen CO lines. For more than sixteen lines, additional 147A protectors are required. (See Figure 13 for a typical 147A protector installation.)

Note: The 147A protector is usually not needed with the 391A1 power unit (the power supply module). It maybe needed with the older 391A power supply module in heavy lightning areas.

Complete installation instructions are provided with the protectors (CIB 3109 and CIB 3111).

Unit Loads

A unit load is a measure of power used to determine the electrical load on the power supply module caused by telephones, adjuncts, and DID modules. One unit load equals 1.9 watts.

Unit load and auxiliary power requirements for a new system are computed automatically by the AT&T DOSS Configurator, and any necessary auxiliary power equipment is automatically ordered. However, in the event of maintenance or equipment changes, you must calculate unit loads yourself to ensure proper operation under all conditions (see Appendix D for a unit load worksheet complete with specific unit load values).

The power supply module provides 54 unit loads to each carrier. If the unit load requirement for a carrier exceeds 54, an auxiliary power unit is needed to allow that carrier to support an additional 27 unit loads.

Note: Running the system with more than 54 unit loads per carrier may not appear to do harm. However, this can cause the system to malfunction, creating "no trouble found" situations.

An auxiliary power unit redirects the power requirements from the last two slots on the carrier. Any station connected to the modules in the last two slots receives power from the auxiliary power unit instead of the power supply module.

Besides DID trunks, only telephones and adjuncts that connect to analog and digital ports on the CU require unit load calculations. Any equipment with its own power supply (for example, an answering machine) does not have to be included in the unit load calculation.

Unit Loads for the Hybrid/PBX Mode

The 391A1 power supply module generally supports six modules of any type in a Hybrid/PBX system. However, the unit loads on a carrier can exceed 54 if both of the following exist:

- all six carrier slots have only MLX telephone or analog multiline telephone modules installed
- the carrier has a total of more than 45 MLX-20L or 34-button analog multiline telephone stations installed

Unit Loads for the Key or Behind Switch Mode

In a Key or Behind Switch system with four or fewer modules, no calculation is needed. The 391A1 power supply module generally supports four modules of any type in Key or Behind Switch mode.

Calculating Unit Loads

Calculate the unit loads of each carrier by completing the steps on the worksheet in Appendix D.

Installation

3

Installation of the MERLIN LEGEND Communications System involves these equipment areas:

- control unit
- system wiring
- telephones and consoles

Depending on the system's configuration, other equipment, such as an ISDN 7500B Data Module or a Station Message Detail Recording (SMDR) printer, can also be connected to the CU.

This chapter tells you how to install the system. Follow the recommended sequence whenever possible.

Note: You must record each station jack connection and each station change on the "System Technician's Run Sheet" (see Appendix L).

The Control Unit

Use these instructions to install a basic system control unit. Instructions for installing other equipment, such as an SMDR printer or an ISDN 7500B Data Module, are also given in this chapter. All connections to the CU must be made with the control unit housing removed.

CAUTION:

The system contains components that can be damaged by electrostatic discharge (ESD). To prevent ESD:

- *Properly ground yourself when working on the control unit.*
- *Have the customer maintain relative humidity between 20 percent and 80 percent.*

Install the Basic Carrier

Place the backboard and the basic carrier by using the instructions in Chapter 2 under “Space and Location.” Mount the basic carrier onto the plywood as far left as possible to leave space for system expansion (up to a total of three carriers).

Follow these steps to install the basic carrier (see Figure 14):

1. Mark the screw hole locations on the backboard by using the basic carrier as a guide. Make sure the carrier is level before marking the holes.
2. Lay the carrier to the side.
3. Drill a pilot hole in the center of each of the four marked mounting-hole locations.
4. Anchor the screws approximately halfway into the backboard.
5. Place the control unit housing wire clips around the molding. for the screws on the back of the carrier.

Note: Put on all four housing clips if the system has only one carrier. Put on the housing clips only on the left side of the basic carrier if an expansion carrier is to be added.

6. Position the carrier on the screws and slide the carrier to the left.
7. Check to see that the carrier is level and that the housing clips extend as far as possible from the sides of the carrier. Tighten the screws.

Install the Expansion Carrier

Follow these steps to mount the expansion carrier to the backboard and connect it to the basic carrier or to an existing expansion carrier (see Figure 15).

1. Locate the breakaway plastic tab on the right side of the already mounted carrier. Using a flat-blade screwdriver, gently pry the tab open to expose the card extenders and connectors on the carriers.
2. Align the connector of the expansion carrier with the card extender on the already mounted carrier and slide the connector onto the extender.
3. Mark the screw hole locations on the backboard by using the expansion carrier as a guide. Make sure the carrier is level before marking the holes.
4. Disconnect the connector on the expansion carrier from the card extender on the already mounted carrier and lay the expansion carrier to the side.
5. Drill a pilot hole in the center of each of the four marked mounting-hole locations.
6. Anchor the screws approximately halfway into the backboard.
7. Place the control unit housing clips around the right-hand molding for the screws on the back of the last carrier.

8. Position the expansion carrier on the screws and slide it to the left, reconnecting the card extender on the expansion carrier to the connector on the already mounted carrier. Make sure the connection is secure.
9. Check to see that the carrier is level and that the housing clips extend as far as possible from the right side of the carrier. Tighten the screws.

Install the Power Supply Modules

WARNING

*Do **not** attach any cables or power cords to the power supply module until it is installed in the carrier. Do not apply power to the CU until all the modules and power equipment are installed. Once they are installed, follow the procedures under "Turn the Power On" in this chapter. Failure to comply can result in shock hazard or damage to the equipment.*

If a ring generator is needed, install it in the power supply module before the power supply module is installed in the carrier (see "Install a Ring Generator in the Power Supply Module" in this chapter).

CAUTION:

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

CAUTION:

Remove the protective cover from each module's gold-finger connector before installing the module into the carrier.

Follow these steps to install the power supply modules:

1. Make sure all power to the CU is turned off.
2. Set the power switch on the power supply modules to OFF.
3. Install the ring generator on any power supply module providing power to a 012 basic telephone or 008 OPT module. (See “Install a Ring Generator in the Power Supply Module” in this chapter.)

   Note: Place all 012 and 008 OPT modules in one carrier whenever possible.
4. Add a copper-foil shield to any power supply module that is to be installed in an expansion carrier. (See “Add a Foil Shield to the Power Supply Module” in this chapter.)
5. Install a power supply module in the left-most slot of each carrier.

   a. Lower the module hook onto the rod.

   b. Be sure the connector on the module mates properly with the connector on the carrier.

   c. Push the module into the carrier until it locks into place.
6. Connect one end of the AC power cord to the connector marked AC INPUT on the power supply module.

CAUTION:
Do not plug the power cord into the outlet now.

Install a Ring Generator in the Power Supply Module

A ring generator provides the ringing capability for basic telephones such as single-line telephones. Figure 16 shows the proper placement of the ring generator in the power supply module.

Note: Each carrier that has 012 basic telephone or 008 OPT modules must have a ring generator installed in the carrier's power supply module before the power supply module is installed in the carrier. Place all 012 and 008 OPT modules in one carrier whenever possible.

WARNING:
Hazardous electrical voltages may be present if the following steps are not performed correctly.

Follow these steps to install a ring generator:

1. Turn off the power switch at the power supply module.
2. If there is an auxiliary power unit, unplug it from the AC outlet and then unplug it from the front of the power supply module.
3. Unplug the power supply module's power cord first from the AC outlet (or from the auxiliary power unit) and then from the front of the power supply module itself.
4. Remove the power supply module from the carrier.

   Note: At this point there should be no cords connected to the front of the power supply module.
5. Place the power supply module on its left side and remove the five screws.
6. Carefully turn the module over on its right side and remove the left half of the power supply module.
7. Position a 129B Frequency Generator (ring generator) so that its screw holes are aligned with the screw posts on the power supply module and the transformer is next to the main board.
8. Attach the ring generator to the power supply module with four screws.

9. Connect one end of the cable with the 3-pin connectors to the header labeled P101 on the power supply circuit board. Connect the other end of the cable to the header labeled P1 on the ring generator (see Figure 16).
10. Connect one end of the 4-pin cable to the header labeled P202 on the power supply circuit board. Connect the other end of the cable to the header labeled P2 on the ring generator (see Figure 16).
11. Use the clips provided with the ring generator to attach the cables to the inside edge of the plastic housing (see Figure 16). Make sure the cables do not lie across the circuit boards.
12. Replace the left half of the module housing.
13. Carefully turn the module over and replace the five screws.
14. Stick the modification label “Equipped with 129B Freq. Gen." to the wire manager on the front end of the power supply module.
15. Place the power supply module back in the carrier.

Add a Foil Shield to the Power Supply Module

For each expansion carrier, you must install another power supply module for the additional line and station modules. The added power supply module can cause excessive noise on the module immediately to its right.

To eliminate the noise, apply copper-foil shields to the power supply module housing. These shields and their labels are packaged in the power unit shielding kit included with the expansion carrier.

Follow these steps to install a copper-foil shield (see Figure 17):

1. Lay the power supply module on a flat surface with the right side up (as viewed from the front edge).

2. Wipe the module free of any dust or dirt.
3. Peel the backing paper from the smaller copper-foil shield to expose the adhesive.

   Note: Check the position of the foil shield before sticking it to the side of the module. Once in place, the foil is difficult to remove.
4. Position the foil on the upper part of the module. Work out any air bubbles as you press the foil firmly in place.
5. Peel the backing paper from the larger copper-foil shield to expose its adhesive.
6. Position the foil on the lower part of the module (the shields should meet and not overlap or leave space between). Tuck the foil shield tightly along the ledge (or crease) of the housing. Work out any air bubbles as you press the foil firmly in place.
7. With the copper-foil shield in place, put the power unit information label on the lower piece of foil.
8. Attach the UL or CSA label on the power supply module below the copper-foil shield.

Install the Processor Module

There are three steps to installing the processor module:

- As necessary, modify the processor module for Key-only operation.
- Install the feature module in the processor module.
- Insert the processor module into the carrier.

CAUTION:
To prevent damage from electrostatic discharge (ESD), avoid touching leads, connectors, pins, and other components when handling the circuit board. Use a properly grounded wrist strap.

Modify Processor Module for Key-Only Operation

The system can be configured to operate in Key, Hybrid/PBX, or Behind Switch mode. The mode of operation is chosen and registered with the FCC before the system is installed. The processor module is configured for the multifunction (MF) option when shipped.

The MF option allows the system to operate in any of the three modes (Hybrid/PBX, Key, and Behind Switch), according to how the software is administered. The Key function (KF) option restricts system operation to Key-only mode. Software programming of PBX features and pooled trunks is not possible in this mode.

Follow these steps to modify the processor module for Key operation (see Figure 18):

1. Remove the processor module from its package. Do not open the module case.

CAUTION:
Do not touch the HDR3 header. If the HDR3 header is disturbed, the system default memory can be lost.

2. Locate the header marked HDR4 on the module's circuit board.
3. Locate the shunt attached to one of the pins of the HDR4 header.
4. Remove the shunt from the single header pin; then reinsert it so that it covers both pins on the header.

5. Locate the KF label that is on the jack numbering labels sheet packed with the feature module; stick it on the wire manager at the base of the module.

Install the Feature Module in the Processor Module

Before you install the processor module in the carrier, you must install the feature module in the processor module. The feature module comes in two models: a model for the small processor module and a model for the large processor module.

Follow these steps to install the feature module (see Figure 19):

1. Unpack the feature module.
2. Stick the round feature module label to the front of the processor module housing.
3. Lay the processor module on its left side.
4. Align the connectors on the feature module with the connectors in the processor module.
5. Firmly press the feature module into the processor module.

Insert the Processor Module

CAUTION:
Remove the protective cover from the processor module's gold-finger connector before installing the module into the carrier.

Follow these steps to insert the processor module (see Figure 20):

1. Lower the processor module onto the rod on the carrier in slot 00.
2. Be sure that the connector on the module mates properly with the connector on the carrier.
3. Swing the processor module into the slot.

4. Push firmly until the processor module snaps into place. The processor module should be securely attached to the rear of the carrier and held in place by the tab on the bottom toward the back of the processor module.

CAUTION:
To avoid damage, do not force the module. If the module does not insert easily, push in on the rear locking tab, remove the module, check for any obstruction, and reinsert the module.

Replace the Feature Module

CAUTION:
Make sure that you have all the necessary records to reprogram the system before you replace the feature module. When the feature module is replaced, all system memory is lost and the system must be reprogrammed.

It may become necessary at some point to replace the feature module because of upgrades or malfunctions. Follow these steps to replace the feature module in a fully installed system:

1. Turn off the system (see “Shut the Power Off” later in this chapter). Make sure the ON/OFF switch on the power supply module is set to the OFF position.
2. Remove the processor module from the carrier.
   a. Press up on the tab on the bottom 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. Lay the processor module on its left side.

4. Grasp the metal rings on the outside of the feature module and pull up.
5. Check the HDR4 header on the processor module circuit board for proper mode operation (see "Modify the Processor Module for Key-Only Operation" earlier in this chapter).
6. Align the connectors on the new feature module with the connectors in the processor module.
7. Firmly press the new feature module into the processor module.
8. Insert the processor module back into the carrier (see “Insert the Processor Module” earlier in this chapter).

Install the Auxiliary Power Unit

If the system must support more than 54 unit loads, install an auxiliary power unit, the Auxiliary Power Unit 9024 (see “Unit Loads” in Chapter 2).

Note: An already installed 335A auxiliary power unit can continue to be used if no new telephones or modules are added to the system.

Follow these steps to install an auxiliary power unit (see Figure 21):

1. Make sure that the ON/OFF switch on the power supply module is set to the OFF position.
2. Mount the auxiliary power unit on a surface within 2 feet of the CU (probably the backboard on which the CU is mounted).
3. Insert one end of the modular line cord that comes with the auxiliary power unit into the jack labeled AUX POWER INPUT on the power supply module. Insert the other end of the modular line cord into the jack labeled AUX POWER on the auxiliary power unit.

CAUTION:
Do not plug the power supply module or the auxiliary power unit into the AC outlet until you are ready to turn on the system. See "Turn the Power On" later in this chapter.

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

Install the Line/Trunk and Station Modules

Use caution when installing the line/trunk and station modules to prevent damage to the connectors. See Appendix A for specific wiring applications.

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

Note: Do not leave empty slots between modules in the carrier. The system will ignore modules installed beyond any empty slot.

Follow these steps to install line/trunk and station modules (see Figure 20):

1. Review the system planning form to verify slot placement on the carrier for each module. According to the system planning form, install line/trunk and station modules in slots 01 through 05 on the basic carrier, slots 06 through 11 on the first expansion carrier, and slots 12 through 17 on the second expansion carrier.

Note: Whenever possible, place all 012 and 008 OPT basic telephone modules in the same carrier so that the same ring generator can support them.

CAUTION:
Remove the protective cover from each module's gold-finger connector before installing the module into the carrier.

2. Lower the module onto the rod on the carrier in the appropriate slot.
3. Be sure that the connector on the module mates properly with the connector on the carrier.
4. Swing the module into the slot and firmly push the module into the carrier until it locks into place.

   Note: If you have difficulty installing a module, check the module for alignment problems. Inspect the carrier for damage. If no damage is present, the modules should snap into place. If the carrier is damaged, you must replace it.

5. After all modules have been installed, label all jacks with the numbered labels provided with the feature module. The labels for lines/trunks have a cream-colored background and green numbers. The labels for stations have a cream-colored background and blue numbers.

   a. Label each line/trunk jack on the modules sequentially, from 01 up to 80. Begin with the module in slot 01, numbering from bottom to top on each module and working from left to right across the carrier.

   b. Label each station jack on the modules sequentially, from 01 up to 144. Begin with the module in slot 01, numbering from bottom to top on each module and working from left to right across the carrier.

Note: For each 400EM module, set the dual in-line package (DIP) switches on the module for the desired tie-trunk options (see Figure 72 and "Tie-Trunk Signaling" in Chapter 1).

Follow these steps to remove a module:

1. Press upon the tab on the bottom of the module.
2. Pull the bottom of the module away from the carrier.
3. Lift upward to disengage the module from the rod on the top of the carrier.

Provide Proper Grounding

Proper grounding of the system protects it from

- lightning
- power surges
- power crosses on CO lines/trunks
- electrostatic discharge (ESD)

WARNING:
Grounding circuit continuity is vital for safe operation. There is a risk of electric shock if the system is not properly grounded.

Follow these steps to properly ground the CU power supply modules (see Figures 11 and 12):

1. Attach a #12 or #14 ground wire to the grounding screw on each power supply module.
2. Connect the other end of each ground wire to the terminals of the single-point ground bar on the AC outlet box.

Connect the Control Unit to an AC Outlet

CAUTION:
Be sure the AC outlet has been tested for proper grounding by following the procedures in Chapter 2 under "AC Outlet Tests." The outlet should be 117-VAC, 60-Hz, 3-wire grounded.

CAUTION:
To prevent someone from accidentally shutting off the power, do not connect the CU to a switch-controlled outlet. The AC outlet should be within 5 feet of the CU.

Follow these steps to connect the CU to an AC outlet:

1. Turn the switch on the power supply module in the basic carrier to the OFF position.
2. Turn off the power switches on the expansion carrier power supply modules.
3. Unplug 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 power supply module. Do this for each carrier.
5. Plug the other end of the power cord into the AC outlet. Allow at least 1 foot of slack in the cord. Do this for each carrier.

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

Turn the Power On

CAUTION:
Follow the steps in exact sequence.

When the system is completely installed, follow the steps in the sequence below to turn on the power to the power supply module:

1. For each power supply module and auxiliary power unit (see "Install the Auxiliary Power Unit" earlier in this chapter), plug the AC line cord into the AC outlet.
2. Set the power switch on the power supply modules to ON for all **expansion** carriers.

   The green power lights on the expansion carriers' power supply modules go on.
3. Set the power switch on the **basic** carrier's power supply module to ON.

   The green light on the power supply module goes on. The red light on the processor module goes on for 15 to 45 seconds and then goes off.

If the system is operating properly, you will see the following indicators:

- The green power lights on all the power supply modules remain on.
- The red warning light on the processor module goes on for 15 to 45 seconds during power-up and then goes off.
- All indicators on the 100D and 400EM modules (if present) go on and then off. They remain off when the modules are idle.

If any of these conditions are not present, see Chapter 5, "Maintenance."

Shut the Power Off

During installation you may need to shut the power off for troubleshooting or because you need to add something to the carrier.

⚠ CAUTION
Follow the steps in exact sequence.

1. Turn off the power at the power supply module in the **basic** carrier.
2. Turn off the power at the power supply modules in the **expansion** carriers.
3. Unplug any auxiliary power units. Because the power supply modules are already off, the sequence for removing auxiliary power cords is not important.

Install the Control Unit Housing

The control unit housing is a plastic cover to protect the CU modules. One front panel is used for each carrier. Follow these steps to install the control unit housing (see Figure 22):

1. Lay the front panel(s) face down.
2. If more than one carrier is being housed, slide the front panels together so that the semicircles on the inside line up.
3. Add both side panels to the front panel(s) by sliding the front panel(s) into the slots on the side panels so that the semicircles on the inside line up.
4. Pick up the whole housing and place it on the CU.
   a. Line up the wire clips attached to the carrier with the recesses on the outside of the side panels.
   b. Push back until the clips hook over the tabs and rest in the recesses.

Channel Service Unit

The channel service unit (CSU) provides the interface between the 100D module and the DS1 facilities. Two models are available: the ESF T1 CSU and the 551 T1 L1 CSU.

ESF T1 CSU

The ESF T1 CSU can connect to the DS1 network by using the D4 or extended superframe format (hence the ESF). Also, it is the only CSU to provide the B8ZS line coding needed to transmit a 64-kbps clear channel.

Mount the ESF T1 CSU in a relay rack or on a shelf as a stand-alone unit. Plug the CSU into a 117-VAC outlet.

Note: Before the CSU can be installed, the local telephone company must be contacted for information such as services available, equipment options, and 48-VDC power on the line. Also, a completed "Request for 1.544 Mbps End Section Characteristics" form must be submitted to the telephone company.

To install the ESF T1 CSU, set the switch options, mount the CSU (as needed), and connect the wires from the 100D module and the DS1 network. Follow the procedures below to install an ESF T1 CSU.

Set the DIP Switches on the Rear Panel

The seven 8-position dual in-line package (DIP) switches on the rear panel are set for operating features and for diagnostic tests:

- SW1 sets the CSU address, which must be confirmed with the local telephone company (see Table 3-1).
- SW2 sets the bit-error rate (BER) alarm threshold (see Table 3-2).

- SW3 is not used.
- SW4 sets the Errored Seconds threshold; positions 7 and 8 can be changed to match diagnostic equipment (see Table 3-3).
- SW5 sets signal processing parameters according to the services required by the customer and provided by the telephone company (see Table 3-4).
- SW6 sets signal processing parameters according to the services required by the customer and provided by the telephone company (see Table 3-5).
- SW7 sets the distance from the 100D module to the CSU (see Table 3-6).

  Note: Setting SW7 or administering line compensation for the 100D module can provide for cable distances up to 655 feet. If the SW7 is set and the 100D module is administered, the maximum cable distance between the 100D module and the CSU can be up to 1310 feet.

Note: In the following tables, "up" is the physical position of the setting and represents "off" or "open." "Down" is the physical position of the setting and represents "on" or “closed.” To effect option changes, you must power down the CSU and then power up.

Table 3-1 SW1 Default Settings

Position	Status
1	up
2	down
3	down
4	down
5	down
6	down
7	down
8	down

Table 3-2 SW2 Default Settings

Position	Status	Effect
1	up	BER threshold is 10^{-6}
2	down	BER threshold is 10^{-6}
3	up	BER threshold is 10^{-6}
4	up	BER threshold is 10^{-6}
5	up	not used
6	up	not used
7	up	not used
8	up	Alarm LED/relay operation is momentary.

Table 3-3 SW4 Default Settings

Position	Status	Effect
1	down	not used
2	down	not used
3	down	not used
4	down	not used
5	down	not used
6	down	not used
7	up	disable auto dial modem
8	down	TABS protocol enabled

Table 3-4 SW5 Default Settings

Position	Status	Effect
1	down	DTE is D4 framed.
2	down	Network is AMI.
3	down	DTE is AMI
4	up	generate CRC-6 to DTE
5	up	generate CRC-6 to network
6	up	Part 68 Density enforcement
7	up	does not poll far-end CSU for alarms
8	up	not used

Table 3-5 SW6 Default Settings

Position	Status	Effect
1	down	send received signal to DTE or network during loopback operation
2	up	DTE B8ZS is not decoded.
3	up	Network B8ZS is not decoded.
4	down	network ESF
5	down	default to DIP switch configuration upon power-up
6	up	not used
7	up	not used
8	down	loop network signal back (ESS loopback) to network during keep-alive

Table 3-6 SW7 Settings

Position	Status		
	0 – 150 ft	**150 – 450 ft**	**450 – 655 ft**
1	down	up	up
2	up	down	up
3	up	up	up
4	up	down	up
5	up	up	down
6	up	down	up
7	up	up	down
8	up	up	up

Bit-Error Rate Threshold Option

DIP switch SW2 can be set to alarm at bit-error rate (BER) threshold levels between 10^{-4} and 10^{-9} or can be disabled. Table 3-7 shows the settings for SW2 for the various thresholds.

Table 3-7 SW2 BER Options

	Threshold Option						
Position	**10-4**	**10-5**	**10-6**	**10-7**	**10-8**	**10-9**	**Disable**
1	up	down	up	down	up	down	down
2	up	up	down	down	up	up	up
3	up	up	up	up	down	down	up
4	up	up	up	up	up	up	down
5	not used (up)						
6	not used (up)						
7	not used (up)						
8	up = non-latching mode; down = latching mode						

Switch Settings for Framing in Hybrid/PBX Mode

The framing format for the network and for data terminal equipment can be either D4 or extended superframe (ESF). DIP switches SW5 and SW6 must be set according to the following tables to match the framing format for the network and the equipment. This applies to Hybrid/PBX mode only.

Table 3-8 Switch Settings in Hybrid/PBX Mode: Network and Equipment are ESF Framed

Switch	Position							
	1	2	3	4	5	6	7	8
5	up	down	down	down	down	down	*	up
6	up	up	up	down	down	up	up	up

* When this switch position is set to down, the near-end CSU polls the far-end CSU for alarm status. If the network is set to D4 framing, the polling option at this switch position must be off (up).

Table 3-9 Switch Settings in Hybrid/PBX Mode: Network and Equipment are D4 Framed

Switch	Position							
	1	2	3	4	5	6	7	8
5	down	down	down	up	up	down	up	up
6	up	up	up	up	down	up	up	up

Table 3-10 Switch Settings in Hybrid/PBX Mode: Network is ESF Framed and Equipment is D4 Framed

Switch	Position							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
5	down	down	down	down	up	down	*	up
6	up	up	up	down	down	up	up	up

***** When this switch position is set to down, the near-end CSU polls the far-end CSU for alarm status. If the network is set to D4 framing, the polling option at this switch position must be off (up).

Table 3-11 Switch Settings in Hybrid/PBX Mode: Network is D4 Framed and Equipment is ESF Framed

Switch	Position							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
5	up	down	down	up	up	down	up	up
6	up	up	up	up	down	up	up	up

Set the Power Option Switch

At the power option switch, accessed through the top panel of the ESF T1 CSU, select the appropriate power source:

- span power (SP)
- local power—dry loop (DL)
- local power—wet loop (WL)

CAUTION:
Connecting an ESF T1 CSU provisioned for local power— wet loop to digital microwave, digits/multiplexers, or fiber optics can damage the equipment. Connecting an ESF T1 CSU provisioned for local power — wet loop with span-line power present can damage the CSU. Therefore, the local power — wet loop option can be used only in private networks with user-owned facilities.

Local power is required for total unit operation no matter which method of power is selected.

Note: Select local power—dry loop in almost all cases. If span-line power is provided and the telephone company agrees, you can option the CSU for SP. However, most telephone companies do not provide span-line power for new installations.

Set the Artificial Transmit Line Option

Depending on the distance from the CSU to the first line repeater, set the Line Build-Out (LBO) switch to the proper option (see Table 3-12). The LBO switch is accessed through the top panel of the CSU.

Notes:
- The required setting for the LBO switch is usually specified by the telephone company.
- The receive path contains a fixed 7.5 dB artificial line and an automatic line build-out (ALBO) circuit, which automatically compensate for signal levels in the range of 0 to -27.7 dB.

Table 3-12 Artificial Transmit Line Options

Position	Option	Distance
1	0.0 dB	0—1000 ft
2	7.5 dB	1000—2000 ft
3	15.0 dB	2000—3000 ft

Connect the CSU to the 100D Module and the DS1 Network

Follow these steps to connect the ESF T1 CSU to the 100D module and the DS1 network (see Figure 23):

1. Connect the D8W cord from the 100D module (see Table 3-13) to the rear panel of the CSU in one of the following ways:
   - directly to the wire-wrap connector (see Table 3-14)
   - with a special cable adapter to the 15-pin DTE female connector (see Table 3-15)
2. Connect the network cord to the CSU in one of the following ways:
   - directly to the wire-wrap connector (see Table 3-14)
   - with a special cable adapter to the NET 15-pin male connector (see Table 3-16)

Table 3-13 100D Module Pin Assignments

Pin No.	Designation	Signal
1	T1	RCV (tip)
2	R1	RCV (ring)
4	R	XMT (ring)
5	T	XMT (tip)

Table 3-14 Wire-Wrap Connector Pin Assignments

Pin No.	Signal
1	shield ground
2	shield ground
3	transmit data to the DTE (ring)
5	receive data from the DTE (tip)
8	receive data from the network (tip)
10	transmit data to the network (ring)
19	shield ground
20	shield ground
21	transmit data to the DTE (tip)
23	receive data from the DTE (ring)
26	receive data from the network (ring)

Table 3-14 Continued

Pin No.	Signal
28	transmit data to the network (tip)
30	external ACO input
31	audible com
32	audible N/C (with ACO)
33	audible N/O (with ACO)
34	visual com
35	visual N/C (no ACO)
36	visual N/O (no ACO)

Table 3-15 DTE 15-Pin Connector Pin Assignments

Pin No.	Signal
1	receive data from the DTE (tip)
2 or 8	shield ground
3	transmit data to the DTE (tip)
4 or 15	shield ground
9	receive data from the DTE (ring)
11	transmit data to the DTE (ring)

Table 3-16 Network 15-Pin Connector Pin Assignments

Pin No.	Signal
1	transmit data to the network (tip)
3	receive data from the network (tip)
8	shield ground
9	transmit data to the network (ring)
11	receive data from the network (ring)
15	shield ground

Front Panel

The ESF T1 CSU's front panel consists of LEDs, controls, and test jacks (see Figure 23). Tables 3-17, 3-18, and 3-19 show the functions of these items.

Table 3-17 CSU Front Panel LEDs

LED	Color	When Lit Indicates
LOCAL POWER	Yellow	Local 117 VAC or -48 VDC is ON
Network Side		
FAR END LOOPED	Red	Far-end CSU looped if initiated by near-end CSU
CRITICAL PWR	Yellow	Power is on to critical circuits
PULSES	Green	Normal incoming signal from network
FRAME LOSS	Red	Loss of signal, loss of frame synch, improper frame sequence, or unframed signal
CRC ERROR	Red	CRC error detected
BPV	Red	Non-B8ZS violation detected when optioned for B8ZS; other bipolar violations detected
NEAR END LOOPED	Yellow	Loopback is activated
ALARM	Red	BER threshold exceeded (associated contacts for an audible alarm are also activated)

Table 3-17 Continued

LED	Color	When Lit Indicates
System Side		
LOOPED	Yellow	Loopback activated on system side
FRAME LOSS	Red	Loss of signal, loss of frame synch, improper frame sequence, or unframed signal
LOW DENS	Red	Avg. ones density below threshold or consecutive zeroes threshold
ACO	Yellow	Lights when ACO button is pressed when ALARM LED is lit

Table 3-18 CSU Front-Panel Controls

Control	Function
LOOPBACK	Loops the incoming signal from the system to the system
SENDCODE	Sends "loop up" or "loop down" code to far-end CSU
ACO	Functions only when the ALARM LED is lit turns on ACO LED and deactivates audible alarm; clears alarm if the alarm condition has been cleared

Table 3-19 CSU Front-Panel Test Jacks

Jack	Provides
DIAGNOSTIC	Access via 310 jack to the 4-kbps data link
EQ IN	Break-in access to transmit line to system
EQ OUT	Break-in access to receive line from system
SM IN	Break-in access in transmit path to network
SM OUT	Break-in access in receive path from network
EQ MON	Monitor access to received signal from system
SM MON	Monitor access to received signal from network
+1, -1	Test points for measuring simplex current from network to critical circuits (if provided)

551 T1 L1 CSU

The 551 T1 L1 CSU (see Figure 24) performs many of the same functions as the ESF T1 CSU, but it does not support B8ZS and therefore does not support the 64-kbps clear channel. Also, it does not support extended superframe (ESF) format; if a network requires this format, the ESF T1 CSU must be used.

Mount the 551 T1 L1 CSU in a relay rack, in various types of cabinets, or as a stand-alone unit. This CSU consists of the following components:

- chassis with top and rear cover
- Signal Monitor Unit (plug-in)
- Office Repeater (plug-in)

- Fault Location Filter (a factory-installed option)

Note: Before the CSU can be installed, the serving telephone company must be contacted to obtain all necessary information, such as services available, equipment options, and power on the line. Also a completed "Request for 1.544 Mbps End Section Characteristics" form must be submitted to the telephone company.

Follow these procedures to install the components of the 551 T1 L1 CSU.

Set the Switch Options on the Signal Monitor Unit and the Office Repeater

Set the switches before placing the Signal Monitor Unit (SMU) and the Office Repeater (OR) in the CSU chassis.

The default settings accommodate most installations. However, some options depend upon local line conditions, for example, availability of line power and the type of service requested by the customer.

Also, proper settings for some options must be obtained from AT&T, its authorized representative, or the local telephone company. The local telephone company representative must be informed of the options selected.

Signal Monitor Unit Switch Settings

There are four option switches in the SMU (see Figure 25). These switches govern the operation of the following options:

- ONES causes the unit to transmit an "ALL ONES" keep-alive signal to the CO when the customer signal drops below the minimum average ones-density.

- ESS (electronic switching system) causes the CSU to loop back its receive line to its transmit line (instead of generating "ALL ONES") when the customer signal fails. The loopback framing pattern prevents false alarms at an ESS or a data acquisition control system (DACS).
- ZEROES selects either 16 or 50 consecutive zeroes to be the criteria for lighting the Zeroes LED.
- ACTIVE FAULT LOCATE causes the remote loopback path to preserve bipolar violations to allow single-ended fault locating when active fault filters are used.

Table 3-20 shows the switch settings for the different options.

Table 3-20 SMU Switch Settings

Option	Switch Setting
ONES	#1—closed #2—open
ESS	#1—open #2—closed
ZEROES	#3—closed for 16-zero limit
ACTIVE FAULT LOCATE	#4—closed

Office Repeater Switch Settings

Tables 3-21 and 3-22 show the power mode and artificial line-option settings for the OR (see Figure 26).

Table 3-21 OR Power Mode Option Settings

Power Mode	Screw Options*	S2	S3	S4	S5
Line power	C, E, K	n/a	n/a	AB	B
-48 V with sealing current	C, E, K	Y	OUT	AA	B
-48 V without sealing current	C, G, J	Y	OUT	AA	B

* Letters indicate those screws that are closed.

Table 3-22 OR Artificial Line Options

Line Loss	S1	S5
0 dB	C	n/a
7.5 dB	A	A
15 dB	B	B

Mount the CSU Chassis

After the options have been set on the SMU and the OR, mount the CSU shelf assembly into a rack or other enclosure.

Connect Lines to the Terminal Block (TB1)

The terminal block (TB1) on the back of the chassis is the connecting point for T1 service lines and for fault and loopback wires. Also, if a local power supply is used, the TB1 is the termination spot for the power supply wires.

WARNING:
Voltages as high as 260 V can occur between the transmit and receive pairs of the T1 line.

Follow these steps to connect the lines to TB1 on the back of the CSU chassis (see Figure 27):

1. Connect the T1 service lines to terminals 1 through 5.
2. Connect the fault pair (if provided by the local telephone company) to terminals 8 and 9.
3. Connect the DC loopback pair (if provided by the local telephone company) to terminals 11 and 12.
4. If the CSU is to be locally powered, connect the power supply leads to terminals 14 and 15.

Insert the Signal Monitor Unit

After setting the option switches, plug the SMU into the right side of the 551 T1 L1 CSU chassis.

The SMU has six LEDs and six bantam jacks (see Figure 25). Tables 3-23 and 3-24 show the functions of the LEDs and the test jacks on the front panel.

Table 3-23 SMU Front-Panel LEDs

Label	Color	When Lit Indicates
Avg. Dens	Red	Low average ones density
Zeroes	Red	> 50 consecutive zeroes (needed for encryption) or > 16 consecutive zeroes (option switch S4 closed)
Line Pwr	Yellow	Presence of simplex current
Looped	Yellow	Loopback function activated
BPV	Red	Bipolar violations received
Pulse	Green	Normal 1.544-Mbps pulses present

Table 3-24 SMU Front-Panel Test Jacks

Jack	Provides
EQ (IN-OUT-MON)	Access to transmit input and receive output of the 100D module
SM (IN-OUT-MON)	Access to CSU transmit input and receive output

Insert the Office Repeater

Plug the OR into the left slot of the 551 T1 L1 CSU chassis (see Figure 26). The front panel has

- six 310 jacks for in-line access and monitoring of the span line and the SMU card

- two GMT fuses for protection of the local powering circuitry
- four test points

Note: The transmit path in the OR has an adjustable artificial line; this allows the transmit level to be adjusted to 0, 7.5, or 15 dB to meet the required -15 or -22.5 dB section loss. The receive path contains a fixed 7.5 dB artificial line and an Automatic Line Build-Out (ALBO) circuit, which automatically compensate for signal levels in the range of 0 to -27.7 dB.

Connect the 551 T1 L1 CSU to the 100D Module

Connect the 100D module to the CSU'S rear panel (see Figure 27):

1. Place an adapter on the end of the D8W cord from the 100D module.
2. Plug the adapter into the 15-pin subminiature connector.

Note: The maximum length of cable from the 100D module to the CSU for line compensation is 655 feet.

Table 3-25 shows the pin assignments for the rear panel connections.

Table 3-25 CSU Rear-Panel Pin Assignments

100D Module			551 T1 L1 CSU		
PIN #	DESIG	SIGNAL	D-CONN	DESIG	SIGNAL
1	T1	RCV (tip)	3	T	XMT (tip)
2	R1	RCV (ring)	11	R	XMT (ring)
4	R	XMT (ring)	9	R1	RCV (ring)
5	T	XMT tip)	1	T1	RCV (tip)

DC Power Options

Depending on the type of line provided by the local telephone company, the CSU can be supplied with -48 VDC power on the T`wire pair from the network. If the CSU is not powered from the network, a KS22911,L1 power supply is required. Connect the power supply to the rear panel at TB1 as follows:

- positive lead to terminal 15
- -48 VDC lead to terminal 14

The SMDR Printer and the System Programming PC

Both an SMDR printer and a personal computer (PC) used for system programming can be connected to the processor module.

Connect a Printer to the Control Unit

A printer (AT&T models 475/476 and 572) can be connected to the CU through the SMDR port on the processor module. There are two procedures for installing a printer, depending on whether the printer is within 50 feet of the CU or not.

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

Notes:
- The AT&T 570 printer is not compatible with the system because it is not a serial printer.
- Before connecting a printer, make sure that all modules have been installed on the CU.
- The printer must be plugged into the same AC outlet as the CU.

Connect a Printer Within 50 Feet of the CU

Use the following hardware and procedure to connect a printer to the CU when the printer is within 50 feet of the CU and is powered from the same 117-VAC branch as the CU.

Hardware

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

Procedure (see Figure 28)

1. Take the Z200A EMI filter and cord, and plug the end of the cord closest to the filter into the SMDR port (the top one) on the processor module.
2. Plug the other end of the EMl filter cord into the adapter (355AF or 355A).
3. Connect the female connector on the adapter to the 25-pin male connector on the printer's interface cable.
4. Set the printer options for use with the SMDR feature.
   - For the AT&T 572 printer, set the options on the printer according to Table 3-26. (See the user's guide supplied with the printer for further information.)
   - For the AT&T 475/476 printer, set the DIP (dual in-line package) switches on the printer according to Table 3-27. (See the user's guide supplied with the printer for further information.)

Table 3-26 AT&T 572 Printer Options

No.	Function	Menu	Status
01	FORM LENGTH	09	11
02	LP1	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	N-"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
32	CHAR. SET (G0,GL)	02	USA

Table 3-26 Continued

No.	Function	Menu Status	
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 3-27 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

Note: Open = off, Closed = on.

Connect a Printer 50 or More Feet from the CU

Use the following hardware and procedure to connect a printer to the CU that is

- 50 or more feet from the CU
- not grounded to the same AC outlet as the CU
- not grounded to an outlet that is on the same 117-VAC branch as the CU and that is 50 feet or less from the CU

Hardware

- Z200A EMI filter
- adapter for the interface cable connector
  - 355A for the male connector
  - 355AF for the female connector
- 400B2 power adapter
- Z3A2 ADU (asynchronous data unit)
- BR1A-4P adapter, 102 connecting block, or 103 connecting block
- EIA crossover cable
- ADU crossover cable
- 2012D transformer
- 248B adapter
- D8W cords
- D6AP power cord
- RS-232 cable

Procedure (see Figure 29)

1. Take the end of the Z200A EMI filter cord that is closest to the filter and plug it into the SMDR port (the top one) on the processor module.
2. Plug the other end of the EMI filter cord into a 355AF adapter.
3. Connect the female connector on the 355AF adapter to one end of the EIA crossover cable. Connect the other end of the EIA cable to the 25-pin male connector of a Z3A2 ADU.

CAUTION:
If the printer is in a building outside the main building (CU location), an ADU and an additional protector must be installed in each building. The ADUs and protectors provide both the CU and the printer additional protection against exposure to lightning, inadvertent contact with power lines, and power currents induced by nearby power lines. See the installation notes packed with the ADU for more information.

4. Plug one end of a D8W cord into the Z3A2 ADU and the other end into an ADU crossover cable.
5. Plug the other end of the ADU crossover cable into one of the jacks on a 400B2 power adapter.
6. Plug one end of a D6AP cord into the other jack of the 400B2 adapter. Plug the other end of the D6AP cord into the jack on a 248B adapter (see Figure 30).
7. Connect the spade-tip wires on the 248B adapter to the screws on a 2012D transformer (see Figure 30).
8. Plug the 400B2 adapter into a BR1A-4P adapter, 102 connecting block, or 103 connecting block.
9. Place a plug onto the end of the inside wiring (DIW) on the CU side and plug the DIW cord into the BR1A-4P adapter, 102 connecting block, or 103 connecting block.

10. On the printer side of the inside wiring, punch down the DIW cord onto a 102 or 103 connecting block.
11. Plug one end of a D8W cord into the 102 or 103 connecting block and the other end into a Z3A2 ADU.
12. Connect one end of an RS-232 cable to the Z3A2 ADU and the other end to the printer.
13. Plug the 2012D transformer into a wall outlet.
14. Set the printer options for use with the SMDR feature.
    - For the AT&T 572 printer, set the options on the printer according to Table 3-26. (See the user's guide supplied with the printer for further information.)
    - For the AT&T 475/476 printer, set the DIP switches on the printer according to Table 3-27. (See the user's guide supplied with the printer for further information.)

Connect a PC to the Control Unit

A PC with MS-DOS* 3.3 or higher can be used for programming and maintenance of the system. The connection of the PC to the CU depends upon whether or not the distance between the two is less than 50 feet.

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

* Registered trademark of Microsoft Corporation.

Connect a PC Within 50 Feet of the CU

Use the following hardware and procedure to connect a PC to the CU when the distance from the PC to the CU is less than 50 feet.

Hardware

- 355AF adapter
- D8W cord
- RS-232 cable

Procedure (see Figure 31)

1. Plug one end of a D8W cord into the system programming/ maintenance port (the lower one) on the processor module. Plug the other end of the D8W cord into a 355AF adapter.
2. Connect one end of an RS-232 cable to the 355AF adapter and the other end to the COM1 port on the PC.

Connect a PC 50 or More Feet from the CU

Use the following hardware and procedure to connect a PC to the CU when the distance from the PC to the CU is 50 or more feet.

Hardware

- 355AF adapter
- 400B2 power adapter
- BR1A-4P adapter, 102 connecting block, or 103 connecting block
- Z3A2 ADU (asynchronous data unit)
- EIA crossover cable
- ADU crossover cable

- 2012D transformer
- 248B adapter
- 102 or 103 connecting block
- DIW cable
- D8W cords
- D6AP power cord
- RS-232 cable

Procedure (see Figure 32)

1. Plug one end of a D8W cord into the system programming/ maintenance jack (the lower one) on the processor module. Plug the other end of the D8W cord into a 355AF adapter.
2. Connect an EIA crossover cable to the 355AF adapter.
3. Connect one end of an RS-232 cable to the EIA crossover cable and the other end to a Z3A2 ADU.

CAUTION:

If the PC is in a building outside the main building (CU location), an ADU and an additional protector must be installed in each building. The ADUs and protectors provide both the CU and the PC additional protection against exposure to lightning, inadvertent contact with power lines, and power currents induced by nearby power lines. See the installation notes packed with the ADU for more information.

4. Plug one end of a D8W cord into the Z3A2 ADU and the other end into an ADU crossover cable.
5. Plug the other end of the ADU crossover cable into one of the jacks on a 400B2 power adapter.
6. Plug one end of a D6AP cord into the other jack of the 400B2 adapter. Plug the other end of the D6AP cord into the jack on a 248B adapter (see Figure 30).

7. Connect the spade-tip wires on the 248B adapter to the screws on a 2012D transformer (see Figure 30).
8. Plug the 400B2 adapter into a BR1A-4P adapter, 102 connecting block, or 103 connecting block.
9. Place a plug onto the end of the inside wiring (DIW) on the CU side and plug the DIW cord into the BR1A-4P adapter.
10. On the PC side of the inside wiring, punch down the DIW cord onto a 102 or 103 connecting block.
11. Plug one end of a D8W cord into the 102 or 103 connecting block and the other end into a Z3A2 ADU.
12. Connect one end of an RS-232 cable to the Z3A2 ADU and the other end to the COM1 port on the PC.
13. Plug the 2012D transformer into a wall outlet.

Data Adapters

Adapters are needed to connect data equipment to the control unit. The kind of adapter used depends on whether or not the data is analog or digital. For analog data a modem or modem pool is used; for digital data an ISDN 7500B Data Module is used.

ISDN 7500B Data Module

The ISDN 7500B Data Module is used to connect a digital data terminal to the system on a 008 MLX module. The data module is used at the digital data station to make and receive data calls. When a data terminal is used to make calls, the keyboard is used to dial the number. Instead of converting digital data signals to analog signals as a modem does, the 7500B maintains a digital data format that allows transmission to another digital station or over the Integrated Services Digital Network Primary Rate Interface (ISDN-PRI) telephone network.

The ISDN 7500B Data Module provides an RS-232 interface for asynchronous data terminal equipment operating at speeds up to 19.2 kbps. The data module also provides a CCITT V.35 interface for synchronous data terminal equipment operating at speeds up to 64 kbps. (Optional enhancement boards must be ordered separately.)

The 7500B can be setup to handle a variety of data communications equipment (DCE) and is the only digital adapter that can be used with the system.

The 7500B front panel has the following (see Figure 33):

- **POWER/TEST** LED. Lights when power is supplied to the 7500B; flashes when 7500B tests are performed.

- **DATA** LED. Flashes to indicate an incoming data call and lights when a call is in progress; flashes when 7500B tests are performed.
- **Display.** Displays status information and option settings.
- **NEXT, BACK,** and **ENTER** buttons. Used to operate the 75008 and to adjust the screen's contrast.

The 7500B back panel has the following (see Figure 34).

- **PHONE** jack. Connects a digital/ISDN (MLX) telephone to the 7500B.
- **LINE** jack. Connects the 7500B to an MLX system module.
- **POWER** connector. Connects the 7500B to the DC power supply, which connects to an AC outlet.
- **PORT 1.** Connects the 7500B to a data terminal, computer, or modem.
- **PORT 2.** When an enhancement board is installed for synchronous operation, Port 2 connects a second data terminal, an automatic calling device (with an RS-366 interface), or a data terminal with a V.35 interface.

Note: A modem can provide an analog data interface from an MLX telephone that has an MFM installed.

When you use the ISDN 7500B Data Module with an MLX telephone, plug one end of the D8W cord into the PHONE jack on the 7500B and the other end of the cord into the LINE jack on the MLX telephone.

The maximum cord length from the 7500B to the telephone cannot exceed 80 feet.

The MLX telephone cannot be used to dial data calls, and the data module cannot be used to dial voice calls. Each device

operates independently, and features are assigned to each device independently.

Note: Do not connect two ISDN 7500B Data Modules on one line.

The data module can be configured as a stand-alone by ordering a WP90110, L1 power unit (PEC 21625). The 7500B can also be configured in a multiple-mount arrangement by ordering a Z77A data mounting (PEC 21626), which provides a common power supply for up to eight data modules. Both the power unit and the data mounting need a 115-VAC power outlet. Neither the power unit nor the data mounting is provided with the data module, and both must be ordered separately.

The 7500B does not have the internal 100-ohm line termination that is provided with MLX telephones. Therefore, when the 7500B is used without an MLX telephone, a 100-ohm, 440A4 terminating resistor adapter (PEC 2709-A59) must be installed on the line near the 7500B.

To provide synchronous operation at speeds up to 64 kbps, one of the following optional circuit boards must be ordered:

- **Multipurpose Enhancement Board.** Provides an RS-366 Automatic Calling Unit (ACU) interface and converts the RS-232 interface on the main circuit board from asynchronous to synchronous. A V.35 adapter cable must be ordered separately to operate at data rates of 56 and 64 kbps. Without the adapter cable, data rates are limited to 1200, 2400, 4800, 9600, and 19,200 bps.
- **High-Speed Synchronous Interface Enhancement Board.** Provides a V.35 interface at synchronous data rates of 48, 56, or 64 kbps. A V.35 adapter cable that converts the 25-pin male connector on the board to the industry-standard 34-pin V.35 interface is included.

Data Module Features

The data module offers the following features:

Asynchronous Features

- RS-232 interface
- asynchronous full-duplex operation
- selected data rates of 300, 1200, 2400, 4800, 9600, and 19,200 bps
- data options set via the data terminal attached to the RS-232 interface
- ability to change options without dropping a data call
- autobaud (also called data metering or speed matching), or the ability to adjust the speed of transmission to match the speed of the data terminal being called
- auto-adjust, or the ability to adjust to the speed and parity of the data terminal being used
- call setup (dialing) from the keyboard of an ASCII data terminal by using the local command (CMD) mode or AT mode
- automatic or manual answering of incoming data calls

Synchronous Features with Multipurpose Enhancement Board

- RS-232 interface
- half- or full-duplex operation using the RS-232 interface at data rates of 1200, 2400, 4800, 9600, and 19,200 using data transport Mode 2
- half- or full-duplex operation at 56 kbps via the V.35 interface adapter cable

- full-duplex operation at 64 kbps via the V.35 interface adapter cable
- automatic answering of incoming data calls
- ability to place outgoing data calls manually and select user-programmable telephone numbers from the data module display on the front panel
- RS-366 interface to an Automatic Calling Unit (ACU)

Synchronous Features with High-Speed Synchronous Enhancement Board

- V.35 interface (The adapter cable is provided when the board is ordered by using PEC 21624.)
- full-duplex operation at 48, 56, and 64 kbps
- half-duplex operation at 56 kbps only
- automatic answering of incoming data calls
- ability to place data calls manually and select user-programmable telephone numbers from the data module display on the front panel

Installation

Various configurations are used on the ISDN 7500B Data Module. Depending on the configuration, some equipment is required and some is optional.

Required Equipment

- ISDN 7500B Data Module
- WP90110,L1 power supply (for stand-alone)
- D8W cord
- EIA-232D cable(s) or V.35 cable

Optional Equipment

- multipurpose enhancement board
- high-speed, synchronous enhancement board with V.35 adapter cable
- 440A4 terminating resistor adapter (needed when the 7500B is installed without an MLX telephone)

Installation Procedures

Follow the steps for the proper configuration to install the ISDN 7500B Data Module.

Stand-Alone, Single-Port Asynchronous DCE Configuration. This configuration uses the basic ISDN 7500B Data Module (see Figure 35):

1. Remove the 7500B from the box.
2. Plug the D8W cord into the jack labeled LINE on the back of the 7500B.
3. Plug the WP90110,L1 power supply cord into the connector labeled POWER on the 7500B.
4. Plug the male end of the EIA-232D cable into the connector labeled PORT 1.
5. Connect the other end of the EIA-232D cable to the data terminal.
6. Plug the other end of the D8W cord into a telephone wall jack or into a 440A4 terminating resistor adapter (when the 7500B is installed without an MLX telephone).
7. As necessary, plug the terminating resistor adapter into the wall jack.
8. Plug the power cords of the WP90110,L1 power supply and the data terminal into an AC power outlet that is not controlled by a wall switch.

Stand-Alone Asynchronous DTE Configuration. Follow the steps below to configure the ISDN 7500B Data Module to work with a modem in a modem pool:

1. Remove the 7500B from the box.
2. Open the door panel on the 7500B.
   a. Insert a pen into the small hole near the LINE label on the back panel.
   b. Push in on the tab in the hole while you pull upon that side of the door.
   c. Repeat steps a and b for the other side of the door panel by sticking your pen into the small hole near the PORT 2 label.
   d. Lift off the door and set it aside.
3. Looking straight down at the inside of the 7500B, locate the large silver arrow pointing toward the back.

   This arrow points to the DCE/DTE flip board, which is perpendicular to the plane of the arrow.
4. Look at the DCE/DTE flip board from the front of the 7500B (see Figure 33).

   Either DTE or DCE will be in the left-hand corner of the board.
5. Adjust the flip board as needed.
   - If DTE is in the left-hand corner of the board, the 7500B is already configured for DTE; go to step 6.
   - If DCE is in the left-hand corner of the board:

   a. Grasp the flip board firmly with both hands.
   b. Pull up gently until the board is completely free.
   c. Turn the board around 180 degrees (DTE is in the left-hand corner.)
   d. Replace the board in its slot.

6. Close the door panel by hooking the hinges under the front housing and then snapping the rear tabs into place.
7. Plug the D8W cord into the jack labeled LINE.
8. Plug the power supply cord into the connector labeled POWER on the 7500B.
9. Plug the male end of the EIA-232D cable into the connector labeled PORT 1.
10. Connect the other end of the EIA-232D cable to the modem (a male-to-male cord or a male-to-female cord with a gender changer is needed).
11. Plug the power cord into an AC power outlet.
12. Plug the D8W cord into a telephone wall jack.

    Note: Before plugging the D8W cord into a wall jack, make sure you do not need the terminating resistor adapter. If you need it, see "Terminating Resistor Adapter Installation" later in this chapter.

Stand-Alone Multipurpose Enhancement DCE Configuration. Follow the steps below to configure the 7500B for use with the multipurpose enhancement board to work with modems:

1. Remove the 7500B from its box or turn off the power on installed sets.
2. Remove the multipurpose enhancement board from its box.
3. Open the door panel on the 7500B.
   a. Insert a pen into the small hole near the LINE label on the back panel.
   b. Push in on the tab in the hole while you pull up on that side of the door.

c. Repeat steps a and b for the other side of the door panel by sticking the pen into the small hole near the PORT 2 label.

d. Lift off the door and set it aside.

4. Remove the protective cover from the PORT 2 slot (see Figure 36).

   a. Hold the cover (the marked area) for the PORT 2 slot in one hand and the rest of the rear panel in the other.

   b. Gently move the cover back and forth until the cover separates from the rear panel.

   c. Discard the cover.

5. Install the multipurpose enhancement board (see Figure 37).

   a. Holding the enhancement board with the EIA-232D connector pointed toward the back of the 7500B and with the component side down, position the board over the open area of the 7500B.

   b. Attach the pigtail connector to the pin between the power connector and the screw for the EIA-232D connector.

   c. Position the board so that its cutouts correspond to the notches in the plastic housing.

   d. Gently push on the board until it is firmly in place and the edges of the board rest on the notches in the housing.

6. Close the door panel by hooking the hinges under the front housing and then snapping the rear tabs into place.

7. Peel off the label indicating the EIA-232D interface from the enhancement board package and stick it to the rear panel under the PORT 2 connector.

8. Plug the D8W cord into the jack labeled LINE.

9. Plug the power supply cord for the 7500B into the connector labeled POWER.

10. Plug the male end of the EIA-232D cable into PORT 1.
11. Connect the other end of the EIA-232D cable to the data terminal or computer port.
12. If the automatic calling unit function is to be used, connect a 25-pin EIA cable between the RS-366 interface (PORT 2) and the computer's RS-366 ACU interface.
13. Plug the power cord for the 7500B into the AC outlet.
14. Plug the D8W cord into the telephone wall jack.

    Note: Before plugging the D8W cord into a wall jack, make sure you do not need the terminating resistor adapter. If you need it, see "Installing the Terminating Resistor Adapter" later in this chapter.

Stand-Alone, High-Speed, Synchronous DCE Configuration. Follow the steps below to configure the ISDN 7500B Data Module for high-speed, synchronous modem operation:

1. Remove the 7500B from its box or turn off the power if the 7500B is already installed.
2. Remove the high-speed, synchronous enhancement board from its box.
3. Open the door panel on the 7500B.
   a. Insert a pen into the small hole near the LINE label on the back panel.
   b. Push in on the tab in the hole while you pull upon that side of the door.
   c. Repeat steps a and b for the other side of the door panel by sticking the pen into the small hole near the PORT 2 label.
   d. Lift off the door and set it aside.

4. Remove the protective cover from the PORT 2 slot (see Figure 36).
   a. Hold the cover (the marked area) for the PORT 2 slot in one hand and the rest of the rear panel in the other.
   b. Gently move the cover back and forth until the cover separates from the rear panel.
   c. Discard the cover.
5. Install the high-speed, synchronous enhancement board (see Figure 37).
   a. Holding the enhancement board with the EIA-232D connector pointed toward the back of the 7500B and with the component side down, position the board over the open area of the 7500B.
   b. Attach the pigtail connector to the pin between the power connector and the screw for the EIA-232D connector.
   c. Position the board so that its cutouts correspond to the notches in the plastic housing.
   d. Gently push on the board until it is firmly in place and the edges of the board rest on the notches in the housing.
6. Close the door panel by hooking the hinges under the front housing and then snapping the rear tabs into place.
7. Plug the D8W cord into the jack labeled LINE.
8. Plug the power supply cord for the 7500B into the connector labeled POWER.
9. Connect a V.35 adapter cable (packaged with the enhancement board) to PORT 2.
10. Connect a V.35 cable between the adapter and the V.35 data terminal.
11. Plug the power cord into the AC outlet.

12. Plug the D8W cord into the telephone wall jack.

    Note: Before plugging the D8W cord into a wall jack, make sure you do not need the terminating resistor adapter. If you need it, see “Terminating Resistor Adapter Installation” below.

Terminating Resistor Adapter Installation

Connect a terminating resistor adapter to the D8W cord going to the wall jack if there is no MLX telephone connected to the ISDN 7500B Data Module. This adapter provides 100 ohms to terminate the line.

Modems

A modem is used at an analog data station to place and/or answer data calls. It converts the digital signals from the data terminal into analog signals for transmission over standard telephone lines. It also converts incoming analog signals to digital signals for acceptance by the data terminal.

Hardware Requirements

Most modems can be connected to the system. If a modem is used in a modem pool, a 2224G modem or its equivalent must be used (see "Modem Pool" later in this chapter).

If you use a modem with an MLX telephone, install a Multi-Function Module (MFM) in the telephone to provide a tip/ring interface for the modem. Connect the modem directly to the MFM. If the modem is used with an analog multiline telephone, a General Purpose Adapter is required to provide a tip/ring interface for the modem. (See "Install the Multi-Function Module" later in this chapter and "General Purpose Adapter" in Chapter 6 for more detailed information.)

When a modem is connected to an MLX telephone using an MFM, dial data calls using the data terminal keyboard and dial voice calls using the telephone dialpad. The MLX telephone cannot be used to dial data calls, and the data module cannot be used to dial voice calls. Each device operates independently, and features are assigned to each device independently.

When a modem is connected to an analog multiline telephone using a GPA, data calls and voice calls are dialed by using the telephone dialpad. The modem and telephone do not operate independently; features assigned to the telephone also apply to the analog data station (modem and associated data terminal).

Modem Features

The modem used in an analog data station (and not in a modem pool) provides the following features:

- dialing or ending asynchronous data calls from the keyboard when connected to a tip/ring station jack on a 012 or 008 OPT module or when connected to an MLX telephone using an MFM
- autobaud (also called data metering or speed matching), or the ability to adjust the speed of transmission to match the speed of the data terminal being called
- automatic or manual answering of incoming data calls
- self-test and maintenance procedures
- ability to set data options for the call an the keyboard and, if necessary, change the options without dropping the call

Modem Pool

A modem pool (also called a conversion resource) is made up of one or more pairings of an ISDN 7500B Data Module and a modem. The modem pool is used to convert data signals from digital to analog or to convert data signals from analog to digital.

This allows data communications between digital data stations and analog data stations.

There are two types of modem pools:

- **Analog to Digital** converts analog signals to digital signals. This allows analog data station users to communicate with inside digital station users or to place data calls using an outside digital ISDN-PRI facility. The modern is connected to the control unit by a basic station jack on a 012 module, and the ISDN 7500B Data Module is connected to the control unit by a digital station jack on a 008 MLX module. Data calls are placed to outside data stations through the control unit using system lines (outside ISDN-PRI facilities connected to the DS1 line/trunk jack on a 100D module in the control unit).
- **Digital to Analog** converts digital signals to analog signals. This allows digital data station users to communicate with inside analog data stations or to place data calls using the regular telephone network.

  The modem is connected to the CU by a tip/ring jack on a 012 or 008 OPT module, and the ISDN 7500B Data Module is connected to the CU by a digital station jack on a 008 MLX module. Data calls are placed to outside data stations through the CU using system lines (outside tines/trunks connected to a line/trunk jack on a 400, 400 GS/LS/TTR 800, 800 GS/LS, 408, 408 GS/LS, 800 DID, or 400EM module in the CU.

Analog-to-digital and digital-to-analog pools can also connect dedicated outside analog data lines to digital ports (008 MLX module) on the system.

Because of interfacing problems between the RS-232 on the modem with the RS-232 on the 7500B, modem pools can operate in one direction only—analog-to-digital or digital-to-analog.

Hardware Requirements

A modem pool requires an ISDN 7500B Data Module(PEC2164-BDM) and a 2224G modem or its equivalent. Since the 7500B in a modem pool operates without an MLX telephone, a 100-ohm 440A4 terminating resistor adapter (PEC 2709-A59) must be installed on the line near the 7500B.

The ISDN 7500B Data Module can be configured as a stand-alone by ordering a WP-90110-L1 power unit (PEC 21625). The 7500B can also be configured in a multiple-mount arrangement by ordering a Z77A data mounting (PEC 21626), which provides a common power supply for up to eight data modules. Both the power unit and the data mounting require a 115-VAC power outlet. Neither is provided with the data module, and both must be ordered separately.

The modem used in a modem pool must have the following features:

- full-duplex operation
- 10-bit code support (start, 8 data bits, stop)
- RS-232 asynchronous interface
- any or all of the following data rates: 300, 1200, 2400, 4800, and 9600 bps
- supports DTMF dialing via the RS-232 interface
- ability to turn on or maintain the Clear-to-Send indicator when it is ready to receive ASCII dialing sequences from the data module in response to a Data-Terminal-Ready signal from the data module
- ability to keep the Data-Set-Ready lead on (and not turn it off) during transition from the interactive dialing mode to the data mode
- ability to terminate a data call or dialing sequence when the data module turns off its Data-Terminal-Ready lead

- ability to turn off the Data-Set-Ready or Receive-Line-Signal detect lead for a minimum of 50 ms when hanging up at the termination of a data call
- ability to turn on the Ring indicator lead for at least 100 ms in the presence of an incoming analog call
- supports Electronic Industries Association (EIA) signals CI and CI2 if the modem is multispeed

Note: AT&T model 2224G (PEC 2224-CEO for stand-alone, PEC 2224-GED for rack-mounting arrangement) is recommended.

Option Settings Requirements

The options set on a modem and a data module in a modem pool differ depending on whether the modem pool is digital-to-analog or analog-to-digital.

Following are the options required for the modem and data module for each type of modem pool. See the user manuals provided with the modem and the ISDN 7500B Data Module for instructions on how the options are set and the meaning of each option.

Digital-to-Analog Modem Pool Option Settings

Data Module Option Settings. Use the following procedure to prepare the ISDN 7500B Data Module for operation in a digital-to-analog modem pool:

1. Use the instructions provided in the 7500B user manual to set the DCE/DTE flip board to the DTE position.
2. Use the front panel controls on the 7500B to set the options on the display (see Table 3-28). See the ISDN 7500B Data Module user's manual for detailed information on using the front panel controls and the meaning for each option.

Table 3-28 ISDN 7500B Data Module Option Settings for Digital-to-Analog Modem Pool Operation

Position No.:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	L	1	:	3	3	3	0	0	0	b	0	0	1	0	1	1
	L	2	:	0	1	1	1	0	0	0	3	1	0	0	0	0

b = blank, L = Line #

Modem Option Settings. The following procedure is one method to prepare the AT&T model 2224G modem for operation in a digital-to-analog modem pool. The procedure is only a recommended method and may be different if you are using another type of modem.

1. Connect a data terminal such as a PC to the modem and plug both the modem and data terminal into an AC outlet.
2. Use the instructions provided with the modem to set all bit-switches to their default positions; except set the switch 1, bit 2 to the right.
3. Save all bit-switch settings by unplugging the modem from the wall outlet and then plugging it back in.
4. Set the data terminal speed to match the modem's default speed.
5. The modem is now operating in the AT&T command protocol. Set the default software options:
   - Type "od"
   - Press Enter
6. Set all bit-switches according to Table 3-29.

7. Unplug the modem from the wall outlet; then plug it back in. Set switch 1, bit 2 to the left. This stores the switch settings in the modem's memory, and the modem is now operating in the AT command protocol.

Table 3-29 Modem Option Setting for Digital-to-Analog Modem Pool Operation

Switch	Bit Number 1	2	3	4	5	6	7	8
1	L	R	L	R	R	R	L	L
2	L	R	L	L	L	L	L	L
3	D	D	D	D	U	U	D	D
4	D	D	D	D	D	U	D	D
5	U	D	U	U	U	D	D	D
7	on	on						

L = left, R = right, U = up, D = down

8. Enter command mode, set the options, and save the options into protected memory to prevent loss of settings in case of a power failure:

   - Type "AT" and press Enter to enter the local mode.
   - Type "AT&D2" and press Enter. Option set: drop call when DTR low.
   - Type "AT&C1" and press Enter. Option set: data carrier detect follow call.
   - Type "ATS0=1" and press Enter. Option set: Auto Answer.

- Type "ATQ0" and press Enter. Option set: enable result codes (factory setting).
- Type "AT&W" and press Enter to write options to protected memory.

Analog-to-Digital Modem Pool Option Settings

Data Module Option Settings. Use the following procedure to prepare the ISDN 7500B Data Module for operation in an analog-to-digital modem pool:

1. Use the instructions provided in the 7500B user manual to set the DCE/DTE flip board to the DTE position.
2. Use the front panel controls on the 7500B data module to set the options on the display (see Table 3-30). See the ISDN 7500B Data Module user's manual for detailed information on using the front panel controls and the meaning for each option.

Table 3-30 ISDN 7500B Data Module Option Settings for Analog-to-Digital Modem Pool Operation

Position No.:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
L 1 :	3	3	3	0	1	0	b	0	0	1	0	1	0			
L 2 :	0	1	1	1	0	0	0	3	1	0	0	0	0			

b= blank, L = Line #

Modem Option Settings. The following procedure is one method to prepare the AT&T model 2224G modem for operation in an analog-to-digital modem pool. This procedure is only a recommended method and may be different if you are using another type of modem.

1. Connect a data terminal such as a PC to the modem and plug both the modem and data terminal into an AC outlet.

2. Use the instructions provided with the modem to set all bit-switches to their default positions; except set the switch 1, bit 2 to the right.
3. Save all bit-switch settings by unplugging the modem from the wall outlet then plugging it back in.
4. Set the data terminal speed to match the modem's default speed.
5. The modem is now operating in the AT&T command protocol. Set the default software options:
   - Type "od"
   - Press Enter.
6. Set all bit-switches according to Table 3-31.

Table 3-31 Modem Option Setting for Analog-to-Digital Modem Pool Operation

Switch	Bit Number 1	2	3	4	5	6	7	8
1	L	R	L	R	R	R	L	L
2	L	R	L	L	L	L	L	L
3	D	D	D	D	U	U	D	D
4	D	D	D	D	D	U	D	D
5	U	D	U	U	U	D	D	D
7	on	on						

L = left, R = right, U = up, D = down

7. Unplug the modem from the wall outlet; then plug it back in. Set switch 1, bit 2 to the left. This stores the switch settings in the modem's memory, and the modem is now operating in the AT command protocol.
8. Enter command mode, set the options, and save the options into protected memory to prevent loss of settings in case of a power failure:
   - Type "AT" and press Enter to enter the local mode.
   - Type "AT&D2" and press Enter. Option set: drop call when DTR low.
   - Type "AT&C1" and press Enter. Option set: data carrier detect follow call.
   - Type "ATS0=1" and press Enter. Option set: Auto Answer.
   - Type "ATQ1" and press Enter. Option set: disable result codes.
   - Type "AT&W" and press Enter to write options to protected memory.

System Wiring

System wiring involves two installations:

- connecting the network interface to the control unit (CU)
- connecting the CU to the stations

On the network interface side, the method of connection depends on the type of network interface that is installed.

On the station side, the method of connection depends on the number of stations; 24 stations and under uses direct connection, while over 24 stations requires building a cross-connect field.

The recommended options for building the wiring field on the station side are Interconnect Wire, a complete wiring kit that uses 110 jack-panel blocks, a template, wiring troughs, D-rings, and D8W cords; or SYSTIMAX, a complete wiring kit containing 110 termination blocks with modular jacks, a 110A field-termination block, a template, wiring troughs, D-rings, and patch cords.

CAUTION:
To avoid coupling power supply noise onto system wiring, allow at least 3 inches of clearance between the basic carrier's power supply and any wiring or termination hardware located left of the CU.

Note: While there are many ways to connect the network interface to the CU and the CU to the stations, the methods shown here are the recommended ones.

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.

If staples are used to attach the cords to walls or baseboards, check that the cords have not been pierced. Also, do not run CO lines from the network interface to the CU if the distance is greater than 25 feet.

Connect the Network Interface to the CU

The local telephone company installs the network interface for the CO lines. Before you install the system, verify that the network interface is the proper type and that it is located within 25 feet of the CU. The adapter needed to connect the CO lines to the CU depends on the type of network interface, as shown in Table 3-32 below.

CAUTION:
To avoid coupling power supply noise onto system wiring, allow at least 3 inches of clearance between the basic carrier's power supply and any wiring or termination hardware located left of the CU.

Table 3-32 Network Interfaces

Network Interface	Description	Adapter
RJ11-type	Connects one outside ground-start (GS), loop-start (LS), or Direct Inward Dialing (DID) line/trunk to one modular jack	
RJ14-type	Connects two outside lines/trunks to one modular jack (GS, LS, and DID)	2-line adapter (267C-type)
RJ21X	50-pin connector connects 25 outside lines/trunks (GS, LS, and DID)	110AB1 jack-panel block
RJ2GX	50-pin connector for up to eight tie trunks	356A for eight tie trunks 259A for one tie trunk
RJ48C/X	Connects DS1 facilities to a 4-pair jack (two active pairs)	Z601A if modular cords are used

After installing the adapter, label each jack going to the CU with the CO line number. Use the list provided by the local telephone company or the planning form(s) for outside lines/trunks as a reference.

You may also need to know the interface codes for network facilities. These codes are shown below in Table 3-33 by trunk type and adapter type.

Table 3-33 CO Network Interface Codes

Line/ Trunk Type	Federal Interface Code for Facility	Network Interface
LS CO line	02LS2	RJ11C, RJ14C RJ21
GS CO trunk	02GS2	RJ11C, RJ14C, RJ21
DID	02RV2-T	RJ11C, RJ14C, RJ21
OPS	0L13C	RJ11C
Tie trunk	TL31M	RJ2GX
DS1	04DU9-B 04DU9-C	RJ48C/X*

* The preferred network interface is the RJ48X. With the RJ48X interface, if no connection is provided by the customer's equipment, the T1 facility's receive pair is looped back to the transmit pair. This simplifies troubleshooting the T1 facility.

In most installations, the network interface is connected through a cross-connect field to the CU. However, for systems with fewer than 24 stations, the line/trunk wires can be directly connected to the CU.

Note: When constructing wiring fields between the network interface and the CU, you must order hardware as individual parts. Do not use Interconnect Wiring or SYSTIMAX kits.

RJ21X Interface

The RJ21X interface has a female 50-pin (25-pair) amphenol connector (see Figure 38). To connect the RJ21 X interface to the CU, you must build a wiring field between the RJ21X interface and the CU. This field, in effect, converts the female amphenol connector to 8-wire modular jacks.

Building the Wiring Field

Build the wiring field between the network interface and the CU by using 110AB1-100JP12 terminal blocks with modular jacks and associated hardware. Use the hardware and procedure below to build this wiring field.

Hardware (see Figure 39)

- 110AB1-100JP12 termination blocks with modular jacks
- 110A1 wire troughs
- D-rings
- D2R cords

Tools (see Figure 40)

- D-impact tool
- spudger
- hand tools

Procedure

Follow these steps to connect the RJ21X network interface to the CU:

1. Drill two diagonally opposite holes in a suitable backboard (plywood is recommended) for each piece of hardware. Keep a 1/16-inch 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, an A25D male-connector, single-ended, 25-pair, non-plenum cable can be used.
5. As needed, mount D-rings to properly dress the wires.
6. Cut off the amphenol connector on the cross-connect field side 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 41).
   d. Remove any insulation fragments with a spudger.
8. Test the CO lines for proper connection (see "Testing CO Lines/Trunks" in this chapter).
9. Label the network interface jacks, CU module jacks, termination blocks, and D2R cords properly (see “Labeling CO Lines/Trunks” in this chapter).
10. For each line/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 CU module.

    Note: The modular jacks on the termination block are 8-wire jacks. The D2R cords are only 6-wire cords, but they will plug into the 8-wire jacks.

CAUTION:
Do not plug an analog multiline telephone, an MLX telephone, or anything else from the station side of the CU into this wiring field on the CO side. Doing so will busy-out the line/trunk.

RJ11 and RJ14 Interfaces

The RJ11 and RJ14 interfaces are connected in nearly identical ways, but the RJ11 interface connects one CO line per jack, while the RJ14 interface connects two lines per jack. Plug a 267C-type adapter into each RJ14 jack (see Figure 38).

Hardware

- D2R cords

Procedure

Follow these steps to connect the RJ11 and RJ14 network interfaces to the CU.

1. Test the CO lines for proper connection (see “Testing CO Lines/Trunks” in this chapter).
2. Label the network interface jacks, the CU module jacks, and the D2R cords properly (see “Labeling CO Lines/Trunks” in this chapter).
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 CU.
4. Dress the wires properly.

RJ2GX Interface

The RJ2GX interface is a 25-pair amphenol connector that interfaces up to eight tie trunks. You construct the cross-connect field in the same way as for the RJ21X interface (see "RJ21X Interface" earlier in this chapter).

Note: RJ21X and RJ2GX interfaces do not require separate termination blocks. If there is room on the termination block for the line wires, both the RJ21X and the RJ2GX can be punched down on the same 110AB1-100JP12 block. Any wires not used are left unterminated.

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

RJ48C/X Interface

The RJ48C/X interface terminates a DS1 line 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 T1 facility's receive pair to the transmit pair. This helps in testing the T1 facility from the CO.

Testing CO Lines/Trunks

Before connecting the CO lines/trunks to the CU, you must verify that a dial tone is being received and that you can dial out on every line.

Note: DID trunks can be tested only through the CU; 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.

Test Loop-Start Lines/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 lines/trunks, you should perform this test with a rotary telephone.)

1. Plug the telephone or the craft set into each CO line jack (either at the network interface or at the cross-connect field) and listen for a dial tone.
2. If you find a CO line that does not have a dial tone, check for a bad adapter or loose connections.
3. If adapters and wiring are in working order but you still don't hear a dial tone, notify the customer.
4. If you hear a dial tone, dial a known telephone number to verify dialing. Also check that you have good two-way transmission after the CO completes the connection.
5. If outward dialing is not possible on any of the lines, notify the customer.

   Note: It is the customer's responsibility to report service outages to the local telephone company.

Test Ground-Start Lines/Trunks

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

Note: If a single-line telephone with a ground key is not available, ground one side of a line/trunk.

1. Plug the single-line telephone into each CO line jack (either at the network interface or at the cross-connect field).

2. Ground the ring lead by pushing the ground key or by grounding one side of the line/trunk.
3. Pick up the handset.

   You should hear a dial tone.
4. Remove the ground from the ring lead.
5. Dial a known telephone number to verify dialing. Also check that you have good two-way transmission after the CO completes the connection.
6. If you find a CO line that does not have a dial tone, check for a bad adapter or loose connections.
7. If adapters and wiring are in working order but you still don't hear a dial tone, notify the customer.
8. If outward dialing is not possible on any of the lines, notify the customer.

   Note: It is the customer's responsibility to report service outages to the local telephone company.

Labeling CO Lines/Trunks

You can have up to 80 CO line jacks on the communications system (01 to 80). Follow the procedure in this chapter to label each D2R or D8W cord, network interface jack, and CU module jack.

Procedure

1. Review the system planning forms to determine each CO line assignment on the CU.
2. Place a green cord label (packaged with the basic carrier) at each end of every D2R or D8W cord. The green label indicates the number of the CO line jack to which the cord is connected.

3. Label the jacks on the termination blocks.
4. Leave a copy of the CO line assignment planning form in a secure spot near the CU.

Connect the CU to the Stations

The following recommended methods of wiring the system from the CU to the stations are divided according to the number of stations: 24 stations and under, and over 24 stations.

CAUTION:
To avoid coupling power supply noise onto system wiring, allow at least 3 inches of clearance between the basic carrier's power supply and any wiring or termination hardware located left of the CU.

Note: You must record each station jack connection and each station change on the "System Technician's Run Sheet" (see Appendix L).

24 Stations and Under

For a system with up to 24 stations, direct wiring is recommended. To do this, plug in one end of a DIW cord into the station jack on the CU module and connect the other end to the 103/104 wall jack of the station.

Hardware (see Figure 42)

- DIW cords
- Unicon plug
- cable ties

Tools (see Figure 40)

- 4-pair plug presser

Procedure

1. Run the DIW cord from the CU to the station and cut it. Allow enough slack for dressing the wire.
2. Attach a Unicon plug to the CU end of the DIW cord by using the 4-pair plug presser.
3. Plug the DIW cord into the CU and connect the other end to the station jack (see “Terminating Cable at a Station Outlet” in this chapter).
4. Repeat steps 1 to 3 for each station line.
5. Dress the wires properly by using cable ties. Fasten wire runs vertically to the left or right of the CU. The final horizontal wire run to the CU must be fastened within 12 inches of the CU. Allow sufficient slack to reach any port on the CU.
6. Label the CU module jacks, station jacks, and DIW cords properly (see “Label the System Wiring” in this chapter).

Over 24 Stations

For systems with more than 24 stations, the two recommended methods are Interconnect Wiring and SYSTIMAX.

Interconnect Wiring

Interconnect Wiring is required when the system has more than 24 stations and SYSTIMAX has not been ordered. The Interconnect Wiring module provides the hardware to interconnect up to 12 stations with 110-type wiring.

For Interconnect Wiring, you must build a jack field between the CU and the stations by using 110AB1-100JP12 termination blocks with modular jacks and 110A1 wire troughs.

Hardware

Each kit includes:

- instructions and parts sheet
- 110AB1-100JP12 termination blocks with modular jacks
- 110A1 wire troughs
- D-rings
- D8W cords

Tools (see Figure 40)

- D-impact tool
- spudger
- hand tools

Procedure

1. Drill two diagonally opposite holes in a suitable backboard (plywood is recommended) for each piece of hardware. Keep a 1/16-inch space between each piece of hardware.
2. Mount the wire troughs and the termination blocks. There is a wire trough above each termination block.
3. If necessary, repeat steps 1 and 2 for a second column.
4. Mount the termination blocks and terminate the station cable. If the station cable is bottom feed, start at the top and work down. If the station cable is top feed, start at the bottom and work up.
   a. Mount a termination block to the wall with appropriate fasteners.
   b. Strip the jacket off the 4-pair DIW station wires, exposing the conductors.
   c. Punch down the station wires to the termination block.

(1) Route the station wires underneath the termination block and through the fanning slots.

(2) Insert the conductors into the designated 110 connecting blocks already on the termination block. Follow the color sequence shown in Figure 43.

(3) Use the D-impact tool to seat the conductors (see Figure 41).

(4) Remove any insulation fragments with a spudger.

d. Repeat steps a through c above for each termination block.

5. Mount the wire troughs.
6. As needed, mount the D-rings.
7. Label the D8W cords, termination blocks, and DIW cords properly (see "Label the System Wiring" in this chapter).
8. Plug one end of a D8W cord into the station jack on the CU module and the other end into the designated jack on the termination block. Do this for all stations.
9. Dress the wires through the wire troughs and D-rings (see Figure 44).

SYSTIMAX

SYSTIMAX is a wiring method that uses kits containing all the hardware you need to build a cross-connect field between the CU and the station jack.

CAUTION:

To avoid coupling power supply noise onto system wiring, allow at least 3 inches of clearance between the basic carrier's power supply and any wiring or termination hardware located left of the CU.

With each kit you can build up to 24 jacks. The maximum number of stations on the system is 144 and would require six kits.

Hardware (see Figures 39 and 42)

Each kit includes:

- instructions and parts sheet
- template
- two 110AB1-100JP12 termination blocks with modular jacks
- one 110AB1-100FT field-terminated block
- 110A1 wire troughs
- D-rings
- 110P8A5B patch cords
- D8W cords

Tools (see Figure 40)

- D-impact tool
- 788J1 impact tool
- spudger
- hand tools

Procedure

1. Locate the proper wall space. The cross-connect field will usually be to the right of the CU. Leave enough space between the CU and the cross-connect field to allow for system growth.
2. Attach the template to the wall or backboard with a staple gun, tacks, or tape. Make sure that the upper edge of the template outline is 70 inches above the floor and that the template is parallel to the floor (see Figure 45).
3. Find the placement of the hardware on the template (see Figure 46). The first and third columns on the template show where the termination blocks go; the middle column shows the place for the field-terminated blocks.

   Keep the elements of a kit in the same-colored blocks. For example, the termination blocks of kit #1 go in the green section of column 1; the field-terminated block of kit #1 goes in the green section of column 2.
4. Drill two diagonally opposite holes for each piece of hardware. You can drill right through the template (see Figure 47). There is a 1/16-inch space between the outline of each piece of hardware; keep this space as you mount the hardware.
5. Remove the template from the wall. Keep it in one piece so you can check it for correct placement of the hardware.
6. Mount the wire troughs and termination blocks on columns 1 and 3 as needed.
7. Mount the field-terminated blocks on column 2 and terminate the station cable. If the station cable is bottom feed, start at the top and work down. If the station cable is top feed, start at the bottom and work up. In either case, work on one field-terminated block at a time.

   a. Run the station cable underneath the field-terminated block.

b. Strip 12 inches of jacketing off the cable, exposing the conductors.

c. Press the conductors into the index strip on the field-terminated block according to the color sequence shown in Figure 43. Make sure each pair keeps its twist up to the index strip. (Each pair is split by a raised tooth on the index strip.)

d. Use the 788J1 impact tool to seat and trim the conductors (see Figure 48). Make sure the blade edge is positioned properly: blade up for rows 1 and 3, blade down for rows 2 and 4.

e. Continue seating and trimming conductors from left to right for each row.

Note: The last two right-hand slots must remain vacant.

f. Reverse the blade edge on the 788J1 impact tool and use the tool to seat the connecting blocks on each index strip (see Figure 49). Make sure the slate strip on each connecting block is facing down.

8. As shown on the template, mount the wire troughs on column 2 after all the field-terminated blocks have been wired.

9. Mount the D-rings between the columns as needed to dress the patch cords.

10. Plug one end of a D8W cord into the proper CU module station jack and the other end into the corresponding jack on the termination block in column 1 or column 3. Repeat for all the D8W cords.

11. Dress the D8W cords through the wire trough above the termination block (see Figure 44).

Note: Each kit has extra D-rings and wire troughs. Use them as needed to dress the cords.

12. Label the termination and field-terminated blocks (see “Label the System Wiring” in this chapter). Write the appropriate information (such as extension numbers and users’ names) on the strip labels provided and snap the designation strips into place.
13. Use the 110P8A5B patch cords to connect termination blocks to field-terminated blocks (see Figure 50). Properly dress the patch cords through the wire troughs and D-rings.

Wire a Telephone for Two Voice-Pairs

If an analog telephone requires either the Voice Announce to Busy feature or the Simultaneous Voice and Data feature, you must assign two adjacent odd/even station jacks (01 and 02, 13 and 14, etc.) on an analog station module to that telephone. The numbers of these station jacks are boxed on the planning forms.

Two voice-pairs (one pair from each jack) must be connected from the CU to the telephone (see Figure 51). A bridging adapter is used to connect both voice-pairs to the telephone.

Note: In Figure 51, the wire from station jack 39 connects to the jack labeled EVEN on the bridging adapter. The label on the bridging adapter refers to the default intercom number, which does not necessarily match the station jack number in terms of odd and even. Odd/even wiring refers to jack numbers, not intercom numbers.

Terminate Cable at a Station Outlet

There are many kinds of station outlets, which are fundamentally all the same. Some are wall-mounted, affixed directly onto a wall surface, and others are flush-mounted, where the jacks are located inside a wall housed in a regular electrical box. On the workstation side, a cord plugs into the jack; on the closet side, the 4-pair wire is hardwired to the outlet.

Following is one method to use when connecting 4-pair wire to a wall-mounted station outlet. You should be able to adapt the method used to join 4-pair wire to flush-mounted outlets.

Note: In some cases the electrical boxes will already be mounted; in others the installer must do the job. In either case, the box should be installed before the wire is terminated on the outlet.

1. Take the outlet apart by first unscrewing the screw that holds the sections together; then pull off the termination clips.
2. Pull out a few feet of slack from the wall.
3. Use diagonal pliers to strip 3 to 4 inches off the end of the 4-pair wire.
4. Thread the conductors through a hole in the base of the outlet.
5. Press the wires into appropriate slots on the outlet (see Figure 52).
6. Use diagonal pliers to clip off the ends of the conductors.
7. Press the clips back on over the wires (see Figure 52).
8. Strip off the protective paper from the adhesive strips and press them onto the back of the outlet.
9. Press the outlet onto the wall.
10. As further security, also screw the outlet to the wall.
11. Screw the parts of the outlet together.

Label the System Wiring

If done correctly, labeling can provide valuable information about the location of wire or cable within the building and save hours of frustrating work.

There are five types of labels used for identification:

- **Cable labels.** Cable labels are white adhesive-backed tabs that are stuck to the cables to identify the source and the destination of the cables before they are pulled to and terminated in satellite closets and equipment rooms. The labels come in a variety of shapes and sizes to accommodate different sizes of cable. Use a pen or a felt-tip marker to write on the surface.
- **Field labels.** Field labels are adhesive-backed tabs that are applied to smooth surfaces in the equipment room and satellite closets. They identify components. Use a pen or a felt-tip marker to write on them.
- **Insert labels.** Insert labels are cardboard-like strips that slip inside the clear plastic designation strips located between the rows of a termination or field-terminated wiring block. They are color-coded to identify the origins of cables.

  Along with the color-coding scheme, alphanumeric codes on the labels help to identify the specific location of the same pair or series of pairs at the other end of the cable (see Table 3-34).
- **Jack labels.** Jack labels are small, white, rectangular-shaped stick-on tabs that are stuck to the cover plate or housing of station outlets. They identify the location of the satellite closet where the cable to that outlet is terminated and the number of the circuit.
- **Station cord labels.** The blue station cord labels are packaged with the CU carriers and wrap around each end of the station cords leaving the CU.

Table 3-34 Insert Labels

Color	What It Identifies	Special Features
Light blue	4-pair cable originating at station outlets in offices or other locations	The fourth pair of the 4-pair cable to MLX stations is reserved for supplying power to one DSS at an operator console.
White	Various types of riser (house) or campus cable connections	
Gray	Closet letter and circuit number	Used with 25-pair tie cables that link large riser closets and smaller satellite closets or two riser/satellite closets
Green	CO pairs	Used only on the line/trunk or auxiliary field in the equipment room
Purple	System-common equipment, such as a PBX or a data switch	Usually supplied with the system-common equipment
Yellow	Auxiliary circuits arranged in 3-pair modularity	For auxiliary circuits not arranged in 3-pair modularity, use blank labels. If a system has customized labels for the auxiliary system, use them.

Table 3-34 Continued

Color	What It Identifies	Special Features
Orange	Connections from transmission electronics equipment, such as multiplexer or concentrators	Supplied by the equipment manufacturers

Labeling 4-Pair Wire and Outlets

It doesn't matter whether you pull the 4-pair wire from the station to the CU or from the CU to the station. In either case, mark one end of the 4-pair wire with the location or destination of the other end.

Note: In the following procedure, it is assumed you are pulling from the station to the CU.

1. If you have not already received labeling instructions from the designer of your system, assign a number to each jack on the floor.
2. Put the boxes of wire near the offices (and jacks) to which they have been assigned.
3. Mark the end of each 4-pair wire with the number of the jack to which the wire has been assigned.
4. Mark the box with the letter of the closet to which the 4-pair is pulled and with the circuit number of the wire. This is the same as the number you wrote on the wire sheath. Wire 1 becomes circuit 1; wire 2 becomes circuit 2.
5. At the boxes next to the offices, pull out enough wire to reach the wall jacks. Allow plenty of slack. Cut the wire and mark the end of the 4-pair wire with the closet letter and the circuit number.

6. After you pull the wire into the office or work area and fish it through the wall opening for the wall jack, transfer the information to the faceplate of the jack itself. If you've done the job correctly, you should now have the correct closet letter and circuit number of the wire on the jack.
7. When the 4-pair wire reaches the CU cross-connect field, punch down the pairs in the sequence they are labeled on the sheath.
8. On the blue labels designed for the 110-type field-terminated block, add any necessary information. With preprinted labels, you add only the floor number. With blank labels, you also have to write in the closet letter and the number from the wire sheath.

If no labeling exists, simply assign a different number to each 4-pair wire and write that number on both the box and the wire end. Anyone who comes after you will find both ends of the wire labeled with the same unique number and should be able to proceed accordingly.

Checking Poorly Labeled Wiring

If you don't understand the labeling system used or a label is missing or damaged, use a tone device and a telephone handset to match like wires.

Hardware

- tone device
- telephone handset
- telephone cord with an 8-pin modular plug
- 4-pair patch cord

Tools

- diagonal pliers or wire strippers

Procedure

1. Insert the 8-pin plug of the telephone cord 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 untwist the wires.
4. Extending from the bottom of the tone device are two clips. Attach one wire of the pair you have chosen to one of the clips and the other wire to the other clip.
5. Turn on the switch on the outside of the tone device. You will hear a high-pitched, alternating signal.
6. Take the telephone handset and a 4-pair patch cord to the cross-connect field between the CU and the station.
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, cutoff the other end of the patch cord and expose the pairs. Don't cut off too much of the cord because you'll need the length to test the top rows of the cross-connect field.
9. The handset also has two clips with "teeth" that extend from its base. Attach the clip of the handset to the exposed wires of the patch cord. Set the switch on the side of the handset to MONITOR.
10. Listen in the handset for the tone device signal.
11. If you hear the signal, you have found the correct wires. Correctly label both the cross-connect field and the outlet.
12. 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.

Remove Damaged Connecting Blocks

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

Procedure

1. Remove the wires or the patch cord from the connecting block.
   - With interconnect wiring, remove the station wires with long-nosed pliers and tag the wires with tape to identify their position.
   - With SYSTIMAX, pull off the patch cord.
2. Place a 788K1 retainer tool against the conductor pairs beneath the connecting block to be removed.
3. Grip the connecting block in the center with pliers. Move the block gently up and down and pull it out (see Figure 53).
4. 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. Reseat it with the D-impact tool.
5. Seat the new connecting block by using the 788J1 impact tool (see Figure 49).
6. Replace the station wire onto the connecting block.
   - With interconnect wiring, remove the tag from the station wires and reseat the wires by using the D-impact tool.
   - With SYSTIMAX, attach the patch cord to the connecting block.

IROB Protection

Equipment connected to the analog multiline telephone station jacks (on the 008, 408, and 408 GS/LS/TTR modules) or to the MU telephone jacks (on the 008 MLX module) that is located in a different building from but within 1000 cable feet of the CU requires IROB (in-range out-of-building) protection units. These IROBS protect the equipment and the CU from lightning strikes and power surges. Two units are required for each piece of equipment — one for the CU end of the wire run, the other for the equipment end.

Note: No 012 basic telephone modules can be used in IROB applications.

Use the following IROB protectors:

- TII Model 343 (PEC 32918) for analog multiline telephones and equipment (see Figure 54)
- AT&T Model 505A (PEC 32919) for MLX telephones and equipment (see Figure 55)

WARNING:
The IROB protectors must be installed by an AT&T service technician, or an authorized representative, or a qualified installer. For installation instructions, read the CIB that comes with the IROB protector.

Make sure each IROB protector is properly connected and is grounded to an approved building ground.

Note: The 505A IROB protector contains fused primary and secondary protection for two pairs of wires. Auxiliary power cannot be fed through the 505A protector to terminal equipment.

Telephones and Consoles

The telephone system supports the MLX-10,™ MLX-10D,™ MLX-20L,™ and MLX-28™ telephones (see Figures 5–8), as well as analog multiline and single-line telephones.

The following describes how to install the MLX telephones and consoles, the Multi-Function Module, and the Direct Station Selector.

Install the Multi-Function Module

The Multi-Function Module (MFM) is an optional adapter for connecting tip/ring (T/R) or supplemental alert devices to any MLX telephone. If you are installing an MFM, do it before you install the MLX telephone.

The MFM provides a modular jack connection for

- T/R devices such as single-line telephones, fax machines, modems, credit card verification terminals, cordless telephones, and answering machines. The MLX telephone and the adjunct that is connected to the MFM are independent and can place and receive calls at the same time. The MFM is the only T/R adapter used with the MLX telephones.
- supplemental alerts such as bells, chimes, horns, and strobes. These alerts notify people in noisy areas of incoming calls.

The MFM is set for T/R devices or for supplemental alerts by two jumper blocks preset at the factory for T/R operation.

The MFM comes with the following (see Figure 56):

- a KS22911,L2 power supply
- a 400B or 400B2 adapter

- a D6AP cord

Before installing the MFM, consider the following:

- The KS22911,L2 power supply must be connected to an electrical outlet that is within 50 feet of cord length of the MLX telephone.
- If you are connecting an MFM and two Direct Station Selectors (DSSs) to the telephone, a 329A power unit is required. (The 329A power unit must be ordered separately.)
- A longer D8W telephone cord is required if the wall jack is more than 7 feet from the MLX telephone.

Note: The MFM uses one of the two B channels when it is active. This means that when an accessory, 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.)

Procedure

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

Follow these steps to install and replace an MFM and change its pin settings.

1. Remove the user card tray from the bottom of the desk stand on the telephone.

2. Remove the desk stand and the module cover (see Figure 57).

   Note: To install or replace an MFM in a previously wall-mounted MLX-10 or MLX-10D telephone, go to step 2c.

   a. Place the telephone face down on a flat surface. Press on the top rear center of the stand to release the tab.

   b. Pull the stand toward you and away from the telephone.

   c. Use a screwdriver to remove the screw in the lower right-hand corner of the module cover.

   d. Press the center of the right side of the module cover with one hand and lift the cover to remove it.

3. Remove an existing MFM (see Figure 58).

   Note: If the telephone does not have an existing MFM, go to step 4. To reset the jumpers on an existing MFM, go to step 5.

   a. Locate the MFM locking tabs on the top and bottom of the telephone. Spread these tabs apart to release the MFM.

   b. Grasp the MFM by the edges and pull it toward you to free the connector pins. Do not touch the connector pins. Set the MFM aside on a clean surface.

4. Install a new MFM (see Figure 58).

   a. Hold the MFM circuit board by the edges with the long connector pins facing the underside of the telephone.

   b. Taking care not to touch the connector pins, push down on the MFM board so that the connector pins are inserted into the socket in the telephone.

   c. Press firmly to lock the tabs in place. The connector pins and tabs must be secure.

5. As needed, adjust the jumper settings for T/R operation or for a supplemental alert device (see Figure 59).
   a. Pull the connectors off.
   b. Push the connectors down over the appropriate pins.
6. Replace the module cover.
   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 (see Figure 60).

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

   b. There are locking tabs on both sides of the module cover and a screwpost on the right side of the telephone. Place the tab in the slot on the left side of the telephone.
   c. Lower the cover to the right and press firmly to lock the tabs in place. Both tabs must be secure.
   d. Replace and tighten the screw you removed earlier.
7. Replace the desk stand and the user card tray.

   Note: If you are wall mounting an MlX-10 or MLX-10D telephone, do not replace the desk stand. Go to step 8.

   a. The desk stand has two height adjustments. Insert the tab at the bottom of the stand in either the low or high position.
   b. Insert the tab at the top of the stand into the corresponding slot on the desk telephone. To readjust the stand, see the instructions on the bottom of the card tray.

8. Connect the telephone (see Figure 61).
   a. Plug the D8W cord from the telephone into the 8-conductor (large) 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 into the modular jack of the KS22911,L2 power supply. The total length of the cords connecting the power supply to the MLX telephone must be less than or equal to 50 feet.

CAUTION:
Plugging the D6AP cord into the 8-conductor (large) modular jack on the 400B or 400B2 adapter can cause electrical damage to the control unit and the telephone.

   c. Plug the power supply into a 117-VAC outlet not controlled by a wall switch.
   d. Insert the plug end of the 400B or 400B2 adapter into the wall jack.
9. Test the MFM for T/R operation by using the directions in Test the MLX Telephones with an MFM in this chapter.
10. Attach the adjunct (see Figure 62).
   a. Insert one end of the cord supplied with the adjunct into the jack labeled TEL/OTHER on the back of the telephone.
   b. Route the adjunct and D8W telephone cords through the cord channel.
   c. Test the adjunct by dialing its extension.

Note: See Appendix B for a list of approved adjuncts.

Attach the Direct Station Selector

The Direct Station Selector (DSS) is an optional piece of telephone equipment. One or two DSSs can be connected to an MLX-28D or MLX-20L telephone.

Note: Connect the DSS(s) before you install the MLX telephones.

Before installing the DSS, consider the following:

- Auxiliary power is required when
  - an MLX telephone (with or without an MFM) has two DSSs attached. Use a 329A power unit (must be ordered separately).
  - an MLX telephone has one DSS and one MFM attached. Use the KS22911,L2 power unit, 400B adapter, and D6AP cord provided with the MFM.
  - two MLX telephones are on the same carrier, each with one DSS attached. Use a KS22911,L2 power unit, 400B adapter, and D6AP cord for any additional stations with DSSs; these can be ordered separately but are also provided with an MFM.
- When additional CU carrier power is required and the system is backed up by an Uninterruptible Power Supply (UPS), the Auxiliary Power Unit 9024 should also be connected to this UPS.
- The total length of cords between the KS22911,L2 or 329A power supply and the MLX telephone can be no more than 50 feet.
- Improper operation can result if the 2-foot D8AC cord (packaged with the DSS) is replaced with a longer cord.

Procedure

Note: If you are connecting two DSSs to the telephone, unpack the second DSS now.

1. Adjust the angle of the DSS (see Figure 57).

   The DSS is packed fully assembled with the desk stand 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, place the DSS face down on a flat surface and follow these steps:

   a. Press on the top rear center of the stand to release the tab. Pull the stand toward you and away from the DSS.

   b. To adjust the stand to the high position, insert the tab at the bottom of the stand into the other slot.

   c. 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 (see Figure 63).

   a. There are two jacks on the DSS labeled IN and OUT. Plug one end of the D8AC cord into the jack labeled IN.

   b. Route the D8AC cord through the cord channel on the left side of the DSS.

      - If you are installing 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 63).

   a. Place the two DSSs side by side and face down.

   b. Route the D8AC cord from the IN jack of the second DSS (DSS2) through the cord channel of the first DSS (DSS1).

   c. Plug this D8AC cord into the jack labeled OUT on DSS1.

4. Wire the telephone to the DSS(s) (see Figure 63).

a. With the handset removed from the telephone, place the telephone face down on a flat surface to the right of the upside-down DSS(s).

b. Plug the D8AC cord from the IN jack of the DSS1 into the jack labeled DSS on the telephone, and route the cord through the cord channel.

c. Plug the D8W line cord into the jack labeled LINE of the MLX telephone. The D8AC and D8W cords share the cord channel on the telephone.

5. Turn the telephone and the DSS(s) face up with the telephone now to the left of the DSS(s).

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.

Notes:
- If auxiliary power is not required, go to step 7.
- If auxiliary power is required, go to step 8.

7. Connect the telephone (auxiliary power is not required) by plugging the D8W cord into the wall jack. Go to step 9.

8. Connect the telephone (auxiliary power is required; see Figure 61).

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 of the 400B or 400B2 adapter, and plug the other end of the D6AP cord into the modular jack of the KS22911,L2 or 329A power supply.

CAUTION:
Plugging the D6AP cord into the 8-conductor (large) modular jack of the 400B or 400B2 adapter can cause electrical damage to the control unit and 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-VAC outlet.

Note: The combined total length of the D6AP and D8W cords can be no more than 50 feet.

9. Label the DSS designation cards.

a. Pull the tab at the top of the large plastic cover and rotate the cover toward you.

b. Remove the cover and the large designation card.

c. Write or type the button assignments on the card. For the DSS1, use the side of the large card that is labeled 00 through 49. For the DSS2, use the side labeled 50 through 99.

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

d. Replace the card and the plastic cover. Be sure the coated side of the cover is facing up.

e. Repeat these steps to remove the small plastic cover and to label the small designation card.

Note: If the MLX telephone to which the DSS is attached is unplugged from the CU and then again plugged into the CU, the display on the telephone may disappear. Press the Home button to bring back the display.

Assemble the MLX Telephone or Console

Before installing an MLX telephone or console, consider the following:

- A 630B Phonemount (not included) is required to mount an MLX-10 or MLX-10D telephone to the wall.
- To connect an adjunct, you must first have a Multi-Function Module (MFM). (Adjuncts include answering machines, alerts, and fax machines.) If you are installing an MFM, do it now by using the procedure in "Install the Multi-Function Module" earlier in this chapter. After the MFM is installed, go to step 1.

Procedure

1. Remove or adjust the desk stand (see Figure 57).

   MLX telephones are packed fully assembled with the desk stand in the low position. The angle of any MLX desk telephone can be adjusted to the high position. If you are wall mounting an MLX-10 or MLX-10D telephone, you must first remove the desk stand. To remove the desk stand or adjust its angle, place the telephone face down on a flat surface and follow these steps:

   a. Press on the top rear center of the stand to release the tab(s). Pull the stand toward you and away from the telephone.

      Note: If you have removed the stand to wall mount an MLX-10 or MLX-10D telephone, set the stand aside and go to step 2.

   b. To adjust the stand to the high position, insert the tab(s) at the bottom of the stand into the slot(s).

c. Lower the stand and press the tab(s) at the top into the corresponding slot(s) on the telephone.

Note: The diagram on the bottom of the user card tray also shows the steps to adjust the stand.

2. Connect the line cords (see Figure 62).

a. Plug one end of the D8W cord into the telephone jack labeled LINE on the underside of the telephone.

b. Route the D8W cord through the cord channel on the back of the telephone.

c. If the telephone is for desktop use, turn the desk telephone face up and plug the D8W cord into the wall jack.

3. Install the handset by inserting one end of the coiled H4DU handset cord into the handset and the other end into the jack on the side of the telephone.

4. Label the extension identification card (see Figure 64).

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.

b. Type or write the assigned extension number on the card.

Notes:

- If you are mounting an MLX-10 or MLX-10D wall telephone, go to step 5.
- If you are assembling a desk telephone, go to step 6.

5. Prepare the handset holder for wall mounting (see Figure 64).

a. Remove the handset holder by pushing it up and pulling it out.

b. Rotate the handset holder 180° and replace it in its slot.

6. Replace the extension identification card and plastic cover by inserting one end into the slot and bending the cover to snap the other end into place.

Notes:

- If you are mounting an MLX-10 or MLX-10D wall telephone, go to step 7.
- If you are assembling a desk telephone, go to step 8.

7. Mount an MLX-10 or MLX-10D wall 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 cord (DIW or D8W) through the hole in the backplate and have it exit at the top of the backplate, leaving 10 inches of cord to connect the telephone (see Figure 65).

   d. Attach the backplate to the wall by using the instructions provided with the 630B Phonemount.

   e. Insert the two short screws provided with the Phonemount into the mounting plate (see Figure 65). Be sure to thread the upper screw through the jack guard.

   f. Plug the free end of the cord into the jack labeled LINE on the back of the telephone. Route the cord through the cord channel above the jack (see Figure 62).

   g. Position the telephone on the mounting plate mounting studs and then slide the telephone down to lock it in place. To remove the telephone, slide it up and off (see Figure 65).

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. Replace the card and the plastic cover. Be sure the textured side of the cover is facing you.
9. Adjust the contrast on the telephone's display.
   - MLX-20L. Slide the lever on the top of the telephone.
   - MLX-10D and MLX-28D. Follow the directions in the user's guide for the appropriate MLX telephone.

System Acceptance Test

Once the system has been installed and initialized, it is ready for acceptance testing. Test all lines/trunks, telephones, and features to ensure they are working correctly. If any equipment is not working correctly, see Chapter 5, “Maintenance.”

Test the MLX Telephones

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

If you hang up during any of these procedures, you are automatically taken out of the test mode.

Follow these steps to test the basic features of an MLX telephone:

1. Pick up the handset of the telephone being tested and push an Intercom button (Key or Behind Switch mode) or a System Access button (Hybrid/PBX mode). After receiving a dial tone, dial ∗00 to activate the 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.

2. To test the line buttons, press any line button with two LEDs.

   The diagnostic tone should stop, and the LEDs for that button should go off.

3. Press the same line button repeatedly to toggle between the green and red LEDs.

4. To test a fixed-feature button with one LED, press the button.

   *The **Feature** and **HFAI** LEDs should go 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.*

   Note: If the **Mute** button has been pressed before the Speaker button, the **Mute** LED cannot be turned off; it will wink.

5. Press the fixed-feature buttons repeatedly to toggle the LEDs on and off.

6. To test the red **Message** light, press either a fixed-feature button without an LED (such as **Transfer** or **Drop)** or any dialpad button.

   *The **Message** LED should go off.*

7. Press the fixed-feature or dialpad button repeatedly to toggle the **Message** LED on and off.

8. Hang up the handset to leave test mode.

Test the MLX Telephones with a Display

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

1. Press the labeled display buttons **(Home, Menu, Inspct,** and **More).**

   The display should spell out these button labels.

2. Press the unlabeled display buttons.

   The display should spell out `Display Button` *and the number of the button pressed (1 - 4).*

Test the MLX Telephones with an MFM

Test a MLX telephone with an MFM installed and configured for a T/R adapter. Follow these steps to check the proper channel operation and the MFM circuitry for the TTR, the ring generator, and the message LED:

1. Connect a known working 2500-type single-line telephone with a message light to the MFM adapter. The 2500 telephone must also have a mechanical ringer.
2. Pick up the handset on the 2500 telephone and dial ∗09 after receiving the dial tone.

   You should receive another dial tone.
3. Press any button to deactivate the test tone.
4. Dial the following sequence of numbers: 123456789∗0# and press the switchhook quickly.

   You should receive a confirmation tone.
5. Hang up.

   The CU should send a ring burst, and the message LED on the 2500 telephone should go on.
6. Turn off the message LED by dialing the appropriate code number.

Test the Telephones for Intercom Dial Tone

Follow these steps to test for intercom dial tone:

1. Press the Intercom or System Access 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 the red LED on the intercom or System Access button should go on, you should hear an intercom dial tone, and the green LED next to the **Speaker** button should go on.*

3. Press the **Speaker** button again to disconnect the Intercom or System Access button.

   *The red and green LEDs next to the Intercom or System Access button should go off, the green LED next to the **Speaker** button should go off and the dial tone should stop.*

Test the Telephones for Outside Line Dial Tone

Follow these steps to test for an outside line dial tone:

1. Without lifting the handset, press a line button.

   The red LED next to this button should go on.

2. Pick up the handset or press the **Speaker** button.

   The green LED next to the red LED at the line button should go on, and you should hear a dial tone.

3. Hang up as needed and repeat steps 1 and 2 for each line button on the telephone.

Test the Analog Multiline and Single-Line Telephones

Follow these steps to test the basic functioning of analog telephones:

1. If you are at a multiline telephone, press the Intercom or System Access button.

2. Pick up the handset.

   You should hear a dial tone.

3. Dial the extension number of another working telephone.

   You should hear ringback at the calling telephone and ringing at the called telephone.

4. At the called telephone, have someone pickup the handset; verify that you have good two-way communication.
5. At both telephones, hang up.
6. If you are at a multiline telephone, press an outside line button or the System Access button.
7. Pick up the handset.

   You should hear a dial tone.

8. If you are using an System Access button, dial the dial-out code.
9. Dial one of the numbers assigned to the telephone you want to answer the call.

   You should hear ringback at the calling telephone and ringing at the answering telephone.

10. Have someone pick up the handset at the answering telephone; verify that you have good two-way communication.
11. At both telephones, hang up.
12. If the station is toll restricted, place a toll call.

    You should hear a reorder tone.

Test the Ground-Start and Loop-Start Lines/Trunks

Follow these steps to test the GS and LS outgoing and incoming lines/trunks at a telephone:

1. Dial ∗03 followed by the line/trunk ID number (01-80).

You should hear a dial tone for a working line/trunk, a reorder tone for a DID trunk or an invalid line/trunk number, or a busy tone if the line/trunk is in use.

Note: Dialing ∗03 on a single-line telephone works only if the line/trunk accepts touch-tone dialing. After you dial ∗ 03 on a single-line telephone, you may have to wait for a "click" before dialing the line/trunk number.

2. Repeat for all outgoing lines/trunks.
3. Dial an incoming line/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 lines/trunks.
6. Hang up to exit the test mode.

Test the DID Trunks

Follow these steps to test the DID trunks:

1. Pick up the handset at the test terminal. Dial ∗03 and then dial a DID number.

   You should hear ringback at the calling telephone and should hear ringing and see the green LED turn on at the called telephone.

   Note: Dialing ∗03 on a single-line telephone works only if the line/trunk accepts touch-tone dialing. After you dial ∗03 on a single-line telephone, you may have to wait for a "click" before dialing the line/trunk number.

2. Have someone pick up the handset on the called telephone; verify that you have good two-way communication.
3. At the calling telephone, put the call on hold. Have the person at the called telephone keep the call active by either placing it on hold or laying the handset down.

4. Call all the DID numbers by repeating steps 1 through 3.

   Note: If there are not enough dial-out trunks, work with the CO to check all the DID trunks or have someone call from the outside to check each DID trunk.

5. Hang up all the telephones used in this test.

Note: Before making the following tie-trunk tests, make sure that the tie trunks for the system are connected and properly configured.

Test the Incoming Tie Trunks

Follow these steps to make sure the incoming tie trunks work:

1. At the far-end tie-trunk site, have someone pickup the handset and access a tie trunk assigned to a button on your telephone.

   Your telephone should ring, and the green LED next to the tie-trunk button should flash.

   Note: To test a dial-repeating tie trunk, have the person at the far-end tie-trunk site dial a system extension number. (No dialing is required to test an automatic incoming tie trunk.)

2. Pick up your handset and verify that you have good two-way communication.
3. At your telephone and the distant telephone, hang up.
4. Repeat steps 1 through 3 for all incoming tie trunks.

Test Outgoing and Two-Way Automatic-Start Tie Trunks

Before testing outgoing or two-way automatic-start tie trunks, have someone ready to receive your call at the receiving telephone. Follow these steps:

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 goes on.

   Note: In Hybrid/PBX systems with Pooled tie trunks Press the System Access button and dial the pool dial-out code.

2. Pick up the handset.

   The green LED goes on next to the red LED at the tie-trunk button, and you hear ringing.

3. When the person answers, verify that you have good two-way communication and hang up.

4. Repeat this procedure for each automatic-start tie trunk administered.

Test the Outgoing and Two-Way Dial-Repeating Tie Trunks

Test dial-repeating tie trunks (wink-start, immediate-start, and delay-start) when you are sure that someone can receive your call at the far end. Follow these steps:

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 goes on.

   Note: In Hybrid/PBX systems with pooled tie trunks, press the System Access button and dial the pool dial-out code.

2. Pick up the handset.

The green LED next to the red LED at the tie-trunk button goes on.

3. Dial the tie-trunk number of the station where someone is waiting for your call.

   You hear ringing.

4. When the person answers, verify that you have good two-way communication and hang up.

5. Repeat steps 1 through 4 for each tie trunk administered.

Test The Incoming and Two-Way Automatic-Start Tie Trunks

Follow these steps to test incoming and two-way automatic-start tie trunks:

1. At a preset time, have someone at the far-end tie-trunk site place a call to your telephone by dialing the proper tie-trunk number.

   You hear ringing at the telephone connected to the tie trunk, and the green LED next to the tie-trunk button flashes.

2. Pick up the handset.

   The *red LED next to the tie-trunk button goes on, and the green LED becomes steady.*

3. Verify that you have good two-way communication and hang up.

4. Repeat steps 1 through 3 for each tie trunk administered.

Test the Incoming and Two-Way Dial-Repeating Tie Trunks

Follow these steps to test the dial-repeating tie trunks:

1. At a preset time, have a 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 the tie-trunk button flashes.

2. Pick up the handset.

   The red LED next to the tie-trunk button goes on, and the green LED becomes steady.

3. Verify that you have good two-way communication and hang up.

4. Repeat steps 1 through 3 for each tie trunk administered.

Test the Dial Access Codes

Follow these steps to test the dial access codes:

1. Verify the proper operation of each feature requiring a dial access code:

   - Automatic Route Selection (ARS)
   - Group Calling
   - Group Page
   - Listed Directory Number (the QCC queue)
   - Park
   - Pools
   - Remote Access

2. If any feature is not working properly, check the system programming translations.

Test the System Features

You can test these system features from an MLX telephone or an analog multiline telephone:

- Automatic Route Selection (ARS)
- Coverage
- Group Calling
- Station Message Detail Recording (SMDR)
- System Speed Dial

Note: You can also use a single-line telephone to test all of these features except for Coverage.

ARS and SMDR Tests

If ARS patterns have been translated, you can test the routing by placing toll calls and checking the line/trunk indicated on the SMDR printout.

Follow these steps to verify ARS patterns:

1. Determine which toll numbers to call by examining the system administrator's ARS patterns.
2. At any multiline telephone, pickup the handset, dial the ARS access code, and dial one of the toll numbers. Make sure that the call is completed before hanging up.
3. Repeat step 2 for any additional toll numbers.
4. At the SMDR printer, verify that the call was placed over the correct line/trunk group and check the number of seconds before the call is reported on the SMDR printout. If there are errors, check the translations.

Group Calling Test

Follow these steps to test the Group Calling feature:

1. At any telephone, pickup the handset, dial the CO line/trunk access code, and dial a calling group listed directory number.
2. At the ringing telephone in the calling group, have someone pick up the handset; verify that you have good two-way communication.
3. Repeat steps 1 and 2 for each calling group.
4. Make additional calls to check each member of each calling group.
5. Test the calling group delay announcement (if provided) by making the whole group busy or by logging out all members of the group.
6. At any telephone, dial the calling access code and repeat step 2.

System Speed Dial Test

Follow these steps to test System Speed Dial:

1. From the test telephone, determine which numbers have been translated for System Speed Dial. (Get the list of translated numbers from the system manager.)
2. 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

Follow these steps to test Coverage:

1. Have someone call the covered telephone.

2. Count the number of rings that occur 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 at the covering telephone.
5. Check both individual and group coverage.

Test the Operator Console

Testing the operator console, whether it is analog or digital, is the same as testing an MLX telephone, except for testing the console's unique feature buttons. Follow these steps to test the operator console:

1. Pick up the handset of the telephone being tested and push an Intercom button (Key or Behind Switch mode) or an System Access button (Hybrid/PBX mode). After receiving the intercom dial tone, dial ∗00 to activate the 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.

2. To test the line buttons, press any line button with two LEDs.

   The diagnostic tone should stop, and the LEDs for that button should go off.

3. Press the same line button repeatedly to toggle the green and red LEDs on and off.
4. To test a fixed-feature button with one LED, press the button.

   *The **Feature** and HFAI LEDs should go 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.*

Note: If the **Mute** button has been pressed before the **Speaker** button, the **Mute** LED cannot be turned off; it will wink.

5. Press the fixed-feature buttons repeatedly to toggle the LEDs on and off.
6. To test the red **Message** light, press either a fixed-feature button without an LED (such as **Transfer** or **Drop)** or any dialpad button.

   *The **Message** LED should go off.*
7. Press the fixed-feature or dialpad button repeatedly to toggle the **Message** LED on and off.
8. Verify that all features are working properly.
9. If any features are not working properly, verify the translations through system programming.

Test the DSS

At each Direct Station Selector (DSS), check that all lights are operational. Using the DSS, call a telephone in the system. Test that the page buttons on the DSS work properly.

Test the Night Service

Follow these steps to test the Night Service feature on the system operator console:

1. At the system operator console, press the Night Service button. If the Night Service with Outward Restriction option is programmed, enter the assigned password after pressing the Night Service button.

   The Night Service LED goes *on.*

   Note: Night Service on a DLC can also be activated by pressing the **Feature** button and dialing 39.

2. Pick up the handset and press a button for any outside line/trunk. Dial the CO line/trunk access code and the number of a CO line/trunk that receives Night Service coverage.
3. Verify that the telephones assigned to the Night Service group are ringing.
4. Have someone pick up the handset at a telephone in the Night Service group; verify that you have good two-way communication.
5. At both telephones, hang up.
6. Repeat steps 2 through 5 for each Night Service line/trunk.
7. Test telephones that have been 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.

      (1) Hang up the handset.

      (2) Press the Recall button and dial the password.

      Note: On an MLX telephone without a programmed Recall button, press the **Feature** button and dial 775 and the password before picking up the handset.

      (3) Pick up the handset and make an outside call.

      (4) Verify that you have good two-way communication and hang up.
8. At the operator console, press the Night Service button again and verify that the Night Service LED goes off.

Test the Dictation System Access

Place a call to verify that the dictation equipment can be accessed. If dictation equipment has not been installed, this feature cannot be tested.

1. At the test telephone, pickup the handset.
2. Dial the access code and the number associated with the dictation equipment.
3. Verify that the ready tone is being transmitted.
4. Test the transmission in both directions. Make a recording and play it back.
5. Hang up.

Test the Paging Interface

Note: If testing ZoneMate* 9 paging equipment (used with PagePac†20), get an acknowledge tone. Then dial the zone code and make an announcement.

Follow these steps to test the paging interface:

1. Pick up the handset at the test telephone and dial the access code or extension number for a particular zone.

   You may hear a confirmation tone.

2. Make an announcement into the handset.

   You should hear the announcement from the loudspeaker(s).

3. Hang up.
4. Repeat steps 1 through 3 for all paging zones provided.

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* Trademark of Dracon, a division of Harris Corporation.

† Registered trademark of Dracon, a division of Harris Corporation.

Test Music-on-Hold

Follow these steps to verify that music is provided to outside callers placed on hold. Inside callers do not receive Music-on-Hold (MOH).

1. Pickup the handset at the test telephone. Dial the CO line/trunk access code and the system's listed directory number, or if you are using the DID trunk, dial any station.
2. At the called station, answer the incoming call.
3. At the called station, press Hold.

   The line button's green LED should flash.
4. Verify that music is heard at the calling telephone.
5. Hang up.

Note: If you use equipment that rebroadcasts music or other copyrighted materials, you 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 you can purchase a Magic on Hold® system, which does not require you to obtain such a license, from AT&T or your authorized representative.

Test the PFT 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 lines/trunks must be operational. Also, a PFT telephone on a GS line must have a GS button (see Figure 66) attached to the telephone. Follow these steps to test the PFT jacks:

1. Plug a touch-tone or rotary dial telephone into a PFT jack.

2. Note the outside line number assigned to the lowest-position line/trunk jack on the module and be sure that the outside line/trunk is connected to the system.
3. Turn off power to the CU, first at the power supply module on the basic carrier and then at the power supply module on each expansion carrier.
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, again push the GS button attached to the telephone.
7. Dial an outside number where you know someone will 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 jack bridged by the PFT jack to which you are connected.
9. Have that person call the number after you hang up.

   Your phone should ring after the other person completes dialing the number.
10. Answer the phone and verify that you have good two-way communication before disconnecting.

    Note: Test all PFT jacks (by repeating steps 1 through 10 for each jack) before going to step 11.
11. Turn the power back on, first at each expansion carrier and then at the basic carrier.

Test the Touch-Tone Receivers

Four touch-tone receivers (TTRs) are system resources available on each 400, 400 GS/LS, and 800 DID module. The 008 OPT and 012 basic telephone modules also provide two TTRs per module for system use. Follow these steps to test the TTRs:

1. At a single-line telephone connected to a 012 or 008 OPT module, pick up the handset. Dial ∗04 and the 2-digit number (starting with 01) of the TTR to be tested.

   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 (for example, you dialed 07 and your system has only a 012 module and one 400 module for a total of six TTRs). Try again.*

   if you hear a dial tone after one to three seconds of silence, proceed with this test.

2. Dial the digits 123456789∗0#.

   You should hear a dual-tone multifrequency (DTMF) signal as each button is pressed. After all the digits are dialed, you should hear a dial tone.

3. Repeat the test for each TTR.

Programming Procedures

4

System Programming

Two types of equipment are used to program and maintain the system:

- **System Programming Console, an MLX-20L telephone** connected to the station jack assigned for system programming. The factory setting is the first jack on the first 008 MLX module in the control unit. The jack is also factory-set as the operator position.

  If system programming or maintenance activities interfere with call handling, the system programming assignment can be changed to any of the first five jacks on the first 008 MLX module.

- **Personal Computer (PC) with System Programming and Maintenance (SPM),** a PC connected to the system programming and maintenance port (the lower RS-232 jack) on the processing module for on-site system programming and maintenance. Remote system programming and maintenance uses the built-in 1200-bps modem assigned to two fixed time-division multiplexed (TDM) time slots.

Remote System Programming

To program with a PC with SPM from a remote location, place a data call using the instructions provided with the modem.

1. You can establish the data connection with the built-in modem in one of the following ways:
   - Call the system on a Remote Access line, enter the barrier code, and dial the code for the internal modem (*10)
   - Call the system on a regular line and ask the system operator to transfer you to the internal modem
   - Call the remote location (such as the National Service Assistance Center) from the system and then transfer the call to the internal modem
2. When a connection is made with the system modem, use the following instructions to enter and exit system programming.

Entering and Exiting System Programming

Entering System Programming

Once the system programming console or PC is connected directly to the control unit (CU) or you have established a remote connection using a PC with a modem, follow these steps to enter system programming.

Step	Console	PC
1. Display main menu	**Menu**	**SPM** Press any key
2. Select System Programming	**Sys Program**	**F1**
3. Display System Programming menu	**Exit**	**F5**

Exiting System Programming

Step	Console	PC
■ To return to the main menu from any screen	**Menu**	
■ To return to the main menu from the System Programming menu	**Exit**	**F5**
■ To exit system programming completely and return to normal activities	**Home**	**Home**

SPM Main Menu Options

Table 4-1 SPM Main Menu Options

Sys Program	Enter system programming and configure the system as shown on the planning forms for the system.
Backup	Save a backup copy of the system's programming either on a floppy diskette or on the hard disk.
Boards	Determine which modules (port boards) are in each slot of the CU.
Print-Opts	Set up the options for the printer used for Station Message Detail Recording (SMDR) and connected to the SMDR port. See "Installation" chapter for details.
Maint Mode	The AT&T systems technician or authorized dealer uses this function for maintenance tests that ensure the hardware and software of the system are operating correctly.
Restore	Restore the system's programming from a floppy diskette or from a file stored on the hard disk.

Table 4-1 Continued

Pass-Thru	This option is used when the system configuration includes the Integrated Solution II (IS II) application. It is used by AT&T's NSAC or an AT&T authorized dealer to establish a remote connection from a computer at their location to the IS II computer connected to the system.
Password	Change the password.

Each option on the System Programming menu is described below.

Table 4-2 System Programming Menu Options

System	Set system operating conditions.
SysRenumber	Replace the factory settings for the system numbering scheme with 1- to 4-digit number that are more meaningful for the customer's business or more convenient for telephone users.
Operator	Program features for the operator positions.
LinesTrunk	Program line or trunk options
Extensions	Program features for telephones (such as restrictions or line assignments).
Options	Program system-wide features (such as Transfer Return or Delay Ring).

Table 4-2 Continued

Tables	Program features that require entering information in a table (such as Allowed Lists or Disallowed Lists).
AuxEquip	Program auxiliary equipment connected to the system (such as an answering machine or a fax).
NightSrvce	Program Night Service features.
Labeling	Program the labels shown on display telephones (such as Public Directoy or Posted Messages).
Data	Specify telephones that require Simultaneous Voice and Data capability.
Print	Print system programming reports (such as system configuration or extension assignments).
Cntrl Prog	Perform centralized telephone programming (assign features to specific buttons on telephones).
Exit	Exit system programming.

System Programming Screens

The console display area shows three types of system programming screens:

- **menu selection screen** — allows you to select from several options on the menu.
- **informational screens** — provide information about what is currently programmed on the system. You cannot make changes to these screens.
- **data entry screens** — allow you to enter specific information for programming the features in the system.

The actual system programming screens are shown in *System Programming.*

Programming Command

Table 4-3 Commands Using Fixed Buttons

Function	Command	
	Console	PC
To return to normal call-handling mode or to SPM idle state	**Home**	**Home**
To display the System Programming main menu on the console or SPM main menu on the PC	**Menu**	**End**
To display more menu items when a ">" is shown on line 7	**More**	**PgUp**
To display the Inspect screen that lists all telephones or lines with a specific feature assigned	**Inspct**	**PgDn**
To clear all information from a screen or to enter a stop in a System Speed Dial or Personal Speed Dial programming sequence	**Drop**	**Alt+P**
To enter a pause in a System Speed Dial or Personal Speed Dial programming sequence	**Hold**	**Alt+H**

Table 4-4 Commands Appearing on the Screen

Function	Command	
	Console	**PC**
To remove a feature from a line/trunk or telephone	When Delete command appears on the screen: **Delete**	When Delete command appears on the screen: **F8**
	When Delete command doesn't appear on the screen: **Drop**	When Delete command doesn't appear on the screen: **Alt+P**
To move the cursor from right to left and erase characters	**Bksp**	**F4**
To save an entry and update line 1 of the screen with the next extension or item number. (Next or F9 is used only when entering information for sequentially numbered extensions or entries.)	**Next**	**F9**
To return to the previous screen or menu without entering or changing information	**Exit**	**F5**

Table 4-5 Commands Applicable Only to SPM

Function	Command PC
To activate the SPM Help option	**Ctrl+F1**
To reset the SPM program (return to SPM main menu and drop the connection with the control unit). Use reset when invalid characters appear on the screen. If programming from a remote location, the call to the system must be re-established. **Note:** Do not use reset while performing a Restore procedure. This will cause corruption of system programming information.	**Ctrl+F5**

Programming Procedures

The system programming procedures on the following pages are listed in the sequence used to program a new system. The procedures not used for new system programming (for example, Restart or Board Renumber) are also included and are listed in System Programming menu order.

Each of the programming procedures assumes that you are connected on-site or that you have established a remote connection to the control unit, and that the System Programming menu is displayed. Each procedure begins and ends with the System Programming menu. (For detailed information on system programming preparation and programming basics, review Chapters 1 and 2 of *System Programming).*

Before you program changes to new system, review Chapter 3 of *System Programming,* which identifies the initial programming procedures, the sequence that should be followed, and the system forms necessary to plan and program each option. If you are using a PC with SPM to program the system, back up the system programming information on a disk using the backup procedure in this chapter.

Before you make changes to an established system, read Chapter 4 of *System Programming,* update the appropriate planning forms to reflect the changes you are making, and, if you are using a PC with SPM to make changes to the system, back up the current system programming information on a disk using the backup procedure in this chapter.

If system programming was performed using a surrogate switch or if system programming was lost or corrupted due to a malfunction, use the Restore procedure in this chapter to load the backup system programming information into the system's memory.

Set the Basic System Operating Conditions

Restarting the System (Cold Start)

Step	Console	PC
1. Display System Restart screen	**System**	**F1**
	Restart	**F1**
2. Advise the system whether to continue restart process		
■ To continue restart process	**Yes**	**F1**
	System restarts and session is terminated automatically	System restarts and session is terminated automatically
■ To cancel restart process	**No**	**F2**
	Exit	**F5**

System Progamming Position Assignment

Step	Console	PC
1. Display System Programming Port screen	**System**	**F1**
	SysProg Port	**F2**

Step	Console	PC
2. Erase current extension and enter extension of new system programming position	**Drop** Dial extension, * + slot and port, or # + logical ID, or press DSS button for extension no.	**Alt+ P** Type extension, * + slot and port, or # + logical ID
3. Save entry and exit	**Enter** Session is terminated automatically	**F10** **F5**

Mode

Step	Console	PC
1. Display Mode screen	**System** **Mode**	**F1** **F3**
2. Specify operation		
■ For Key	**Key**	**F 1**
■ For Hybrid/PBX	**Hybrid/PBX**	**F2**
■ For Behind Switch	**BehndSwtch**	**F3**
3. Save selection	**Enter** System restarts and session is terminated	**F10** System restarts and session is terminated

Automatic Maintenance Busy

Step	Console	PC
1. Display Auto Maintenance Busy screen	System Mainten Busy	F1 F6
2. Determine malfunctioning line service for outgoing calls		
■ To automatically take malfunctioning lines or trunks out of service for outgoing calls	Enable	F1
■ To leave malfunctioning lines or trunks available for outgoing calls	Disable	F2
3. Save choice then	Enter	F10
■ If Disable was selected	Exit	F5
■ If Enable was selected and:		
■ No tie lines/trunks	Exit Exit	F5 F5

Continued

Step	Console	PC
3. *Continued*		
■ Automatic Maintenance Busy is wanted for tie trunks	**Enable**	**F1**
	Enter	**F10**
	Exit	**F5**
■ Automatic Maintenance Busy is not wanted for tie trunks	**Disable**	**F2**
	Enter	**F10**
	Exit	**F5**

System Date

Step	Console	PC
1. Display Date screen	**System**	**F1**
	Date	**F7**
2. Erase assigned date and set current date	**Drop** Dial date [mmddyy]	**Alt+P** Type date [mmddyy]
3. Save entry and exit	**Enter**	**F10**
	Exit	**F5**

System Time

Step	Console	PC
1. Display Time screen	**System** **Time**	**F1** **F8**
2. Erase assigned time and set current time	**Drop** Dial current time: [hhmm]	**Alt+P** Type current time: [hhmm]
3. Save entry and exit	**Enter** **Exit**	**F10** **F5**

Board Renumbering (Cold Start After Adding or Changing Modules)

Step	Console	PC
1. Display Board Renumber screen	**System** **Board Renum**	**F1** **F9**
2. Advise the system whether to continue board renumber process		
■ To continue board renumber process	**Yes** System restarts and session is terminated automatically	**F1** System restarts and session is terminated automatically
■ To cancel renumber process	**No** **Exit**	**F 2** **F 5**

System Renumbering

System Numbering Plan Selection

Step	Console	PC
1. Display Default Numbering screen	**SysRenumber** **Default Numbering**	**F2** **F1**
2. Specify system numbering plan		
■ For 2-Digit	**2-Digit**	**F1**
■ For 3-Digit	**3-Digit**	**F2**
■ For set up Space	**SetUp Space**	**F3**
	Exit	**F5**
3. Exit	**Exit**	**F5**

Single Renumbering

Step	Console	PC
1. Display Single System Renumber menu	**SysRenumber** **Single**	**F2** **F2**
■ To see more choices	More	PgUp
2. Select item to renumber	Press button next to choice	Press function key next to choice

Step	Console	PC
3. Enter current extension and save entry	Dial extension, * + slot and port, or # + logical ID, or press DSS button for extension no. **Enter**	Type extension, * + slot and port, or # + logical ID **F10**
4. Enter new extension number	Dial extension, * + slot and port, or # + logical ID, or press DSS button for extension no.	Type extension, * + slot and port, or # + logical ID
5. Save entry and either renumber more items or exit		
■ To save entry and renumber another item of the same type:		
■ If next extension number is sequential	**Next** Repeat step 4	**F 9** Repeat step 4
■ If next extension number is not sequential	**Enter** Repeat steps 2-5	**F10** Repeat steps 2–5
■ To save entry and exit when all entries are complete	**Enter** **Exit** **Exit**	**F10** **F5** **F5**

Block Renumbering

Step	Console	PC
1. Display Block Renumber screen	**SysRenumber** **Block**	**F 2** **F 3**
2. Select type of group to renumber	Press button next to choice	Press function key next to choice
3. Enter first group member's line/trunk or extension number and save entry	Dial extension, * + slot and port, or # + logical ID, or press DSS button for extension no. **Enter**	Type extension, * + slot and port, or # + logical ID **F10**
4. Enter last group member's line/trunk or extension number and save entry	Dial extension, * + slot and port, or # + logical ID, or press DSS button for extension no. **Enter**	Type extension, * + slot and port, or # + logical ID **F10**
5. Assign new extension numbers to the group and exit	Dial extension, * + slot and port, or # + logical ID, or press DSS button for extension no. **Enter**	Type extension, * + slot and port, or # + logical ID **F10**

Step	Console	PC
6. When all entries are complete	**Exit**	**F5**
	Exit	**F5**

Direct Station Selector (DSS) Page Buttons

Step	Console	PC
1. Display Single screen and select DSS Buttons	**SysRenumber**	**F2**
	Single	**F2**
	More	**PgUp**
	DSS Buttons	**F1**
2. Identify Page button to program (1-3) and save entry	Dial Page button number: [n]	Type Page button number: [n]
	Enter	**F10**
3. Identify first extension number for group of 50 or 100 extension numbers represented by Page button shown on line 1	Dial extension number: [nnnn]	Type extension number: [nnnn]

Step	Console	PC
4. Save entry and either program more page buttons or exit		
■ To save entry and assign extensions to the next page button:		
If next extension number is sequential	**Next**	**F9**
	Repeat step 3	Repeat step 3
If next extension number is not sequential	**Enter**	**F10**
	Repeat steps 2–4	Repeat steps 2–4
■ To save entry and exit when all entries are complete	**Enter**	**F10**
	Exit	**F5**
	Exit	**F5**

System Operator Positions

QCC System Operator Positions—Hybrid/PBX Only

The following applies if you want to add or delete QCC operator positions:

- If you want to add QCC operator positions, the primary QCC operator position must be the first one you add.
- The primary QCC position cannot be deleted if other QCC positions are to remain in the system.
- If you want to delete all QCC operator positions, the primary QCC operator position must be the last one that you delete before you select the Store All option in step 6.

Step	Console	PC
1. Display Operator Positions screen and select Queued Call	**Operator Positions Queued Call**	**F3 F1 F2**
2. Assign or delete QCC operator positions using system programming console with a DSS attached *If system programming console **does not** have a DSS attached; or if programming with SPM, go to step 3.*		

Continued

Step	Console	PC
2. *Continued*		
■ To assign QCC operator position	Press each position's DSS button to turn red LED on. Go to step 6	
■ To delete QCC operator positions	Press each position's DSS button to make red LED flash. Go to step 6	
3. Using system programming console that **does not** have a DSS attached or when programming with SPM		
■ To identify QCC operator position to assign or delete	Dial extension, * + slot and port, or # + logical ID	Type extension, * + slot and port, or # + logical ID
■ To view currently assigned operator positions	Inspct then **Exit** **Positions** **Queued Call** Return to step 2	PgDn then **F 5** **F1** **F2** Return to step 2

Step	Console	PC
4. Assignor delete QCC operator position		
■ To assign displayed extension number as QCC operator position	**Enter**	**F10**
■ To delete displayed extension number as QCC operator position	**Delete**	**F8**
5. Assign or delete more operator positions	Repeat steps 3 and 4	Repeat steps 3 and 4
6. When all entries are complete *The system resets and automatically assigns factory settings for operator positions.*	**StoreAll**	**F3**

DLC Operator Positions Including Those Used for Call Management System

Step	Console	PC
1. Display Operator Positions screen and select Direct Line	**Operator**	**F3**
	Positions	**F1**
	Direct Line	**F1**

Step	Console	PC
2. Assignor delete DLC operator positions using system programming console with a DSS attached *If system programming console **does not** have a DSS attached; or if programming with SPM, go to step 3.*		
■ To assign DLC operator position	Press each position's DSS button to turn red LED on. Go to step 6	
■ To delete DLC operator positions	Press DSS button to make red LED flash. Go to step 6	
3. Using system programming console that does not have a DSS attached or when programming with SPM		
■ To identify DLC operator position to assign or delete	Dial extension, * + slot and port, or # + logical ID	Type extension, * + slot and port, or # + logical ID

Continued

Step	Console	PC
3. *Continued*		
■ To view currently assigned operator positions	**Inspct** then **Exit** **Positions** **Direct Line** Return to step 2	**PgDn** then **F5** **F1** **F1** Return to step 2
4. Assignor delete DLC operator position		
■ To assign displayed extension number as DLC operator position	**Enter**	**F10**
■ To delete displayed extension number as DLC operator position	**Delete**	**F8**
5. Assign or delete more operator positions	Repeat steps 3 and 4	Repeat steps 3 and 4
6. When all entries are complete *The system sets and automatically assigns factory settings for operator positions.*	**StoreAll**	**F3**

Lines and Trunks

Type of Trunk on 400 GS/LS, 408 GWLS, or 800 GWLS Module

Step	Console	PC
1. Display Loop-Start/ Ground-Start/DS1 screen	`LinesTrunks` `LS/GS/DS1`	**F4** **F1**
2. Identify slot number (1-17) in control unit that contains 400, 408, or 800 GS/LS module and save entry	Dial slot number: [nnnn] `Enter`	Type slot number: [nn] **F10**
3. Specify type of trunks to be connected to module	Select option for type of trunks	Press function key for type of trunks

Note: Ground-start can be selected only when the shunt is removed; the control unit is not modified for key-only operation

Step	Console	PC
4. If All Ground or All Loop was selected	Go to step 6	Go to step 6
■ If Ground-Start or Loop-Start was selected, identify port number on 400, 408, (ports 1-4) or 800 (ports 1-8) module that has ground-start or loop-start trunks connected *If you are programming more than one sequentially numbered port with the same type, enter lowest port number.*	Dial port number: [n]	Dial port number: [n]
5. Save entry and either program more ports or return to Lines and Trunks menu		
■ To save entry and assign trunk type shown on line 1 to another port number:		
If next port number is sequential	**Next**	**F9**
	Repeat step 4	Repeat step 4
If next port number is not sequential	**Enter**	**F10**
	Exit	**F5**
	LS/GS/DS1	**F1**
	Repeat steps 2–5	Repeat steps 2–5

Continued

Step	Console	PC
5. *Continued*		
■ To save entry and return to Lines and Trunks menu when all entries are complete	**Enter**	**F10**
	Exit	**F5**
■ To view currently assigned ports on 400/408/800 GS/LS module with trunk type shown on line 1	**Inspct** then **Exit**	**PgDn** then **F5**
6. To program another trunk type	**LS/GS/DS1** Repeat from step 3	**F 1** Repeat from step 3
■ When all entries are complete, exit	**Exit**	**F5**

Dial Signaling for Loop-Start/Ground-Start Lines or Trunks

Step	Console	PC
1. Display Touch-Tone/Loop Start Disconnect screen and select Outward Dialing Mode	**LinesTrunks**	**F 4**
	TT/LS Disc	**F 3**
	OutMode	**F 1**

Step	Console	PC
2. Select specific lines or trunks associated with the 20 line buttons on console or SPM screen		
■ For logical IDs 1-20	**Lines 01-20**	**F 1**
■ For logical IDs 21-40	**Line 21-40**	**F 2**
■ For logical IDs 41-60	**LInes 41-60**	**F 3**
■ For logical IDs 61-80	**Lines 61-80**	**F 4**
3. Specific signaling		
■ For touch-tone	Press line button for each line/trunk to turn green LED on	Press function key for each line/trunk to make letter "G" appear on screen
■ For rotary dial	Press line button for each line/trunk to turn green LED off	Press function key for each line/trunk to erase letter "G"
4. Exit	**Exit**	**F 5**
	Exit	**F 5**
	Exit	**F 5**

Note: An alternate method for steps 2 and 3 is to select Entry Mode (F6), identify the line/trunk (dial or type line/trunk number, logical ID, or slot and port no.), and select Enter (F10) to assign touch-tone, or select Delete (F8) to assign rotary dial.

Loop-Start Line/Trunk Disconnect Signaling Reliability

Step	Console	PC

1. Display Touch-Tone/Loop Start Disconnect screen and select Loop-Start Disconnect	`LinesTrunks`
	`TT/LS Disc`
	`LS`
	`Disconnect`
		F4
		F3
		F2

2. Classify disconnect signal received on loop-start lines/trunks ■ To classify as ■ To classify as unreliable	`Yes` `No`	F1 F2

3. Save choice and exit	`Enter`
	`Exit`
	`Exit`
		F10
		F5
		F5

Toll Type

Step	Console	PC
1. Display Toll Type screen	`LInesTrunks` `Toll Type`	F4 F10

Step	Console	PC
2. Select specific lines/ trunks associated with the 20 line buttons on the console or SPM screen		
■ For logical IDs 1-20	**Lines 01-20**	**F1**
■ For logical IDs 21–40	**Lines 21-40**	**F2**
■ For logical IDs 41–60	**Lines 41-60**	**F3**
■ For logical IDs 61-80	**Lines 61-80**	**F4**
3. Specify toll prefix requirement for long distance calls		
■ To specify toll prefix is required	Press line button for each line/trunk to turn green LED on	Press function key for each line/trunk to make letter "G" appear on screen
■ To specify toll prefix is not required	Press line button for each line/trunk to turn green LED off	Press function key for each line/trunk to erase letter "G"
4. Exit	**Exit**	**F5**
	Exit	**F5**

Note: An alternate method for steps 2 and 3 is to select Entry Mode (F6), identify the line/trunk (dial or type line/trunk number, logical ID, or slot and port no.), and select Enter (F10) to specify a toll prefix is required, or select Delete (F8) to specify a toll prefix is not required.

Hold Disconnect Interval

Step	Console	PC
1. Display Hold Disconnect screen	LinesTrunks	F 4
	More	PgUp
	Hold Dscnct	F 1
2. Select specific lines/trunks associated with the 20 line buttons on console or SPM screen		
■ For logical IDs 1–20	Lines 01-20	F 1
■ For logical IDs 21–40	Lines 21-40	F 2
■ For logical IDs 41–60	Lines 41-60	F 3
■ For logical IDs 61–80	Lines 61-80	F 4
3. Assign Hold Disconnect Interval		
■ For long Hold Disconnect interval	Press line button for each line/trunk to turn green LED on	Press function key for each line/trunk to make letter “G” appear on screen
■ For short Hold Disconnect interval	Press line button for each line/trunk to turn green LED off	Press function key for each line/trunk to erase letter “G”

Note: An alternate method for steps 2 and 3 is to select Entry Mode (F6), identify the line/trunk (dial or type line/trunk number, logical ID, or slot and port no.), and select Enter (F10) to assign a long hold disconnect, or select Delete (F8) to assign a short hold disconnect.

Step	Console	PC
4. Exit	**Exit**	**F5**
	Exit	**F5**

Principal User for Remote Call Forwarding and Coverage

Step	Console	PC
1. Display Principal User screen	**LinesTrunks**	**F4**
	More	**PgUp**
	PrncipalUsr	**F2**
2. Identify line/trunk to program and save entry	Dial line/trunk no. (801-880), * + slot and port, or # + logical ID	Type line/trunk no. (801-880), * + slot and port, or # + logical ID
	Enter	**F10**
3. Identify extension to assign or remove as principal user of line/trunk	Dial extension, * + slot and port, or # + logical ID, or press DSS button for extension no.	Type extension, * + slot and port, or # + logical ID

Step	Console	PC
4. To remove extension as principal user	**Delete**	**F8**
■ To remove more extensions as principal users	**PrncipalUsr** Repeat steps 2-4	**F2** Repeat steps 2-4
To assign extension as principal user and assign a principal user for another line/trunk		
■ If next line/trunk number is sequential	**Next** Repeat step 3	**F9** Repeat step 3
■ If next line/trunk number is not sequential	**Enter** **PrncipalUsr** Repeat steps 2-4	**F10** **F2** Repeat steps 2-4
To assign extension as principal user when all entries are complete	**Enter**	**F1O**
5. Exit	**Exit**	**F5**

Queued Call Console (QCC) Queue Priority (HybridIPBX Only)

Step	Console	PC
1. Display QCC Queue Priority screen	**LinesTrunks** **More** **ACC Prior**	**F 4** **PgUp** **F3**

Step	Console	PC
2. Assign QCC queue priority level (1-7)	Dial priority level: [n]	Type priority level: [n]
3. Save entry	**Enter**	**F10**
4. Select specific trunks associated with the 20 line buttons on console or SPM screen		
■ For logical IDs 1–20	**Lines 01-20**	**F 1**
■ For logical IDs 21–40	**Lines 21-40**	**F 2**
■ For logical IDs 41–60	**Lines 41-60**	**F 3**
■ For logical IDs 61-80	**Lines 61-80**	**F 4**
5. Assign or remove queue priority shown on line 1		
■ To assign queue priority to trunk	Press line button for each trunk to turn green LED on	Press function key for each trunk to make letter "G" appear on screen
■ To remove queue priority from trunk	Press line button for each trunk to turn green LED off	Press function key for each trunk to erase letter "G"

Note: An alternate method for steps 4 and 5 is to select Entry Mode (F6), identify the line/trunk (dial or type line/trunk number, logical ID, or slot and port no.), and select Enter (F10) or Next (F9) to assign queue priority shown on line 1, or select Delete (F8) to delete queue priority shown on line 1.

Step	Console	PC
6. When all entries are complete exit	Exit Exit	F5 F5

QCC Operator to Receive Calls

Step	Console	PC
1. Display QCC Operator screen	LinesTrunks More QCC Opper	F 4 PgUp F4
2. Identify individual QCC operators to receive calls on trunks identified in step 4	Dial extension, * + slot and port, or # + logical ID or press DSS button for extension no.	Dial extension, * + slot and port, or # + logical ID
3. Save entry	Enter	F10
4. Select specific trunks associated with the 20 line buttons on console or SPM screen		
■ For logical IDs 1–20	Lines 01-20	F1
■ For logical IDs 21–40	Lines 21-40	F2
■ For logical IDs 41–60	Lines 41-60	F3
■ For logical IDs 61–80	Lines 61-80	F4

Step	Console	PC
5. Assign or remove calls on trunk to QCC operator shown on line 1 to trunk		
■ To assign calls to QCC operator shown on line 1 of screen	Press line button for each trunk to turn green LED on	Press function key for each trunk to make letter "G" appear on screen
■ To remove calls to QCC operator shown on line 1 of screen	Press line button for each trunk to turn green LED off	Press function key for each trunk to erase letter "G"

Note: An alternate method for steps 4 and 5 is to select Entry Mode (F6), identify the line/trunk (dial or type line/trunk number, logical ID, or slot and port no.), and select Enter (F10) or Next (F9) to assign calls to QCC shown on line 1, or select Delete (F8) to remove calls from QCC shown on line 1.

6. Exit	**Exit**	**F5**
	Exit	**F5**

Trunks to Pools Assignment (HybridPBX Only)

Step	Console	PC
1. Display Pools screen	**LinesTrunks**	**F4**
	Pools	**F9**

Step	Console	PC
2. Identify Pool to program and save entry	Dial pool dial-out code: [nnnn] **Enter**	Type pool dial-out code: [nnnn] **F10**
3. Select specific trunks associated with the 20 line buttons on console or SPM screen		
■ For logical IDs 1–20	**Lines 01-20**	**F1**
■ For logical IDs 21–40	**Lines 21-40**	**F2**
■ For logical IDs 41–60	**Lines 41-60**	**F3**
■ For logical IDs 61–80	**Lines 61-80**	**F4**
4. Assign or remove trunks from pool		
■ To assign trunks to pool	Press line button for each trunk to turn red LED on	Press function key for each trunk to make letter “R” appear on screen
■ To remove trunks from pool	Press line button for each trunk to turn red LED Off	Press function key for each trunk to erase letter “R”

Note: An alternate method for steps 3 and 4 is to select Entry Mode (F6), identify the line/trunk (dial or type line/trunk number, logical ID, or slot and port no.), and select Enter (F10) to assign the trunk to a pool, or select Delete (F8) to remove the trunk from the pool.

Step	Console	PC
5. Exit	**Exit**	**F5**
	Exit	**F5**

Copy Line/Trunk Options

Step	Console	PC
1. Display Line/Trunk Copy menu	**LinesTrunks**	**F4**
	Copy	**F7**
2. To copy line/trunk options to an individual line/trunk	**Single**	**F1**
To copy calling restrictions to a sequentially numbered block of line/trunks	**Block**	**F2**
3. Identify line/trunk to copy calling restrictions from and save entry	Dial line/trunk no. (801 -880), * + slot and port, or # + logical ID	Type line/trunk no. (801 -880), * + slot and port, or # + logical ID
If copying from more than one extension, enter lowest extension number	**Enter**	**F10**

Step	Console	PC
4. If Single was selected, identify line/trunk to copy options **to** or If Block was selected, identify the first line/trunk in block of line/trunks to copy options **to**	Dial line/trunk no. (801-880), * + slot and port, or # + logical ID	Type line/trunk no. (801–880), * + slot and port, or # + logical ID
5. If Single was selected		
■ To save entry and copy options from same line/trunk on line 1 of screen to another individual line/trunk	**Enter** Repeat steps 2-4	**F10** Repeat steps 2-4
■ To copy options from another line/trunk to an individual line/trunk		
▪ If next line/trunk number is sequential	**Next** Repeat step 4	**F9** Repeat step 4
▪ If next line/trunk number is not sequential	**Enter** Repeat steps 2-4	**F10** Repeat steps 2–4
If block was selected, save entry and identify last line/trunk number in block of lines/trunks and save entry	**Enter** Dial line/trunk no. (801–880), * + slot and port, or # + logical ID **Enter**	**F10** Type line/trunk no. (801–880), * + slot and port, or # + logical ID **F10**

Step	Console	PC
6. When copy process is complete	**Exit**	**F5**
	Exit	**F5**
	Exit	**F5**

DS1 Facilities

Type of DS1 Facility

Step	Console	PC
1. Display Loop-Start/ Ground-Start/DS1 screen	**LinesTrunks**	**F4**
	LS/GS/DS1	**F1**
2. Identify slot number (1-17) in control unit that contains 100D and save entry	Dial slot number: [nn]	Type slot number: [nn]
	Enter	**F10**
3. Display Type screen and specify facility type	**Type**	**F1**
■ For T1 facility type	**T1**	**F1**
	Enter	**F10**
	Go to step 4	Go to step 4
■ For PRI facility type	**PRI**	**F2**
	Enter	**F10**
	Go to step 8	Go to step 8

Step	Console	PC
4. If T1 selected in step 3, specify type of emulation and save entry	Select option for type of emulation **Enter**	Press function key for type of emulation **F10**
5. If All Ground, All Loop, or All Unequip selected in step 4	Go to step 8	Go to step 8
If TIE or All Tie selected in step 4, specify transmit/receive insertion loss parameter		
■ To set loss parameter to 0/4 for tie trunks to another PBX and save entry	**TIE-PBX** **Enter** Go to step 6	**F1** **F10** Go to step 6
■ To set loss parameter to 0/6 for tie trunks programmed for network services	**Toll** **Enter** Go to step 6	**F2** **F10** Go to step 6
If Ground-Start, Loop-Start, or Unequipped selected in step 4	Go to step 6	Go to step 6
6. Identify channel (1–24) to program	Dial channel number: [nn]	Type channel number: [nn]

Step	Console	PC
7. To remove channel type	**Delete**	**F8**
■ To remove more channel types from slot number on line 1	Repeat steps 6 and 7	Repeat steps 6 and 7
■ To remove channel types from another DS1 module	**Exit** Repeat steps 3–7	**F5** Repeat steps 3-7
To assign channel type and assign more channel types to slot number shown on line 1 To assign channel type and assign channel types to another DS1 module	**Enter** Repeat steps 6 and 7	**F10** Repeat steps 6 and 7
■ If next slot number is sequential	**Next** Repeat steps 6 and 7	**F9** Repeat steps 6 and 7
■ If next slot number is not sequential	**Enter** **Exit** Repeat steps 3–7	**F10** **F5** Repeat steps 3-7
To assign channel type and return to DS1 Slot menu when all entries are complete	**Enter** **Exit**	**F10** **F5**

Step	Console	PC
8. Exit	**Exit**	**F5**
	Exit	**F5**

Framing Mode

Step	Console	PC
1. Display Loop-Start/ Ground-Start/DS1 Screen	**LinesTrunks** **LS/GS/DS1**	**F 4** **F 1**
2. Identify slot number (1-17) in control unit that contains 100D, save entry, and display format selection screen	Dial slot number: [nn] **Enter** **FrameFormat**	Type slot number: [nn] **F10** **F2**
3. Specify frame format ■ For D4 compatible framing format ■ For Extended Super Frame format	**D4 Compatible** **Extended Super Frame**	**F1** **F2**
4. Save choice and exit	**Enter** **Exit** **Exit**	**F10** **F5** **F5**

Zero Code Suppression

Step	Console	PC
1. Display Loop-Start/ Ground-Start/DS1 screen	**LinesTrunks** **LS/GS/DS1**	**F4** **F4**
2. Identify slot number (1-17) in control unit that contains 100D, save entry, and display zero code suppression selection screen	Dial slot number: [nn] **Enter** **Suppression**	Type slot number: [nn] **F10** **F3**
3. Specify type of zero code suppression		
■ For AM Zero Code Suppression	**AMI-ZCS**	**F1**
■ For Bipolar 8 Zero Code Suppression	**B8ZS**	**G2**
4. Save choice and exit	**Enter** **Exit** **Exit**	**F10** **F5** **F5**

Signaling Mode

Step	Console	PC
1. Display Loop-Start/ Ground-Start/DS1 screen	**LinesTrunks** **LS/GS/DS1**	**F4** **F1**

Step	Console	P c
2. Identify slot number (1-17) in control unit that contains 100D, save entry, and display Signaling screen	Dial slot number: [nn] **Enter** **Signaling**	Type slot number: [nn] **F10** **F4**
3. Specify type of signaling ■ For Robbed Bit signaling ■ For Common Channel signaling	**Robbed Bit** **Common Channel**	**F1** **F2**
4. Save choice then exit	**Enter** **Exit** **Exit**	**F10** **F5** **F5**

Line Compensation

Step	Console	PC
1. Display Loop-Start/ Ground-Start/DS1 screen	**LinesTrunks** **LS/GS/DS1**	**F4** **F1**
2. Identify slot number (1-17) in control unit that contains 100D, save entry, and display Line Compensation screen	Dial slot number:[nn] **Enter** **Line Comp**	Type slot number:[nn] **F10** **F6**

Step	Console	PC
3. Erase currently assigned line compensation and specify amount of decibel loss for line compensation 1= 0.6 dB loss 2= 1.2 dB loss 3= 1.8 dB loss 4= 2.4 dB loss 5= 3.0 dB loss	**Drop** Dial line compensation value:[n]	**Alt+P** Type line compensation value: [n]
4. Save choice then exit	**Enter** **Exit** **Exit**	**F10** **F5** **F5**

Clock Synchronization

Step	Console	PC
1. Display Loop-Start/ Ground-Start/DS1 screen	**LinesTrunks** **LS/GS/DS1**	**F4** **F1**
2. Idendify slot number (1-17) in control unit that contains 100D and save entry	Dial slot number: [nn] **Enter**	Type slot number: [nn] **F10**
3. Display Priority screen	**Clock Sync** **Priority**	**F7** **F7**

Step	Console	PC
4. Specify that the module in slot shown on line 1 provides		
■ Primary clock synchronization	Primary	F1
■ Secondary clock synchronization	Secondary	F2
■ Tertiary clock synchronization	Tertiary	F3
■ No clock synchronization	None	F4
5. Save choice and display Source of Synchronization screen	Enter Source	F10 F2
6. Specify source of clock synchronization		
■ To specify that clock is synchronized to external endpoint	Loop	F 1
■ To specify that clock is free running	Local	F2
7. Save choice and exit	Enter	F10
8. Select Clock Activation	Activation	F3
9. Activate or deactivate clock		
■ To activate clock	Active	F1
■ To deactivate clock	Not Active	F2

Step	Console	PC
10. Save entry and exit	**Enter**	**F10**
	Exit	**F5**
	Exit	**F5**
	Exit	**F5**

Channel Service Unit

Step	Console	PC
1. Display Loop-StaW Ground-Start/DS1 screen	**LineTrunks** **LS/GS/DS1**	**F4** **F1**
2. Identify slot number (1-17) in control unit that contains 100D, save entry, and display Channel Service Unit screen	Dial slot number: [nn] **Enter** **ChannelUnit**	Type slot number: [nn] **F10** **F8**
3. Specify type of channel unit access		
■ For Foreign Exchange	**Foreign Exchange**	**F1**
■ For Special Access	**Special Access**	**F2**
4. Save choice then exit	**Enter**	**F10**
	Exit	**F5**
	Exit	**F5**

Tie Trunks

Tie Trunk Direction

Step	Console	PC
1. Display Tie Lines screen and select Direction	**LinesTrunks**	**F4**
	TIE Lines	**F2**
	Direction	**F1**
2. Identify tie trunk and save entry *If you are programming more than one tie trunk, enter the lowest trunk number.*	Dial trunk no. (801-880) * + slot and port, or # + logical ID	Type trunk no. (801-880), * + slot and port, or # + logical ID
	Enter	**F10**
3. Specify trunk direction		
■ For two-way direction	**Two Way**	**F1**
■ For one-way outgoing	**Outgoing**	**F2**
■ For one-way incoming direction	**Incoming**	**F3**

Step	Console	PC
4. Save choice and either program more tie trunks or exit		
■ To save choice and specify direction for another tie trunk:		
If next tie trunk number is sequential	**Next** Repeat step 3	**F9** Repeat step 3
If next tie trunk number is not sequential	**Enter** **Direction** Repeat steps 2-4	**F10** **F1** Repeat steps 2–4
■ To save choice and exit when all entries are complete	**Enter** **Exit** **Exit**	**F10** **F5** **F5**

Tie Trunk Type

Step	Console	PC
1. Display TIE Lines screen	**LinesTrunks** **TIE Lines**	**F 4** **F 2**
2. Select trunk type to program		
■ For incoming tie trunk type	**Intype**	**F2**
■ For outgoing tie trunk type	**Outtype**	**F3**

Step	Console	PC
3. Identify tie trunk and save entry *If programming more than one tie trunk, enter lowest trunk number.*	Dial trunk no. (801-880), * + slot and port, or # + logical ID **Enter**	Type trunk no. (801-880), * + slot and port, or # + logical ID **F10**
4. Specify tie trunk type		
■ For wink type	**Wink**	**F1**
■ For delay type	**Delay**	**F2**
■ For immediate type	**Immed**	**F3**
■ For automatic type	**Auto**	**F4**
5. Save choice and either program another tie trunk or exit		
■ To save choice and specify type for another tie trunk:		
If next tie trunk number is sequential	**Next** Repeat step 4	**F1** Repeat step 4
If next tie trunk number is not sequential	**Enter** Repeat steps 2–5	**F10** Repeat steps 2–5
■ To save choice and exit when all entries are complete	**Enter** **Exit** **Exit**	**F10** **F5** **F5**

E&M Signal

Step	Console	PC
1. Display Tie Lines screen and select E&M Signal	`LinesTrunks`	**F 4**
	`TIE Lines`	**F 2**
	`E&M Signal`	**F 4**
2. Identify tie trunk and save entry *if you are programming more than one tie trunk, enter the lowest trunk number.*	Dial trunk no (801-880), * + slot and port, or # + logical ID	Type trunk no (801-880), * + slot and port, or # + logical ID
	`Enter`	**F10**
3. Specify E&M trunk signaling		
■ For type 1S signaling	`Type 1S`	**F1**
■ For type 1C signaling	`Type 1C`	**F 2**
■ For type 5 signaling	`Tpye 5`	**F 3**

Step	Console	PC
4. Save choice and either program more tie trunks or exit		
■ To save choice and specify signaling for another tie trunk:		
If next tie trunk number is sequential	**Next**	**F9**
	Repeat step 3	Repeat step 3
If next tie trunk number is not sequential	**Enter**	**F10**
	E&M Signal	**F4**
	Repeat steps 2-4	Repeat steps 2-4
■ To save choice and exit when all entries are complete	**Enter**	**F10**
	Exit	**F5**
	Exit	**F5**

Dial Mode

Step	Console	PC
1. Display TIE Lines screen	**LinesTrunks**	**F4**
	TIE Lines	**F2**
2. Program tie trunk dial mode		
■ For incoming tie trunk dial mode	**Inmode**	**F6**
■ For outgoing tie trunk dial mode	**Outmode**	**F7**

Step	Console	PC
3. Select the specific tie trunks associated with the 20 line buttons on the console or SPM screen		
■ For logical IDs 1–20	**Lines 01-20**	**F1**
■ For logical IDs 21–40	**Lines 21-40**	**F2**
■ For logical IDs 41–60	**Lines 41-60**	**F3**
■ For logical IDs 61–80	**Lines 61-80**	**F4**
4. Specify dial mode		
■ For touch-tone dial mode	Press line button for each tie trunk to turn green LED on	Press function key for each tie trunk to make letter "G" appear on screen
■ For rotary dial mode	Press line button for each rotary tie trunk to turn green LED Off	Press function key next to each rotary tie trunk to erase letter "G"

Note: An alternate method for steps 3 and 4 is to select Entry Mode (F6), identify the tie trunk (dial or type trunk number, logical ID, or slot and port no.), and select Enter (F10) to assign touch-tone, or select Delete (F8) to assign rotary dial.

5. Exit	**Exit**	**F5**
	Exit	**F5**
	Exit	**F5**

Tie Trunk Dial Tone

Step	Console	PC
1. Display Tie Lines screen and select Dial Tone	**LinesTrunks**	**F4**
	TIE Lines	**F2**
	Dialtone	**F8**
2. Select the specific tie trunks associated with the 20 line buttons on the console or SPM screen		
■ For logical IDs 1–20	**Lines 01-20**	**F1**
■ For logical IDs 21–40	**Lines 21-40**	**F2**
■ For logical IDs 41–60	**Lines 41-60**	**F3**
■ For logical IDs 61–80	**Lines 61-80**	**F4**
3. Specify dial tone		
■ For remote dial tone	Press the button for each lineltrunk to turn green LED on	Press the function key for each line/trunk to make letter "G" appear on screen
■ For local dial tone	Press the button for each line/trunk to turn green LED off	Press the function key for each line/trunk to erase letter "G"

Note: An alternate method for steps 2 and 3 is to select Entry Mode (F6), identify the tie trunk (dial or type trunk number, logical ID, or slot and port no.), and select Enter (F10) to assign remote dial tone, or select Delete (F8) to assign local dial tone.

Step	Console	PC
4. Exit	**Exit**	**F5**
	Exit	**F5**
	Exit	**F5**

Answer Supervision Time

Step	Console	PC
1. Display Tie Lines screen and select Answer Supervision	**LinesTrunks** **TIE Lines** **AnsSupvr**	**F4** **F2** **F9**
2. Identify tie trunk and save entry *If you are programming more than one tie trunk, enter the lowest trunk number.*	Dial trunk no . (801-880), * + slot and port, or # + logical ID **Enter**	Type trunk no. (801-880), * + slot and port, or # + logical ID **F10**
3. Specify answer supervision time (20-4800 ms, in increments of 20)	Dial the number of ms: [nnnn]	Type the number of ms: [nnnn]

Step	Console	PC
4. Save entry and either program another tie trunk or exit		
■ To save entry and specify answer supervision for another tie trunk:		
If next tie trunk number is sequential	**Next** Repeat step 3	**F9** Repeat step 3
If next tie trunk number is not sequential	**Enter** **AnsSupvr** Repeat steps 2-4	**F10** **F9** Repeat steps 2-4
■ To save entry and exit when all entries are complete	**Enter** **Exit** **Exit**	**F10** **F5** **F5**

Disconnect Time

Step	Console	PC
1. Display Tie Lines screen and select Disconnect Time	**LinesTrunks** **TIE Lines** **Disconnect**	**F4** **F2** **F10**

Step	Console	PC
2. Identify tie trunk and save entry *If you are programming more than one tie trunk, enter the lowest trunk number.*	Dial trunk no. (801-880), * + slot and port, or # + logical ID **Enter**	Type trunk no. (801-880), * + slot and port, or # + logical ID **F10**
3. Specify disconnect time (140-2400 ms)	Dial number of ms: [nnnn]	Type number of ms: [nnnn]
4. Save entry and either program another tie trunk or exit		
■ To save entry and specify disconnect time for another tie trunk:		
If next tie trunk number is sequential	**Next** Repeat step 3	**F9** Repeat step 3
If next tie trunk number is not sequential	**Enter** **Disconnect** Repeat steps 2-4	**F10** **F10** Repeat steps 2–4
■ To save entry and exit when all entries are complete	**Enter** **Exit** **Exit**	**F10** **F5** **F5**

DID Trunks

Block Assignment

Step	Console	PC
1. Display DID Trunks screen and select Block Assignment	**LinesTrunks**	**F4**
	DID	**F4**
	Block	**F4**
2. Identify block (1 or 2) and save entry	Dial trunk block number: [n]	Type Trunk block number: [n]
	Enter	**F10**
3. Select specific DID trunks associated with the 20 line buttons on the console or SPM screen		
■ For logical IDs 1–20	**Lines 01-20**	**F1**
■ For logical IDs 21–40	**Lines 21-40**	**F2**
■ For logical IDs 41–60	**Lines 41-60**	**F3**
■ For logical IDs 61–80	**Lines 61-80**	**F4**

Step	Console	PC
4. Assign or remove DID trunk		
■ To assign DID trunk to block	Press line button for each trunk to turn green LED on	Press function keys for each trunk to make letter "G" appear on screen
■ To remove DID trunk from block	Press line button for each trunk to turn green LED off	Press function key for each trunk to erase letter "G"

Note: An alternate method for steps 3 and 4 is to select Entry Mode (F6), identify the DID trunk (dial or type trunk number, logical ID, or slot and port no.), and select Enter (F10) to assign to the block, or select Delete (F8) to remove from the block.

5. When all entries are complete	**Exit**	**F5**
	Exit	**F5**
	Exit	**F5**

DID Trunk Type

step	Console	PC
1. Display DID Trunks screen and select DID Trunk Type	**LinesTrunks**	**F4**
	D I D	**F4**
	Type	**F4**

Step	Console	PC
2. Identify block (1 or 2) and save entry	Dial trunk block number: [n] **Enter**	Type trunk number [n] **F10**
3. Specify type for trunk block		
■ For immediate start	**Immed**	**F1**
■ For wink start	**Wink**	**F2**
4. Save choice and either program the other trunk block or exit		
■ To save entry and specify type for the other trunk block	**Next** Repeat step 3	**F9** Repeat step 3
■ To save and exit when all entries are complete	**Enter** **Exit** **Exit**	**FI0** **F5** **F5**

Disconnect Time

Step	Console	PC
1. Display DID Trunks screen and select Disconnect Time	**LinesTrunks** **DID** **Disconnect**	**F4** **F4** **F3**

Step	Console	PC
2. Identify DID trunk and save entry *If you are programming more than one DID trunk, enter the lowest trunk number.*	Dial trunk no. (801-880), * + slot and port, or # + logical ID **Enter**	Type trunk no. (801-880), * + slot and port, or # + logical ID **F10**
3. Specify disconnect time (140-2400 ms, in increments of 10)	Dial number of ms: [nnnn]	Type number of ms: [nnnn]
4. Save entry and either program another DID trunk or exit		
■ To save entry and specify disconnect time for another DID trunk:		
If next tie trunk number is sequential	**Next** Repeat step 3	**F9** Repeat step 3
If next tie trunk number is not sequential	**Enter** **Disconnect** Repeat steps 2-4	**F10** **F 3** Repeat steps 2-4
■ To save entry and exit when all entries are complete	**Enter** **Exit** **Exit**	**F10** **F5** **F5**

Expected Digits

Step	Console	PC
1. Display DID Trunks screen and select Expected Digits	**LinesTrunks** **DID** **Expect Digit**	**F4** **F4** **F4**
2. Identify trunk block (1 or 2) and save entry	Dial trunk block number: [n] **Enter**	Type trunk block number: [n] **F10**
3. Erase current number of expected digits and specify new number of expected digits (1–4)	**Drop** Dial number of expected digits: [n]	**Alt+P** Type number of expected digits: [n]
4. Save entry and either program the other trunk block or exit		
■ To save entry and specify expected digits for the other trunk block	**Next** Repeat step 3	**F9** Repeat step 3
■ To save and exit when all entries are complete	**Enter** **Exit** **Exit**	**F10** **F 5** **F 5**

Delete Digits

Step	Console	PC
1. Display DID trunks Screen and select Delete Digits	**LinesTrunks** **DID** **Delete Digit**	**F4** **F4** **F6**
2. To specify trunk block (1 or 2) and save entry	Dial trunk block number: [n] **Enter**	Type trunk block number: [n] **F10**
3. Erase current number of deleted digits and specify new number of digits to delete (0-4)	**Drop** Dial number of deleted digits: [n]	**Alt+P** Type number of deleted digits: [n]
4. Save entry and either program the other trunk block or exit		
■ To save entry and specify deleted digits for the other trunk block	**Next** Repeat step 3	**F 9** Repeat step 3
■ To save and exit when all entries are complete	**Enter** **Exit** **Exit**	**F10** **F5** **F5**

Add Digits

Step	Console	PC
1. Display DID Trunks screen and select Add Digits	**LinesTrunks** **DID** **Add Digits**	**F4** **F4** **F4**
2. Identify trunk block (1 or 2) and save entry	Dial trunk block number: [n] **Enter**	Type trunk block number [n] **F10**
3. Erase current added digits and specify new digits to add (1-9999)	**Drop** Dial added digits: [nnnn]	**Alt+P** Type added digits: [nnnn]
4. Save entry and either program the other trunk block or exit		
■ To save entry and specify digits to add for the other trunk block	**Next** Repeat step 3	**F9** Repeat step 3
■ To save and exit when all entries are complete	**Enter** **Exit** **Exit**	**F10** **F5** **F5**

Signaling

Step	Console	PC
1. Display DID Trunks screen and select Signaling	**LinesTrunks** **DID** **Signaling**	**F4** **F4** **F8**
2. Identify trunk block (1 or 2) and save entry	Dial trunk block number: [n] **Enter**	Type trunk block number: [n] **F10**
3. Specify DID trunk signaling type		
■ For rotary signaling	**Rotary**	**F1**
■ For touch-tone signaling	**TouchTone**	**F2**
4. Save choice and either program the other trunk block or exit		
■ To save choice and specify signaling for the other trunk block	**Next** Repeat step 3	**F9** Repeat step 3
■ To save choice and exit when all entries are complete	**Enter** **Exit** **Exit**	**F10** **F5** **F5**

Invalid Destination

Step	Console	PC
1. Display DID Trunks screen and select Invalid Destination	LinesTrunks	F4
	DID	F4
	InvalDstn	F9
2. Specify invalid destination of calls to unassigned numbers		
■ To redirect to backup extension	Send to Backup Extension	F1
■ To specify fast busy signal	Return Fast Busy	F2
3. Save choice and exit	Enter	F10
	Exit	F5
	Exit	F5

PRI Facilities

Telephone Number

Step	Console	PC
1. Display PRI screen and select Phone Number	**LinesTrunks**	**F4**
	PRI	**F6**
	PhoneNumber	**F1**
2. Identify line/trunk and save entry	Dial line/trunk no. (801-880), or # + logical ID	Type line/trunk no. (801–880), or # + logical ID
	Enter	**F10**
3. Assign telephone number to channel (up to 12 digits, any combination of 0 and 9)	Dial telephone number: [nnn nnnnnnnnn]	Type telephone number: [nnn nnnnnnnnn]

Step	Console	PC
4. Save entry and either program more PRI channels or exit		
■ To save entry and assign telephone number to another PRI channel:		
If next line/trunk number is sequential	**Next** Repeat step 3	**F9** Repeat step 3
If next line/trunk number is not sequential	**Enter** **PhoneNumber** Repeat steps 2-4	**F10** **F1** Repeat steps 2-4
■ To save entry and exit when all entries are complete	**Enter** **Exit** **Exit**	**F10** **F5** **F5**

B-Channel Groups

1. Display B-Channel Groups screen B Channels	**LinesTrunks** **PRI** **B-ChannlGrp** **B Channels**	**F4** **F6** **F2** **F1**
2. Identify B-Channel group (1-69) to program and save entry	Dial group number: [nn] **Enter**	Type group number: [nn] **F10**

Step	Console	PC
3. Identify B Channel to assign to group	Dial B-Channel slot and port number: [* sspp]	Type B-Channel slot and port number: [* sspp]
4. To remove B Channel from group	**Delete**	**F8**
■ To remove more B Channels from Night Service group on line 1	Repeat step 3	Repeat step 3
■ To remove B Channels from another group	**Exit**	**F 5**
	B Channels	**F1**
	Repeat steps 2-4	Repeat steps 2–4
To assign B Channel to group and assign more B Channels to group shown on line 1	**Enter**	**F10**
	Repeat step 3	Repeat step 3
To assign B Channel to group and assign B Channels to another group		
■ If next group number is sequential	**Next**	**F9**
	Repeat step 3	Repeat step 3
■ If next group number is not sequential	**Enter**	**FI0**
	Exit	**F5**
	B Channels	**F1**
	Repeat steps 2-4	Repeat steps 2–4

Step	Console	PC
5. When all entries are complete		
■ To view all B Channels assigned to a group and exit	**Inspct** **Exit**	**PgDn** **F5**
■ To exit without viewing all B Channels assigned to a group	**Exit**	**F5**
6. Select lines then identify B-Channel group (1-69) to program and save entry *If programming more than one group, enter lowest group number.*	**Lines** Dial group number: [nn] **Enter**	**F2** Type group number: [nn] **F10**
7. Select specific lines/ trunks associated with the 20 line buttons on console or SPM screen		
■ For logical IDs 1–20	**Lines 01-20**	**F1**
■ For logical IDs 21–40	**Lines 21-40**	**F2**
■ For logical IDs 41–60	**Lines 41-60**	**F3**
■ For logical IDs 61–80	**Lines 61-80**	**F4**

Step	Console	PC
8. Assign or remove line/trunk from group		
■ To assign line/trunk to group	Press line button for each line/trunk to turn green LED on	Press function key for each line/trunk to make letter "G" appear on screen
■ To remove line/trunk from group	Press line button for each line/trunk to turn green LED off	Press function key for each line/trunk to erase letter "G"

Note: An alternate method for steps 7 and 8 is to select Entry Mode (F6), identify the line/trunk (dial or type line/trunk number or logical ID), and select Enter (F10) or Next (F9) to assign the line/trunk to the group, or select Delete (F8) to delete the line/trunk from the group.

9. When all entries are complete	**Exit**	**F5**
	Exit	**F5**
	Exit	**F5**
	Exit	**F5**

Network Service

Step	Console	PC
1. Display B-Channel Groups screen and select Network Service	**LinesTrunks** **PRI** **B-ChannlGrp** **NetworkServ**	**F4** **F6** **F2** **F3**
2. Identify B-Channel group (1-69) and save entry	Dial group number: [nn] **Enter**	Type group number: [nn] **F10**
3. Specify service		
■ For Megacom WATS	**MegacomWATS**	**F1**
■ For Megacom 800	**Megacom800**	**F2**
■ For ACCUNH switched 56/64 digital service (SDS)	**ACCUNET SDS**	**F3**
■ For Software Defined Network (SDN)	**SoftDefNetw**	**F4**
■ To specify another service	**Other**	**F6**
4. Save choice	**Enter**	**F10**

Step	Console	PC
5. If you selected Megacom WATS, Megacom 800, ACCUNET SDS, or SDN in step 3, exit	**Exit**	**F5**
	Exit	**F5**
	Exit	**F5**
If you selected Other in step 3, enter 5-digit binary code used to represent service, save entry and exit	Dial binary code: [nnnnn]	Type binary code: [nnnnn]
	Enter	**F10**
	Exit	**F5**
	Exit	**F5**
	Exit	**F5**

Copy Telephone Number to Number to Send

Note: You can use this procedure instead of the Telephone Number to Send procedure to specify that the Telephone Number to Send should be copied from the Telephone Number assigned to each channel in the B-Channel group.

Step	Console	PC
1. Display B-Channel Groups screen and select Com Number	**LinesTrunks**	**F4**
	PRI	**F6**
	B-ChannlGrp	**F2**
	Copy Number	**F4**
2. Identify B-Channel group (1-69) and save entry	Dial Group number: [nn]	Type group number: [nn]
	Enter	**F10**

Step	Console	PC
3. Specify whether telephone number should be copied to number to send		
■ To specify that telephone number is copied as the telephone number to send when an outgoing call is made on each channel	**Copy PhnNum to NumToSend**	**F1**
■ To specify that telephone number is not copied as the telephone number to send and/or no number to send is sent when outside calls are made on each channel	**Do not Copy Phone Number**	**F2**

Step	Console	PC
4. Save choice and either program more B-Channel groups or exit		
To save choice and specify copy telephone number to telephone number to send for another B-Channel group		
■ If next group number is sequential	**Next**	**F9**
	Repeat step 3	Repeat step 3
■ If next group number is not sequential	**Enter**	**F10**
	Copy Number	**F4**
	Repeat steps 2–4	Repeat steps 2–4
To save choice and exit when all entries are complete	**Enter**	**F10**
	Exit	**F5**
	Exit	**F5**
	Exit	**F5**

Telephone Number to Send

Note: You can use the Copy Telephone Number to Telephone Number to Send procedure instead of this procedure to specify that the Telephone Number to Send should be copied from the Telephone Number assigned to each channel in the B-Channel group.

Step	Console	PC
1. Display PRI screen and select Phone Number to Send	**LinesTunnks** **PRI** **NumbrToSend**	**F4** **F6** **F3**
2. Identify line/trunk and save entry *If you are programming more than one line/trunk, enter lowest number.*	Dial line/trunk no. (801-880) or # + logical ID **Enter**	Type line/trunk no. (801-880), or # + logical ID **F10**
3. Assign telephone number to line (up to 12 digits, any combination of 0 and 9)	Dial telephone number: [nnn nnnnnnnnn]	Type telephone number: [nnn nnnnnnnnn]
4. Save entry and either program another PRI line/trunk or exit ■ To save entry and assign telephone number to send to another PRI line/trunk: If next line/trunk number is sequential	**Next** Repeat step 3	**F 9** Repeat step 3

Continued

Step	Console	PC
4. *Continued*		
If next line/trunk number is not sequential	**Enter** **NumbrToSend** Repeat steps 2-4	**F10** **F3** Repeat steps 2–4
■ To save entry and exit when all entries are complete	**Enter** **Exit** **Exit**	**F10** **F5** **F5**

Test Telephone Number

Step	Console	PC
1. Display PRI screen and select Test Telephone Number	**LinesTrunks** **PRI** **Test TelNum**	**F4** **F6** **F4**

Step	Console	PC
2. Identify slot number (1-17) that contains 100D module and save entry *If programming more than one module, enter lowest slot number.*	Dial slot number: [nn] **Enter**	Type slot number: [nn] **F10**
3. Assign test telephone number to DS1 module (up to 12 digits, any combination of 0 through 9)	Dial telephone number: [nnn nnnnn nnnn]	Type telephone number: [nnn nnnnnnnnn]
4. Save entry and either program another 100D module or exit		
■ To save entry and assign test telephone number to another 100D module:		
If next slot number is sequential	**Next** Repeat step 3	**F 9** Repeat step 3
If next slot number is not sequential	**Enter** **Test TelNum** Repeat steps 2-4	**F10** **F4** Repeat steps 2–4
■ To save entry and exit when all entries are complete	**Enter** **Exit** **Exit**	**F10** **F5** **F5**

Timers and Counters

Step	Console	PC
1. Display PRI screen, Protocol screen, and select Timers	**LinesTrunks** **PRI** **Protocol** **Timers**	**F 4** **F 6** **F 6** **F 1**
2. Identify slot number (1-17) that contains 100D module and save entry	Dial slot number: [nn] **Enter**	Type slot number: [nn] **F10**
3. If no change to setting for T200 Timer	Go to step 6	Go to step 6
To change T200 Timer setting, display T200 Timer screen	**T200 Timer**	**F 1**
4. Erase current setting and enter new setting (1000-3000 ms)	**Drop** Dial number of ms: [nnnn]	**Alt+P** Type number of ms: [nnnn]

Step	Console	PC
5. Save entry and either program another 100D module or return to PRI Settings menu		
■ Tosave entry and change T200 Timer for another 100D module:		
If next slot number is sequential	**Next** Repeat step 4	**F9** Repeat step 4
If next slot number is not sequential	**Enter**	**F10**
	Exit	**F5**
	Timers	**F1**
	Repeat steps 2–5	Repeat steps 2-5
■ To save entry and return to PRI settings menu when all entries are complete	**Enter**	**F10**
6. If no change to setting for T203 Timer	Go to step 9	Go to step 9
To change T203 Timer setting, display T203 Timer screen	**T203 Timer**	**F2**
7. Erase current setting and enter new setting (1-60 see)	**Drop** Dial number of seconds: [nn]	**Alt+P** Type number of seconds: [nn]

Step	Console	PC
8. Save entry and either program another 100D module or return to PRI Settings menu		
■ Tosave entry and change T203 Timer for another 100D module:		
If next slot number is sequential	**Next** Repeat step 7	**F9** Repeat step 7
If next slot number is not sequential	**Enter** **Exit** Repeat steps 6–8	**F10** **F5** Repeat steps 6-8
■ To save entry and return to PRI settings menu when all entries are complete	**Enter**	**F10**
9. If no change to setting for N200 counter	Go to step 12	Go to step 12
To change N200 counter setting, display N200 Counter screen	**N200Counter**	**F3**
10. Erase current setting and enter new setting (1-5)	**Drop** Dial number of transmissions: [n]	**Alt+P** Type number of transmissions: [n]

Step	Console	PC
11. Save entry and either program another 100D module or return to PRI Settings menu		
■ To save entry and change N200 Counter for another 100D module:		
If next slot number is sequential	**Next** Repeat step 10	Repeat step 10
If next slot number is not sequential	**Enter** **Exit** Repeat steps 9–11	**F10** **F 5** Repeat steps 9–11
■ To save entry and return to PRI settings menu when all entries are complete	**Enter**	**F10**
12. If no change to setting for N201 Counter	Go to step 15	Go to step 15
To change N201 counter setting, display N201 Counter screen	**N201Counter**	**F4**
13. Erase current setting and enter new setting (16-260)	**Drop** Dial number of octets: [nnn]	**Alt+P** Type number of octets: [nnn]

Step	Console	PC
14. Save entry and either program another 100D module or return to PRI Settings menu		
■ To save entry and change N201 Counter for another 100D module:		
If next slot number is sequential	**Next** Repeat step 13	**F9** Repeat step 13
If next slot number is not sequential	**Enter** **Exit** Repeat steps 12-14	**F10** **F5** Repeat steps 12-14
■ To save entry and return to PRI settings menu when all entries are complete	**Enter**	**F10**
15. If no change to setting for K Counter	Go to step 18	Go to step 18
To change K Counter setting, display K Counter screen	**K Counter**	**F 6**
16. Erase current setting and enter new setting (1–15)	**Drop** Dial number of frames: [nn]	**Alt+P** Type number of frames: [nn]

Step	Console	PC
17. Save entry and either program another 100D module or return to PRI Settings menu		
■ To save entry and change K Counter for another 100D module:		
If next slot number is sequential	**Next** Repeat step 16	**F9** Repeat step 16
If next slot number is not sequential	**Enter** **Exit** Repeat steps 15-17	**F10** **F5** Repeat steps 1 5–17
■ To save entry and return to PRI settings menu when all entries are complete	**Enter**	**F10**
18. If no change to setting for T303 Timer	Go to step 21	Go to step 21
■ To change T303 Timer setting, display T303 Timer screen	**T303 Timer**	**F7**
19. Erase current setting and enter new setting (4-12 see)	**Drop** Dial number of seconds: [nn]	**Alt+P** Type number of seconds: [nn]

Step	Console	PC
20. Save entry and either program another 100D module or return to PRI Settings menu		
■ To save entry and change T303 Timer for another 100D module:		
If next slot number is sequential	**Next** Repeat step 19	**F9** Repeat step 19
If next slot number is not sequential	**Enter** **Exit** Repeat steps 18-20	**F10** **F5** Repeat steps 18-20
■ To save entry and return to PRI settings menu when all entries are complete	**Enter**	**F10**
21. If no change to setting for T305 Timer	Go to step 24	Go to step 24
■ To change T305 Timer setting, display T305 Timer-screen	**T305 Timer**	**F8**
22. Erase current setting and enter new setting (4-30 sec)	**Drop** Dial number of seconds: [nn]	**Alt+P** Type number of seconds: [nn]

Step	Console	PC
23. Save entry and either program another 100D module or return to PRI Settings menu		
■ To save entry and change T305 Timer for another 100D module:		
If next slot number is sequential	**Next** Repeat step 22	**F9** Repeat step 22
If next slot number is not sequential	**Enter**	**F10**
	Exit Repeat steps 21-23	**F5** Repeat steps 21-23
■ To save entry and return to PRI settings menu when all entries are complete	**Enter**	**F10**
24. If no change to setting for T308 Timer	Go to step 27	Go to step 27
To change T308 Timer, display T308 Timer screen	**T308 Timer**	**F9**
25. Erase current setting and enter new setting (4–12 sec)	**Drop** Dial number of seconds: [nn]	**Alt+P** Type number of seconds: [nn]

Step	Console	PC
26. Save entry and either program another 100D module or return to PRI Settings menu		
■ To save entry and change T308 Timer for another 100D module:		
If next slot number is sequential	**Next** Repeat step 25	**F9** Repeat step 25
If next slot number is not sequential	**Enter** **Exit** Repeat steps 24-26	**F10** **F5** Repeat steps 24-26
■ To save entry and return to PRI settings menu when all entries are complete	**Enter**	**F10**
27. If no change to setting for T309 Timer	Go to step 30	Go to step 30
To change T309 Timer setting, display T309 Timer screen	**T309 Timer**	**F10**
28. Erase current setting and enter new setting (30-120 sec)	**Drop** Dial number of seconds: [nnn]	**Alt+P** Type number of seconds: [nnn]

Step	Console	PC
29. Save entry and either program another 100D module or return to PRI Settings menu		
■ To save entry and change T309 Timer for another 100D module:		
If next slot number is sequential	**Next** Repeat step 28	**F9** Repeat step 28
If next slot number is not sequential	**Enter**	**F1O**
	Exit Repeat steps 27-29	**F5** Repeat steps 27–29
■ To save entry and return to PRI settings menu when all entries are complete	**Enter**	**F1O**
30. If no change to setting for T310 Timer	Go to step 33	Go to step 33
To change T310 Timer setting, display T310 Timer screen	**More** **T310 Timer**	**PgUp** **F1**
31. Erase current setting and enter new setting (2–10 sec)	**Drop** Dial number of seconds: [nn]	**Alt+P** Type number of seconds: [nn]

Step	Console	PC
32. Save entry and either program another 100D module or return to PRI Settings menu		
■ Tosave entry and change T310 Timer for another 100D module:		
If next slot number is sequential	**Next** Repeat step 31	**F9** Repeat step 31
If next slot number is not sequential	**Enter** **Exit** Repeat steps 30-32	**F10** **F5** Repeat steps 30-32
■ To save entry and return to PRI settings menu when all entries are complete	**Enter**	**F10**
33. If no change to setting for T313 Timer	Go to step 36	Go to step 36
To change T313 timer setting, display T313 Timer screen	**T313 Timer**	**F2**
34. Erase current setting and enter new setting (4–12 sec)	**Drop** Dial number of seconds: [nn]	**Alt+P** Type number of seconds: [nn]

Step	Console	PC
35. Save entry and either program another 100D module or return to PRI Settings menu		
■ To save entry and change T313 Timer for another 100D module:		
If next slot number is sequential	**Next** Repeat step 34	**F9** Repeat step 34
If next slot number is not sequential	**Enter** **Exit** Repeat steps 33-35	**F10** **F 5** Repeat steps 33-35
■ To save entry and return to PRI settings menu when all entries are complete	**Enter**	**F10**
36. If no change to setting for T316 Timer	Go to step 39	Go to step 39
To change to setting for T316 Timer, display T316 Timer screen	**T316 Timer**	**F3**
37. Erase current setting and enter new setting (30-120 sec)	**Drop** Dial number of seconds: [nnn]	**Alt+P** Type number of seconds: [nnn]

Step	Console	PC
38. Save entry and either program another 100D module or return to PRI Settings menu		
■ To save entry and change T316 Timer for another 100D module:		
If next slot number is sequential	**Next**	**F9**
	Repeat step 37	Repeat step 37
If next slot number is not sequential	**Enter**	**F10**
	Exit	**F5**
	Repeat steps 36-38	Repeat steps 36-38
■ To save entry and return to PRI settings menu when all entries are complete	**Enter**	**F10**
39. Exit	**Exit**	**F5**
	Exit	**F5**
	Exit	**F5**
	Exit	**F5**

Terminal Equipment Identifier

Step	Console	PC
1. Display PRI screen, Protocol screen, and select Terminal Equipment Identifier (TEI)	**LinesTrunks**	**F4**
	PRI	**F6**
	Protocol	**F6**
	TEI	**F2**
2. Identify slot number (1-17) that contains 100D module and save entry	Dial slot number: [nn]	Type slot number: [nn]
	Enter	**F10**
3. Erase current setting and enter new setting (0-63)	**Drop**	**Alt+P**
	Dial ID number: [nn]	Type ID number: [nn]
4. Save entry and either program another 100D module or exit		
■ To save entry and change terminal equipment identifier for another 100D module:		
If next slot number is sequential	**Next**	**F9**
	Repeat step 3	Repeat step 3
If next slot number is not sequential	**Enter**	**F10**
	TEI	**F2**
	Repeat steps 2-4	Repeat steps 2-4
■ To save entry and exit when all entries are complete	**Enter**	**F10**
	Exit	**F5**
	Exit	**F5**
	Exit	**F5**

Telephones

Assign Lines/Trunks or Pools to Telephones

Step	Console	PC
1. Display Assign Lines/Trunks screen	**Extensions**	**F6**
	LinesTrunks	**F1**
2. Identify telephone to program and save entry	Dial extension, * + slot and port, or # + logical ID, or press DSS button for extension no.	Type extension, * + slot and port, or # + logical ID
	Enter	**F10**
3. Select specific lines/trunks associated with the 20 line buttons on the console or SPM screen		
■ For logical IDs 1–20	**Lines 01-20**	**F1**
■ For logical IDs 21–40	**Lines 21-40**	**F2**
■ For logical IDs 41–60	**Lines 41-60**	**F3**
■ For logical IDs 61–80	**Lines 61-80**	**F4**

Step	Console	PC
4. Assign or remove lines/trunks or pools		
■ To assign a line/trunk line button to telephone	Press line button for each line/trunk to turn green LED on	Press function key for each line/trunk to make letter "G" appear on screen
■ To remove a line/trunk button from telephone	Press line button for each line/trunk to turn green LED off	Press function key for each line/trunk to erase letter "G"
■ To assign a pool button	Press line button for any trunk in pool until both red and green LEDs are on	Press function key for any trunk in pml until both letters "R" and "G" appear on screen
■ To remove a pool button	Press line button for any trunk in pool to turn green LED off (red LED remains on)	Press function key for any trunk in pool to erase letter "G" (letter "R" remains on screen)

Note: An alternate method for steps 3 and 4 is to select Entry Mode (F6), identify the line/trunk (dial or type line/trunk number, logical ID, or slot and port no.), and select Enter (F10) to assign the line/trunk or pool to the telephone, or select Delete (F8) to remove the line/trunk or pool assignment from the telephone.

5. Exit	**Exit**	**F5**
	Exit	**F5**

Copy Line/Trunk Assignments

Step	Console	PC
1. Display Copy Lines screen	**Extensions** **Line Copy**	**F6** **F2**
2. To copy line assignments to individual telephones	**Single**	**F1**
To copy line assignments to sequentially numbered block of telephones	**Block**	**F2**
3. Identify telephone to copy line assignments **from** and save entry *If copying from more than one extension, enter lowest extension number.*	Dial extension, * + slot and port, or # + logical ID, or press DSS button for extension no. **Enter**	Type extension, * + slot and port, or # + logical ID **F10**
4. If Single was selected, identify telephone to copy assignments **to** or If Block was selected, identify the first telephone in block of telephones to copy assignments **to**	Dial extension, * + slot and port, or # + logical ID, or press DSS button for extension no.	Type extension, * + slot and port, or logical ID no.

Step	Console	PC
5. If Single was selected		
■ Tosave entry and copy line assignments from extension on line 1 of screen to another individual telephone	**Enter** **Exit** Repeat step 4	**F10** **F5** Repeat step 4
■ To copy line assignments ftom another extension to an individual telephone		
■ If next extension number is sequential	**Next** Repeat step 4	**F9** Repeat step 4
■ If next extension number is not sequential	**Enter** **Exit** **Single** Repeat steps 3-5	**F10** **F5** **F1** Repeat steps 3-5
If block was selected, save entry and identify last extension in block of telephones and save entry	**Enter** Dial extension, * + slot and port, or # + logical ID, or press DSS button for extension no. **Enter**	**F10** Type extensions, * + slot and port, or # + logical ID **F10**
6. When copy process is complete	**Exit** **Exit** **Exit**	**F5** **F5** **F5**

Intercom or System Access Button Assignment

Step	Console	PC
1. Display Centralized Programming screen	**More** **Cntr-Prg**	**PgUp** **F4**
2. Identify telephone, save entry, and start centralized telephone programming process	Dial extension, * + slot and port, or # + logical ID, or press DSS button for extension no.	Type extension, * + slot and port, or # + logical ID
	Enter	**F10**
	Start	**F10**
3. Select specific line buttons associated with the 20 line buttons on the console or PC with SPM		
■ To select buttons 1-20	**Page 1**	**F7**
■ To select buttons 21-34	**Page 2**	**F8**
4. Indicate button wanted as System Access Ring, Voice, Originate Only or Shared button	Press button being programmed	Press function key for button being programmed
5. Continue programming process	**List Feature**	**F10**

Step	Console	PC
6. Assign the type of System Access button **Note:** To speed programming, dial codes are shown in this step. Items can also be selected from the display.		
■ To program System Access **Ring** button	Dial ∗16	Type ∗16
■ To program System Access **Voice** button	Dial ∗16 Press button being programmed again **Enter**	Type ∗16 **Shift** + function key for button being programmed again **F10**
	Dial ∗19	Type ∗19
■ To program System Access **Originate Only-Ring** button	Dial ∗18	Type ∗18
■ To program System Access **Originate Only-Voice** button	Dial ∗18 Press button being programmed again **Enter**	Type ∗18 Shift + function key for button being programmed again **F10**
	Dial ∗19	Type ∗19

Continued

Step	Console	PC
6. *Continued*		
■ To program System Access **Shared** button	Dial ∗17 + extension no. of principal telephone [nnnn] + button number of specific button being shared [nn]	Type ∗17 + extension no. of principal telephone [nnnn] + button number of specific button being shared [nn]
■ To remove System Access Ring, Voice, Outgoing Only, or Shared assignment from button	Dial ∗21	Type ∗21
■ To change current assignment for System Access Voice, Originate Only, or Shared button from Voice to Ring	Dial ∗∗19	Type ∗∗19
7. Exit	**Exit**	**F5**

Analog Multiline Telephones with BIS and/or HFAI Capability

Step	Console	PC
1. Display BIS/HFAI extensions screen	**Extensions** **BIS/HFAI**	**F 6** **F 8**

Step	Console	PC
2. If a DSS **is not** attached to system programming console or if programming with SPM	Go to step 3	Go to step 3
If a DSS **is** attached		
■ To specify that telephone has BIS/HFAI capability	Press DSS button for each telephone to turn red LED on. Go to step 6	
■ To specify that telephone does not have BIS/HFAI capability	Press DSS button for each telephone to turn red LED off. Go to step 6	
3. If a DSS **is not** attached to system programming console or if programming with SPM		
■ Identify telephone to program	Dial extension, * + slot and port, or # + logical ID	Type extension, * + slot and port, or # + logical ID
4. To specify that telephone **has** BIS/HFAI capability.	**Enter**	**F10**
To specify that telephone **does** not have BIS/HFAI capability	**Delete**	**F8**

Step	Console	PC
5. To program more telephones	Repeat steps 3 and 4	Repeat steps 3 and 4
To view telephones with BIS/HFAI capability	**Inspct**	**PgDn**
6. Exit	**Exit**	**F5**
	Exit	**F5**

Analog Multiline Telephones Requiring Voice Announce to Busy Feature

Step	Console	PC
1. Display Voice Signal Pair screen	**Extensions**	**F6**
	VoiceSignl	**F10**
2. If a DSS **is not** attached to system programming console or if programming with SPM	Go to step 3	Go to step 3
If a DSS **is** attached		
■ To assign voice/voice pairing for Voice Announce to Busy feature	Press DSS button for either extension to turn red LED on (red LED for other extension automatically goes on). Go to step 6	

Continued

Step	Console	PC
2. *Continued*		
■ To remove voice/voice pairing for Voice Announce to Busy feature	Press DSS button for either extension to turn red LED off (red LED for other extension automatically goes off). Go to step 6	
3. If a DSS **is not** attached to system programming console or if programming with SPM		
■ Identify extension number for either pair member	Dial extension, * + slot and port, or # + logical ID	Type extension, * + slot and port, or # + logical ID
4. To assign voice/voice pairing for Voice Announce to Busy feature	**Enter**	**F10**
To remove voice/voice pairing for Voice Announce to Busy feature	**Delete**	**F8**
5. To program more telephones	Repeat steps 3 and 4	Repeat steps 3 and 4
To view extensions with voice/Voice pairing for Voice Announce to Busy feature	**Inspct**	**PgDn**

Step	Console	PC
6. Exit	**Exit**	**F5**
	Exit	**F5**

Analog Multiline Telephones Requiring Simultaneous Voice and Data Feature

Step	Console	PC
1. Display Data Voice/Data screen	**More** **Data** **Voice/Data**	**PgUp** **F2** **F1**
2. If a DSS **is not** attached to system programming console or if programming with SPM	Go to step 3	Go to step 3
If a DSS **is** attached		
■ To assign voice/data pairing for Simultaneous Voice and Data feature	Press DSS button for either extension to turn red LED on (red LED for other extension in pair automatically goes on). Go to step 6	

Continued

Step	Console	PC
2. *Continued*		
■ To remove voice/data pairing for Simultaneous Voice and Data feature	Press DSS button for either extension to turn red LED off (red LED for other extension automatically goes off). Go to step 6	
3. If a DSS is not attached to system programming console or if programming with SPM		
■ Identify extension number for either pair	Dial extension, * + slot and port, or # + logical ID	Type extension, * + slot and port, or # + logical ID
4. To assign voice/data pairing for Simultaneous Voice and Data feature	**Enter**	**F10**
To remove voice/data pairing for Simultaneous Voice and Data feature	**Delete**	**F8**
5. To program more telephones	Repeat steps 3 and 4	Repeat steps 3 and 4
To view extensions with Simultaneous Voice and Data feature	**Inspct**	**PgDn**
6. Exit	**Exit**	**F5**
	Exit	**F5**

Auxiliary Equipment

Music-on-Hold

Step	Console	PC
1. Display Music-on-Hold screen	**AuxEquip** **MusicOnHold**	**F9** **F1**
2. Identify line jack where music source is connected	Dial line/trunk no. (801–880), * + slot and port, or # + logical ID	Type line/trunk no. (801–.80), * + slot and port, or # + logical ID
3. To specify that line jack is used for Music-on-Hold feature	**Enter**	**F10**
To remove Music-on-Hold assignment from line jack	**Delete**	**F8**
4. Exit	**Exit**	**F5**

Note: If you use equipment that rebroadcasts music or other copyrighted materials, you 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, you can purchase a Magic on Hold® system, which does not require you to obtain such a license, from AT&T or your authorized dealer.

Loudspeaker Paging

Step	Console	PC
1. Display Loudspeaker Page screen	**AuxEquip** **Ldspkr Pg**	**F9** **F2**
2. Identify line jack where loudspeaker paging system is connected	Dial line/trunk no. (801-880), * + slot and port, or # + logical ID	Type line/trunk no. (801-880), * + slot and port, or # + logical ID
3. To specify that line jack is used to connect loudspeaker paging system	**Enter**	**F10**
■ To remove loudspeaker paging assignment from line jack	**Delete**	**F8**
4. To specify more loudspeaker paging line jacks (maximum 3)	Repeat steps 2 and 3	Repeat steps 2 and 3
To view loudspeaker paging system line/trunk numbers and exit	Inspct **Exit**	PgDn **F5**
To exit without viewing loudspeaker paging system line/trunk numbers	**Exit** **Exit** **Exit**	**F5** **F5** **F5**

Fax

Step	Console	PC
1. Display Fax screen and select Port	**AuxEquip** **Fax** **Port**	**F9** **F3** **F1**
2. If a DSS **is not** attached to system programming console or if programming with SPM	Go to step 3	Go to step 3
If a DSS is attached		
■ To specify that station jack is used to connect fax machine	Press DSS button for each extension to turn red LED on. Go to step 6	
■ To remove fax machine assignment	Press DSS button each extension to turn red LED off. Go to step 6	
3. If a DSS **is not** attached to system programming console or if programming with SPM		
■ Identify station jack where fax machine is connected	Dial extension, * + slot and port, or # + logical ID	Type extension, * + slot and port, or # + logical ID

Step	Console	PC
4. To specify that line jack is used to connect fax machine	**Enter**	**F10**
To remove fax machine assignment from line jack	**Delete**	**F8**
5. To specify more fax ports (maximum 16)	Repeat steps 3 and 4	Repeat steps 3 and 4
To view fax machine extension numbers	**Inspct**	**PgDn**
6. Return to Fax menu	**Exit**	**F5**
7. To assign or remove telephones to receive fax message-waiting indication, display Message Waiting screen, and identify fax machine sending message-waiting indication	**Msg Waiting** Dial extension, * + slot and port, or # + logical ID, or press DSS button for extension no.	**F2** Type extension, * + slot and port, or # + logical ID
If you are programming more than one fax machine, enter lowest extension number.	**Enter**	**F10**

Step	Console	PC
8. If a DSS **is not** attached to system programming console or if programming with SPM	Go to step 9	Go to step 9
If a DSS **is** attached		
■ To specify that telephone receives message-waiting indication	Press DSS button for each telephone to turn red LED on. Go to step 11	
■ To remove message-waiting indication from telephone	Press DSS button for each telephone to turn red LED off. Go to step 11	
9. If a DSS **is not** attached to system programming console or if programming with SPM		
■ Identify telephone to receive message-waiting indication	Dial extension, * + slot and port, or # + logical ID	Type extension, * + slot and port, or # + logical ID

Step	Console	PC
10. To remove message-waiting indication from telephone	**Delete**	**F8**
■ To remove message-waiting indication from more telephones for fax on line 1	Repeat step 9	Repeat step 9
■ To remove message-waiting indication from telephones for another fax	**Exit** Repeat steps 7–10	**F5** Repeat steps 7–10
To assign message-waiting indication to telephone and assign message-waiting indication to more telephones (maximum 4) for fax shown on line 1	**Enter** Repeat step 9	**F10** Repeat step 9
To assign message-waiting indication to telephone and assign message-waiting to telephones for another fax		
■ If next extension number is sequential	**Next** Repeat step 9	**F9** Repeat step 9
■ If next extension number is not sequential	**Enter** **Exit** Repeat steps 7–10	**F10** **F5** Repeat steps 7-10

Continued

Step	Console	PC
10. *Continued* To assign message-waiting indication to telephone and assign message-waiting to telephones for another fax	**Enter**	**F10**
11. To view telephones with receiving message-waiting indication from fax on line 1	**Inspct**	**PgDn**
Return to Fax menu without viewing telephones with message-waiting	**Exit**	**F5**
12. To change length of time before system is notified that fax message has arrived, display Fax Threshold Duration screen	**Threshold**	**F3**
13. Erase currently programmed number of seconds and specify new number of seconds (0-30)	**Drop** Dial number of seconds: [nn]	**Alt+P** Type number of seconds: [nn]
14. Save entry and exit	**Enter** **Exit** **Exit** **Exit**	**F10** **F5** **F5** **F5**

Maintenance Alarms

Step	Console	PC
1. Display Maintenance Alarms screen	**AuxEquip** **MaintAlarms**	**F 9** **F 4**
2. Specify line jack to connect to maintenance alarm and save entry	Dial line trunk (801-880), * + slot and port, or # + logical ID	Type line trunk (801-880), * + slot and port, or # + logical ID
3. To assign maintenance alarm to line jack To remove maintenance alarm assignment from line jack	**Enter** **Delete**	**F10** **F 8**
4. To program more maintenance alarms	Repeat steps 2 and 3	Repeat steps 2 and 3
5. Exit	**Exit**	**F5**

Voice Messaging System (VMS)/Automated Attendant (AA) Options

Note: Use Calling Group Type procedure in Group Assigned Features section to identify voice message interface (VMI) port and specify if VMI port is integrated or generic.

Step	Console	PC
1. Display VMS/AA menu	**AuxEquip** **VMS/AA**	**F 9** **F 6**

Step	Console	PC
2. If no change to number of rings before transfer	Go to step 4	Go to step 4
To change number of rings before transfer, display Transfer Retn Interval screen	**TransferRtn**	**F1**
3. To erase current setting, specifv that calls are not transferred to the backup position and save entry	**Drop** Dial **0** **Enter**	**Alt+P** Type **0** **F10**
To set number of rings (1-9) before calls are transferred to the backup position and save entry	Dial number of rings: [n] **Enter**	Type number of rings: [n] **F10**
4. If VMS/AA equipment is generic or no change to touch-tone duration	Go to step 6	Go to step 6
If VMS/AA equipment is integrated, to change current setting for touch-tone duration, display Touch-Tone Duration screen	**TT Duration**	**F2**
5. Erase current setting, enter new setting (50–200ms, in multiples of 25), and save entry	**Drop** Dial number of milliseconds: [nnn] **Enter**	**Alt+P** Type number of milliseconds: [nnn] **F10**

Step	Console	PC
6. If VMS/AA equipment is generic or no change to touch-tone intewal	Go to step 8	Go to step 8
If VMS/AA equipment is integrated, to change current setting for touch-tone interval, display Touch-Tone Interval screen	**TT Interval**	**F3**
7. Erase current setting, enter new setting (50-200 ms, in multiples of 25), and save entry	**Drop** Dial number of milliseconds: [nnn] **Enter**	**Alt+P** Type number of milliseconds [nnn] **F10**
8. Exit	**Exit** **Exit**	**F5** **F5**

Optional Telephone Features

Pool Dial Out Code (Hybrid/PBX only)

Step	Console	PC
1. Display Pool Dial-Out Code screen	**Extensions** **Dial Outcd**	**F 6** **F 3**
2. Identify telephone to program and save entry	Dial extension, * + slot and port, or # + logical ID, or press DSS button for extension no. **Enter**	Type extension, * + slot and port, or # + logical ID **F10**
3. Identify pool dial-out code to allow or restrict telephone from using	Dial pool dial-out code: [nnn]	Type pool dial-out code: [nnn]
4. To allow dial-out code use	**Enter**	**F10**
To restrict dial-out code use	**Delete**	**F8**

Step	Console	PC
5. To allow or restrict extension shown on line 1 from using another pml dial-out code To assign or remove pool dial-out restriction from another telephone	Repeat steps 3 and 4	Repeat steps 3 and 4
■ If next extension number is sequential	**Next** Repeat steps 3 and 4	**F9** Repeat steps 3 and 4
■ If next extension number is not sequential	**Exit** **Dial Outcd** Repeat steps 2-5	**F5** **F3** Repeat steps 2-5
6. Exit	**Exit** **Exit** **Exit**	**F5** **F5** **F5**

Call Restrictions

Step	Console	PC
1. Display Call Restriction screen	**Extensions**	**F6**
	Restriction	**F4**
2. Identify telephone to program and save entry	Dial extension, * + slot and port, or # + logical ID or press DSS button for extension no.	Type extension, * + slot and port, or # + logical ID
	Enter	**F10**
3. Assign or remove restrictions		
■ To remove restrictions	**Unrestricted**	F1
■ To restrict telephones from making outside calls (local and toll)	**Outward Restrict**	F2
■ To restrict telephones from making toll calls	**Toll Restrict**	F3
4. Save choice and either assign or remove more restrictions or exit		
■ To save choice and assign or remove restrictions to another extension:		

Continued

Step	Console	PC
4. *Continued*		
If next extension number is sequential	**Next** Repeat step 3	**F9** Repeat step 3
If next extension number is not sequential	**Enter** **Restriction** Repeat steps 2-4	**F10** **F4** Repeat steps 2-4
■ To save choice and exit when all entries are complete	**Enter** **Exit**	**F10** **F5**

Copy Call Restrictions

Step	Console	PC
1. Display Restriction screen	**Extensions** **RestrctCopy**	**F6** **F6**
2. To copy calling restrictions to an individual telephone	**Single**	**F1**
To copy calling restrictions to a sequentially numbered block of telephones	**Block**	**F2**

Step	Console	PC
3. Identify telephone to copy calling restrictions **from** and save entry *If copying from more than one extension, enter* lowest *extension number.*	Dial extension, * + slot and port, or # + logical ID, or press DSS button for extension no. **Enter**	Type extension, * + slot and port, or # + logical ID **F10**
4. If Single was selected, identify telephone to copy assignments **to** or If Block was selected, identify the first telephone in block of telephones to copy assignments **to**	Dial extension, * + slot and port, or # + logical ID or press DSS button for extension no.	Type extension, * + slot and port, or # + logical ID
5. If Single was selected ■ To save entry and copy restrictions from same extension on line 1 of screen **to** another individual telephone	**Enter** **Exit** Repeat step 4	**F10** **F5** Repeat step 4

Continued

Step	Console	PC
5. *Continued*		
■ To copy line assignments from another extension to an individual telephone		
■ If next extension number is sequential	**Next** Repeat step 4	**F9** Repeat step 4
■ If next extension number is not sequential	**Enter**	**F10**
	Exit	**F5**
	Single Repeat steps 3-5	**F1** Repeat steps 3-5
If block was selected, save entry and identify last extension in block of telephones and save entry	**Enter** Dial extension, * + slot and port, or # + logical ID, or press DSS button for extension no.	**F10** Type extension, * + slot and port, or # + logical ID
	Enter	**F10**
6. When copy process is complete	**Exit**	**F5**
	Exit	**F5**
	Exit	**F5**

Forced Account Code Entry

Step	Console	PC
1. Display Forced Account Code Entry screen	**Extensions** **Account**	**F6** **F7**
2. If a DSS **is not** attached to system programming console or if programming with SPM	Go to step 3	Go to step 3
If a DSS is attached		
■ To assign Forced Account Code Entry to telephones	Press DSS button for each telephone to turn red LED on. Go to step 6	
■ To remove forced account code entry from telephones	Press DSS button for each telephone to turn red LED off. Go to step 6	
3. If a DSS **is not** attached to system programming console or if programming with SPM		
■ Identify telephone to program	Dial extension, * + slot and port, or # + logical ID	Type extension, * + slot and port, or # + logical ID

Step	Console	PC
4. To assign Forced Account Code Entry to telephone	Enter	F10
To remove Forced Account Code Entry from telephone	Delete	F8
5. To program more telephones	Repeat steps 3 and 4	Repeat steps 3 and 4
To view telephones with Forced Account Code Entry	Inspct	PgDn
6. Exit	Exit	F5
	Exit	F5

Microphone Operation

Step	Console	PC
1. Display Extensions screen and select Microphone Disable	Extensions	F6
	More	PgUp
	Mic Disable	F7

Step	Console	PC
2. If a DSS **is not** attached to system programming console or if programming with SPM	Go to step 3	Go to step 3
If a DSS **is** attached		
■ To disable telephone microphone	Press DSS button for each telephone to turn red LED on. Go to step 6	
■ To enable telephone microphone	Press DSS button to turn red LED off. Go to step 6	
3. If a DSS **is not** attached to system programming console or if programming with SPM		
■ Identify telephone to program	Dial extension, * + slot and port, or # + logical ID	Type Extension, * + slot and port, or # + logical ID
4. To disable telephone microphone	**Enter**	**F10**
To enable telephone microphone	**Delete**	**F 8**
5. To program more telephones	Repeat steps 3 and 4	Repeat steps 3 and 4
To view telephones disabled microphones	**Inspct**	**PgDn**
6. Exit	**Exit**	**F5**
	Exit	**F5**

Remote Call Forwarding

Step	Console	PC
1. Display Extensions screen and select Remote Call Forwarding	**Extensions** **More** **Remote Frwd**	**F6** **PgUp** **F8**
2. If a DSS **is not** attached to system programming console or if programming with SPM	Go to step 3	Go to step 3
If a DSS **is** attached		
■ To allow telephone to forward calls to outside numbers	Press DSS button for each telephone to turn red LED on. Go to step 6	
■ To restrict telephone from forwarding calls to outside numbers	Press DSS button for each telephone to turn red LED off. Go to step 6	
3. If a DSS **is not** attached to system programming console or if programming with SPM		
■ Identify telephone to program	Dial extension, * + slot and port, or # + logical ID	Type extension, * + slot and port, or # + logical ID

Step	Console	PC
4. To allow telephone to forward calls to outside numbers	**Enter**	**F10**
To restrict telephone from forwarding calls to outside numbers	**Delete**	**F8**
5. To program more telephones	Repeat steps 3 and 4	Repeat steps 3 and 4
To view telephones with Remote Call Forwarding capability	**Inspct**	**PgDn**
6. Return to Extensions menu	**Exit**	**F 5**
7. To specify that individual telephones are allowed to forward calls received on personal line buttons to an outside number, display Remote Call Forward screen	**Extensions** **More** **Remote Frwd**	**F 6** **PgUp** **F8**
8. Identify line/trunk on which to allow telephone to forward calls and save entry	Dial line/trunk no. (801–880), * + slot and port, or # + logical ID, **Enter**	Type line/trunk no.. (801–880), * + slot and port, or # + logical ID **F10**

Step	Console	PC
9. Identify telephone allowed to forward calls to outside numbers on line/trunk on line 1 (maximum 1 per line/trunk)	Dial extension, * + slot and port, or # + logical ID, or press DSS button for extension no.	Type extension, * + slot and port, or # + logical ID
10. To restrict telephone from forwarding calls to outside numbers on line/trunk shown on line 1	**Delete**	**F8**
■ To restrict telephones from forwarding calls to outside numbers on another line/trunk	**Exit** **Remote Frwd** Repeat steps 8-10	**F 5** **F 8** Repeat steps **8-10**
To allow telephone to forward calls to outside numbers on line/trunk and assign telephones to another line/trunk		
■ If next line/trunk number is sequential	**Next** Repeat step 9	**F9** Repeat step 9
■ If next line/trunk number is not sequential	**Enter** **Exit** **Remote Frwd** Repeat steps 8-10	**F10** **F 5** **F8** Repeat steps 8-10

Continued

Step	Console	PC
10. *Continued*		
■ To allow telephone to forward calls to outside numbers when all entries are compiete	**Enter**	**F10**
11. Exit	**Exit**	**F5**

Optional Operator Features

Operator Hold Timer

Step	Console	PC
1. Display Operator screen and select Hold Timer	**Operator** **Hold Timer**	**F3** **F3**
2. Erase current number of seconds and enter new number of seconds	**Drop** Dial number of seconds: [nnn]	**Alt+P** Type number of seconds: [nnn]
3. Save entry and exit	**Enter** **Exit**	**F10** **F 5**

Direct Line Console Automatic Hold Option

Step	Console	PC
1. Display Operator screen and select DLC Hold	**Operator** **DLC Hold**	**F3** **F4**
2. Enable or disable Automatic Hold		
■ To enable Automatic Hold	**Auto Hold Enable**	**F1**
■ To disable Automatic Hold	**Auto Hold Disable**	**F2**
3. Save entry and exit	**Enter** **Exit**	**F10** **F5**

Hold Return

Step	Console	PC
1. Display Queued Call screen and select Hold Return	**Operator**	**F3**
	Queued call	**F2**
	Hold Rtrn	**F1**
2. Set Hold Return		
■ To specify that calls hold return to QCC queue when hold timer expires twice	**Return to Queue**	**F1**
■ To specify that calls remain on hold on QCC position after hold timer expires twice	**Remain on Hold**	**F2**
3. Save entry and exit	**Enter**	**F10**
	Exit	**F5**
	Exit	**F5**

Automatic Hold or Release

Step	Console	PC
1. Display Queued Call screen and select Automatic Hold or Release	Operator	F3
	Queued Call	F2
	Hold Release	F2
2. Specify that in-progress calls are automatically put on hold, or automatically disconnected when another call button is pressed		
■ For Automatic Hold	Auto Hold	F1
■ For Automatic Release	Auto Release	F2
3. Save choice and exit	Enter	F10
	Exit	F5

Queue Over Threshold

Step	Console	PC
1. Display Queued Call screen and select Queue Over Threshold	**Operator** **Queued Call** **Threshold**	**F3** **F2** **F3**
2. To erase current number of calls and specify whether QCC operators are notified when calls in queue are over threshold	**Drop**	**Alt + P**
■ To specify maximum number of calls allowed in QCC queue (0-99) before operators are notified	Dial number of calls: [nn]	Type number of calls: [nn]
■ To specify that operators are not notified when calls are in QCC queue are over threshold	Dial **0**	Type **0**
3. Save entry and exit	**Enter** **Exit** **Exit**	**F10** **F5** **F5**

Elevate Priority

Step	Console	PC
1. Display Queued Call screen and select Elevate Priority	**Operator** **Queued Call** **ElvatePrior**	**F 3** **F 2** **F 4**
2. Erase currently programmed number of seconds, and specify call priority interval	**Drop**	**Alt+P**
■ To specify calls are not reprioritized	Dial **0**	Type **0**
■ To specify length of time (5–30 seconds) before calls are reprioritized	Dial number of seconds: [nn]	Type number of seconds: [nn]
3. Save entry and exit	**Enter** **Exit** **Exit**	**F10** **F5** **F5**

Calls-In-Queue Alert

Step	Console	PC
1. Display Queued Call screen and select In Queue Alert	**Operator** **Queued Call** **InQue Alert**	**F3** **F2** **F6**
2. Identify operator position to receive In Queue Alert and save entry	Dial extension, * + slot and port, or # + logical ID, or press DSS button for **Enter**	Type extension * + slot and port, or # + logical ID **F10**
3. Specify In Queue Alert for operator		
■ To specify that operator receives in queue alert	**InQue Alert Enable**	**F1**
■ To specify that operator does not receive in queue alert	**InQue Alert Disable**	**F2**

Step	Console	PC
4. Save entry and either program another operator position or exit		
■ To save entry and assign In Queue Alert to another operator position		
■ If next extension number is sequential	**Next** Repeat step 3	**F9** Repeat step 3
■ If next extension number is not sequential	**Enter** **InQue Alert** Repeat steps 2-4	**F10** **F6** Repeat steps 2-4
■ To save entry and exit when all entries are complete	**Enter** **Exit** **Exit**	**F10** **F5** **F5**
■ To view operator positions receiving In Queue alert and exit	**Inspct** then **Exit** **Exit**	**PgDn** then **F5** **F5**

Call Type Queue Priority Level

Step	Console	PC
1. Display Queued Call screen and select Call Types	**Operator**	**F3**
	Queued Call	**F2**
	Call Types	**F7**
2. Select type of call to program and display queue priority assignment screen for call type selected		
■ If Group Coverage is not selected	Press button next to choice	Press function key next to choice
	Priority	**F1**
■ If Group Coverage is selected	**GrpCoverage**	**F8**
	Priority	**F1**
	Dial coverage group number (1-30): [nn]	Type coverage group number (1-30): [nn]
	Enter	**F10**
3. Erase current priority level and assign new priority level (1-7)	**Drop** Dial queue priority level: [n]	**Alt+P** Type queue priority level: [n]
4. Save and exit	**Enter**	**F10**
	Exit	**F5**
	Exit	**F5**
	Exit	**F5**
	Exit	**F5**

QCC Operator to Receive Call Types

Step	Console	PC
1. Display Queued Call screen and select Call Types	**Operator** **Queued Call** **Call Types**	**F3** **F2** **F7**
2. Select type of call to program and display QCC operator assignment screen for call type selected		
■ If Group Coverage is not selected	Press button next to choice **Operator**	Press function key next to choice **F2**
■ If Group Coverage is selected	**GrpCoverage** **Operator** Dial coverage group number (1-30): [nn] **Enter**	**F8** **F2** Type coverage group number (1-30): [nn] **F10**
3. If a DSS **is not** attached to system programming console or if programming with SPM	Go to step 4	Go to step 4

Continued

Step	Console	PC
3. *Continued*		
If a DSS **is** attached		
■ To specify that operator receives call types	Press DSS button for each operator position to turn red LED on. Go to step 6	
■ To specify that operator does not receive call type	Press DSS button for each operator position to make red LED flash. Go to step 6	
4. If a DSS **is not** attached to system programming console or if programming with SPM, identify operator position to program	Dial extension, * + slot and port, or # + logical ID or Dial **0** for initiating operator	Type extension, * + slot and port, or # + logical ID or Type **0** for initiating operator
5. To specify that operator position receives the call type	**Enter**	**F10**
To prevent operator number from receiving the call type	**Delete**	**F 8**

Step	Console	PC
6. To program more telephones	Repeat steps 4 and 5	Repeat steps 4 and 5
To exit when all entries are complete	Exit	F5
	Exit	F5
	Exit	F5
	Exit	F5
	Exit	F5

Message Center Operation

Step	Console	PC
1. Display Queued Call screen and select Message Center	Operator	F3
	Queued Call	F2
	Msg Center	F8
2. Identify operator position to assign or remove as QCC Message Center	Dial extension, * + slot and port, or # + logical ID, or press DSS button for extension no.	Type extension * + slot and port, or # + logical ID
3. To assign operator position as QCC Message Center	Enter	F10
To remove operator position as QCC message center	Delete	F8

Step	Console	PC
4. To program more operator positions	Repeat steps 2 and 3	Repeat steps 2 and 3
To exit	**Exit**	**F5**
	Exit	**F5**
	Exit	**F5**

Automatic or Manual Extended Call Completion

Step	Console	PC
1. Display Queued Call screen and select Automatic or Manual Extended Call Completion	**Operator** **Queued Call** **ExendComplt**	**F3** **F2** **F9**
2. Select type of call completion for operator using DSS console		
■ To provide QCC operator with one-touch extended call completion	**Automatic Complete**	**F1**
■ To require that QCC operator extend calls by pressing the **Release** button in addition to DSS button	**Manual Complete**	**F2**
3. Save choice and exit	**Enter** **Exit** **Exit**	**F10** **F5** **F5**

Return Ring

Step	Console	PC
1. Display Queued Call screen and select Return Ring	**Operator** **Queued Call** **Return Ring**	**F3** **F2** **F10**
2. Erase currently programmed number of rings and specify new number of rings (1–15) before an extended call returns	**Drop** Dial number of rings: [nn]	**Alt+P** Type number of rings: [nn]
3. Save entry and exit	**Enter** **Exit** **Exit**	**F10** **F5** **F5**

Position Busy Backup

Step	Console	PC
1. Display Queued Call screen and select QCC Position Busy Backup	**Operator** **Queued Call** **More** **QCC Backup**	**F3** **F2** **PgUp** **F1**

Step	Console	PC
2. Identify calling group to provide QCC queue backup	Dial calling group extension no.: [nnnn] or Press DSS button for extension no.	Type calling group extension no.: [nnnn]
3. To assign calling group as Position Busy Backup	**Enter**	**F10**
To remove calling group Position Busy Backup	**Delete**	**F8**
4. Exit	**Exit**	**F5**
	Exit	**F5**

Optional Group-Assigned Features

Call Pickup Groups

Step	Console	PC
1. Display Call Pickup Groups screen	**Extensions** **Call Pickup**	**F6** **F9**
2. Identify group to program (1-30) and save entry If programming more than one group, enter lowest group number	Dial call pickup group number: [nn] **Enter**	Type call pickup group number: [nn] **F10**
3. If a DSS **is not** attached to system programming console or if programming with SPM	Go to step 4	Go to step 4
If a DSS **is** attached		
■ To assign telephones, to call pickup group	Press DSS button for each telephone to turn red LED on. Go to step 6	
■ To remove telephone from call pickup group	Press DSS button for each telephone to turn red LED off. Go to step 6	

Step	Console	PC
4. If a DSS **is not** attached to system programming console or if programming with SPM, identify telephone to program	Dial extension, * + slot and port, or # + logical ID	Type extension, * + slot and port, or # + logical ID
5. To remove telephone from call pickup group	**Delete**	**F8**
■ To remove more telephones from call pickup group on line 1	Repeat step 4	Repeat step 4
■ To remove telephones from another call pickup group	**Exit** **Call Pickup** Repeat steps 2-5	**F5** **F9** Repeat steps 2-5
To assign telephone to call pickup group and assign more telephones to call pickup group shown on line 1	**Enter** Repeat step 4	**F1O** Repeat step 4
To assign telephone to call pickup group and assign telephones to another call pickup group		
■ If next group number is sequential	**Next** Repeat step 4	**F9** Repeat step 4

Continued

Step	Console	PC
5. *Continued*		
■ If next group number is not sequential	**Enter**	**F10**
	Exit	**F5**
	Call Pickup	**F9**
	Repeat steps 2-5	Repeat steps 2-5
6. When all entries are complete, to view telephones assigned to call pickup group	**Inspct**	**PgDn**
7. Exit	**Exit**	**F5**
	Exit	**F5**

Group Paging

Step	Console	PC
1. Display Group Page screen	**Extensions**	**F6**
	More	**PgUp**
	Group Page	**F2**
2. Identify paging group to program and save entry	Dial paging group extension number: [nnnn]	Type paging group extension number: [nnnn]
If programming more than one group, enter lowest group extension number	**Enter**	**F10**

Step	Console	PC
3. If a DSS **is not** attached to system programming console or if programming with SPM	Go to step 4	Go to step 4
If a DSS **is** attached		
■ To assign telephones to paging group	Press DSS button for each telephone to turn red LED on. Go to step 6	
■ To remove telephones from paging group	Press DSS button to turn red LED off. Go to step 6	
4. If a DSS **is not** attached to system programming console or if programming with SPM, identify telephone to program	Dial extension, * + slot and port, or # + logical ID	Type extension, * + slot and port, or # + logical ID
5. To remove telephone from paging group	**Delete**	**F8**
■ To remove more telephones from paging group on line 1	Repeat step 4	Repeat step 4
■ To remove telephones from another paging group	**Exit** **Group Page** Repeat steps 2-5	**F5** **F2** Repeat steps 2–5

Continued

Step	Console	PC
5. *Continued*		
To assign telephone to paging group and assign more telephones to paging group shown on line 1	**Enter** Repeat step 4	**F10** Repeat step 4
To assign telephone to paging group and assign telephones to another paging group		
■ If next group extension number is sequential	**Next** Repeat step 4	**F9** Repeat step 4
■ If next group extension number is not sequential	**Enter** **Exit** **Group Page** Repeat steps 2-5	**F10** **F5** **F2** Repeat steps 2-5
When all entries are complete, to view telephones assigned to paging group	**Inspct**	**PgDn**
6. Exit	**Exit** **Exit**	**F5** **F5**

Group Call Coverage

Step	Console	PC
1. Display Group Coverage screen	**Extensions** **More** **Group Cover**	**F6** **PgUp** **F3**
2. Identify call coverage group to program (1-30) and save entry	Dial group number: [nn] **Enter**	Type group number: [nn] **F10**
3. If a DSS **is not** attached to system programming console or if programming with SPM	Go to step 4	Go to step 4
If a DSS **is** attached		
■ To assign telephones as sender in call coverage group	Press DSS button for each telephone to turn red LED on. Go to step 6	
■ To remove telephone from call coverage group	Press DSS button for each telephone to turn red LED off. Go to step 6	
4. If a DSS **is not** attached to system programming console or if programming with SPM, identify telephone to program	Dial extension, * + slot and port, or # + logical ID	Type extension, * + slot and port, or # + logical ID

Step	Console	PC
5. To remove telephone from call coverage group	**Delete**	**F8**
■ To remove more telephones from call coverage group on line 1	Repeat step 4	Repeat step 4
■ To remove telephones from another call coverage group	**Exit** **Group Cover** Repeat steps 2-5	**F5** **F3** Repeat steps 2-5
To assign telephone to call coverage group and assign more telephones to call coverage group shown on line 1	**Enter** Repeat step 4	**F1O** Repeat step 4
To assign telephone to call coverage group and assign telephones from another call coverage group		
■ If next group number is sequential	**Next** Repeat step 4	**F9** Repeat step 4
■ If next group number is not sequential	**Enter** **Exit** **Group Cover** Repeat steps 2-5	**F10** **F5** **F3** Repeat steps 2-5
When all entries are complete, to view telephones assigned to call coverage group	**Inspct**	**PgDn**

Step	Console	PC
6. Exit	Exit	F5
	Exit	F5

Delayed Ring Interval for Individual or Group Cover Buttons

Step	Console	PC
1. Display Delay Ring screen	Options	F7
	Delay Ring	F4
2. Erase currently programmed number of rings and specify new number of rings (1-6) before delayed ring	Drop Dial number of rings: [n]	Alt+P Type number of rings: [n]
3. Save entry and exit	Enter	F10
	Exit	F5

Coverage Delay Interval

Step	Console	PC
1. Display Coverage Delay screen	Options	F7
	More	PgUp
	Cover Delay	F6

Step	Console	PC
2. Erase currently programmed number of rings and specify new number of rings (1-9) before delayed ring	**Drop** Dial number of rings: [n]	**Alt+P** Type number of rings: [n]
3. Save entry and exit	**Enter** **Exit**	**F10** **F5**

Group Calling Member Assignments

Step	Console	PC
1. Display Group Calling menu and select Members	**Extensions** **More** **Grp Calling** **Members**	**F 6** **PgUp** **F 4** **F 9**
2. Identify calling group to program and save entry	Dial calling group extension no.: [nnnn] or Press DSS button for extension no. **Enter**	Type calling group extension no.: [nnnn] **F10**
3. If a DSS **is not** attached to system programming console or if programming with SPM	Go to step 4	Go to step 4

Continued

Step	Console	PC
3. *Continued*		
If a DSS **is** attached		
■ To assign telephones to calling group	Press DSS button for each telephone to turn red LED on. Go to step 6	
■ To remove telephone from calling group	Press DSS button for each telephone to turn red LED off. Go to step 6	
4. If a DSS **is not** attached to system programming console or if programming with SPM, identify telephone to program	Dial extension, * + slot and port, or # + logical ID	Type extension, * + slot and port, or # + logical ID
5. To remove telephone from calling group	**Delete**	**F8**
■ To remove more telephones from calling group on line 1	Repeat step 4	Repeat step 4
■ To remove telephones from another calling group	**Exit** **Members** Repeat steps 2–5	**F5** **F9** Repeat steps 2-5

Continued

Step	Console	PC
5. *Continued*		
To assign telephone to calling group and assign more telephones to calling group shown on line 1	**Enter** Repeat step 4	**F10** Repeat step 4
To assign telephone to calling group and assign telephones to another calling group		
■ If next group extension number is sequential	**Next** Repeat step 4	**F9** Repeat step 4
■ If next group extension number is not sequential	**Enter** **Exit** **Members** Repeat steps 2-5	**F10** **F5** **F9** Repeat steps 2-5
When all entries are complete, to view telephones assigned to calling group	**Inspct**	**PgDn**
6. Exit	**Exit** **Exit** **Exit**	**F5** **F5** **F5**

Group Calling Line/Trunk or Pool Assignment

Step	Console	PC
1. Display Group Calling menu and select Line/Pool assignment	**Extensions** **More** **Grp Calling** **Line/Pool**	**F6** **PgUp** **F4** **F10**
2. Identify calling group to program and save entry	Dial calling group extension no.: [nnn] or Press DSS button for extension no. **Enter**	Type calling group extension no.: [nnnn] **F10**
3. Identify line/trunk or pool to assign to calling group	Dial line/trunk no. (801-880), * + slot and port, # + logical ID, or pool dial-out code	Type line/trunk no. (801-880), * + slot and port, # + logical ID, or pool dial-out code
4. To remove line/trunk or pool from calling group	**Delete**	**F8**
■ To remove more lines/ trunks or pools from calling group on line 1	Repeat step 3	Repeat step 3
■ To remove lines/trunks or pools from another calling group	**Exit** **Line/Pool** Repeat steps 2-4	**F5** **F10** Repeat steps 2-4

Continued

Step	Console	PC
4. *Continued*		
To assign line/trunk or pool to calling group and assign more lines/trunks or pools to calling group shown on line 1	**Enter** Repeat step 3	**F1O** Repeat step 3
To assign line/pool or pool to calling group and assign lines/trunks or pods to another calling group		
■ If next group extension number is sequential	**Next** Repeat step 3	**F9** Repeat step 3
■ If next group extension number is not sequential	**Enter** **Exit** **Line/Pool** Repeat steps 2-4	**F10** **F5** **F10** Repeat steps 2-4
To assign iine/trunk or pool to calling group when all entries are complete	**Enter**	**F10**
To view lines/trunks or pools assigned to calling group	**Inspct**	**PgDn**
5. Exit	**Exit** **Exit** **Exit**	**F5** **F5** **F5**

Hunt Type

Step	Console	PC
1. Display Group Calling menu and select Hunt Type	**Extensions**	**F6**
	More	**PgUp**
	Grp Calling	**F4**
	Hunt Type	**F1**
2. Identify calling group to program and save entry	Dial calling group extension no.: [nnnn] or Press DSS button for extension no.	Type calling group extension no.: [nnnn]
	Enter	**F10**
3. Specify hunt type		
■ To specify circular hunt type	**Circular**	**F1**
■ To specify linear hunt type	**Linear**	**F2**

Step	Console	PC
4. Save entry and either program another calling group or exit		
■ To save entry and assign hunt type for another calling group:		
■ If next group extension number is sequential	**Next** Repeat step 3	**F9** Repeat step 3
■ If next group extension number is not sequential	**Enter** Repeat steps 2 and 3	**F10** Repeat steps 2 and 3
■ To save entry and exit when all entries are complete	**Enter** **Exit** **Exit** **Exit**	**F10** **F5** **F5** **F5**

Group Calling Delay Announcement

Step	Console	PC
1. Display Group Calling menu and select Delay Announcement	**Extensions**	**F6**
	More	**PgUp**
	Grp Calling	**F4**
	DelayAnnce	**F2**
2. Identify calling group to program and save entry	Dial group calling extension no.: [nnnn] or Press DSS button for extension no.	Type group calling extension no. [nnnn]
	Enter	**F10**
3. Identify announcement device to assign to calling group	Dial extension, * + slot and port, # + logical ID, or press DSS button for extension no.	Type extension, * + slot and port, or # + logical ID
	Enter	**F10**
4. To remove delay announcement device from calling group	**Delete**	**F8**
■ To remove delay announcement from another calling group	**Exit**	**F5**
	DelayAnnce Repeat steps 2-4	**F2** Repeat steps 2-4

Continued

Step	Console	PC
4. *Continued*		
To assign delay announcement device to calling group and assign delay announcement device to another calling group		
■ If next group extension number is sequential	**Next** Repeat step 3	**F9** Repeat step 3
■ If next group extension number is not sequential	**Enter** **Exit** **DelayAnnce** Repeat steps 2-4	**F10** **F5** **F2** Repeat steps 2-4
5. Exit	**Exit** **Exit** **Exit**	**F5** **F5** **F5**

Group Coverage

Step	Console	PC
1. Display Group Calling menu and select Group Coverage	**Extensions**	**F6**
	More	**PgUp**
	Grp Calling	**F4**
	GrpCoverage	**F3**
2. Identify calling group to program and save entry	Dial group calling extension no.: [nnnn] or Press DSS button for extension no.	Type group calling extension no.: [nnnn]
	Enter	**F10**
3. Identify coverage group (1-30) to assign to calling group as receiver	Dial coverage group number: [nn]	Type coverage group number: [nn]
	Enter	**F10**
4. To remove calling group as receiver for coverage group	**Delete**	**F8**
■ To remove calling group shown on line 1 as receiver for another coverage group	Repeat step 3	Repeat step 3
■ To remove another calling group as receiver for coverage group	**Exit**	**F5**
	GrpCoverage	**F3**
	Repeat steps 2-4	Repeat steps 2-4

Continued

Step	Console	PC
4. *Continued*		
To assign calling group as receiver for coverage group and assign another calling group as receiver for another coverage group		
■ If next calling group extension number is sequential	**Next** Repeat step 3	**F9** Repeat step 3
■ If next calling group extension number is not sequential	**Enter** **GrpCoverage** Repeat steps 2-4	**F10** **F3** Repeat steps 2-4
To assign calling group as receiver when all entries are complete	**Enter**	**F10**
5. Exit	**Exit**	**F5**
	Exit	**F5**
	Exit	**F5**

Group Calling Overflow and Threshold

Step	Console	PC
1. Display Group Calling menu and select Grour Calling Overflow Coverage	**Extensions** **More** **Grp Calling** **Overflow**	**F6** **PgUp** **F4** **F6**
2. Identify calling group to program and save entry	Dial calling group extension no.: [nnnn] or Press DSS button for extension no. **Enter**	Type calling group extension no.: [nnnn] **F10**
3. Identify calling group or QCC listed directory number to assign for backup coverage for calling group	Dial extension no.: [nnnn] or Press DSS button for extension no.	Type extension no.: [nnnn]
4. To assign extension to provide backup coverage To remove extension as backup coverage	**Enter** **Delete**	**F10** **F 8**

Step	Console	PC
5. To exit without changing currently programmed number of calls	Go to step 6	Go to step 6
To change currently programmed number of calls before overflow, erase current number, enter new number (1-99), and save entry	**Drop** Dial number of calls: [nn] **Enter**	**Alt+P** Type number of calls: [nn] **F10**
6. Exit	**Exit**	**F5**
	Exit	**F5**

Group Calling Message Waiting Receiver

Step	Console	PC
1. Display Group Calling menu and select Message Waiting Receiver	**Extensions**	**F 6**
	More	**PgUp**
	Group Calling	**F4**
	Message	**F4**
2. Identify calling group to program and save entry	Dial calling group extension no.: [nnnn] or Press DSS button for extension no.	Type calling group extension no.: [nnnn]
	Enter	**F10**

Step	Console	PC
3. Identify telephone to assign as a message-waiting receiver for calling group	Dial extension, * + slot and port, # + logical ID, or press DSS button for extension no.	Type extension, * + slot and port, or # + logical ID
4. To remove telephone as message-waiting receiver	**Delete**	**F8**
■ To remove telephones as message-waiting receiver from another calling group	**Exit**	**F5**
	Message Repeat steps 2-4	**F4** Repeat steps 2-4
To assign telephone as message-waiting receiver and assign telephones as message-waiting receiver for another calling group		
■ If next group extension number is sequential	**Next** Repeat step 3	**F9** Repeat step 3
■ If next group extension number is not sequential	**Enter**	**F10**
	Exit	**F 5**
	Message Repeat steps 2-4	**F4** Repeat steps 2-4
5. Exit	**Exit**	**F5**
	Exit	**F5**
	Exit	**F5**

Group Calling CalIs-In-Queue Alarm Threshold

Step	Console	PC
1. Display Group Calling menu and select In Queue Alarm Threshold	**Extensions** **More** **Grp Calling** **Queue Alarm**	**F6** **PgUp** **F4** **F6**
2. Identify calling group to program and save entry	Dial calling group extension no.: [nnnn] or Press DSS button for extension no. **Enter**	Type calling group extension no.: [nnnn] **F10**
3. Erase currently programmed number of calls and specify number of calls (1–99) before group members are notified	**Drop** Dial number of calls: [nn]	**Alt+P** Type number of calls: [nn]
4. Save entry and program another calling group or exit ■ To save entry and specify in-queue alarm threshold for another calling group ■ If next group extension number is sequential	**Next** Repeat step 3	**F9** Repeat step 3

Continued

Step	Console	PC
4. *Continued*		
■ If next group extension number is not sequential	**Enter** Repeat steps 2-4	**F10** Repeat steps 2-4
■ To save entry and exit when all entries are complete	**Enter** **Exit** **Exit**	**F10** **F5** **F5**

Group Calling External Alert for Calls-In-Queue Alarm

Step	Console	PC
1. Display Group Calling menu and select External Alert for In Queue Alarm	**Extensions** **More** **Grp Calling** **Xtnl Alert**	**F6** **PgUp** **F4** **F7**
2. Identify calling group to program and save entry	Dial group calling extension no.: [nnnn] or Press DSS button for extension no. **Enter**	Type group calling extension no.: [nnnn] **F10**

Step	Console	PC
3. Identify external alert to assign for in-queue alarm for calling group	Dial extension, * + slot and port, # + logical ID, or press DSS button for extension no.	Type extension, * + slot and port, or # + logical ID
4. To remove external alert as in-queue alarm for calling group	**Delete**	**F8**
■ To remove external alerts from another calling group	**Exit**	**F5**
	Xtnl Alert	**F7**
	Repeat steps 2 4	Repeat steps 2 4
To assign external alert as in-queue alarm for another calling group		
■ If next group extension number is sequential	**Next**	**F9**
	Repeat step 3	Repeat step 3
■ If next group extension number is not sequential	**Enter**	**F10**
	Exit	**F5**
	Xtnl Alert	**F7**
	Repeat steps 2-4	Repeat steps 2-4
5. Exit	**Exit**	**F5**
	Exit	**F5**
	Exit	**F5**

Group Type

Step	Console	PC
1. Display Group Calling menu and select Group Type	**Extensions**	**F6**
	More	**PgUp**
	Grp Calling	**F4**
	More	**PgUp**
	Group Type	**F1**
2. Identify calling group to program and save entry	Dial calling group extension no.: [nnnn] or Press DSS button for extension no.	Type calling group extension no.: [nnnn]
	Enter	**F10**
3. Specify group type		
■ To specify automatic log-in after power failure	**Auto Login**	**F1**
■ To specify manual log-in after power failure	**Auto Logout**	**F2**
■ To specify that calling group is used for integrated voice message system and automatic log-in after power failure	**Integ VMI**	**F3**

Continued

Step	Console	PC
3. *Continued*		
■ To specify that calling group is used for generic voice message system and automatic log-in after power failure	**Generic VMI**	**F4**
4. Save entry and either program another calling group or exit		
■ To save entry and assign group type to another calling group		
■ If next group extension number is sequential	**Next** Repeat step 3	**F 9** Repeat step 3
■ If next group extension number is not sequential	**Enter** Repeat steps 2-4	**F10** Repeat steps 2-4
■ To save entry and exit when all entries are complete	**Enter** **Exit** **Exit**	**F10** **F5** **F5**

System Features

Transfer Return Time

Step	Console	PC
1. Display Transfer screen and select Return time	**Options** **Transfer** **Return Time**	**F7** **F1** **F1**
2. Erase currently programmed number of rings and specify number of rings (1–9) before transferred calls are returned to originator	**Drop** Dial number of rings: [n]	**Alt+P** Type number of rings: [n]
■ To specify that transferred calls are not returned to originator	Dial **0**	Type **0**
3. Save entry and exit	**Enter** **Exit** **Exit**	**F10** **F5** **F5**

One-Touch Transfer

Step	Console	PC
1. Display Transfer screen and select One-Touch Transfer	**Options** **Transfer** **One Touch**	**F7** **F1** **F2**

Step	Console	PC
2. Enable or disable One-Touch Transfer		
■ To specify One-Touch Transfer with manual completion (transfer is automatically initiated when Auto Dial or DSS button is pressed and user must press another button to complete transfer)	**Transfer** **Enter** **Manual**	**F1** **F10** **F1**
■ To specify One-Touch Transfer with automatic completion (transfer is automatically initiated and completed when Auto Dial or DSS button is pressed)	**Transfer** **Enter** **Automatic**	**F1** **F10** **F2**
■ To specify One-Touch Hold (call is put on hold when Auto Dial or DSS button is pressed)	**Hold**	**F2**
3. Save entries and exit	**Enter** **Exit** **Exit**	**F10** **F5** **F5**

Transfer Audible

Step	Console	PC
1. Display Transfer screen and select Transfer Audible	**Options**	**F7**
	Transfer	**F1**
	Audible	**F3**
2. Specify type of Transfer Audible		
■ To specify that caller being transferred hears Music-on-Hold	**Music-On-Hold**	**F1**
■ To specify that caller being transferred hears ringing	**Ringback**	**F2**
3. Save entry and exit	**Enter**	**F10**
	Exit	**F5**
	Exit	**F5**

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Type of Transfer

Step	Console	PC
1. Display Transfer screen and select Transfer Type	Options	F7
	Transfer	F1
	Type	F4
2. Specify type of transfer		
■ To specify that Intercom or System Access Voice button is automatically selected	Voice Announce	F1
■ To specify that Intercom or System Access Ring button is automatically selected	Ring	F2
3. Save entry and exit	Enter	F10
	Exit	F5
	Exit	F5

Camp-On Return Time

Step	Console	PC
1. Display Camp-On Return Time screen	Options	F7
	CampOn	F2

Step	Console	PC
2. Erase currently programmed number of seconds and specify number of seconds (30-300, in increments of 10) before camped-on call returns to operator	**Drop** Dial number of seconds: [nnn]	**Alt+P** Type number of seconds: [nnn]
3. Save entry and exit	**Enter** **Exit**	**F10** **F5**

Call Park Return Time

Step	Console	PC
1. Display Call Park Return Time screen	**Options** **CallParkRtn**	**F7** **F3**
2. Erase currently programmed number of seconds and specify number of seconds (30-300, in increments of 10) before parked call returns to originator	**Drop** Dial number of seconds: [nnn]	**Alt+P** Type number of seconds: [nnn]
3. Save entry and exit	**Enter** **Exit**	**F10** **F5**

Automatic Callback Interval

Step	Console	PC
1. Display Automatic Callback Interval screen	**Options** **Callback**	**F7** **F6**
2. Erase currently programmed number of rings and specify new number of rings (1-6) before system cancels Automatic Callback request	**Drop** Dial number of rings: [n]	**Alt + P** Type number of rings: [n]
3. Save entry and exit	**Enter** **Exit**	**F10** **F5**

Extension Status

Step	Console	Text
1. Display Extension Status screen	**Options** **Ext Status**	**F7** **F7**
2. Specify Extension Status mode		
■ To specify extension status for Hotel mode	**Hotel**	**F1**
■ To specify extension status for Calling Group/CMS	**GrpCall/CMS**	**F2**

Step	Console	PC
3. Save choice and exit	Enter	F10
	Exit	F5

SMDR Call Report Format

Step	Console	PC
1. Display SMDR menu and select Call Report Format	Options	F7
	SMDR	F8
	Format	F1
2. Specify format for SMDR call report printing		
■ To specify that SMDR call reports are printed in basic format	Basic SMDR	F1
■ To specify that SMDR call reports are printed in ISDN format	ISDN SMDR	F2
3. Save choice and exit	Enter	F10
	Exit	F5
	Exit	F5

SMDR Call Length

Step	Console	PC
1. Display SMDR menu and select Call Length	Options	F7
	SMDR	F8
	Call Length	F2
2. Erase currently programmed number of seconds and set minimum time (0-255 seconds) before calls are recorded on SMDR reports	Drop Dial number of seconds: [nnn]	Alt+P Type number of seconds: [nnn]
3. Save entry and exit	Enter	F10
	Exit	F5
	Exit	F5

SMDR Calls Recorded on Call Report

Step	Console	PC
1. Display SMDR menu and select Call Report	Options	F7
	SMDR	F8
	Call Report	F3

Step	Console	PC
2. Specify SMDR calls recorded		
■ To specify that SMDR information is recorded for both incoming and outgoing calls	In/Out	F1
■ To specify that SMDR information is recorded only for outgoing calls	Out Only	F2
3. Save choice and exit	Enter	F10
	Exit	F5
	Exit	F5

Inside Dial Tone

Step	Console	PC
1. Display Inside Dial Tone screen	Options	F7
	Inside Dial	F9
2. Specify Inside Dial Tone		
■ To specify that system dial tone is different from outside dial tone	Inside	F1
■ To specify that system dial tone is same as outside dial tone	Outside	F2
3. Save entry and exit	Enter	F10
	Exit	F5

Reminder Service Cancel

Step	Console	PC
1. Display Reminder Service Cancel screen	Options Remind Svc	F 7 F10
2. Erase currently programmed time of day and set or deactivate Reminder Service Cancel	Drop	Alt + P
■ To deactivate Reminder Service Cancel	Enter Exit	F10 F5
■ To set the time of day that all reminders are cancelled	Dial time of day: [hhmm] Enter Exit	Type time of day: [hhmm] F10 F5

Redirect Outside Calls to Unassigned Extension Numbers

Step	Console	PC
1. Display Redirect Unassigned Extension Numbers screen	Options More Unassigned	F7 PgUp F1

Step	Console	PC
2. Redirect calls to unassigned extension numbers		
■ To redirect calls to unassigned extension numbers to QCC queue (Hybrid/PBX only)	**QCC Queue**	**F1**
	Enter	**F10**
	Exit	**F5**
■ To redirect calls to unassigned extension numbers to another extension	**Extension**	**F2**
	Enter Dial extension * + slot and port, # + logical ID, or press DSS button for extension no.	**F10** Type extension, * + slot and port, or # + logical ID
	Enter	**F10**
	Exit	**F5**
■ To redirect calls to unassigned extension numbers to a calling group	**Grp Calling**	**F3**
	Enter Dial calling group extension no.: [nnnn]	**F10** Type calling group extension no.: [nnnn]
	Enter	**F10**
	Exit	**F5**

Host System Dial Codes for Behind Switch Mode

Step	Console	PC
1. Display Behind Switch menu	**Options** **More** **BehndSwitch**	**F7** **PgUp** **F2**
2. Select feature to program		
■ For Transfer	**Transfer**	**F1**
■ For Conference	**Conference**	**F2**
■ For Drop	**Drop**	**F3**
3. Erase currently programmed host system dial code, enter new dial code, and save entry	**Drop** Dial host system dial code: [nnnnnn] **Enter**	**Alt + P** Type host system dial code: [nnnnnn] **F10**
4. Exit	**Exit** **Exit**	**F5** **F5**

Recall Timer

Step	Console	PC
1. Display Recall Timer screen	**Options** **More** **RecallTimer**	**F7** **PgUp** **F3**

Step	Console	PC
2. Select length of recall timer		
■ For 350 ms	350 ms	F1
■ For 450 ms	450 ms	F2
■ For 650 ms	650 ms	F3
■ For 1 sec	1 sec	F4
3. Save entry and exit	Enter	F10
	Exit	F5

Rotary Operation

Step	Console	PC
1. Display Rotary Operation screen	Options	F7
	More	PgUp
	Rotary	F4
2. Select rotary operation		
■ For delay	Delay	F1
■ For no delay	No Delay	F2
3. Save entry and exit	Enter	F10
	Exit	F5

Allowed Lists

Step	Console	PC
1. Display Allowed List screen	**Tables** **AllowList**	**F8** **F1**
2. Identify specific list (0-7) and entry number (0-9) and save If programming more than one entry, enter lowest entry number	Dial list number followed by entry number: [le] **Enter**	Type list number followed by entry number: [le] **F10**
3. Erase current entry and identify allowed area code and/or exchange included in the list	**Drop** Dial number: [nnnnnn] or [nnn]	**Alt + P** Type number: [nnnnnn] or [nnn]
4. Save entry and either enter more items or exit		
■ To save entry and enter next item in Allowed List shown on line 1		
■ If next entry number is sequential	**Next** Repeat step 3	**F9** Repeat step 3
■ If next entry number is not sequential	**Enter** **AllowList** Repeat steps 2-4	**F10** **F1** Repeat steps 2-4
■ To save entry and exit when all entries are complete	**Enter** **Exit**	**F10** **F5**

Allowed Lists Assignment to Telephones

Step	Console	PC
1. Display Assign Allowed Lists To screen	**Tables** **AllowTo**	**F8** **F2**
2. Identify Allowed List (0-7) to assign to telephone(s) and save entry	Dial lit number: [n] **Enter**	Type list number: [n] **F10**
3. If a DSS **is not** attached to system programming console or if programming with SPM	Go to step 4	Go to step 4
If a DSS **is** attached		
■ To assign Allowed List to telephone	Press DSS button for each telephone to turn red LED on. Go to step 6	
■ To remove Allowed List assignment from telephones	Press DSS button for each telephone to turn red LED off. Go to step 6	
4. If a DSS **is not** attached to system programming console or if program with SPM, identify telephone to program	Dial extension no., ✱ + slot and port no., or # + logical ID	Type extension no., ✱ + slot and port no., or # + logical ID

Step	Console	PC
5. To remove Allowed List from telephone	**Delete**	**F8**
■ To remove Allowed List on line 1 from more telephones	Repeat step 4	Repeat step 4
■ To remove another Allowed List from telephones	**Exit** **AllowTo** Repeat steps 2-5	**F5** **F2** Repeat steps 2-5
To assign Allowed List to telephone and assign Allowed List shown on line 1 to more telephones	**Enter** Repeat step 4	**F10** Repeat step 4
To assign Allowed List to telephone and assign another Allowed List to telephones		
■ If next list number is sequential	**Next** Repeat step 4	**F9** Repeat step 4
■ If next list number is not sequential	**Enter** **Exit** **AllowTo** Repeat steps 2-5	**F10** **F5** **F2** Repeat steps 2-5
6. When all entries are complete, exit	**Exit** **Exit**	**F5** **F5**

Disallowed Lists

Step	Console	PC
1. Display Disallow List screen	**Tables** **Disallow**	**F8** **F3**
2. Identify specific list (0-7) and entry number (0-9) and save If programming more than one entry, enter lowest entry number.	Dial list number followed by entry number: [le] **Enter**	Type list number followed by entry number: [le] **F10**
3. Erase current entry and identify disallowed number included in the list	**Drop** Dial number: [nnnnnnnnnn]	**Alt+P** Type number: [nnnnnnnnnn]
4. Save entry and either enter more items or exit		
■ To save entry and entef next item in Disallowed List shown on line 1		
■ If next entry number is sequential	**Next** Repeat step 3	**F9** Repeat step 3
■ If next entry number is not sequential	**Enter** **Disallow** Repeat steps 2-4	**F10** **F3** Repeat steps 2-4
■ To save entry and exit when all entries are complete	**Enter** **Exit**	**F10** **F5**

Disallowed Lists Assignment to Telephones

Step	Console	PC
1. Display Disallow to List screen	**Tables** **DisallowTo**	**F8** **F4**
2. Identify disallowed list (0-7) to assign to telephone(s) and save entry	Dial list number: [n] **Enter**	Type list number: [n] **F10**
3. If a DSS **is not** attached to system programming console or if programming with SPM	Go to step 4	Go to step 4
If a DSS is attached		
■ To assign Disallowed List to telephone	Press DSS button for each telephone to turn red LED on. Go to step 6	
■ To remove Disallowed List assignment from telephones	Press DSS button for each telephone to turn red LED off. Go to step 6	
4. If a DSS **is not** attached to system programming console or if programming with SPM, identify telephone to program	Dial extension no., ⋆ + slot and port no., or # + logical ID	Type extension no., ⋆ + slot and port no., or # + logical ID

Step	Console	PC
5. To remove Disallowed List from telephone	**Delete**	**F8**
■ To remove Disallowed List on line 1 from more telephones	Repeat step 4	Repeat step 4
■ To remove another Disallowed List from telephones	**Exit** **DisallowTo** Repeat steps 2-5	**F5** **F4** Repeat steps 2-5
To assign Disallowed List to telephone and assign Disallowed List shown on line 1 to more telephones	**Enter** Repeat step 4	**F10** Repeat step 4
To assign Disallowed List to telephone and assign another Disallowed List to telephones		
■ If next list number is sequential	**Next** Repeat step 4	**F9** Repeat step 4
■ If next list number is not sequential	**Enter** **Exit** **DisallowTo** Repeat steps 2-5	**F10** **F5** **F4** Repeat steps 2-5
6. When all entries are complete, exit	**Exit** **Exit**	**F5** **F5**

Remote Access Line/Trunk Assignment

Step	Console	PC
1. Display Remote Access screen and select Lines and Trunks	**LinesTrunks**	**F 4**
	Remote Access	**F 8**
	LinesTrunks	**F 1**
2. Identify line/trunk to program and save entry	Dial line/trunk no. (801–880), * + slot and port no., or # + logical ID	Type line/trunk no., * + slot and port no., or # + logical ID
	Enter	**F10**
3. Specify Remote Access use		
■ To specify line/trunk is always used for Remote Access	**Dedicated**	**F1**
■ To specify line/trunk is used for Remote Access only when Night Service is activated	**Shared**	**F2**
■ To remove Remote Access	**No Remote**	**F3**

Step	Console	PC
4. Save entry and either program-more lines/trunks or exit		
■ To save entry and assign Remote Access to another line/trunk		
■ If next line/trunk number is sequential	**Next** Repeat step 3	**F9** Repeat step 3
■ If next extension number is not sequential	**Enter** **LinesTrunks** Repeat steps 2-4	**F10** **F1** Repeat steps 2-4
■ To save entry and exit when all entries are complete	**Enter** **Exit** **Exit**	**F10** **F5** **F5**

Remote Access Automatic Callback

Step	Console	PC
1. Display Remote Access screen and select Automatic Callback (queueing)	**LinesTrunks** **RemoteAccss** **Auto Queueing**	**F4** **F8** **F6**

Step	Console	PC
2. Specify Automatic Callback use		
■ To allow Remote Access users to use Automatic Callback feature	**Enable**	**F1**
■ To prevent Remote Access users from using Automatic Callback feature	**Disable**	**F2**
3. Save your choice and exit	**Enter**	**F10**
	Exit	**F5**
	Exit	**F5**

Remote Access Without Barrier Codes—Class of Restriction

Step	Console	PC
1. Display Remote Access (DISA) menu	**LinesTrunks**	**F4**
	Remote Access	**F8**
■ To program non-tie lines	**Non-TIE**	**F2**
■ To program tie trunks	**TIE Lines**	**F3**

Step	Console	PC
2. To change current call restrictions	**Restriction**	**F 2**
■ To remove restrictions	**Unrestrcted**	**F1**
	Enter	**F10**
■ To restrict from making outside calls (local and toll)	**Outward Restrict**	**F2**
	Enter	**F10**
■ To restrict from making toll calls	**Toll Restrict**	**F3**
	Enter	**F10**
To change ARS facility restriction level (FRL)	**ARS Restrct**	**F 3**
■ Erase current level, assign new ARS FRL (0-6), and save your entry	**Drop** Dial FRL Value: [n] **Enter**	**Alt + P** Type FRL value: [n] **F10**
To assign Allowed Lists	**Allow List**	**F 4**
■ Identify Allowed List (0-7) you want to assign	Dial list number: [n] **Enter**	Type list number:[n] **F10**
■ To assign another list	Repeat above action	Repeat above action
■ To view all lists assigned and Exit	**Inspct** **Exit**	**PgDn** **F5**
■ To return to Remote Access menu without viewing lists	**Exit**	**F5**

Continued

Step	Console	PC
2. *Continued*		
To assign Disallowed Lists	**Disallow Lst**	**F6**
■ Identify Disallowed List (0-7) you want to assign and save your entry	Dial list number: [n] **Enter**	Type list number: [n] **F10**
■ To assign another list	Repeat above action	Repeat above action
■ To view all lists assigned and Exit	**Inspct** **Exit**	**PgDn** **F5**
■ To return to Remote Access menu without viewing lists	**Exit**	**F5**
3. Exit	**Exit**	**F5**
	Exit	**F5**
	Exit	**F5**

Remote Access Barrier Codes

Step	Console	PC
1. Display Remote Access (DISA) menu	**LinesTrunks**	**F 4**
	RemoteAccss	**F 8**
■ To program non-tie lines	**Non-Tie**	**F 2**
■ To program tie trunks	**Tie Lines**	**F 3**

Step	Console	PC
2. To establish or remove barrier code requirement	**BarrierCode**	**F1**
■ To specify that barrier codes are required for Remote Access, save choice and return to Remote Access (DISA) menu	**Barrier Code Required**	**F1**
	Enter	**F10**
	Exit	**F5**
■ To remove barrier code requirement, save entry and return to Remote Access (DISA) menu	**Barrier Code Not Required**	**F2**
	Enter	**F10**
	Exit	**F5**
3. To add, change, or remove individual barrier codes, display Remote Access Barrier code screen	**BarrierCode**	**F4**
	Codes	**F3**
4. Identify barrier code to program and save entry	Dial barrier code number: [nn]	Type barrier code number: [nn]
	Enter	**F10**

Step	Console	PC
5. To remove previously established barrier code	**Drop**	**Alt + P**
To change previously established barrier code	**Drop**	**Alt + P**
	Dial four-digit code: [nnnn]	Type four-digit code: [nnnn]
To add new barrier code	Dial four-digit code: [nnnn]	Type four-digit code: [nnnn]
■ To save entry and add change or remove another barrier code		
■ If next barrier code number is sequential	**Next** Dial four-digit code: [nnnn] Repeat this step	**F9** Dial four-digit code: [nnnn] Repeat this step
■ If next barrier code is not sequential	**Enter** **Codes** Repeat steps 4 and 5	**F10** **F2** Repeat steps 4 and 5
■ To save entry when all entries are complete	**Enter**	**F10**
6. Exit	**Exit**	**F5**
	Exit	**F5**
	Exit	**F5**

Remote Access with Barrier Codes — Class of Restriction

Step	Console	PC
1. Display Remote Access Barrier Code menu	**LinesTrunks** **RemoteAccss** **BarrierCode**	**F4** **F8** **F4**
2. Select option		
■ To change current call restrictions	**Restriction**	**F3**
■ To change ARS facility restriction level (FRL)	**ARS Restrct**	**F4**
■ To assign Allowed Lists	**Allow List**	**F6**
■ To assign Disallowed Lists	**DisallowLst**	**F7**
3. Identify barrier code to program and save entry	Dial barrier code number: [nn] **Enter**	Type barrier code number: [nn] **F10**

Step	Console	PC
4. If you selected Restriction in step 2		
■ To remove restrictions	**Unrestrcted**	**F1**
■ To restrict from making outside calls (local and toll)	**Outward Restrict**	**F2**
■ To restrict from making toll calls	**Toll Restrict**	**F3**
If you selected ARS Restrict in step 2		
■ Erase current level and assign new ARS FRL	**Drop** Dial FRL value: [n]	**Alt + P** Type FRL value: [n]
If you selected Allowed List in step 2		
■ Identify Allowed List (0-7) to assign	Dial list number: [n]	Type list number: [n]
If you selected Disallowed List in step 2		
■ Identify Disallowed List (0-7) to assign	Dial list number: [n]	Type list number:[n]

Step	Console	PC
5. To save entry and assign class of restrictions to another barrier code		
■ If barrier code number is sequential	**Next** Repeat steps 4 and 5	**F 9** Repeat steps 4 and 5
■ If barrier code number is not sequential	**Enter** Select option from remote access Barrier Code menu Repeat steps 2-5	**F10** Select option from remote access Barrier Code menu Repeat steps 2-5
To save entry when all entries are complete	**Enter**	**F10**
6. If you selected Allowed List or Disallowed List in step 2, to view all lists assigned and exit	**Inspct** **Exit**	**PgDn** **F5**
7. Exit	**Exit** **Exit** **Exit**	**F5** **F5** **F5**

Automatic Route Selection

1 + 7 Digit Dialing Requirements

Step	Console	PC
1. Display Automatic Route Selection menu and select ARS 1 + 7 Dialing	**Tables** **ARS** **ARS 1 + 7 Dial**	**F8** **F6** **F1**
2. Specify dialing for 1 + 7 digit dialing		
■ To specify 1 + 7 digit dialing is valid within area code	**Within Area Code**	**F1**
■ To specify 1 + 7 digit dialing in not valid within area code	**Not within Area Code**	**F2**
4. Save entry and exit	**Enter** **Exit**	**F10** **F5**

ARS Tables

Step	Console	PC
1. Display Automatic Route Selection menu and select ARS Table Input	**Tables** **ARS** **ARS Input**	**F8** **F6** **F2**
2. Identify table (1-16) you want to program and save entry	Dial table number: [nn] **Enter**	Type table number: [nn] **F10**

Step	Console	PC
3. Specify ARS Table type		
■ To specify 6-Digit Table type	**6-Digit**	**F1**
■ To specify Area Code Table type	**AreaCode**	**F2**
■ To specify Exchange Table type	**Exchange**	**F3**
■ To specify 1 + 7 Table type	**1 + 7**	**F4**
4. Save entry	**Enter**	**F10**
5. Identify entry number (1-100) and save entry If programming more than one entry, enter lowest entry number	Dial entry number: [nnn] **Enter**	Type entry number: [nnn] **F10**
6. Identify area code or exchange included on table and save entry	Dial number: [nnn]	Type number: [nnn]
■ To save entry and enter another entry in ARS table shown on line 1		
■ If next entry number is sequential	**Next** Repeat this step	**F9** Repeat this step

Continued

Step	Console	PC
6. *Continued*		
■ If next entry number is not sequential	**Enter**	**F10**
	ARS	**F 6**
	ARS Input	**F 2**
	Repeat steps 2-6	Repeat steps 2-6
■ To save your entry when all entries are complete	**Enter**	**F10**
7. Exit	**Exit**	**F 5**

Start and Stop Trees for Subpattems

Step	Console	PC
1. Display Automatic Route Selection menu and select	**Tables**	**F8**
	A R S	**F6**
	Sub B Start	**F8**
2. Identify table (1-18) to program and save entry	Dial table number: [nn]	Type table number: [nn]
	Enter	**F10**
3. Erase currently assigned start time, and assign new start time for Subpattern B and save entry	**Drop**	**Alt + P**
	Dial Start time: [hhmm]	Type start time: [hhmm]
	Enter	**F10**
4. Select Subpattern B stop time	**Sub B Stop**	**F 9**

Step	Console	PC
5. Identify table (1-18) to program and save entry	Dial table number: [nn] **Enter**	Type table number: [nn] **F10**
6. Erase currently assigned start time and assign stop time for Subpattem B (Start Time for Sub-pattern A)	**Drop** Dial stop time: [hhmm]	**Alt + P** Type stop time: [hhmm]
7. Save entry and exit	**Enter** **Exit**	**F10** **F5**

Pool Routing

Step	Console	PC
1. Display Automatic Route Selection menu	**Tables** **ARS**	**F8** **F6**
2. Select subpattern to program pool routing for		
■ To program pool routing for Subpattern A	**Sub A Pools**	**F3**
■ To program pool routing for Subpattern B	**Sub B Pool**	**F10**

Step	Console	PC
3. Identify table number (1-18) and route number (1-6) to program and save entry	Dial table number followed by route number: [ttr] **Enter**	Type table number followed by route number: [ttr] **F10**
4. Identify pool on which to route calls and save entry	Dial pool dial-out code: [nnn]	Type pool dial-out code: [nnn]
■ To save entry and enter pool dial-out code for another pool route in ARS table shown on line 1		
■ If next pool route number is sequential	**Next** Repeat this step	**F9** Repeat this step
■ If next entry number is not sequential	**Enter** or **Sub A Pools** or **Sub B Pools** Repeat steps 2-4	**F10** or **F3** or **F10** Repeat steps 2-4
■ To save your entry when all entries are complete	**Enter**	**F10**
5. Exit	**Exit** **Exit**	**F5** **F5**

Facility Restriction Level

Step	Console	PC
1. Display Automatic Route Selection menu	**Tables** **ARS**	**F8** **F6**
2. Select Subpattern to program Facility Restriction level for		
■ To program Facility Restriction level for Subpattern A	**Sub A FRL**	**F4**
■ To program Facility level for Subpattern	**More** **Sub B FRL**	**PgUp** **F1**
3. Identify the table number (1-18) and route number (1-6) to program and save entry If programming more than one pool route, enter lowest pool route number	Dial table number followed by route number: [ttr] **Enter**	Type table number followed by route number: [ttr] **F10**

Step	Console	PC
4. Specify restriction level (0-6) and save entry	Dial restriction level: [n] **Enter**	Type restriction level: [n] **F10**
■ To save entry and enter FRL to another pool route in ARS table shown on line 1		
■ If next entry number is sequential	**Next** Repeat this step	**F9** Repeat this step
■ If next entry number is not sequential	**Enter** Repeat steps 2-4	**F10** Repeat steps 2-4
■ To save entry when all entries are complete	**Enter**	**F10**
5. Exit	**E x i t** **E x i t**	**F5** **F5**

Digit Absorption

Step	Console	PC
1. Display Automatic Route Selection menu	**Tables** **ARS**	**F8** **F6**

Step	Console	PC
2. Select Subpattern to program Absorb Digits for		
■ To program Absorb Digits for Subpattern	**Sub A Absorb**	**F6**
■ To program Absorb Digits for Subpattern B	**More**	**Pgup**
	Sub B Absorb	**F2**
3. Identify table number (1-18) and route number (1-6) to program and save entry If programming more that one pool route, enter lowest pool route number	Dial table number followed by pool route number: [ttr] **Enter**	Type table number followed by pool route number: [ttr] **F10**
4. Specify number of digits to absorb (0-11)	Dial number of digits: [nn]	Type number of digits: [nn]
■ To save entry and enter number of digits to absorb for another pool route in ARS table shown on line 1		
■ If next pool route number is sequential	**Next** Repeat this step	**F9** Repeat this step
■ If next entry number is not sequential	**Enter** Repeat steps 2-4	**F10** Repeat steps 2-4
■ To save your entry when all entries are complete	**Enter**	**F10**

Step	Console	PC
5. Exit	Exit	F5
	Exit	F5

Other Digits

Step	Console	PC
1. Display Automatic Route Selection menu	Tables	F8
	ARS	F6
2. Select Subpattern to program other digits for		
■ To program other digits for Subpattern A	Sub A Digit	F7
■ To program other digits for Subpattern B	More	PgUp
	Sub B Digit	F3
3. Identify the table number (1-18) and route number (1-6) to program and save entry	Dial table number followed by pool route number: [ttr]	Type table number followed by pool route number: [ttr]
If programming more than one pool route, enter lowest pool route number	Enter	F10

Step	Console	PC
4. Specify number of other digits (up to 20) and save entry	**Drop** Dial digits: [nnnnnnnnnnnnnnnnnnn]	**Alt + P** Type digits: [nnnnnnnnnnnnnnnnnnrm]
■ To save entry and enter other digits for another pool route in ARS table shown on line 1		
■ If next pool route number is sequential	**Next** Repeat this step	**F9** Repeat this step
■ If next entry number is not sequential	**Enter** Repeat steps 2-4	**F10** Repeat steps 2-4
■ To save your entry when all entries are complete	**Enter**	**F10**
5. Exit	**Exit** **Exit**	**F5** **F5**

N11 Special Number Table

Step	Console	PC
1. Display Automatic Route Selection menu and select N11 Special Numbers Table	**Tables** **ARS** **More** **SpeclNumber**	**F8** **F6** **PgUp** **F4**

Step	Console	PC
2. To change current Facility Restriction Level (FRL)	**ARS FRL**	**F1**
■ Erase current FRL value, enter new value (0-6), and save entry	**Drop** Dial FRL value: [n] **Enter**	**Alt + P** Type FRL value: [n] **F10**
To specify other digits to add	**ARS Digit**	**F2**
■ Erase currently programmed other digits, specify new other digits to be added to called number and save entry	**Drop** Dial Other Digits to add: [nnnnnnnnnnnnnnnnnnnl **Enter**	**Alt + P** Type Other Digits to add: [nnnnnnnnnnnnnnnnnnn] **F10**
3. Exit	**Exit**	**F5**
	Exit	**F5**
	Exit	**F5**

Dial 0 Tables

Step	Console	PC
1. Display Automatic Route Selection menu and select Dial 0 Special Numbers Table	**Tables**	**F8**
	ARS	**F6**
	More	**PgUp**
	Dial 0	**F6**

Step	Console	PC
2. Select option		
■ To change Pool Routing erase current pool routing, assign new pool route, and save entry	**ARS Pool** **Drop** Dial pool dial-out code: [nnn] **Enter**	**F1** **Alt+P** Type pool dial-out code: [nnn] **F10**
■ To change current Facility Restriction level (FRL) erase current FRL value, enter new value (0-6), and save entry	**ARS FRL** **Drop** Dial pool dial-out code: [n] **Enter**	**F2** **Alt + P** Type FRL value: [n] **F10**
■ To specify other digits to add, erase currently programmed other digits, specify new other digits to be added, and save entry	**ARS Digit** **Drop** Dial Other digits to add: [nnnnnnnnnnnnnnnnnnnl **Enter**	**F 3** **Alt + P** Type Other Digits to add: [nnnnnnnnnnnnnnnnnnn] **F10**

Step	Console	PC
3. Exit	**Exit**	**F5**
	Exit	**F5**
	Exit	**F5**

Night Service

Night Service with Group Assignment

Step	Console	PC
1. Display Night Service Group Assignment screen	**NightSrvce**	**F10**
	GroupAssign	**F1**
2. Identify operator position to program and save entry	Dial extension, * + slot and port, # + logical ID, or press DSS button for extension no.	Type extension, * + slot and port, or # + logical ID
	Enter	**F10**
3. Identify telephone to assign to group	Dial extension, * + slot and port, # + logical ID, or press DSS button for extension no.	Type extension, * + slot and port, or # + logical ID
4. To remove telephone from Night Service Group	**Delete**	**F8**
■ To remove more telephones from Night Service group on line 1	Repeat step 3	Repeat step 3
■ To remove telephones from another Night Service group	**Exit**	**F5**
	GroupAssign	**F1**
	Repeat steps 2-4	Repeat steps 2-4

Continued

Step	Console	PC
4. *Continued*		
To assign telephone to Night Service group and assign more telephones to Night Service group shown on line 1	**Enter** Repeat step 3	**F10** Repeat step 3
To assign telephone to Night Service group and assign telephones to another Night Service group		
■ If next extension number is sequential	**Next** Repeat step 3	**F9** Repeat step 3
■ If next extension number is not sequential	**Enter** **Exit** **GroupAssign** Repeat steps 2-4	**F10** **F5** **F1** Repeat steps 2-4
5. When all entries are complete, exit	**Exit** **Exit**	**F 5** **F 5**

Night Service with Outward Restriction

Step	Console	PC
1. Display Night Service OutRestrict screen	**NightSrvce** **OutRestrict**	**F10** **F 2**

Step	Console	PC
2. Check for password		
■ If no password is displayed	Go to step 3	Go to step 3
■ If password is displayed, to erase currently assigned password	**Drop**	**Alt + P**
3. Remove or assign Password requirement		
■ To remove password requirement	**Enter** Go to step 9	**F10** Go to step 9
■ To assign required 4-digit password (any combination of digits 0-9) and save entry	Dial password: [nnnn] **Enter**	Type password: [nnnn] **F10**
4. Add or change Emergency Allowed list	**Emergency**	**F3**
5. Identify specific entry number on Emergency Allowed List (0-9) and save entry l	Dial entry number: [n] **Enter**	Type entry number: [n] **F10**
6. Erase current entry and identify telephone number included in list and save entry	**Drop** Dial telephone number: [nnn nnnnnnnnn]	**Alt + P** Type telephone number: [nnn nnnnnnnnn]

Continued

Step	Console	PC
6. *Continued*		
■ To save entry and enter another telephone number		
■ If next entry number is sequential	**Next** Repeat this step	**F9** Repeat this step
■ If next entry number is not sequential	**Enter** Repeat steps 4-6	**F10** Repeat steps 4-6
■ To save entry when all entries are complete	**Enter**	**F10**
7. To assign telephones to Exclusion list	**ExcludeList**	**F4**
8. Identify telephone to program	Dial extension, * + slot and port, # + logical ID, or press DSS button for extension no.	Type extension, * + slot and port, or # + logical ID
■ To assign telephone to Exclusion list	**Enter**	**F10**
■ To remove telephone from Exclusion List	**Delete**	**F8**
■ To add or move more telephones	Repeat this step	Repeat this step
9. When all entries are complete, exit	**Exit**	**F5**
	Exit	**F5**

Night Service with Time Set

Step	Console	PC
1. Display Night Service screen	**NightSrvce**	**F10**
2. Activate or suspend Night Service with Time Set		
■ To suspend Night Service with Time Set	Go to step 8	Go to step 8
■ To add or change start time	**Start**	**F 6**
3. Erase currently programmed start day of week and time	**Drop**	**Alt + P**
4. Identify start day of the week number and time (use 24-hour clook) and save entry Day of the week number 0 = Sunday 1 = Monday 2 = Tuesday 3 = Wednesday 4 = Thursday 5 = Friday 6 = Saturday	Dial day of the week number followed by 4-digit time of day: [dtttt] **Enter**	Type day of the week number followed by 4-digit time of day: [dtttt] **F10**
5. Add or Change stop time	**Stop**	**F 7**
6. Erase currently programmed stop day of week and time	**Drop**	**Alt+P**

Step	Console	PC
7. Identify stop day of the week number and time (use 24-hour clock) and save entry Day of the week number 0 = Sunday 1 = Monday 2 = Tuesday 3 = Wednesday 4 = Thursday 5 = Friday 6 = Saturday	Dial day of the week number followed by 4-digit time of day: [dtttt] **Enter**	Type day of the week number followed by 4=digit time of day: [dtttt] **F10**
8. To program start and stop times for more days of the week To suspend Night Service With Time Set or record current day of the week	Repeat steps 2-7	Repeat steps 2-7
■ Display Night Service Day of Week Screen	**Day of Week**	**F 8**
■ To suspend Night Service with Time Set	Dial **9**	Type **9**

Continued

Step	Console	PC
8. *Continued*		
■ To record current day of the week number Day of week number 0 = Sunday 1 = Monday 2 = Tuesday 3 = Wednesday 4 = Thursday 5 = Friday 6 = Saturday	Dial day of the week number: [n]	Type day of the week number: [n]
9. Save entry and exit	**Enter** **Exit**	**F10** **F5**

Notes: Changing the System Time while in Night Service mode will **deactivate** the Night Service. You must manually reactivate the Night Service.

After you restore, you **must** manually update the Current Day of the Week field in the Night Service menu.

Labeling

Extension Directory

Step	Console	PC
1. Display Labeling screen and select Directory and Extension	**More**	**Pgup**
	Labeling	**F1**
	Directory	**F1**
	Extension	**F2**
2. Identify extension to label and save entry.	Dial extension, * + slot and port, # + logical ID, or press DSS button for extension no.	Type extension, * + slot and port, or # + logical ID
	Enter	**F10**
3. Erase current label	**Drop**	**Alt + P**
4. Enter label for extension identified in step 2 and save	Enter label	Type label
	Enter	**F6**
Use punctuation button to toggle between letters and punctuation shown on display		
Use template provided with the System Programming Guide or PC keyboard		

Step	Console	PC
5. To label another extension	Repeat from step 2	Repeat from step 2
When all entries are complete	**Exit**	**F5**
	Exit	**F5**
	Exit	**F5**

Lines or Trunks

Step	Console	PC
1. Display Labeling screen and select Lines or Trunks	**More**	**PgUp**
	Labeling	**F1**
	LinesTrunks	**F2**
2. Identify line or trunk to label and save entry	Dial line/trunk no. (801-880), * + slot and port, or # + logical ID	Type line/trunk no. (801-880), * + slot and port, or # + logical ID
	Enter	**F10**
3. Erase current label	**Drop**	**Alt + P**

Step	Console	PC
4. Enter label for line/trunk identified in step 2 and save *Use punctuation button to toggle between letters and punctuation shown on display* *Use template provided with the System Programming Guide or PC keyboard*	Enter label **Enter**	Type label **F6**
5. To label another line or trunk	Repeat from step 2	Repeat from step 2
When all entries are complete	**Exit**	**F5**

Posted Message

Step	Console	PC
1. Display Labeling screen and select Posted Message	**More** **Labeling** **PostMessage**	**PgUp** **F1** **F3**
2. Identify posted message number (1-20) you want to add or change and save entry	Dial posted message number: [nn] **Enter**	Type posted message number: [nn] **F10**
3. Erase current message	**Drop**	**Alt + P**

Step	Console	PC
4. Enter new message for Posted Message identified in step 2 and save entry *Use punctuation button to toggle between letters and punctuation shown on display.* *Use template provided with the System Programming Guide or PC keyboard.*	Enter message **Enter**	Type message **F6**
5. To add or change another message	Repeat from step 2	Repeat from step 2
When all entries are complete	**Exit**	**F5**

Group Calling

Step	Console	PC
1. Display Labeling screen and select Group Calling	**More** **Labeling** **Grp Calling**	**PgUp** **F1** **F4**
2. Identify calling group to label and save entry	Dial extension or press DSS button for extension no. **Enter**	Type extension **F10**
3. Erase current label.	**Drop**	**Alt+P**

Step	Console	PC
4. Enter label for calling group identified in step 2 and save *Use punctuation button to toggle between letters and punctuation shown on display.* *Use template provided with the System Programming Guide or PC keyboard.*	Enter label **Enter**	Tvpe label **F 6**
5. To label another calling group	Repeat from step 2	Repeat from step 2
When all entries are complete	**Exit**	**F5**

System Speed Dial/System Directory

Step	Console	PC
1. Display Labeling screen and select Directory and System	**More** **Labeling** **Directory** **System**	**PgUp** **F 1** **F 1** **F 1**
2. Identify dial code to add or change and save entry	Dial dial code number: [nnn] **Enter**	Type dial code number: [nnn] **F10**
3. Erase current label	**Backspace**	**F2**

Step	Console	PC
4. Enter label for dial code identified in step 2 and save entry *Use punctuation button to toggle between letters and punctuation shown on display.* *Use template provided with the System Progmming Guide or PC keyboard.*	Enter label **Enter**	Type label **F6**
5. Erase currently assigned telephone number	**Backspace**	**F2**
6. Assign telephone number to dial code entered in step 2 and save entry	Dial telephone number: [nnnn nnnnnnnnnnn] **Enter**	Type telephone number: [nnnn nnnnnnnnnnn] **F6**
■ If you want the telephone number displayed when dialed	**Yes** **Enter**	**F1** **F10**
■ If you do not want the telephone number displayed when dialed	**No** **Enter**	**F2** **F10**
7. To add or change another System Speed Dial number	**System** Repeat from step 2	**F1** Repeat from step 2
When all entries are complete	**Exit**	**F5**

Backup, Restore, and Print System Programming Reports

Back Up System Programming

Step	Console	PC
1. Prepare to back up system programming onto diskette		Insert diskette in drive A
2. Display Backup Screen		**F2**
3. To store backup file on hard disk		
■ Backup file does not exist		Press down arrow to highlight New File
		Enter
To use default file name (default.ams)		**Enter**
To specify a name of your choice		Type file name
		Enter
■ If backup file exists		Press down arrow to highlight file name
		Enter

Continued

Step	Console	PC
3. *Continued*		
To store backup file on floppy		**Enter**
■ If backup file does not exist		Press down arrow to highlight New File
		Enter Type file name
■ If backup file exists		Press down arrow to highlight file name
		Enter
4. File information transfer begins, and number on the screen shows progress of transfer		Wait until Backup successful screen is displayed

Note: Interrupting an in-progress backup will result in an incomplete backup file stored on the disk.

5. Return to SPM Main Menu	**Enter**

Note: After you complete a system backup you **must** press **Enter** to return to the Main Menu.

Restore System Programming

Step	Console	PC
1. Prepare to restore system programming from diskette		Insert diskette in drive A
2. Select Restore		**F7**
3. To restore from backup file stored on hard disk		Press down arrows to highlight file name **Enter**
To restore from backup file stored on floppy		Press down arrow to highlight Floppy Disk **Enter** Press down arrow to highlight file name **Enter**

Step	Console	PC
4. File information transfer begins and number on the screen shows progress of transfer.		Wait until Restore successful. screen is displayed

CAUTION

An unsuccessful restore procedure causes a frigid start. If being performed remotely, the system drops the connection immediately. All system programming is lost, and the system returns to the factory settings. In addition, interrupting an in-progress restore procedure causes corruption in system programming information which results in system malfunction. In either case ***you must reconnect to the switch and do another restore immediately.***

5. Return to SPM Main Menu	**Enter**

Note: After you restore, you **must** manually update the Current Day of the Week field in the Night Service menu.

Print

See Appendix I for a list and a sample of all system programming reports.

Step	Console	PC
1. If using a PC with SPM, direct system programming reports to PC or SMDR printer by selecting Print-Options from SPM Main Menu		**F4**
■ To direct reports to SMDR printer		**F1**
■ To direct reports to PC		**F2**
■ To return to SPM Main Menu		**F5**
2. Display Print screen	**More** **Print**	**PgUp** **F3**
3. Select Print Reports		
■ If report you want to print is not displayed	**More**	**PgUp**
■ When report you want to print is displayed	Press the button next to report name	Press function key for report name

Step	Console	PC
4. If you did not select Allowed or Disallowed List in step 3	Go to step 5	Go to step 5
If vou selected Allowed or Disallowed List in step 3, identify the list you want to print	Dial list number: [n] **Enter**	Type list number: [n] **F10**
5. If reports are being sent to SMDR printer or you are programming with a system programming console	Go to step 6	Go to step 6
If reports are being sent to a PC running SPM		
To print a hard copy of the report:		Highlight **LPT1:** **Enter**
To print reports to a hard disk:		
■ if print file does not exist		Highlight **MAKE NEW FILE** **Enter**
■ To save to default file name:		**Enter**
■ To save to file name of your choice:		Type [file name] **Enter**

Continued

Step	Console	PC
5. *Continued*		
■ If print file exists		Highlight [file name] **Enter**
To print reports to a floppy disk:		Highlight **G0T0 FLOPPY** **Enter**
■ If print file does not exist		Highlight **MAKE NEW FILE**
■ To save to default file name:		**Enter**
■ To save to file name of your choice:		Type [file name] **Enter**
■ If print file exists		Highlight [file name] **Enter**
6. When printing is complete, Print menu is displayed.		
To Return to System Programming Menu	**Exit**	**F5**

Step	Console	PC
4. If you did not select Allowed or Disallowed List instep 3	**Exit**	**F5**
If you selected Allowed or Disallowed List in step 3, identify the list you want to print	Dial list number: [n] **Enter** **Exit**	Type List number:[n] **F10** **F 5**
5. If reports are being sent to SMDR printer or you are programming with a system programming console	Go to step 6	Go to step 6
If reports are being sent to a PC running SPM		
To print a hard copy of the report:		Highlight **LPT1:** **Enter**
To print reports to a hard disk:		
■ If print file does not exist		Highlight **MAKE NEW FILE** **Enter**
■ To save to default file name:		**Enter**
■ To save to file name of your choice:		Highlight [file name] **Enter**

Continued

Step	Console	PC
5. *Continued*		
■ If print file exists		Highlight [file name] **Enter**
To print reports to a floppy disk:		Highlight **GOTO FLOPPY** **Enter**
■ If print file does not exist		Highlight **MAKE NEW FILE**
■ To save to default file name:		**Enter**
■ To save to file name of your choice:		Highlight [file name] **Enter**
■ If print file exists		Highlight [file name] Enter
6. Return to System Programming Menu	**Exit**	**F5**

Maintenance and Troubleshooting

5

Maintenance

The purpose of maintenance is to detect, report, and clear problems quickly with minimum disruption of service. To do this, the system isolates troubles to a single replaceable module whenever possible.

To isolate problems, the control unit (CU) runs automatic diagnostic, auditing, and monitoring tests. Errors found by the automatic tests go into error logs. In addition, demand tests can be run by using an MLX-20L telephone or a PC with System Programming and Maintenance (SPM) software.

Notification of trouble comes from users who report problems or from alarms generated by the system when it detects serious errors. Alarms can appear as an LED on an operator console and as a status display on the maintenance terminal.

Maintenance can be done on-site or from a remote location.

Note: You must record any station jack change on the "System Technician's Run Sheet" (see Appendix L).

Equipment

To access the maintenance program on-site, you need an MLX-20L telephone or a PC with SPM software. In addition, you should have the following tools:

- EIA breakout box
- digital voltmeter (KS-20599 or equivalent)
- 110/66-type punchdown tool
- Dracon TS21 or equivalent touch-tone test telephone
- assorted flathead screwdrivers
- assorted Phillips-head screwdrivers
- long-nosed pliers
- regular pliers
- wrist grounding strap
- laptop PC with MS-DOS ⋆ 3.3 or higher and SPM software
- troubleshooting guide
- replacement parts recommended by the National Service Assistance Center (NSAC)

Remote access to the maintenance program requires a PC with SPM software.

⋆ Registered trademark of Microsoft Corporation.

Maintenance Elements

This section describes the important elements of the maintenance program.

Error Logs

Errors occur because of hardware malfunctions, recurring program logic inconsistencies (PLIs), or system restarts. Whenever an error occurs, it is entered into an error log.

Errors are classified in the error log as transient or permanent. Basically, transient errors are intermittent and permanent errors are steady. Each error has a threshold count that, when exceeded, escalates an error from transient to permanent. To be automatically cleared, each type of error must be trouble-free for a set time period.

The error logs are

- permanent system errors
- transient system errors
- last 10 system errors

Error logs are stored in battery-backed-up RAM.

Alarms

A permanent error causes an alarm. This alarm lights a red LED next to a line or feature button (on a system operator console or other designated telephone) programmed for alarm notification. The LED stays on until the error is cleared.

Alarms can be cleared

- automatically by the system when the error condition no longer exists
- manually by the user
  - by replacing a module
  - by clearing an error log entry via the **Drop** button on an MLX-20L telephone or via ALT-P on a PC

Restarts

Depending on the severity and duration of a problem, it maybe necessary to restart the system either by a warm start, cold start, or frigid start. Certain errors can cause the system to automatically restart; cold starts and frigid starts can be initiated by the maintenance technician.

- **Frigid start.** All calls are dropped, and the system configuration information is erased. All system memory must be reinitialized, including customer translations. The entire system must be rebooted.

  Note: After a frigid start, the default printer is the PC printer, not the SMDR printer. If you want printouts on-site from the SMDR printer, make sure you change the option.

- **Cold start.** A power interrupt of more than one second causes a cold start. All calls are dropped, but customer translations are saved.

  Notes:
  - A cold start does not blank out the screen on an MLX-28D telephone until the end of the cold start.
  - A cold start can cause stations with the Extension Status feature to lose their toll restrictions.

- **Warm start.** Loss of power for less than 250 ms causes a power transfer to the internal battery backup and causes a warm start. Stable calls are not dropped, but calls in the process of being established may be. Call processing resumes from the point where new and stable calls are handled.

  Notes:
  - Power interruptions of less than 100 ms generally are not noticed by the system.
  - Warm starts can cause a telephone to ring without having an associated call. To stop the ringing, place a new call to the telephone.

Every restart causes an error log entry, and each type of restart has its own error code.

System Status Displays

The power supply module, processor module, 400 EM module, and 100D module are the only modules that physically have LEDs. However, the System Status screen displays simulated LEDs for all the modules except the power supply module.

The simulated LEDs are R (red), Y (yellow), and G (green). R indicates an alarm or standby state; when a module enters a normal state, the R LED goes off. When a call is in progress on a module, the Y LED is on. The word “on” or “off” appears after the R, Y, or G.

Automatic Tests

The system automatically runs tests to

- monitor the status of equipment
- audit operations consistency
- detect hardware malfunctions

The tests check hardware and software that are in service but do not disrupt normal service. Any errors detected are registered in the error logs. Errors are corrected automatically whenever possible. As necessary, automatic testing causes an alarm.

Demand Tests

Demand diagnostic tests for the line/trunk and station modules are selected and scheduled by using the menu screens. Demand tests

- increase the effectiveness of on-site troubleshooting and repair
- verify complaints of malfunctioning equipment

Note: For some modules, the demand test does not test the shared memory.

When a demand test fails, the module being tested either was not busied-out or is faulty and may have to be replaced.

To run demand tests, the processor module, the power supply module, and the MLX-20L telephone or PC must be working.

Note: You cannot run a demand test on the 008 MLX module to which the MLX-20L telephone is attached. However, you can run a demand test on this module from the PC.

To run a demand test, you must take the equipment out of service. You can choose “Busy-Out” or “Reset" to do this, but “Busy-Out” is preferred since:

- Busy-out removes lines and stations as they become idle but does not disrupt calls in progress.
- Reset drops all calls in progress and removes equipment from service.

Once the equipment is out of service, you can select demand tests. After testing is finished, choose “Restore" from the menu to cancel “Busy-Out" or "Reset.”

Note: A cold start or a warm start does not restore equipment that has been busied-out or reset.

On-Site Maintenance

You can do on-site maintenance with an MLX-20L telephone or a PC with SPM software. The MLX-20L plugs into whichever of the first five jacks on the first MLX module is being used as the system programming/maintenance port. (The default is the first MLX jack.) Only one jack at a time can be used for system programming or maintenance. The PC plugs into the RS-232 system programming/maintenance port.

Remote Maintenance

By using a PC with System Programming and Maintenance (SPM) software, the maintenance technician and personnel from the National Service Assistance Center (NSAC) and the National Technical Service Center (NTSC), or an authorized AT&T representative, can remotely access the maintenance program. This remote access is provided by a built-in 1200-bps modem in the processor module.

Note: Line noise can distort the SPM screen. When this happens, the remote administrator should hang up and redial.

Once in the maintenance program, the remote administrator can use the menu screens as the on-site technician does to check error logs, check system status, and even cause restarts.

The remote administrator can access the maintenance program by

- dialing the listed directory number for the customer's system. Usually this rings at the system operator's console, and the operator transfers the call to the system programming/ maintenance (SPM) port. The remote administrator then enters the password. (When remote SPM is in use, any local administration is blocked.)
- directly dialing the SPM port by using the Remote Access feature. The administrator enters an access barrier code and the password to connect to the SPM port.

Note: The on-site system technician can also call the SPM port by using either method above. However, it is recommended that the technician connect the laptop PC directly to the RS-232 port on the processor module.

Security

Certain security measures guard against unauthorized remote access. A barrier code can be used for access to the built-in modem. In addition to the barrier code, the SPM software has password validation.

CAUTION:

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 "Customer Support Information" at the front of this book for more information on security.

The following menu selections must be used with care. To eliminate any selection mishaps, you must confirm or cancel them.

- Busy-Out
- Reset
- Restore
- Poke
- System Erase

Maintenance Strategy

The goal of maintenance is to isolate the trouble to one or more replaceable units and to replace the faulty units as quickly as possible. To help isolate the fault, check equipment in the following order:

1. Telephones and adjuncts
2. Station wiring
3. Line/trunk and station modules
4. Processor module
5. Power supply module
6. Carrier backplane

Note: Traffic problems can result from having more than 64 personal lines or pool buttons on the system. If you have traffic problems, check this first.

Use the maintenance program as follows:

1. Check the error logs.
2. If the error logs indicate trouble in the processor module, correct that problem first since it may be causing trouble in the line/trunk and station modules.

3. Run demand tests on the line/trunk and station modules to further isolate the trouble.
4. If replacing the faulty equipment does not solve the problem, use the screen menus to find the hardware vintage, the software vintage, and the ROM ID of the modules.
5. Refer the problem to the NTSC.

Using the Maintenance Screens

Using the maintenance screens involves selecting items on menus. The menu selections are identical whether you are using an MLX-20L telephone or a PC. The only difference is that the function keys on the computer keyboard simulate the display buttons on the telephone.

In the following procedures, a representation of the menu screen is shown with the actions to take. To enter maintenance programming, press the button for “Menu” and then the button for “Maintenance.” The following main menu appears:

```
Maintenance:
Make a selection
System
Slot
Port

Exit
```

Note: On the maintenance screens, the power supply modules are not shown and the processor module is numbered “00.”

System Screens

System screens are used for getting information; you cannot alter anything with system screens.

Error Logs

Error logs you what errors have occurred in the system. Write down any errors before you leave the error logs.

Select "System" from the main menu.

```
System:
Make a selection
Status
Error Log
Inventory

Exit
```

Select "Error Log:"

```
System Error Log:
Make a selection
Last 10
Permanent
Transient
(most recent alarm)
Exit
```

Select the error log desired, for example, “Permanent."

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

```
Permanent Errors:
aaaaaaaaaaaaaaaaaaaaaaa
Slotxx Portxx    Countxxx
First  mm/dd/yy  hh:mm
Last   mm/dd/yy  hh:mm
Code   Xxxx
Exit                    >
```

The error information appears.

System Status

The System Status screen displays the simulated LED status for each module, except the power supply modules.

Select “System” from the main menu.

```
System:
Make a selection
Status
Error Log
Inventory

Exit
```

Select "Status."

```
System Status:
Slot00:  Raaa
Slot0l:   Raaa Yaaa Gaaa
Slot02:   Raaa Yaaa Gaaa
Slot03:   Raaa Yaaa Gaaa
SlotC14:   R   Y   G
Exit                >
```

The screen appears with simulated LEDs for each module for red, yellow, and green. Press the "More" button to display more modules, up to 17. If a slot is empty, **R, Y,** and **G** will appear, but not **on** or **off.**

System Inventory

System Inventory shows the vintage of the hardware and software and the ROM ID.

Select "System" from the main menu.

```
System:
Make a selection
Status
Error Log
Inventory

Exit
```

Select "Inventory."

```
System Inventory
Slot 00
Board xxxxxxxxxxxxxxx
Hardware Vintage: xx
LEGEND R1 ID: xx
D1D1D1D1D1D1D1D1D1D1
Exit              >
```

The processor module inventory information appears. Press the "More" button to show the inventory information for the other modules.

```
System Inventory:
Slot xx
Board xxxxxx
Hardware Vintage: xx
Firmware Vintage: xx

Exit                >
```

The inventory information for the first line/trunk and station module appears. Press "More" to show information for the next module.

Slot Screens

Slot screens let you check the status of the module in a particular slot and to perform maintenance activities such as demand tests and restore.

Note: On the maintenance screens, the power supply modules are not represented and the processor module is numbered “00.”

To get to all slot functions, select “Slot” from the main menu.

```
Slot:
Enter slot number (00-17)

xx

Backspace
Exit                Enter
```

The slot screen appears. Enter the slot number of the module you want by keying in the number, using the dialpad (MLX-20L telephone) or the keyboard (PC) and pressing “Enter.”

Slot Status

Slot Status gives information about the module in a particular slot.

Enter the slot number of the module you want.

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

Exit
```

This is the slot menu for the processor module. Select “Status” from the Slot menu.

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

Alarms:

Exit
```

This is the screen for the processor module.

```
Slot xx:
Make a selection
Status       Demand Test
Busy-Out     Reset
Restore

Exit
```

If you entered a slot number other than 00 and the module in that slot is not the 100D module, this screen appears. Select "Status."

```
Status Slot xx:
LED:      Raaa Yaaa Gaaa
Errors:
Mode:
Alarms:
Maintenance  Busy
Exit
```

This screen appears with information for the module in the numbered slot.

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

If you entered the slot number of the 100D module, this screen appears. Select "Status."

```
Status Slot xx:
LED:      Raaa Yaaa Gaaa
Errors:
Mode:
Alarms:
Maintenance Busy
Exit
```

The 100D module status information appears.

Busy-Out and Reset

You must busy-out or reset any module before you run a demand test for it and before you replace it. “Busy-Out" is the preferred choice because it does not drop calls in progress.

In the following screens, "Busy-Out” is used, but choosing “Reset” works the same way.

```
Slot xx:
Make a selection
Status       Demand Test
Busy-Out     Reset
Restore

Exit
```

Choose "Busy-Out” from this Slot screen.

```
Busy-Out Slot xx:

Busy-Out in Progress



Exit
```

This screen appears.

```
Busy-Out Slot xx:

Busy-Out Complete



Exit
```

This screen appears when busy-out is successfully completed.

```
Busy-Out Slot xx:

Busy-Out  FAILED


Exit
```

This screen appears when busy-out fails.

Demand Tests

Demand tests let you pinpoint module problems.

Note: Before running any tests on the processor module, back up the system translations by using the PC with SPM (see “Back Up System Programming” in Chapter 4).

After you run a demand test on a module, you must restore the module. See "Restore” later in this chapter.

Module Demand Test. Request this demand test to find out if the module is functioning properly.

Note: A module must be busied-out before a demand test is run.

```
Slot xx:
Make a selection
Status       Demand Test
Busy-Out     Reset
Restore

Exit
```

Select "Demand Test" from the Slot menu.

```
Demand Test Slot xx:
Make a selection
Note: Busy out port first
Go
Repeat

Exit
```

Choose “Go” to run a test once; choose “Repeat” to repeat a test continuously.

```
Demand Test Slot xx:
Board aaaaaaaa
Test FAILED
(Contents of test reg)


Exit
```

If you selected "Go," the test runs. A screen appears with "Test in Progress," “Test Successfully Completed,” or “Test FAlLED” (and the contents of the test register), a sin this example.

```
Demand Test Slot xx:
Run continuously?
Yes
Cancel


Exit
```

If you selected "Repeat," this screen appears and you choose whether to continue the test or not.

Processor Module Demand Test If you select “Demand Test” for the processor module, you get three choices: “Peek,” “Poke,” and “System Erase.”

⚠ CAUTION:

“Peek” and “Poke” should be done only at the direction of the NTSC.

```
Demand Test Slot 00:
Make a selection
Peek
Poke
System Erase

Exit
```

With “Peek” you can examine system memory or circuit board memory but cannot change anything.

"Poke" allows you to change a configuration, but this also changes the memory.

“System Erase” is a frigid start and erases all system memory.

```
Slot 00 EnterHexAddress:
aaaaaaaa              Hex
                    Enter
Backspace            Exit
A                       B
C                       D
E                       F
```

If you selected "Peek," this screen appears. Key in the memory address and press "Enter."

```
Peek Address Oxaaaaaaaa:

OxFFFF              OxFFFF
OxFFFF              OxFFFF
OxFFFF              OxFFFF
OxFFFF              OxFFFF
Exit                    >
```

This status screen appears. Press "More" to view the next 16 bytes of memory locations.

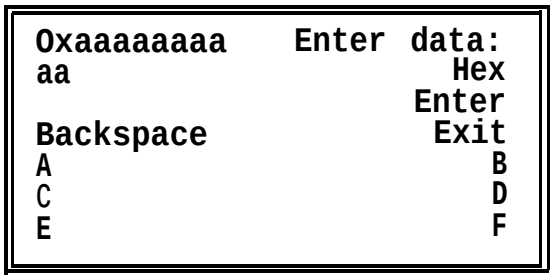
The first 2-byte word of data at the requested address is shown in the upper left-hand part of the screen. The next two-byte word is shown in the upper right-hand part of the screen.

```
Poke - WARNING! ! SYSTEM
MEMORY WILL BE MODIFIED!
Continue
Cancel


Exit
```

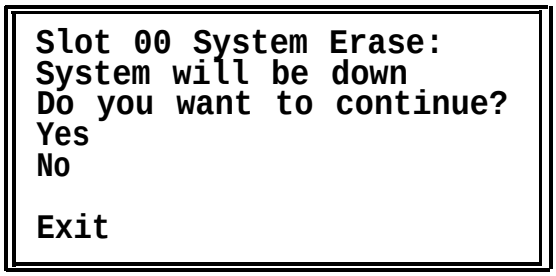
If you selected "Poke," this screen appears. Choose to continue or cancel.

```
Slot 00   Enter address:
aaaaaaaa              Hex
                    Enter
Backspace            Exit
A                       B
c                       D
E                       F
```

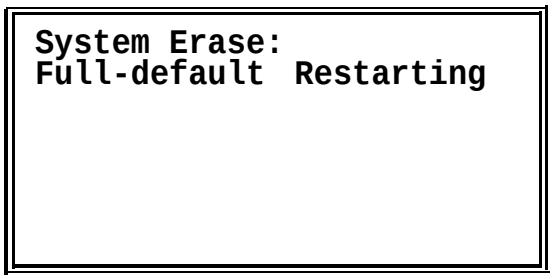
If you selected "Continue," this screen appears. Key in the address of the desired memory address and press "Enter."



This screen appears and you can enter any changes you want to make. Press "Enter" when you are done.



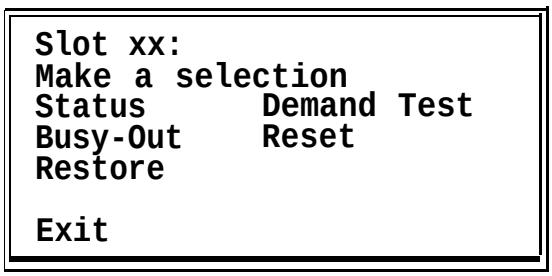
If you selected “System Erase,” this screen appears. Choose “Yes” or “No." Remember that "System Erase" wipes out the system’s memory.



If you chose to continue with "System Erase," this screen appears.

Restore

You must restore a module after a demand test has been run and after a module has been replaced.



After entering the slot number for the module, this screen appears. Choose "Restore."

```
Restore Slot xx:

Restore in Progress


Exit
```

This screen appears and indicates that restore is in progress.

```
Restore Slot xx:

Restore Complete


Exit
```

When restore is successfully completed, this screen appears.

```
Restore Slot xx:

Restore FAILED
Board Mismatch

Exit
```

If the restore fails, this screen appears, indicating a board mismatch (a different module from the one replaced has been inserted in the slot).

100D Module Selections

The 100D module has three slot selections that are unique: “Error Events,” “Clock,” and "CSU-lpbk" (loopback). Each of these is selected from the 100D module Slot screen below.

Error Events. “Error Events” lists the errors for the current and previous hours for the 100D module.

Enter the slot number of the 100D module.

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

This screen appears. Select "Error Events."

```
Status Slot xx:
Make a selection
Current hr
Previous hr
```

Choose “Current hr” or "Previous hr."

```
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
```

This screen appears if you selected "Current hr." The "Previous hr" screen is identical except for the title line.

Clock. Choosing "Clock" from the 100D module Slot screen provides information on the clock synchronization for that module.

```
Clock Slot XX:
mm/dd/yy      hh:00-hh:mm
Admin as:
Active:
Synch source:
PPM:  xxx
Exit
```

If you selected "Clock" this screen appears.

Channel Service Unit Loopback Test. Before you select the channel service unit (CSU) loopback test from the Slot screen, you must do the following:

1. Plug one end of a bantam-to-bantam patch cord (or a loopback fixture, if one is available) into the EQ OUT jack on the front of the CSU.

   This causes the CSU to either loop back the network signal or send the all-ones pattern, depending on the chosen CSU option.

2. Plug the other end of the patch cord into the EQ IN jack on the CSU.
3. Using the maintenance screens, busy out the 100D module (see "Line/Trunk or Station Busy-Out" later in this chapter).

Select “CSU-lpbk” from the 100D module Slot screen to start the 100D module to test data looping through the CSU. (Four tests are run for each channel.) The following screen appears.

```
CSU-lpbk Slot xx:
CSU-lpbk in Progress


Exit
```

This screen indicates that the loopback test is running.

```
CSU-lpbk Slot xx:
CSU-lpbk  Passed


Exit
```

This screen appears if the loopback test is successfully completed.

```
CSU-lpbk Slot xx:
CSU-lpbk Failed
xxx xxx xxx xxx xxx xxx
xxx xxx xxx xxx xxx xxx
xxx xxx xxx xxx xxx xxx
xxx xxx xxx xxx xxx xxx
Exit
```

This screen appears if the loopback test fails. The screen shows the number of failures for each channel.

After the test is completed, restore the 100D module by using the maintenance screens (see "Line/Trunk or Station Restore" later in this chapter) and unplug the patch cord, first from the EQ IN jack and then from the EQ OUT jack.

Port Screens

Port screens show information for individual lines/trunks and stations, as well as information for RS-232 ports and modems. They also allow you to busy-out and restore these lines/trunks and stations.

Select “Port” on the main menu screen.

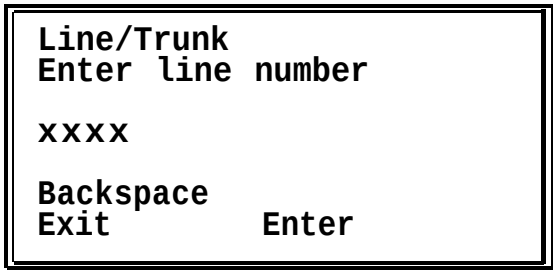
```
Port:
Make a selection
Line/Trunk          Modem
Station
RS232 Port1
RS232 Port2
Exit
```

This screen appears. Choose the port you want.

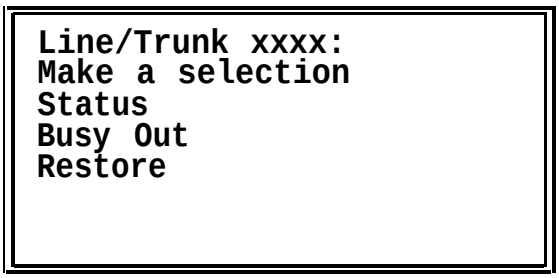
Line/Trunk and Station Selections

Choosing “Line/Trunk” or “Station” gives you three options: “Status,” “Busy-Out,” and “Restore.”

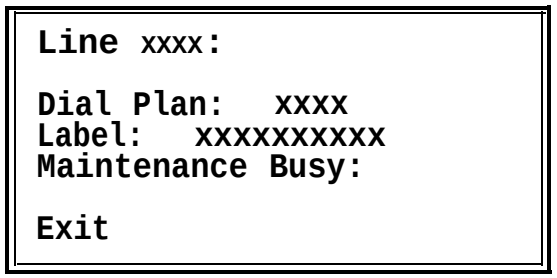
Line/Trunk or Station Status. Select “Line/Trunk” to pull up the following screen. (The steps to review the status of a station are the same as in the line/trunk procedure.)



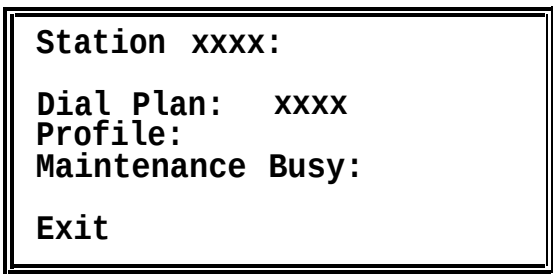
Enter the dial plan line number for a particular line/trunk and mess "Enter."



Select "Status."



This screen appears with the current line/trunk status information.



This is the screen for station status information.

Line/Trunk or Station Busy-Out. This allows you to busy-out an individual line or station without affecting an entire module.

Note: A telephone on a busied-out line cannot be accessed. The system provides a busy signal and, as applicable, a busy message to any incoming calls. However, when a queued call console (QCC) is busied out, calls to that QCC remain in queue until the QCC is restored or the caller disconnects.

```
Line/Trunk xxxx:
Make a selection
Status
Busy Out
Restore

Exit
```

Select "Busy-Out."

```
Line/Trunk  xxxx:

Busy-Out in Progress



Exit
```

This screen appears, indicating that the busy-out is in progress.

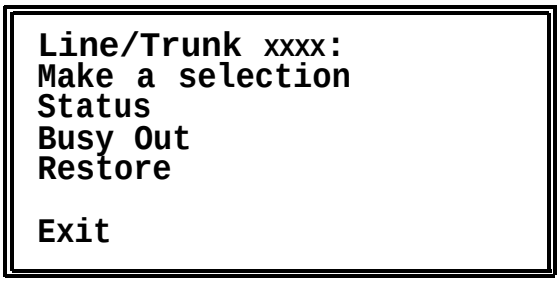
```
Busy-Out  Line/Trunk
Xxxx:

Busy-Out  Successfully
Completed


Exit
```

If the busy-out has finished successfully, this screen appears.

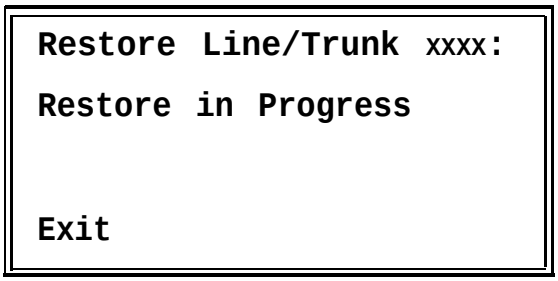
```
Busy-Out  Line/Trunk
xxxx:

Busy-Out FAILED



Exit
```

If the busy-out fails, this screen appears.

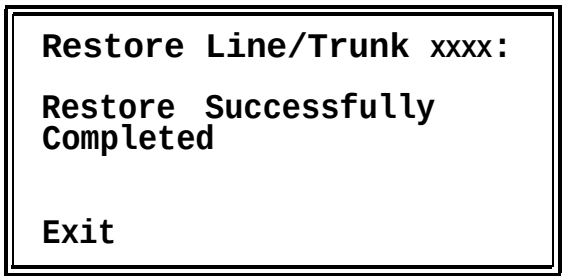
Line/Trunk or Station Restore. You must restore a line/trunk or station after you have used busy-out.



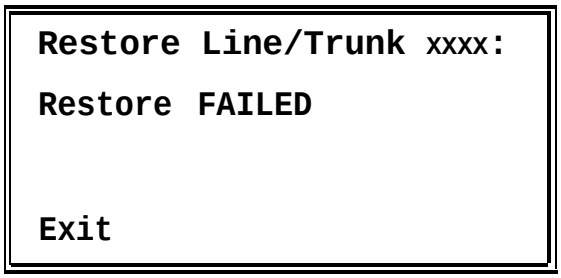
Select "Restore."



This screen appears, indicating that the restorers in progress.



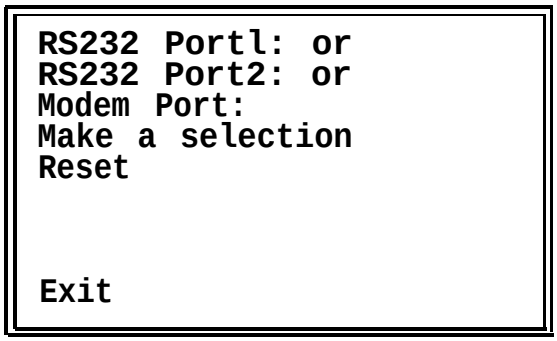
If the restore is completed successfully, this screen appears.



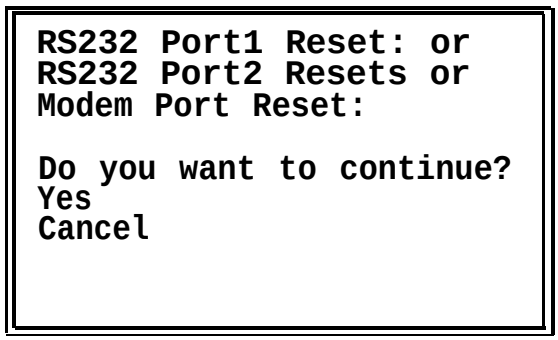
If the restore fails, this screen appears.

RS-232 or Modem Port Reset. Select the desired RS-232 port or the modem from the Port menu.

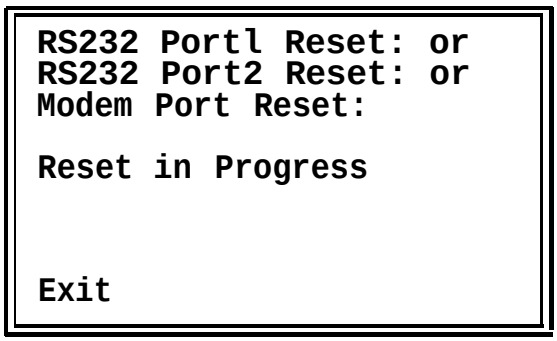
Note: Port 1 is the system programming/maintenance port and Port 2 is the SMDR port.



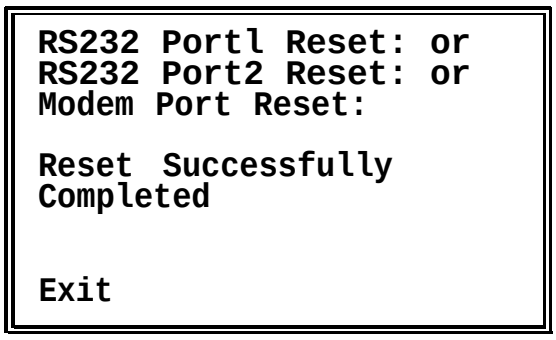
If you want to reset the RS-232 ports or the modem, select “Reset.”



Select “Yes” to start the reset.



This screen appears, indicating that the reset is in progress.



If the reset is completed successfully, this screen appears.

```
RS232 Port1 Reset: or
RS232 Port2 Reset: or
Modem Port Reset:

Reset FAILED



Exit
```

If the reset fails, this screen appears.

Replacing Equipment

When an error has been isolated to one of the following pieces of equipment, you can replace the equipment:

- carrier
- power supply module
- processor module
- line/trunk and station modules
- telephones (and adjuncts)

Notes:

- You must record any station jack change on the "System Technician's Run Sheet" (see Appendix L).
- The ring generator and auxiliary power units can also be faulty and must be replaced. (See Chapter 3, "Installation," for information on replacing this equipment.)

Replacing the Carrier

Typical carrier problems include power supply failure, sudden failure of one or more line/trunk and station modules, or system problems that cannot be isolated to a specific module.

Follow these steps to check carrier problems:

1. Visually inspect the pins on the carrier. (Bent or broken pins often cause carrier problems.) To do this, you may have to remove one or more line/trunk and station modules by using Busy-Out, Reset, and Restore.
2. If you find a problem with the carrier, you must replace it (but not the line/trunk and station modules). Carriers cannot be repaired in the field.
3. Attach a tag that describes the problem to the faulty carrier.

Replacing the Power Supply Module

Failure of the power supply shuts down everything connected to the carrier.

If the power supply fails, check that the interlocking post in the power supply slot of the carrier has not broken off. Without this post, the power supply will not operate and the carrier must be replaced.

Follow these steps to replace the power supply module:

1. If possible, save the translations on a floppy disk by using the backup function.

   Note: If the power supply module on the basic carrier has failed, the system cannot save the translations to a disk.
2. Power down the system by turning off

   a. the power supply module on the basic carrier

   b. the power supply module(s) on the expansion carrier(s)

   c. any auxiliary power unit (if present)
3. Unplug the system from the AC outlet.
4. Remove the power supply module and insert a new one.

5. Restore power by turning on

   a. any auxiliary unit (if present)

   b. the power supply module(s) on the expansion carrier(s)

   c. the power supply module on the basic carrier

   The system automatically cold starts.

Replacing the Processor Module

A failed processor module must be repaired immediately. Follow these steps to replace a failed processor module:

1. If possible, save all the translations to a floppy disk by using the backup function.

   Note: When the processor module fails, backup is usually impossible.

2. Power down the system by turning off

   a. the power supply module on the basic carrier

   b. the power supply module(s) on the expansion carrier(s)

   c. any auxiliary power unit (if present)

3. Unplug the SMDR printer and/or system programming PC cords if present.

4. Remove the processor module.

5. Inspect the processor module for any visible problems.

6. Inspect the carrier backplane.

7. Remove the feature module from the processor module and install it in the new processor module.

8. Install the new processor module.

9. Restore power by turning on
   a. any auxiliary unit (if present)
   b. the power supply module(s) on the expansion carrier(s)
   c. the power supply module on the basic carrier

   The system automatically cold starts.

10. Use the maintenance screens to select “System Erase” (frigid start).
11. Restore the system translations from the backup floppy disk.
12. Plug in the SMDR printer and/or administrative PC cords.
13. Attach a tag identifying any visible problems and any relevant error reports to the replaced processor module.

Replacing the Line/Trunk and Station Modules

Line/trunk and station modules can be removed and inserted without affecting normal call processing. Leave the system power on. All line/trunk and station modules can be removed or inserted at the same time.

Notes:

- Although the system is designed for line/trunk and station modules to be removed and replaced 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.

The module removed must be replaced with a module having the same type of circuit board, in other words, the same signature. If a module is replaced with another type of module, or if a module is added to the system without the system being powered down, a cold start occurs. If you move the first 008 MLX module from its

slot, you must renumber the modules by selecting “Board Renumber” from the System Programming menu.

Note: This procedure is not the procedure for replacing the processor module.

Follow these steps to replace a line/trunk and station module:

1. Busy-out or reset the module. (Busy-out is recommended.)

   The module enters standby mode for a reset.

2. Label all line/trunk and station cords (if they haven’t been labeled already) and unplug them from the module.
3. Run a demand test by entering the test mode.
4. Remove the module and inspect it for visible damage.
5. Insert the new module.
6. Select “Restore” to put the module back in service.
7. Plug in the line/trunk and station cords.
8. Attach a tag identifying any visible problems or failure symptoms, and any relevant error reports to the replaced module.

Replacing the Telephones and Adjuncts

Once a problem has been isolated to a telephone (or a group of telephones), various tests can be done to see if the telephone is working properly. Check the telephone wire first. Also, swap a telephone you know is good with the one you think is faulty. These practical steps isolate the problem quickly.

The following describes the telephone tests and how to fix particular problems.

MLX Telephone Tests

Follow the procedure below to test MLX telephones. The tests check the

- LEDs
- display screen
- ringer
- buttons
- switchhook
- B-channel operation

Follow this basic procedure for any MLX telephone test:

1. Pick up the handset.
2. At the dial tone, enter the feature access code (*00) by pressing the dialpad.

   The software should place the telephone in test mode.

3. Run the test.
4. Hang up when done.

Note: Telephones cannot be tested remotely.

Basic MLX Telephone Test. This test connects a test tone to the B channel and sends a repeated ring burst to the telephone. All the LEDs turn on.

Follow these steps to test an MLX telephone:

1. Press a line/feature button with two LEDs to toggle these LEDs red and green.

2. Press a fixed-feature button with one LED to toggle the LED on and off.

   Note: Mute and **Speaker** LEDs may not toggle consistently since they are managed by both the CU and the telephone.

3. Press a fixed-feature button without an LED or press a dialpad button to toggle the **Message** LED on and off.

4. Press the fixed-feature buttons and the dialpad in the following sequence to turn on all the LEDs:

   a. **Volume** down

   b. **Volume** up

   c. **Transfer**

   d. **Conf**

   e. **Drop**

   f. **Hold**

   g. 123456789*0#

MLX Telephones with Displays Test. Activating the test blacks out the display.

Follow these steps to test an MLX telephone with a display:

1. Press any display button.

   A unique character string should appear.

2. Press each display button in turn to cause a unique character string to appear.

MLX Telephones with a DSS Test. Activating the test turns on all the LEDs. Follow the steps in "Basic MLX Telephone Test" above to get the LED response.

MLX Telephones with Multi-Function Modules (MFMs) in the T/R Mode Test. To run this test, you must connect a single-line telephone to the MFM.

Follow these steps to test a telephone with an MFM:

1. At the system access or intercom dial tone, dial the feature code ∗09 to activate the test.

   The diagnostic test tone connects to the B channel.

2. Press the sequence 123456789∗0# and then quickly press the switchhook.

   The CU should send a confirmation tone.

3. Hang up.

   The CU should send a ring burst to the MFM, turn on the ***Message*** *LED, and resume normal operations.*

Fixing Telephone Problems

When a user complaint or a system test identifies the telephone as the problem area, the trouble can be in the telephone itself, in the mounting cord, or in the wiring between the CU and the telephone. Check the wiring and the mounting cord before checking the telephone.

Note: If the wiring has been crushed or severed, the -48-VDC power supply may be shorted.

General Telephone and Wiring Troubles

Symptom:

Intermittent telephone trouble

Procedure:

1. Swap a known good telephone with the suspect telephone to determine if the problem is localized to the suspect telephone. If local power is provided, check the power supply.
2. If trouble disappears, the fault is with the suspect telephone. Replace it.
3. If the known good telephone does not work properly, the fault is in the wiring or the line/trunk and station module.
4. Check the other telephones connected to the same module. If they are working properly, the fault is probably in the wiring, or it may be a single-port failure on the line/trunk and station module. Swap the wiring between the jack field and the telephone to see if it is a wiring problem. Fix the wiring problem.
5. If the other telephones connected to the same line/trunk and station module are not working properly, the fault is probably in the line/trunk and station module.
6. Check the LEDs on the line/trunk and station module.
7. Check the error log for relevant messages.
8. Replace the faulty line/trunk and station module.

Analog Multiline Telephone Troubles

Symptom:

Telephone LEDs and/or ringing tones do not work properly.

Procedure:

1. Move the T/P lever on the left-hand side to the “T” (test) position.

   You should hear tone ringing. All the red and green LEDs on the terminal should flash alternately.

2. If LEDs do not light, check the CU and wiring by using a known good phone.
3. Move the T/P lever to its normal position.

   Ringing tone should stop, and the LEDs should be off.

4. If any part of the test fails, replace the telephone.

Symptom:

Time appears on the display, but the incoming call information does not.

Procedure:

Move the T/P lever on the side of the telephone to the center position.

Voice Transmission Troubles

Symptom:

Telephone does not receive tones.

Procedure:

Check the CU and wiring with a known good telephone.

Single-Line Telephone Problems

Symptom:

Many single-line telephones cannot dial correctly even though they are receiving calls.

Procedure:

Using a single-line telephone, test the touch-tone receivers (TTRs) as follows:

1. Pick up the handset and dial ∗04 and the 2-digit number of the TTR to be tested.
   - If you hear a busy tone, the receiver is in use.
   - If you hear a reorder tone, you have misdialed or have reached an invalid TTR.
   - If you hear a dial tone, continue this test.
2. Dial the digits 123456789∗0#.

   You should hear a DTMF signal as each button is pressed. If the test is successful, you will hear a dial tone within one to three seconds after you enter #.
3. Repeat the test for each TTR.
4. Replace the module containing the faulty TTR if this test fails.

Symptom:

User cannot make outside calls on touch-tone telephone.

Procedure:

Check the individual line/trunk for rotary-dial programming.

Call Forward Problems

Symptom:

Users are getting other people's calls.

Procedure:

Usually this problem results from someone unknowingly activating Call Forward. Cancel the forwarding of calls to the receiving telephone as follows:

- For multiline telephones
  1. Press the **Feature** button.
  2. Dial *34*.
- For single-line telephones
  1. Pick up the handset.
  2. Dial #*34*.
  3. Hang up.

Central Office Troubles

The automatic maintenance program takes the ports out of service when a line/trunk is malfunctioning. The line/trunk is periodically tested to put it back in service.

Maintenance Busy

When a line/trunk cannot be seized for an incoming or outgoing call, the line/trunk is automatically put into a maintenance-busy state. When a line/trunk is in a maintenance-busy state, no outgoing calls can be placed on it. However, the line/trunk still receives incoming calls.

Note: Maintenance busy does not apply to DID trunks because DID trunks cannot be used to make outgoing calls.

While the line/trunk is in a maintenance-busy state, the software periodically runs tests to try to seize the line/trunk. If the seizure is unsuccessful, the line/trunk stays in a maintenance-busy state. If the seizure is successful, the line/trunk is placed back in service. If a test is running when an incoming call is received on the line/trunk, the test is dropped and the call is processed.

Note: No more than 50 percent of tines/trunks in a pool can be maintenance busy at one time. The only exceptions are

- 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 far end of the line

A permanent error is entered when more than 50 percent of the lines/trunks in a pool are maintenance busy. When the maintenance-busy level falls below 50 percent, the permanent error is automatically removed.

Note: Make sure that no modules are in a maintenance-busy state during a backup procedure (see "Back Up System Programming" in Chapter 4, "Programming Procedures"). Any module in a maintenance-busy state will be recorded as such on the translations disk.

Conditions Causing a Maintenance-Busy State

- **Ground-Start Line/Trunk**
  - A seizure of the line/trunk is attempted that results in incomplete handshaking between the CO and the system.

    After four occurrences, the line/trunk is put into a maintenance-busy state and a permanent error is logged.

- The CO fails to disconnect when the GS line/trunk is dropped by the system.

  After two occurrences, the line/trunk is put into a maintenance-busy state and a permanent error is !ogged.

- No loop current is detected when the GS line/trunk is seized.

  The port is marked maintenance busy and a permanent error is logged.

■ Loop-Start Line/Trunk

- No loop current exists when the LS line/trunk is seized.

  The port is marked maintenance busy and a permanent error is logged.

■ 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 far-end station fails to disconnect.

  A transient error is reported. Atfer 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 automatic maintenance busy as a system programming option. If you do, there is also a menu selection to include tie trunks.

Manual Correction of Line/Trunk Problems

If the system cannot seize a line/trunk even after repeated attempts, you may have to replace the module. To identify the line/trunk problem, first check for a dial tone at the CU. If you do not hear a dial tone, check the error logs and make a line/trunk test call.

It is sometimes difficult for the customer to detect line/trunk troubles. If a line/trunk is down, an error is recorded in the error log and the line/trunk is taken out of service. If an incoming-only line/trunk is down, however, the only sign of trouble is customer complaints that incoming calls are not being received.

Check the error log 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 Line/Trunk Problems

Symptom:

Outgoing lines/trunks cannot be seized.

Procedure:

1. At the network interface, check for a dial tone from the CO. If a dial tone is not present, notify the customer.

   Note: For GS lines/trunks, apply ground to the ring lead to get a dial tone.

2. Pickup the handset at a test station to get a system dial tone.

3. For a Hybrid/PBX system, dial ∗03.

   Note: Dialing ∗03 on a single-line telephone works only if the line/trunk accepts touch-tone dialing. After you dial ∗03 on a single-line telephone, you may have to wait for a “click” before dialing the line/trunk number.

4. Dial the 2-digit line/trunk number of the line/trunk to be tested (01-80).
5. Listen for a dial tone. if a dial tone is not present, use a test set to isolate the fault to the line/trunk and station module where the line/trunk terminates or to the location in the line/trunk access equipment.
6. If a dial tone is present, dial a working outside number. Verify that the call is complete.

   If the line/trunk is busy, you hear a busy tone. You hear a reorder tone if a wrong line/trunk type (such as DID) or an invalid line/trunk number was dialed.

7. If the module continues to malfunction, replace it.

Incoming Line/Trunk Problems

Symptom:

Incoming lines/trunks do not work properly.

Procedure:

1. Place an incoming call through the troubled line/trunk.
2. For an LS or GS line/trunk, connect a single-line telephone to the line/trunk at the network interface. (If the line/trunk is a GS line/trunk, you need to have a GS button attached to the telephone.) Press the GS button for a GS line/trunk. Listen for ringing. Pick up the handset and check line seizure. Dial an outside number and verify that you have good two-way transmission.
3. At the maintenance terminal, check the line/trunk translations to be sure this line/trunk has been properly translated. (See the system planning forms.)
4. If the module continues to malfunction, replace it.

Line/Trunk Error Summary

Table 5-1 shows the line/trunk errors reported when a transient or permanent error is registered by the system. These errors are also recorded for T1 ports.

Note: In some cases, errors occur not because a single port fails but because the entire T1 link fails. If the entire T1 link fails, the periodic T1 board-level maintenance monitoring functions perform the testing and activate alarming.

Table 5-1 Line/Trunk Errors

Error	Line/Trunk
No loop current	LS and GS lines/trunks
No external release on far-end disconnect	GS, DID, and tie lines/trunks
On-hook before ready to receive digits; trunk with delay-dial or wink-start	DID and tie trunks
On-hook before wink; trunk with delay-dial or wink-start	DID and tie trunks
Stuck ringing	LS and GS lines/trunks
Wink too short for valid signal	Tie trunks

The 100D System Module—T1 Maintenance

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 and handling. The system detects errors and takes the facility out of service, if appropriate. It attempts to restore the facility 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.
- Maintaining the synchronization plan. 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.

Troubleshooting

Table 5-2 below is a quick reference for maintenance problems and possible solutions.

Table 5-2 Maintenance Problems and Solutions

Error Code	Screen Description	Possible Cause	Solution
0001	**TIMEOUT COLD START**	■ Software initiated ■ Power failure ■ Faulty processor module	No action is needed. If problem persists, check or replace processor module.
0002	**POWER UP WARM START**	■ Power failure ■ Power supply failure ■ Faulty processor module	Check for erratic AC power. Check power supply voltages and replace if necessary; otherwise no action is needed. If problem persists, check or replace processor module.
0003	**SOFTWARE COLD START**	■ Software initiated ■ Faulty processor module	No action is needed. If problem persists, check or replace processor module.
0004	**SOFTWARE WARM START**	■ Software initiated ■ Faulty processor module	No action is needed. If problem persists, check or replace processor module.
0006	**INCOMPLETE COLD START**	■ System was cold started while restart was in progress ■ Power supply failure ■ Faulty processor module	Check power supply voltages and replace if necessary; otherwise no action is needed. If problem persists, check or replace processor module.

Table 5-2 Continued

Error Code	Screen Description	Possible Cause	Solution
0007	**SANITY TIMEOUT RESET**	■ Processor module sanity timer failure ■ Software failure ■ Module failure ■ Backplane failure	Check module and replace if necessay, or check or replace processor module.
0008	**MAX RESET COUNT EXCEEDED**	■ System initiated cold start because of too many warm starts. ■ Power supply module failure ■ Faulty processor module	Check power supply voltages and replace power supply module if necessary; otherwise no action is needed. If problem persists, check or replace processor module.
0009	**FRIGID START**	■ Processor module was removed while in use, and system initiated frigid start because of translation loss. ■ User initiated frigid start	Restore translations if backup disk is available. If no backup is available, reprogram system by using instructions in Chapter 4, “Programming Procedures."
000A	**POWER UP COLD START**	■ Power supply module failure ■ Faulty processor module ■ Power failure	Check power supply voltages and replace if necessary; otherwise no action is needed. If problem persists, check or replace processor module.
000B	**CARD INSERTED/ REMOVED**	■ Module was installed or removed	Usually no action is needed.
000C	**SLOT STREAM CNT EXCEEDED**	■ Excessive interrupts generated by slot	If problem persists, check or replace processor module.

Table 5-2 Continued

Error Code	Screen Description	Possible Cause	Solution
000D	**FMWR NOT IN STANDBY MODE**	■ Module firmware is not in standby mode at cold start.	If problem persists, check or replace module.
000E	**COMMAND BUFFER FULL**	■ Module failure ■ Faulty processor module	No action is needed. If problem persists, check or replace module.
000F	**TASK RUNNING TOO LONG**	■ Faulty processor module	No action is needed. If problem persists, check or replace processor module.
0010	**INVALID SLOT INTERRUPT**	■ System cannot determine module responsible for generating interrupt	Check modules and replace if necessary. If problem persists, check or replace processor module.
0011	**STACK OVERFLOW**	■ Faulty processor module	Check or replace processor module.
0012	**INVALID RESET FLAG**	■ Faulty processor module	Check or replace processor module.
0013	**DUART STREAMING INT**	■ Faulty processor module	Check or replace processor module.
0014	**PROCESSOR ERR INTERRUPT**	■ Faulty processor module	Check or replace processor module.
0015	**MODULE MISMATCH**	■ Module inserted into wrong slot, and physical and logical types do not match	Change programming to reflect proper module or install proper module.
0C01	**NO I-VMS PORT IN SERV**	■ All VMS ports are out of service.	No action is needed.

Table 5-2 Continued

Error Code	Screen Description	Possible Cause	Solution
1C01	**POOL M-BUSY EXCEEDS 50%**	■ 50% or more of lines/trunks in the pool indicated by the **PORT** number are maintenance busy.	Check line/trunk.
3001	**ALARM TABLE FULL**	■ Error logs are full, and no more errors can be written to them.	Correct indicated errors, then remove entries from transient system error log to create space. If problem persists, cold start system before continuing with troubleshooting.
6C01	**DS1 LOSS OF SIGNAL ALARM**	■ Service on line is lost. ■ T1 facility failure	Check T1 facility and report to service provider; otherwise no action is needed. If problem persists, contact the NTSC.
6C02	**DS1 BLUE ALARM**	■ All 1s are being received. ■ Service on link is lost. ■ Far end is out of service.	Check T1 facility and report to service provider; otherwise no action is needed. If problem persists, contact the NTSC.
6C04	**DS1 YELLOW ALARM**	■ Far end lost frame synchronization. ■ Service on line is lost.	Check T1 facility and report to service provider; otherwise no action is needed. If problem persists, contact the NTSC.

Table 5-2 Continued

Error Code	Screen Description	Possible Cause	Solution
6C05	**DS1 LOSS OF MULTIFRAME**	■ Service on link is lost.	Occurs only with common-channel signaling. Check T1 facility and report to service provider; otherwise no action is needed. If problem persists, contact the NTSC.
6C06	**DS1 REMOTE MULTIFRAME**	■ Far end is experiencing loss-of-multiframe. ■ Service on link is lost.	Occurs only with common-channel signaling. Check T1 facility and report to service provider; otherwise no action is needed. If problem persists, contact the NTSC.
6C07	**DS1 MAJOR ALARM**	■ Average bit error rate is greater than 10E-3. ■ Service on link is lost.	Check T1 facility and report to service provider; otherwise no action is needed. If problem persists, contact the NTSC.
6C08	**DS1 MINOR ALARM**	■ Average bit error rate is greater than 10E-6.	Check T1 facility and report to service provider; otherwise no action is needed. If problem persists, contact the NTSC.
6C09	**DS1 MISFRAME ALARM**	■ Misframe count reached 17.	Check T1 facility and report to service provider; otherwise no action is needed. If problem persists, contact the NTSC.
6C0A	**DS1 SLIP ALARM**	■ Slip count reached 88.	Check T1 facility and report to service provider; otherwise no action is needed. If problem persists, contact the NTSC.

Table 5-2 Continued

Error Code	Screen Description	Possible Cause	Solution
7001	**PRI SVC AUDIT TIMEOUT**	■ Timeout of B-channel service audit	Check PRI facility and report to service provider; otherwise no action is needed. If problem persists, contact the NTSC.
7002	**PRI SVC STATE INCONSIST**	■ Inconsistent B-channel service state	Check PRI facility and report to service provider; otherwise no action is needed. If problem persists, contact the NTSC.
7003	**PRI D-CHNL INOPER-ATIVE**	■ D-channel inoperative	Check PRI facility and report to service provider; otherwise no action is needed. If problem persists, contact the NTSC.
7004	**PRI B-CHNL NOT RELEASED**	■ Timeout of call-release message	Check PRI facility and report to service provider; otherwise no action is needed. If problem persists, contact the NTSC.
7005	**PRI B-CH GROUP INCONSIST**	■ Inconsistent B-channel trunk group	Check PRI facility and report to service provider; otherwise no action is needed. If problem persists, contact the NTSC.

Table 5-2 Continued

Error Code	Screen Description	Possible Cause	Solution
7402	**LOOP CONTROL BIT NOT SET**	■ No loop current	Test the line/trunk with a single-line telephone. If the problem is not in the line/trunk, swap the positions of similar line/trunk and station modules. If the problem follows the module, replace the line/tnmk and station module.
7403	**NO LOOP**	■ No loop current	Test the line/trunk with a single-line telephone. If the problem is not in the line/trunk, swap the positions of similar line/trunk and station modules. If the problem follows the module, replace the line/trunk and station module.
7404	**STUCK RINGING**	■ Continuous ringing from CO ■ AC power cross	Test the line/trunk with a single-line telephone. If the problem is not in the line/trunk, swap the positions of similar line/trunk and station modules. If the problem follows the module, replace the line/trunk and station module.
7801	**NOT IN NORMAL OP MODE**	■ During background port board check, system detected port board that was not in normal operation mode.	If problem persists, check or replace module.

Table 5-2 Continued

Error Code	Screen Description	Possible Cause	Solution
7802	**SANITY INT NOT GENERATED**	■ Station port board failure	If problem persists, check or replace module.
7803	**NO PORT BOARDS AVAILABLE**	■ No port boards are present.	No action is needed. Remove entry from transient log.
7804	**INVALID SANITY RESPONSE**	■ Station board failure	If problem persists, check or replace module.
7805	**INVALID SLOT ID FROM TA**	N/A	Contact the NTSC.
7806	**NOT IN STANDBY MODE**	■ Faulty module detected during cold start.	If problem persists, check or replace module.
7807	**SELF TEST NOT COMPLETED**	■ Faulty module detected during cold start or background check.	If problem persists, check or replace module.
7808	**TEST RESULT REGISTER BAD**	■ Faulty module detected during cold start or background check.	If problem persists, check or replace module.
7809	**TEST STATUS REGISTER BAD**	■ Faulty module detected during cold start or background check.	If problem persists, check or replace module.
780A	**DPR TEST NOT COMPLETED**	■ Faulty module detected during cold start or background check.	If problem persists, check or replace module.

Table 5-2 Continued

Error Code	Screen Description	Possible Cause	Solution
780C	**RAM TEST FAILURE**	N/A	Contact the NTSC.
7800	**ROM TEST FAILURE-UPPER**	■ Memory failed ROM test.	Replace the feature module. If problem persists, check or replace processor module.
780E	**ROM TEST FAILURE-TEST**	■ Memory failed ROM test.	Replace the feature module. If problem persists, check or replace processor module.
8001	**TA HARDWARE ERROR**	N/A	Swap the positions of similar line/trunk and station modules. If the problem follows the module, replace the line/trunk and station module. If the problem stays at that position, test the line/trunk.
8402	**WINK TOO SHORT**	■ Wink from far end is less than minimum for an outgoing tie trunk with delay-dial or wink-start. Line is waiting for valid signal. ■ Faulty cable	Check far end for proper operation and programming. Check for faulty cable. Replace the line/trunk and station module as needed.
8403	**NO EXTERNAL RELEASE**	■ Far end not disconnected within 4 minutes.	Check far end for proper operation and programming. Check for faulty cable.

Table 5-2 Continued

Error Code	Screen Description	Possible Cause	Solution
8404	**ON HOOK BEFORE WINK**	■ Far end went on-hook before handshake was completed on an outgoing tie trunk with delay-dial or wink-start, or on a DID trunk with wink-start.	If problem persists, check tie trunk configuration. Check the far end for proper working and translation. Check for faulty cable. Replace the line/trunk and station module as needed.
8405	**ON HOOK BEFORE READY**	■ Far end went on-hook before guard time elapsed on an outgoing tie trunk with delay-dial-start or wink-start, or on DID trunk with delay--dial-start or wink-start.	Check the far end for proper working and translation. Check for faulty cable. Replace the line/trunk and station module as needed.
8406	**INTERDIGIT TOO SHORT**	■ Noisy line	Check the far end to see if it is working and translated properly. Check for faulty cable. Replace line/trunk and station module as needed.
8407	**BAD UPDATE**	■ Invalid trunk parameter	Turn the power off for at least 1 second and then back on. Repeat system programming procedure. If the problem persists, replace the line/trunk and station module.

Table 5-2 Continued

Error Code	Screen Description	Possible Cause	Solution
8408	**ROTARY RATE > 12PPS**	■ Noisy line	Check the far end to see if it is working and translated properly. Check for faulty cable. Replace line/trunk and station module as needed.
8409	**ROTARY RATE < 8PPS**	■ Noisy line	Check the far end to see if it is working and translated properly. Check for faulty cable. Replace line/trunk and station module as needed.
840A	**BAD DOWNLINK MESSAGE**	■ Unrecognized message from the processor module to the line/trunk and station module ■ Unsteady power cycle	Turn power off for at least 1 second and then back on. Repeat system programming procedure. If problem persists, replace line/trunk and station module.
840B	**NO LOOP CURRENT**	■ Communication problems between the tine/trunk and station module and the CO ■ No loop current	Swap positions of similar line/trunk and station modules. If problem follows the module, replace line/trunk and station module. If problem stays at that position, test line/trunk.

Table 5-2 Continued

Error Code	Screen Description	Possible Cause	Solution
840C	**STUCK RINGING**	■ Continuous ringing from CO ■ AC power cross	Swap positions of similar line/trunk and station modules. If problem follows module, replace line/trunk and station module. If problem stays at that position, test line/trunk.
840D	**INCORRECT FIRMWARE STATE**	■ Incorrect system module firmware state	Turn power off for at least 1 second and then back on. Repeat system programming procedure. If problem persists, replace line/trunk and station module.
840E	**TRK UPLINK MESSAGE ERROR**	■ Unrecognized message from the processor module to the line/trunk and station module	Turn power off for at least 1 second and then back on. Repeat system programming procedure. If problem persists, replace line/trunk and station module.

Adapters, Acessories, and Applicaitons

6

This chapter provides descriptions and installation instructions for the adapters that connect adjuncts and accessories to the control unit and the telephones. It also describes accessories and applications that add features to the system.

Adapters

A variety of adjuncts (see Appendix B) can be connected to analog and digital telephones and to the system by using one of the following adapters: General Purpose Adapter (GPA), ISDN 7500B Data Module, Multi-Function Module (MFM), or Supplemental Alert Adapter (SAA).

General Purpose Adapter

A GPA permits the attachment of a tip/ring (T/R) device such as a single-line telephone, modem, or answering machine to an analog multiline telephone. The device must be touch-tone, not rotary.

Note: The GPA is intended for answer-only service. Calls must be originated (dialed) by using the associated analog multiline telephone. The GPA has no touch-tone receivers or pulse dial detectors for dialing.

Plug one end of a 4-pair cord into the V.T. jack on the back of the GPA and the other end into the OTHER jack on the underside of the telephone. Plug the cord from the adjunct into the TEL. EQUIP. jack on the GPA (see Figure 67).

Slide the switch on the back of the GPA to the setting that provides the GPA service required.

- **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, answering machine, or fax machine. Incoming calls ring only on the analog multiline telephone.
- **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.** This setting is used in two ways:
  - with a device, such as an answering machine or a modem, to answer calls. An Auto Answer–All button is needed so that calls can be answered automatically.
  - to make and receive calls on the telephone while using a computer or modem that is attached to the GPA. This is called “simultaneous voice and data.”

ISDN 7500B Data Module

See “ISDN 7500B Data Module” in Chapter 3.

Multi-Function Module

See "Install the Multi-Function Module” in Chapter 3.

Supplemental Alert Adapter

An SAA allows the connection of an extra alerting device, such as a bell or chime, to an analog muitiline telephone. Alerts notify people working in noisy areas of incoming, transferred, and inside calls.

Note: The MFM allows the connection of alerting devices to an MLX telephone.

Follow these steps to install an SAA (see Figure 68):

1. Plug the telephone cord into the jack labeled Telephone
2. Plug the cord from the external alert device into the jack labeled ALERTER.
3. Plug the cord from the station jack into the jack labeled Control Unit.

Unusable Adjuncts and Adapters

The following analog telephone adjuncts and adapters are not to be used with the system and, in some cases, will damage the device or the system if connected:

- 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)

Accessories

When adjuncts and adapters are connected to telephones, the power requirements of the telephone and the communications system increase. Adding a power accessory to an individual telephone or to the system accommodates these additional needs.

Power accessories can also be used for grounding and protecting special telephone connections. To install power units or power protection equipment, follow the instructions in the customer information booklet (CIB) included with the equipment. Other accessories provide backup for power failures and alarms for system malfunctions.

Telephone Power Unit

Connected between the telephone and the wall jack, the KS22911 and 329A power units provide additional power to individual telephones that have adjuncts, adapters, and/or Direct Station Selectors (DSSs) attached or to telephones far from the CU. Adding local power to a few telephones can reduce the system load.

A KS22911 kit for MLX telephones comes complete with a D6AP cord, the KS22911,L1 power supply unit, and a 400B or 400B2 adapter. For analog multitine telephones, the KS22911 kit includes the KS22911,L1 power supply unit, a D6AP cord, and a Z400F adapter.

The 329A power unit (PEC 31578) does not come in a kit, so the D6AP cord and the 400B or 400B2 adapter must be ordered separately.

Note: Telephone operation without adjuncts is guaranteed for a wiring run up to 1000 cable-feet from the CU.

Auxiliary Power Units

When a power demand of over 54 unit loads is placed on one power supply module, an Auxiliary Power Unit 9024 is generally needed and increases power by 27 unit loads.

To determine the number of unit loads for each power supply module on each carrier, see “Unit Loads” in Chapter 2 and Appendix D.

Note: Only one auxiliary power unit can be connected to the 391A power supply unit. If additional 48-VDC power is needed, connect some telephones to KS22911 or 329A telephone power units.

In-Range Out-of-Building (IROB) Protector

See "IROB Protection" in Chapter 3, “Installation.”

Power Failure Transfer

A power failure transfer (PFT) telephone is a single-line telephone connected to a PFT jack on a 400, 400/GS/LS/TTR, 800,800 GS/LS, 408, or 408 GS/LS module (see Figure 4). In the event of a power failure, the system shuts off and the PFT telephone automatically turns onto be used for making and receiving calls.

Notes:

- The PFT jack does not operate unless a power outage occurs or the power supply units are turned off.
- A single-line telephone connected to an MFM cannot be used as a PFT telephone.

- If PFT telephones are to be connected to GS lines/trunks, a GS button (see Figure 66) must be added to each PFT telephone. If the button is used with modular 2500 telephones, the button should be wired from the wall jack.
- If rotary lines/trunks are used, rotary telephones must be used as PFT telephones.

System Alarms

An alarm detected by the system can cause the CU to activate contact closures at a GS or LS port (programming of an LS port is preferred). When the contacts close, a signal is passed on to a Universal Paging Access Module (UPAM) and then to an external alert. Alerting devices can be a strobe, horn, bell, or chime.

A UPAM is needed because 48-VDC alerting devices require four contact closures and the GS or LS ports have only two. The UPAM provides the additional two.

Trouble Alarms

A GS or LS port can be programmed to activate an alarm connected to the port via a UPAM (see Figure 69). When system trouble (caused by hardware or software malfunction) is detected by the operator console, a signal is sent to that port. The port's switching contacts close and send the signal onto the UPAM, which activates an external alert.

Power Failure Alarm

A GS or LS PFT port can be programmed to activate an alerting device during a power failure. The device is connected to the port via a UPAM (see Figure 70). When a power failure occurs, the switching contacts on the PFT port close and send a signal to the UPAM, which activates an external alert.

Note: A PFT telephone cannot be used on this port when the port is connected for a power failure alarm.

Power Failure DID Busy-Out

The PFT port on a GS or LS module can be programmed to automatically short the busy-out wire pair associated with a group of DID trunks. Usually an LS line/trunk is used as the busy-out pair. When a power failure occurs, shorting this busy-out pair signals the CO that the DID trunks are out of service (see Figure 71).

Note: To remove the GS or LS module containing the PFT port for the DID busy-out, you must first short the busy-out pair and then disconnect the modular cord from the PFT jack. Otherwise, a false busy-out will occur. Remove the short after the system is powered up.

Applications

The following software and hardware applications can be installed on the system. See the customer information booklet (CIB) or installation manual (for UNIX*-based applications) that comes with each application for detailed installation instructions.

- stand-alone products
  - Call Accounting Terminal (CAT)
    - CAT—Business (CAT/B)
    - CAT—Hospitality (CAT/H)
  - MERLIN® Attendant for the MERLIN LEGEND™ Communications System
  - MERLIN MAIL™ Voice Messaging System for the MERLIN LEGEND Communications System
- MS-DOS†-based products
  - Call Accounting System (CAS) for the MERLIN LEGEND™ Communications System
    - CAS Plus—Business
    - CAS—Hospitality
  - Call Management System (CMS) for the MERLIN LEGEND™ Communications System
  - System Programming and Maintenance (SPM) for the MERLIN LEGEND™ Communications System — DOS

* Registered trademark of UNIX System Laboratories, Inc.

† Registered trademark of Microsoft Corporation

- UNIX-based products
  - Integrated Solution II (IS II)
    - — AUDIX Voice Power (AVP) — IS II
    - — Call Accounting System (CAS) — IS II
    - — Integrated Voice Power Automated Attendant (IVP AA) — IS II
    - — System Programming and Maintenance (SPM) — IS II

Voice Messaging Systems and Touch-Tone Receivers

The following applications are voice messaging systems (VMSs):

- MERLIN MAIL Voice Messaging System
- MERLIN Attendant
- AUDIX Voice Power—IS II
- Integrated Voice Power Automated Attendant---IS II

The system provides generic and integrated voice messaging interface (VMI) ports. The MERLIN MAIL Voice Messaging System and AUDIX Voice Power—IS II applications use streams of touch-tone codes (called mode codes) to communicate information.

Applications that use mode codes must be connected to integrated VMI ports. Applications (such as MERLIN Attendant and Integrated Voice Power Automated Attendant---IS II) that do not use mode codes connect to generic VMI ports. The tip/ring ports on 012 basic telephone modules are programmed to be 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 6-1). TTRs are supplied by the following modules: 008 OPT, 012, 400, and 400 GS/LS/TTR. However, the VMS applications are not supported on the 008 OPT module.

Table 6-1 TTRs Required by VMS

No. of VMS Ports	No. of TTRs Required	No. of 012 Modules	No. of 400 or 400 GS/LS/TTR Modules
1	1	1	0
2	1	1	0
3	2	1	0
4	2	1	0
6	3	2 or 1	0 1
8	4	2 or 1	0 1

Call Accounting System

The AT&T Call Accounting System (CAS) for the MERLIN LEGEND Communications System is ideal for medium- and large-sized 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-based Integrated Solution II (IS II) software application.

CAS runs on an approved AT&T MS-DOS-based PC. Two versions of this product are offered: CAS—Hospitality (CAS/H) for hotels and health care facilities and CAS Plus—Business (CAS Plus) for other types of businesses.

The CAS Plus and CAS/H applications allow companies to calculate the cost of calls by using the rates charged by AT&T and other carriers in one of 10 major metropolitan areas. Careful selection of the area that most closely matches the company's location and needs assures accurate costing. Rate information can be customized for a telephone exchange at an additional charge.

The CAS Plus application does the following:

- **Call Record Processing.** Screens call records, calculates the cost of valid calls, and stores the call records.
- **Report Generation.** Prints the stored call record information reports:
  - Summary Reports provide condensed information such as the number of calls, duration, and cost.
  - Organization Detail Report shows departmental telephone activity, allowing isolation of how specific extensions are used.
  - Selection Report allows specification of report criteria so that only call records that meet the criteria appear on the report.
  - Account Code Detail Report lists every call associated with each account code entered by users.
  - Facility and Cost Center Reports show the distribution of line/trunk usage over organizations or cost centers.

  - Preselected Reports provide a choice of up to five reports from any of the other report categories and can be printed on demand or at a specified time and date.

- **System Management** lets the system manager do administrative tasks, such as editing tables, setting up reports, and keeping call rate information up to date.
- **Directory Lookup and Message Center** lets the user look up anyone in the organization by name or extension, leave a message, and print or display messages.

Other features of CAS Plus include

- processing of local and short-duration calls or only calls that exceed a certain cost
- adding a service charge to calls before billing them to clients, departments, or projects
- displays with pull-down menus and on-line help

Considerations

- Only one CAS can be connected to the system.
- CAS operates on an approved AT&T PC operating with MS-DOS, version 3.3 or later. The PC must be dedicated to CAS.
- CAS collects detailed information on incoming and outgoing calls to outside numbers only. It does not collect information on calls between extensions.
- CAS does not provide for the processing of automatic number identification (AN I) information. However, the CAS-IS II does. (See "Integrated Solution II" in this chapter.)
- CAS handles call records up to 64 bytes; the number of calls depends on the amount of available disk space. In its largest version, CAS records data for up to 5,000 extensions and 15,000 account codes.

Hardware Requirements

A typical CAS system consists of the following equipment:

- An approved AT&T MS-DOS-based PC with the following configuration:
  - 640K RAM
  - Hard disk drive with at least 3 Mbytes of available space for the application software
  - parallel printer output
  - serial SMDR input
- 132- or 80-column parallel printer
- D8W modular cord and 355AF adapter connecting the SMDR port on the communications system to the COM1 serial port on the PC
- MS-DOS system disk version 3.3 or later
- CAS software (CAS/H, CAS Plus)

Installation

CAS can be installed by using the instructions supplied with the product. Highlights of these instructions areas follows:

1. Set up the equipment and identify the PC and MS-DOS software needed for CAS.
2. Complete the worksheets. Be sure the four CAS worksheets show all information you need on telephone lines and extensions, calling patterns and processing options, and departments and personnel.
3. Install the software. Load and test MS-DOS, version 3.3 or later, and the CAS application.
4. Enter the worksheet information. Use the planning worksheets to adjust the software to meet the needs of the customer.

Product References

- *Call Accounting System PIus — Business installation Guide*
- *Call Accounting System — Hospitality Installation Guide*

Call Accounting Terminal

The Call Accounting Terminal (CAT) is a stand-alone application that provides accurate and flexible call accounting at a low cost. Two versions of this product are offered, CAT—Hospitality for hotels and health care facilities and CAT—Business for other types of businesses. The CAT has built-in intelligence and memory for collecting and organizing call information, including the duration of calls, the area code dialed, and the account charged.

The CAT is customized with the latest local and long-distance rates for a company's location so the cost of calls can be calculated accurately. Telephone rate information is stored in a CAT component called an EPROM (erasable and programmable read-only memory). When telephone rates change or a new area code or exchange is added, the customer simply removes the EPROM and installs a new one.

The CAT provides a variety of reports that can be printed on a regular schedule or automatically when 90 percent of the terminal's memory contains call information. CAT reports include

- detailed and summary call information for all the extensions in the system or the same information for a single extension. If account codes are used to track outside calls, similar reports can be printed for the account codes.
- management analyses that organize call information by time of day, cost and duration of calls, area codes and exchanges called, and facilities used to make calls. These reports provide the information a business needs to make informed decisions and manage telephone costs.

Other features of the CAT are

- **flexible pricing.** CAT can be setup to calculate the cost of calls by using toll rates or to charge by the minute. Service charges and discounts can be applied to calls made to local and long-distance numbers and to directory assistance. Calls to certain area codes, such as 900, can also receive special treatment.
- **automatic updates.** When new telephone lines or account codes are added to the system, CAT adds this information automatically the first time a new line or code is used.
- **LCD display** instead of a printed menu
- **Automatic number identification (ANI)** for AT&T Megacom 800 service

  Note: The availability of the caller identification information may be limited by local-serving (caller's) jurisdiction, availability, or CO equipment.

Considerations

- Only one CAT can be connected to the system.
- A serial printer such as the AT&T 572 should be used so that the CAT can be connected directly to the SMDR port on the system's control unit. A parallel printer cannot be attached directly.
- The CAT is unable to process ANI information from the Integrated Services Digital Network (ISDN).
- The CAT can store call information on 5600 calls made from up to 125 telephones that share up to 49 lines. When 5040 of these calls have been processed, reports are printed and memory is cleared. Any calls that come in during this process are held until reports are printed again.

Hardware Requirements

- Call Accounting Terminal
- Serial printer (model 572 is recommended) connected via a serial cable to the SMDR port of the CAT
- D8W modular cord and 355AF adapter connecting the SMDR port on the communications system to the CAT

Installation

The CAT can be installed by using the instructions supplied with the product. Highlights of these instructions areas follows:

1. Before attaching the product to the CU and the printer, set the 10 CAT switches to establish the speed or baud rate for the CAT and its associated printer.
2. Connect the CAT, the printer, and the power supply. The CAT must be placed within the distance noted below:
   - control unit
     - — 14 feet (direct connection)
     - — 1000 feet (using building wiring)
   - serial printer (50 feet)
   - power supply — grounded wall outlet (4 feet)

     Note: Do not use an outlet that is controlled by a wall switch.
3. Test the CAT, following the instructions provided in the customer information booklet (CIB).

Product References

Customer information booklets:

- *Call Accounting Terminal—Business* (CIB 3122)
- *Call Accounting Terminal—Hospitality* (CIB 3123)

Call Management System

The Call Management System (CMS) for the MERLIN LEGEND Communications System is an MS-DOS-based software application that simulates the actions of a system operator by answering calls and distributing them to individual agent telephones. If no agents are available, CMS places calls on hold and, if programmed, plays a recorded announcement to the callers such as, “Thank you for calling the ABC Company. Please hold for the next available agent.” CMS then searches its network for the appropriate agent, usually the one who’s been idle the longest, and transfers the call to that person’s telephone.

CMS is appropriate for businesses with large groups of personnel who perform a common function, such as airline ticketing, filling catalog orders, and providing customer service. Agents within these groups can be divided into agent splits to handle different types of calls or customers. For example, the agents in a travel agency can be divided into three splits: one that handles personal vacations, one that handles business trips, and one that handles group charters. Another split can be designated for support when the call traffic is heavy in the other splits. Calls come into each of the splits on a group of lines designated to ring into the split.

Agents make themselves available and unavailable to take calls by logging in and out. Also, agents can enter the after-call-work (ACW) state, which allows them to complete work on their last call without being interrupted by new CMS calls.

The system can be setup so that agents are automatically in the ACW state whenever they complete a CMS call or so that agents must press a programmed button or dial a feature code to enter ACW.

Other features of CMS include

- easy-to-use management reports that analyze call volume and patterns, as well as agent activity
- Answer Delay option, which determines how long a call rings before it is designated as unanswered and is connected to the recorded announcement
- Forced Delay option, which connects calls to the recorded delay announcement regardless of whether all agents are busy when the calls come in
- designation of priority lines to ensure that calls coming in on these lines are answered first
- display of current agent activity on system status screens to allow monitoring, tracking, and analyzing of short- and long-term performance
- ability to connect Music-on-Hold to callers waiting for agents
- up to four external alerts to show when an exception has occurred; for example, an LED lights when the oldest call has waited longer than 30 seconds. Exception thresholds are programmed.
- summary reports from 1 to 93 days
- real-time dynamic reconfiguration, which lets the user modify the call flow on-line

Considerations

- The CMS cannot be connected to a system that is in Behind Switch mode.
- The CMS can handle calls for up to 28 agents on up to 28 lines, and it can answer calls on two lines at the same time with the same announcement.
- There can be up to six agent splits with 28 agents per split.
- Up to two CMSs can be installed on a system to handle a second set of lines if a business requires more than 28 lines or employs more than 28 agents.
- CMS operates on an approved AT&T PC with MS-DOS, version 3.3. The PC must be dedicated to CMS.
- The CMS supervisor's console is the MERLIN II System Display Console. CMS agents can have any MDX telephone or any analog multiline telephone that can be used with the system. CMS agent telephones must be connected to the first 58 telephone jacks on the control unit. (CMS allows only a two-digit method to specify an extension number; jacks 59 to 144 are designated by four digits.)
- 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 lines/trunks can be loop-start, ground-start, T1 emulated ground-start, or ISDN-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.
- A MERLIN 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 to the system that is compatible with an AT&T MOH coupler.

  Note: If you use equipment that rebroadcasts music or other copyrighted materials, you 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 you can purchase a Magic on Hold system, which does not require that you obtain such a license, from AT&T or your authorized dealer.

Hardware and Software Requirements

- an approved AT&T PC with 640K RAM, 3.5-inch floppy disk drive, and 20-Mbyte hard disk drive.
- an approved AT&T monochrome or color monitor
- CMS interface card with two 14-foot, 4-pair modular plug station cords and one 14-foot DIN connector cord for connection to DA-5 Digital Voice Announcer
- CMS software
- DA-5 Digital Voice Announcer
- parallel printer — AT&T 570 or 571 printer
- parallel printer 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 communications 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

Note: For a list of optional hardware that can be used with CMS, see the documentation provided with CMS.

Installation

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 system CU permits the connection of two CMS applications, and each application can use up to two PCs.

Product References

Call Management System (CMS) for the MERLIN LEGEND Communications System Installation and System Programming Guide

Integrated Solution II

Integrated Solution II (IS II) is a complete package of UNIX-based voice processing and call analysis software that helps to manage telephone usage and costs. IS II offers a single interface to and can include any of the following software:

- **Integrated Voice Power Automated Attendant (IVP AA) — IS II.** The IVP AA answers telephones automatically and transfers callers to the appropriate departments or extensions. Callers are offered a menu of recorded prompts that they respond to by dialing numbers on a touch-tone telephone. Callers without touch-tone telephones can be transferred to the system operator, who then handles their calls. Separate menus for day and night service as well as multilevel menus and corresponding announcements can be set up to ensure that callers reach the right person or department quickly.

IVP AA can operate in touch-tone gate mode or in no-gate mode. To speed handling of calls from touch-tone telephones, gate mode prompts callers to dial 1 to continue to the main menu. If a 1 is not dialed within a programmed interval, calls are automatically transferred to the system operator. In the no-gate mode, callers hear the main menu immediately, and if no response is received after the main menu is played, calls are transferred to the system operator.

IVP AA is a low-cost alternative for businesses that need enhanced call handling without the added voice messaging capabilities of AUDIX Voice Power — IS II.

- **AUDIX Voice Power (AVP) — IS II.** AVP offers all the features of the IVP AA combined with the following services:
  - **Call Answer.** When callers reach a busy extension or there is no answer, this service allows callers to leave a message, transfer to another extension, or transfer to a system operator. Users can program a personal greeting or select a standard greeting and can program a password to prevent others from getting their messages.
  - **Voice-Mail.** This service allows users to send messages to other extensions in the system, forward received messages (along with comments), and reply to received messages. The system manager can send general messages to everyone in the system.
  - **Information Service.** This service provides a call-in information service that plays a recorded message and then disconnects the caller.
  - **Message Drop.** This service offers an answering service (similar to an answering machine), that gives the caller a message and then allows the caller to “drop off” a message, such as a request for service or an order. Callers cannot direct their messages to specific extensions.

- **Call Accounting System (CAS) — IS II.** CAS collects and analyzes call information, calculates the costs of calls by using rates selected by the business, organizes calls by client or project, and prints reports on a daily or as-needed basis. CAS — IS II provides all the functionality of CAS Plus, along with ANI. (For more information on the features of CAS, see "Call Accounting System" in this chapter.)
- **System Programming and Maintenance (SPM) — IS II** SPM is a programming package built into IS II that allows the system manager or a system technician to upgrade and maintain the system and its features and to add, change, or rearrange telephones. Programming can be done on-site or remotely.

The number of incoming lines and subscribers programmed for AVP or IVP AA and the number of busy-hour calls determine how many voice channels are required for the user's system (see Table 6-2).

Table 6-2 Voice Channels Required

No. of Channels Required	Lines	Subscribers	Busy-Hour Calls
2	1 to 6	1 to 20	1 to 20
4	7 to 18	21 to 60	21 to 60
6	19 to 24	61 to 80	61 to 80
8	25 to 42	81 to 200	81 to 200
12	Over 42	201 to 300	201 to 300

IS II also includes the following features:

- **Dial by Name** permits AVP users to call subscribers by dialing the last name of the subscriber instead of dialing the extension number.
- **Alternate Personal Greetings** allows a user to record a second personal greeting in addition to the primary call answering greeting.
- **Fax Transfer** directs incoming fax calls to a designated fax machine.
- **Class of Service** allows the system manager to assign one of 16 predefine parameters to a subscriber. These parameters define the size of the mailbox, the type of coverage, and the activation of the outcalling feature.
- **General Mailbox Options** are two special mailboxes that have reserve extensions. Callers using rotary telephones or needing assistance can be transferred to leave messages in a general mailbox. Subscribers having problems with the system can report them to the trouble mailbox.

Considerations

- IS II uses UNIX System V, Release 3.2.2.
- IS II stores up to 12 hours of voice-mail messages when IS II includes AVP and over 200,000 call accounting records when IS II includes CAS.
- Either IVP AA or AVP can be installed, but not both.
- For IVP AA or AVP, the VMI loop-start ports should be programmed for “reliable” far-end disconnect.
- If IS II includes AVP, when users receive voice-mail messages, the message LEDs on their telephones turn on, if a 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.
  - AVP or IVP AA fails to transfer calls.
  - Calls fail to ring or calls go to coverage prematurely.
- CAS — IS II uses the call information provided by the system's built-in SMDR feature to process calls.
- SPM — IS II reports can be printed out or can be written to a disk (hard or floppy); however, if they are written to a disk, they cannot be looked at (write-only file).
- SPM — IS II reports should not be printed while the system is handling more than 100 calls per hour.
- Only the CAS — IS II and the SPM — IS II applications can be connected to a system operating in Behind Switch mode.

Hardware Requirements

- IS II uses an AT&T Master Controller — an 6386/SX WGS processor with UNIX System V/386, Release 3.2.2 including:
  - Master Controller II processor (with 40-Mbyte, 80-Mbyte, or 200-Mbyte hard disk and a 3.5-inch floppy disk drive). An 80-Mbyte or 200-Mbyte hard disk drive is required if IS II includes either IVP AA or AVP.
  - video monitor (monochrome or color)
  - keyboard
  - optional tape drive (required for systems with a 200-Mbyte hard disk for saving UNIX files, application program files, administrative files, and voice system files during backup)
- A 355 AF adapter for connecting the Master Controller to the serial port on the control unit if they are within 50 feet 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 feet of each other and/or are not on the same AC branch circuit
- Any additional hardware required by the individual applications included in IS II, including the cables and adapters for connecting the applications to the system
- IVP4 boards
- 012 basic telephone module to provide the tip/ring interface for IVP AA or AVP

Installation

Install IS II by using the instructions supplied with the product. Highlights of these instructions areas follows:

1. Setup the equipment and identify the hardware for IS II.
2. Connect the hardware as shown in the instructions.
3. Install the software. Test the IS II application.

If a voice application is installed you will need two 125-Mbyte tape cartridges for system backup.

Product References

Integrated Solution II Installation and Maintenance Guide

MERLIN Attendant

The MERLIN Attendant is a stand-alone application that provides operator-like services through the use of prerecorded messages and electronic switching.

The Attendant automatically answers incoming calls on designated lines with a recorded greeting and transfers these calls to extensions or departments based on information provided by the caller. Since the Attendant can respond only to touch-tone telephone signals, the announcement asks callers who dial from rotary telephones to wait for the system operator.

Calls can be transferred in one of two ways, either “blind” or “supervised.” A blind transfer means the Attendant dials the extension or department requested by the caller and disconnects. If the call is not answered or the phone is busy, the caller is routed to the system operator.

With a supervised transfer, the Attendant transfers the call and can retrieve it if the transfer is unsuccessful. The Attendant then directs the call to another telephone, allows the caller a second route choice, or provides a failed-transfer announcement, depending on how the application has been programmed.

Calls can be answered immediately (Primary Call Handling) or after a delay (Secondary Call Handling), for example, if the call goes unanswered by the system operator after a certain number of rings. Table 6-3 shows the number of Attendants required based on a Primary Call Handling situation.

Table 6-3 Number of Attendants

No. of Attendants Required	2	3	4
Incoming Lines/Trunks	1 to 6	7 to 9	10 to 12
Busy-Hour Calls	1 to 25	25 to 50	50 to 100

Considerations

- The MERLIN Attendant cannot be connected to a system that operates in the Behind Switch mode.
- The MERLIN Attendant cannot be connected to a system that has an AUDIX Voice Power application or a MERLIN MAIL Voice Messaging System installed.
- A maximum of four Attendants can be connected to the system (see Table 6-3).
- All VMI loop-start ports should be programmed for “reliable” far-end disconnect.
- The Attendant can answer every call that comes in or just answer calls that ring on certain lines.
- Unanswered transferred calls do not return to the Attendant; they are redirected to a designated extension, such as the system operator.
- If the extension called is busy or unanswered or if it is after business hours, calls can be directed to an answering machine to allow callers to leave messages.
- The Attendant can direct and transfer calls to fax machines.
- The system may need more touch-tone receivers if
  - Single-line telephone users do not get dial tone.
  - AVP or IVP AA fails to transfer calls.
  - Calls fail to ring or calls go to coverage prematurely.

- When the Attendant is set up for after-hours operation, the time on the Attendant's clock must match the system clock so the end of the business day is recognized.
- The Attendant provides 64 seconds for recording up to five standard messages, including the caller greeting used during and after business hours, a hold announcement for a caller who is being transferred, a connect announcement for the department or extension receiving a transferred call, and a message explaining that a call cannot be completed.

Hardware Requirements

- 012 basic telephone module
- MERLIN Attendant unit and cords

Installation

Although the Attendant physically plugs into only one jack on the 012 basic telephone module, it functionally takes up three ports. Some AC power strips maybe needed since the Attendant is powered by wall-mounted transformers (10 VAC).

Notes:

- Only four ports on the same 012 basic telephone module can be used simultaneously with Attendant. When four ports are used for Attendant, only one other port can be connected to a telephone.
- Powering and grounding procedures must follow those established for T/R telephones that require auxiliary power.

Product References

MERLIN® Attendant Installer's Guide.

MERLIN MAIL Voice Messaging System

The MERLIN MAIL Voice Messaging System for the MERLIN LEGEND Communications System offers integrated call management services at low cost:

- **Automated Attendant.** This service answers telephones automatically and transfers callers to the appropriate departments or extensions. Callers hear a series of recorded prompts that they respond to by dialing numbers on a touch-tone telephone. If there is no answer or the extension is busy, callers can leave a message or try another extension. Callers without touch-tone telephones can be transferred to the system operator, who then handles their calls.

  Separate menus for day and night service, as well as multilevel menus and corresponding announcements, can be set up to ensure that callers reach the right person or department as quickly as possible.

  In addition, the Automated Attendant can direct calls to a fax machine. If the fax machine is busy or does not answer, the call is automatically disconnected.

  A call transfer by the Automated Attendant is either “blind” or “supervised.” A blind transfer means the Automated Attendant dials the extension or department requested by the caller and disconnects. If the call is not answered or the telephone is busy, the call is routed to the system operator.

  With a supervised transfer, the Automated Attendant transfers the call and can retrieve it if the transfer is unsuccessful. The Automated Attendant then directs the call to another telephone, allows the caller a second route choice, or provides a failed-transfer announcement, depending on how the application has been programmed.

- **Call Answer.** When callers reach a busy extension or there is no answer, Call Answer connects the caller to the personal greeting of the called person and allows the caller to leave a message in that person's mailbox. If no personal greeting is available, the caller gets a general message with the recorded name of the called person and then is instructed to leave a message.

  If the called person's mailbox is full, Call Answer connects the caller to a general mailbox. Here the caller gets a message with the recorded name of the called person and can leave a recorded message. The system manager is responsible for forwarding the messages in the general mailbox to the appropriate users.

  If the general mailbox is full, Call Answer tells the caller and the caller can transfer to another extension.

  When a user receives a message, the message LED on the telephone goes on. If a message is left in the general mailbox, the system manager's message LED goes on.

- **Voice-Mail.** This service allows users to send messages to other extensions in the system, forward messages received along with comments, and reply to messages received. Users also can record a personal greeting and program a password to help prevent others from retrieving their messages.

The number of incoming lines and subscribers programmed for Automated Attendant service and the number of busy-hour calls determine how many MERLIN MAIL Voice Messaging System ports are required for the user's system (see Table 6-4).

Table 6-4 MERLIN MAIL Ports Required

No. of Ports Required	2	4
Incoming Lines/Trunks	1 to 6	7 to 18
No. of Subscribers or Busy-Hour Calls	1 to 20	21 to 60

Other MERLIN MAIL Voice Messaging System features are the following:

- **Outcalling** automatically calls the user at a number that the user has programmed when a new message is received. The user can then log in to the voice messaging system to retrieve messages.
- **Pager Notification** calls the user at a designated pager number when a new message is received. However, the user cannot log in to the voice messaging system.
- **Broadcast Lists** allows the system administrator to send a message to every user on the MERLIN MAIL Voice Messaging System. However, this message does not light message-waiting LEDs and does not cause outcalling.
- **Fax Transfer** directs an incoming fax call to a designated fax station—a single machine or a calling group with several machines.
- **Announcement Service** allows a caller to enter a code for information about specific subjects, such as new product information or marketing programs.

Considerations

- The MERLIN MAIL Voice Messaging System cannot be connected to a system in the Behind Switch mode.
- The MERLIN MAIL Voice Messaging System is available in 2-port and 4-port configurations. Both models have four hours of message storage capacity.
- Only four ports on the same 012 basic telephone module can be used simultaneously with the MERLIN MAIL Voice Messaging System. When four ports are used for the MERLIN MAIL Voice Messaging System, only one other port can be connected to a telephone.
- The size of a user's mailbox—that is, the number of minutes of messages that a mailbox can hold—can be matched to individual needs. A mailbox can be set up to hold a maximum of 15 minutes of messages.
- When users receive voice-mail messages, the message LEDs on their telephones turn on, provided that a mailbox has been assigned to each of those telephones.
- All VMI loop-start ports should be programmed for "reliable" far-end disconnect.
- Callers who dial from rotary telephones cannot use the features of the MERLIN MAIL Voice Messaging System and should be directed to the system operator during business hours.
- Automated Attendant can answer calls immediately (Primary Call Handling) or after a delay (Secondary Call Handling), for example, when a call remains unanswered by the system operator after a certain number of rings.
- The system may need more touch-tone receivers if
  - Single-line telephone users do not get dial tone.
  - AVP or IVP AA fails to transfer calls.
  - Calls fail to ring or calls go to coverage prematurely.

- The MERLIN MAIL Voice Messaging System does not work with the MERLIN Attendant.
- Programming of the MERLIN MAIL Voice Messaging System is done via a touch-tone interface. The MERLIN MAIL Voice Messaging System is equipped with an RS-232 serial port and an external modem to support remote diagnostics.

Hardware Requirements

- 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 basic telephone module

  Note: Additional touch-tone receivers (TTRs) maybe needed to allow the 012 module to handle a large number of voice connections.

Installation

MERLIN MAIL Voice Messaging System connects to two or four 012 basic telephone module jacks on the system's CU.

MERLIN MAIL Voice Messaging System unit can be desk or wail mounted and should be placed in an area with low humidity and proper ventilation.

Note: Follow the power and ground procedures for T/R telephones that require auxiliary power.

Product References

MERLIN MAIL™ Voice Messaging System for the MERLIN LEGEND Communications System Installation, System Programming, and Maintenance

System Programming and Maintenance

System Programming and Maintenance (SPM) for the MERLIN LEGEND Communications System is an MS-DOS-based software application that allows the use of a personal computer (PC) for programming and maintaining 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's display shows the same button and screen layout as an MLX-20L telephone.

Either a PC with SPM can be connected directly to the system or SPM can be accessed remotely in one of the following ways:

- Using Remote Access, the system programmer dials the system directly. A password can be set up to prevent unauthorized access.
- The system programmer dials the system operator and asks to be transferred to the system's built-in modem.

Considerations

- SPM operates with MS-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 RS-232 jack on the processor module of the control unit. The RS-232 baud rate is 1200/2400 bps with auto speed adjust.
- The SPM reports can be printed out or can be saved to a disk (hard or floppy).
- SPM reports should not be printed while the system is handling more than 100 calls per hour.
- A printer connected to the PC with SPM can be used to print system programming reports. Or reports can be sent to the printer that is connected to the SMDR port on the system's control unit.
- SMDR information maybe lost while system programming reports are printed via the SMDR port.
- A UNIX-based version of System Programming and Maintenance is available as part of Integrated Solution II, discussed earlier in this chapter.

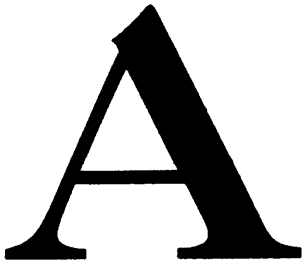
Hardware Requirements

- an approved AT&T PC or other MS-DOS compatible PC with the following:
  - at least 128K of RAM
  - a double-sided floppy diskette drive (either 5 1/4" or 3 1/2")
  - 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 modular cord and 355AF modular adapter if PC is within 50 feet of the control unit. Distances of greater than 50 feet require back-to-back ADUs.

Installation

See “PC with MERLIN LEGEND System Programming and Maintenance” in *MERLIN LEGEND System Programming* for installation instructions.

Wiring



The following tables summarize the basic conductor wire connections in the MERLIN LEGEND Communications System. The diagrams that follow the tables show the main wiring schemes.

Wiring Tables

Table A-1 LS, GS/LS, DID, and OPT 6-Position Jacks

CU Jack		D2R Cord		RJ11 Network Interface		
Desig.	Pin	Plug	Plug	Desig.	Pin	Color
T	3	3	4	T	4	Green
R	4	4	3	R	3	Red

Table A-2 Tie-Trunk and DS1/PR1 8-Position Jacks

E&M Desig.	DS1 Desig.	Jack Pin	Pair #	D8W Cord Color	103A Term Strep	DIW Cable Color
T	T(xmt)	5		G	1	W-BL
R	R(xmt)	4	1	R	2	BL
T1	T1 (rcv)	1		BL	3	W-O
R1	R1(rcv)	2	2	O	4	O
E	n/c	3		BK	5	W-G
M	n/c	6	3	Y	6	G
n/c	n/c	7		BR	7	W-BR
n/c	n/c	8	4	S	8	BR

Table A-3 Tie-Trunk Jack to RJ2GX Network Interface

Pin	C U Jack	Trk 1	Trk 2	Trk 3	Trk 4	Trk 5	Trk 6	Trk 7	Trk 8
T	5	26	29	32	35	38	41	44	47
R	4	1	4	7	10	13	16	19	22
T1	1	27	30	33	36	39	42	45	48
R1	2	2	5	8	11	14	17	20	23
E	3	28	31	34	37	40	43	46	49
M	6	3	6	9	12	15	18	21	24

Table A-4 T/R, Analog Multiline Telephone, and MLX 8-Position Station Jacks

T/R Desig.	Jack Pin	Analog Multiline Telephone Desig.	MLX Desig.	Pair #	D8W Cord Color	103A Term Strep	DIW Cable Color	25-Pr. Conn. Pin
T	5	V1T	TRMT-		G	1	W-BL	1
R	4	V1R	TRMT+	1	R	2	BL	26
n/c	1	CT	n/c		BL	3	W-O	2
n/c	2	CR	n/c	2	O	4	O	27
n/c	3	-48V	REC+		BK	5	W-G	3
n/c	6	GND	REC-	3	Y	6	G	28
n/c	7	V2T*	-48 V		BR	7	W-BR	4
n/c	8	V2R*	GND	4	S	8	BR	29

* These leads are connected at telephones for Voice Announce to Busy but are not connected at the CU. Voice Announce to Busy and Simultaneous Voice and Data require two adjacent odd/even jacks connected to the station via adapter BR-241-B1.

Table A-5 Eight-Pin RS-232 Flow Control Cable

Pin No.	Processor (DCE)	Data Term (DTE)
1		
2	DSR	CTS
3	DTR	DTR
4	GND	GND
5	RXD	
6	TXD	
7	+5	DSR
8		

Wiring Diagrams

The following illustrations are examples of different wiring applications for the MERLIN LEGEND Communications System.

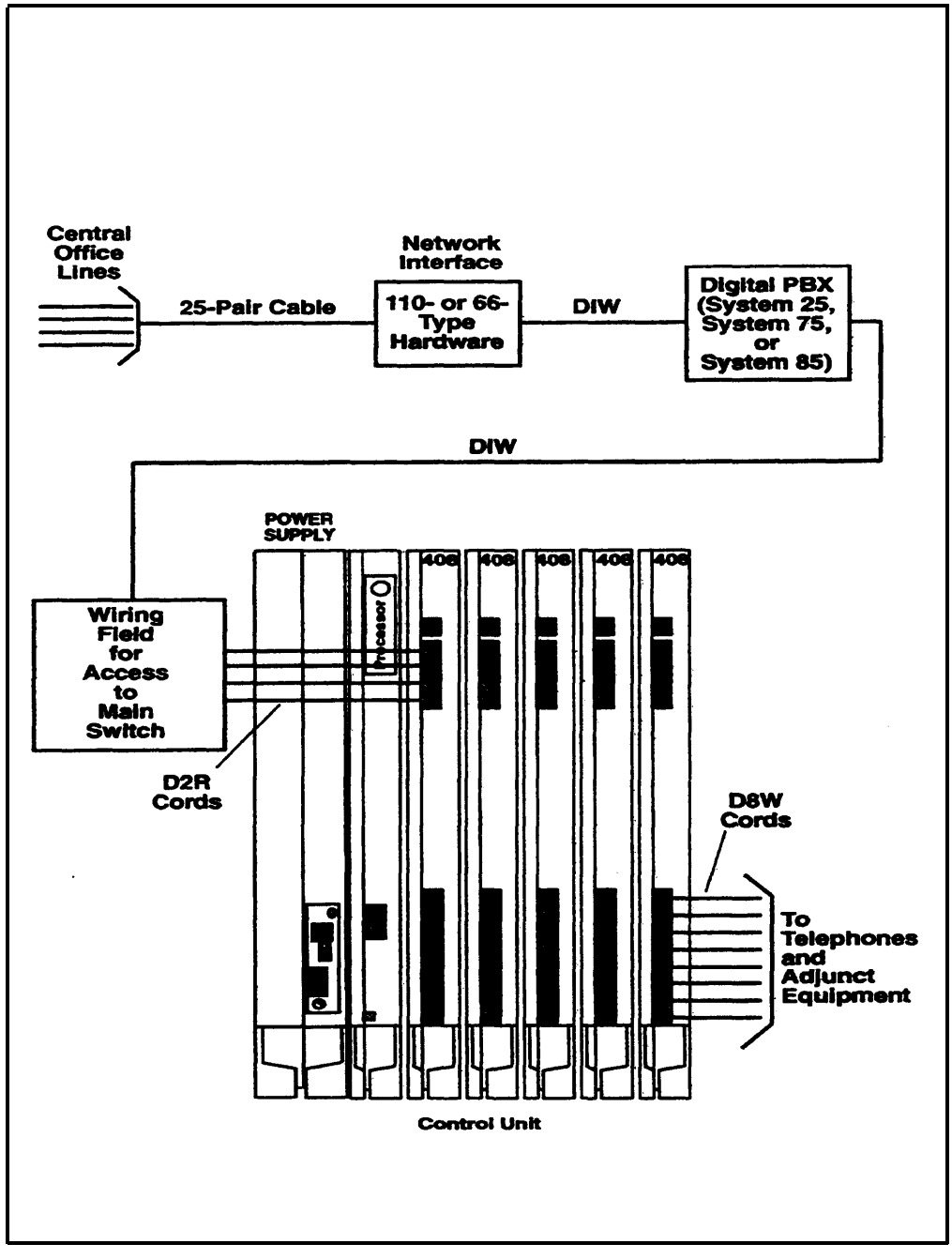


Figure A-1 Behind Switch Wiring

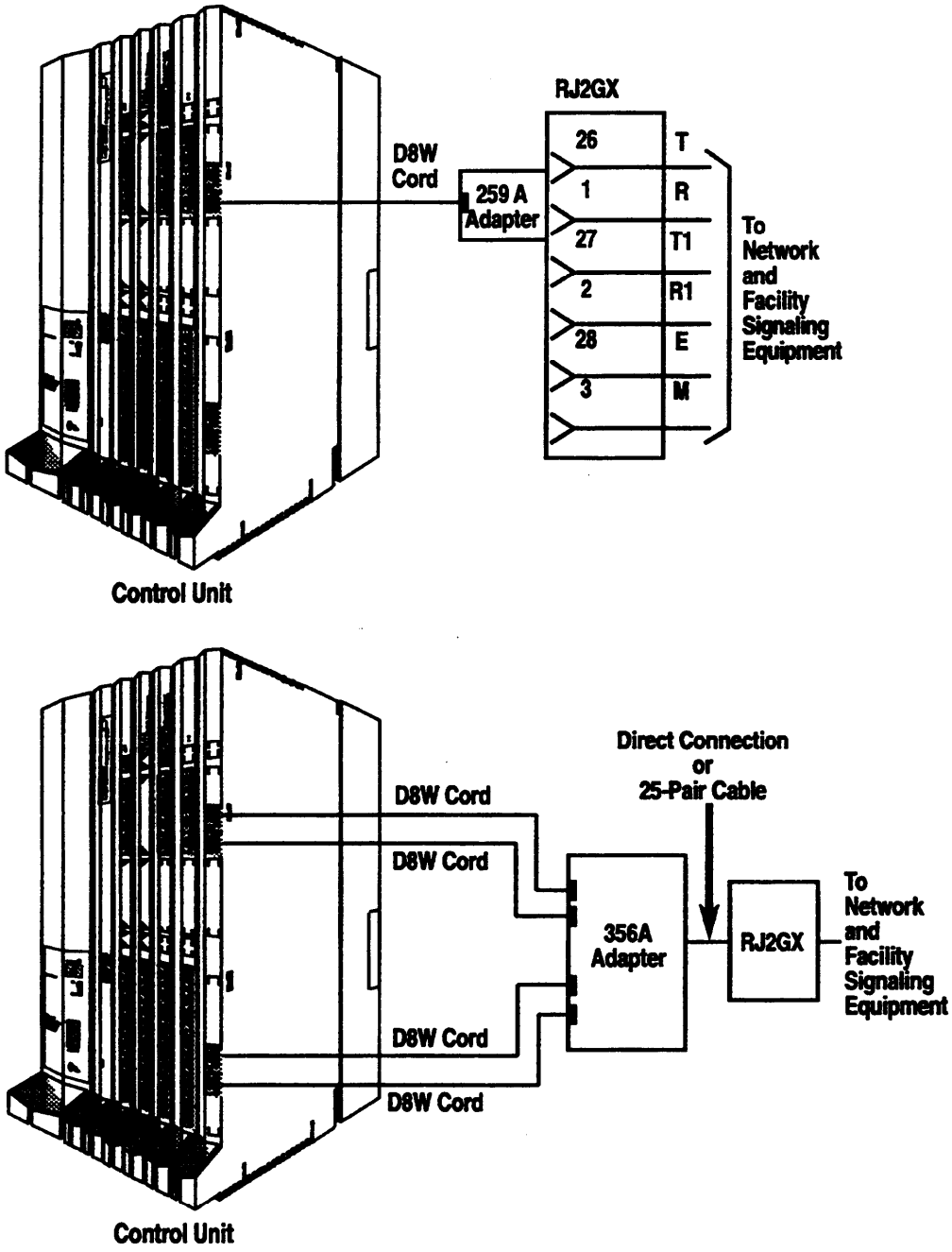


Figure A-2 Tie-Trunk Wiring

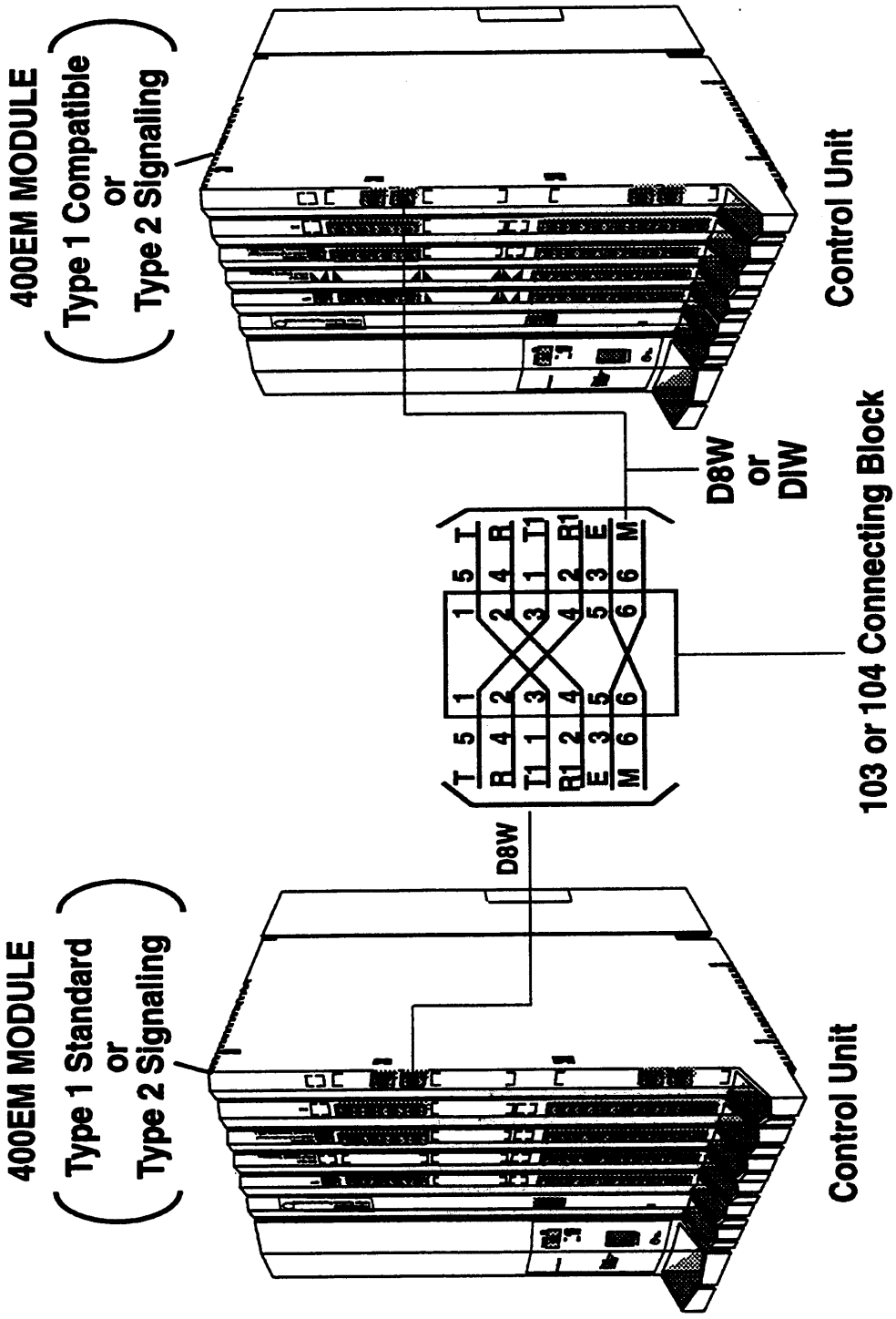


Figure A-3 Back-to-Back Tie-Trunk Wiring

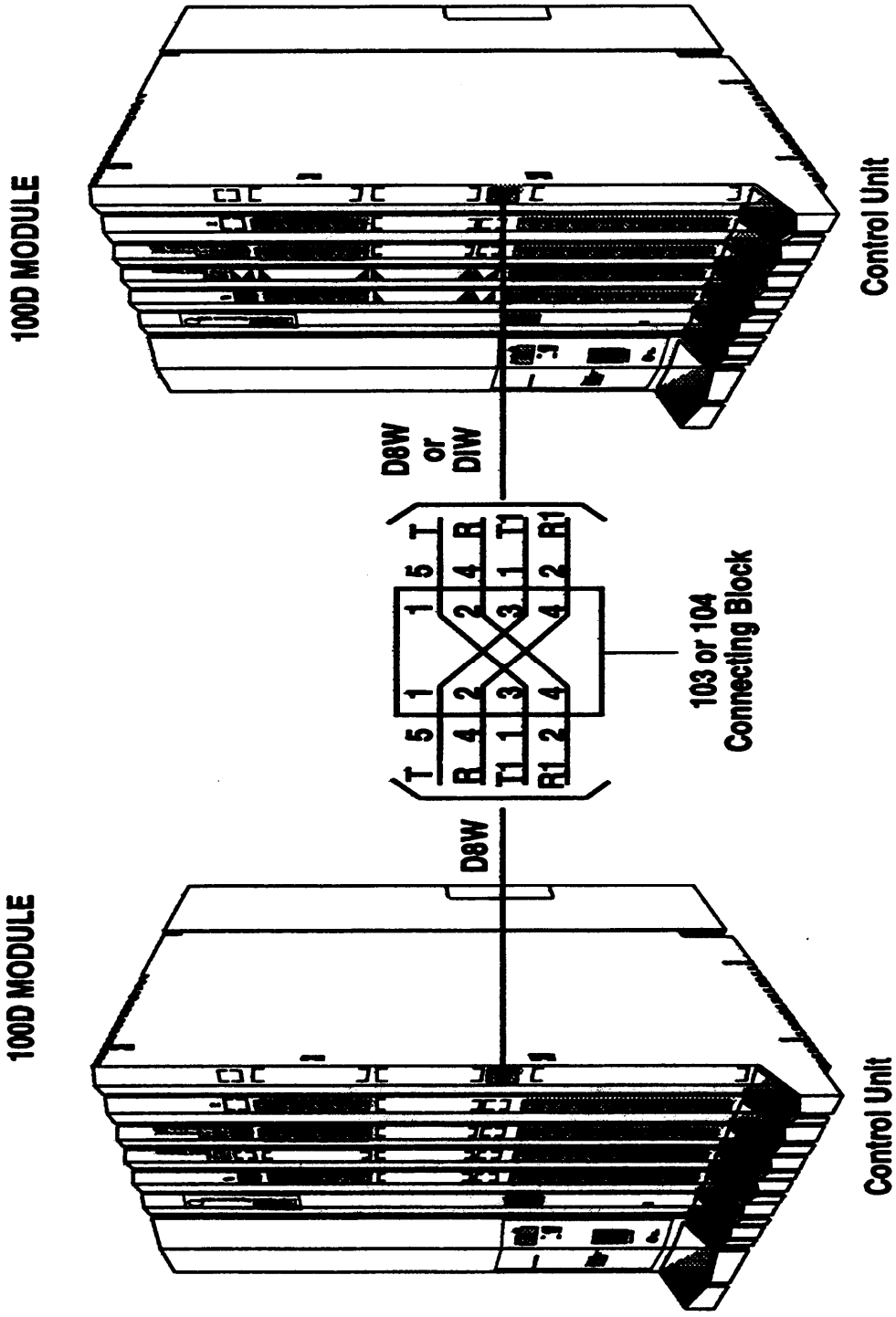


Figure A-4 Back-to-Back 100D Modules

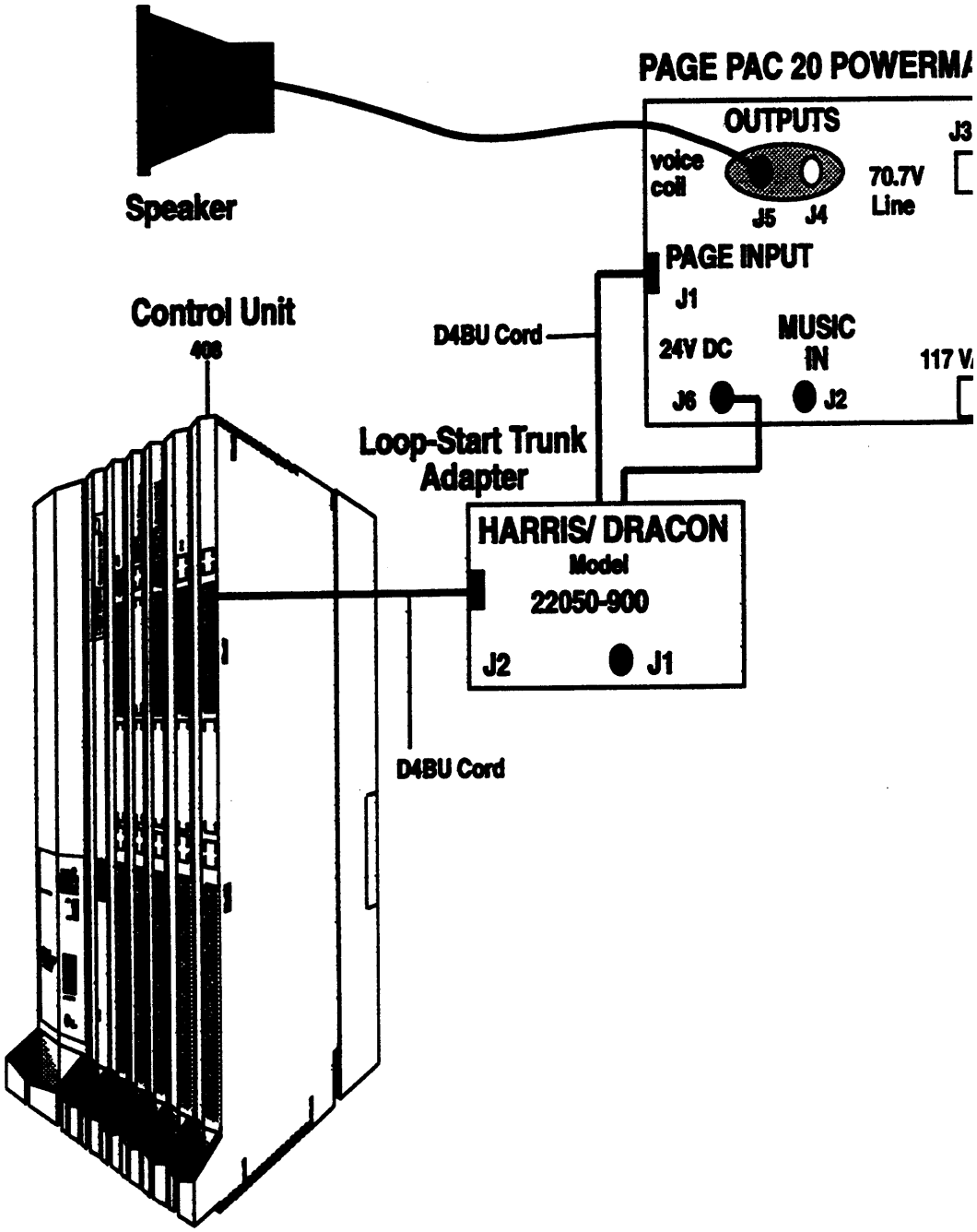
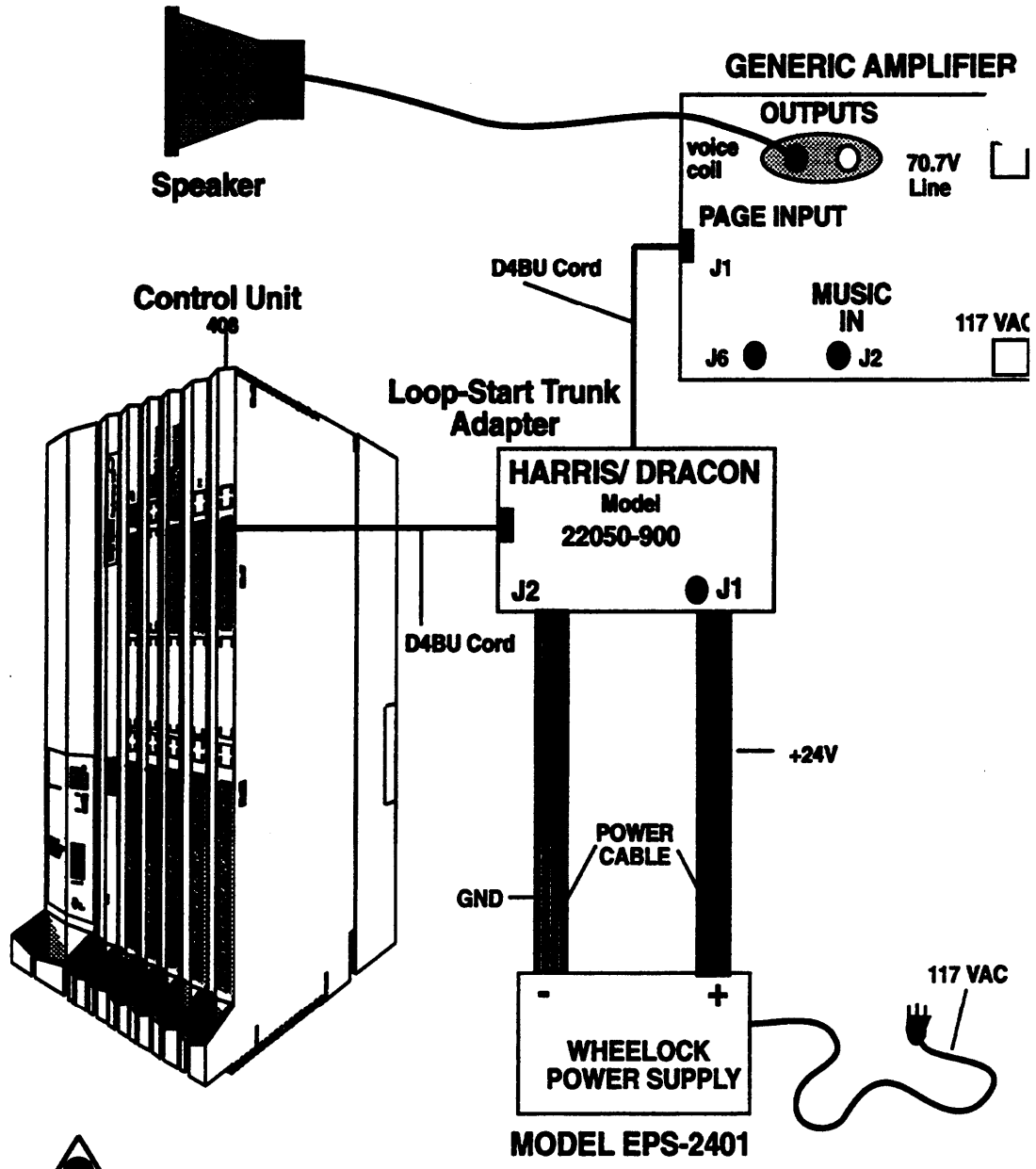
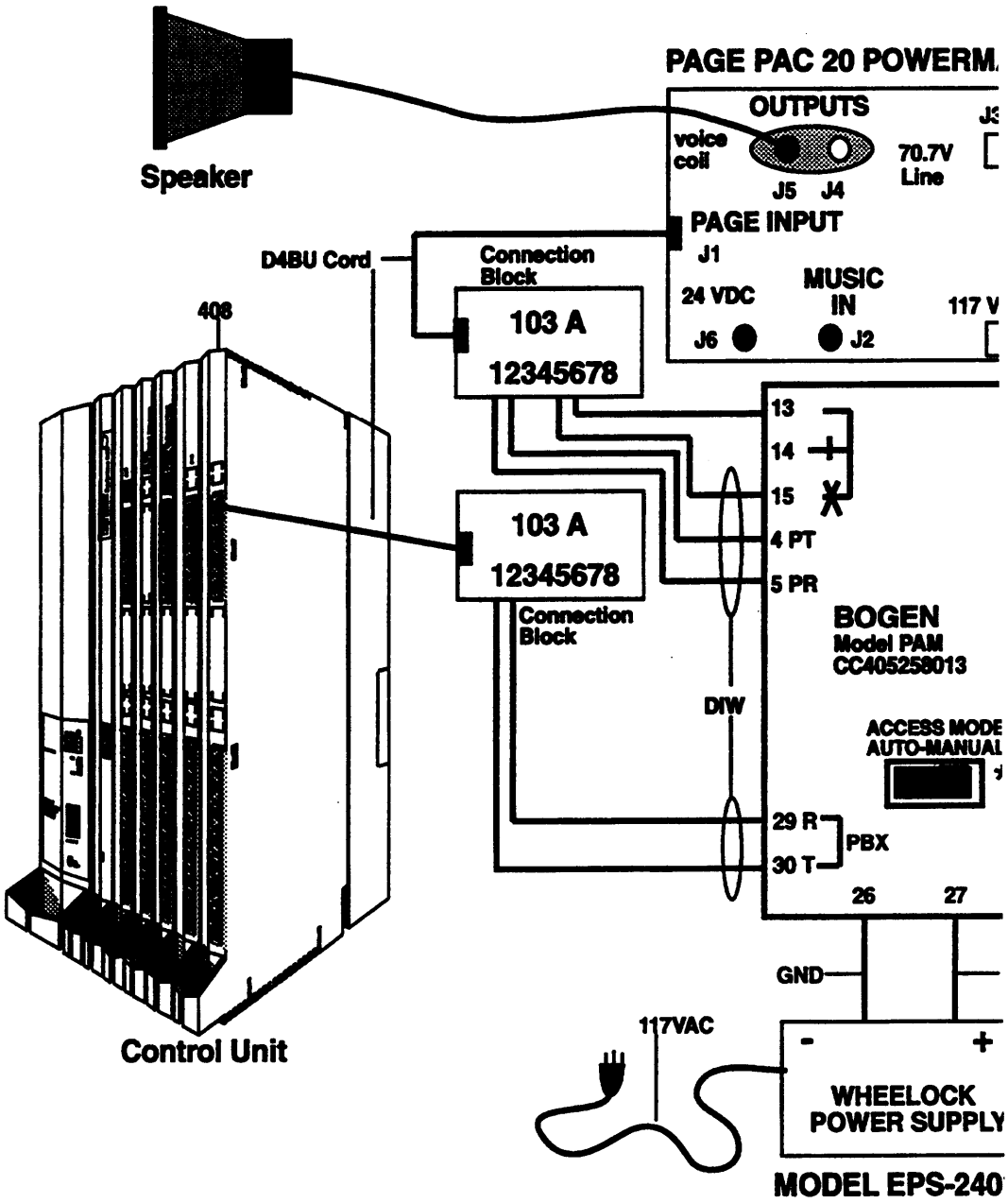


Figure A-5 Single-Zone Paging with PagePac 20



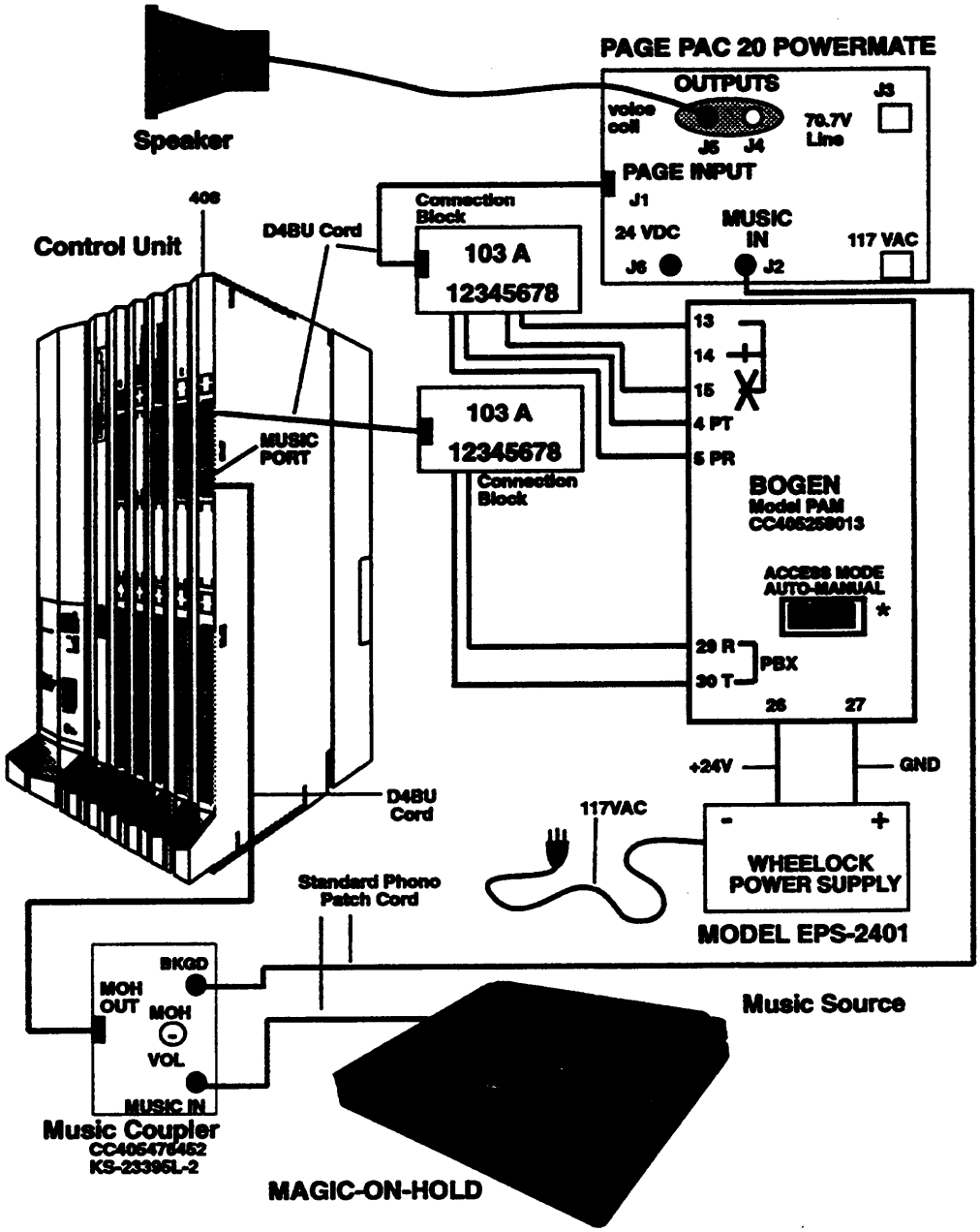
WARNING! The black wire form the LS trunk adapter power cable must be connected to the + input of the Wheelock PS. The grey on black wire must be connected to the - input.

Figure A-6 Single-Zone Paging with Customer-Supplied Amplifier



*** Access mode switch should be set to** MANUAL.

Figure A-7 Single-Zone Paging with Paging Access Module



•Access mode switch should be set to MANUAL

Figure A-8 Single-Zone Paging with Background Music and MOH

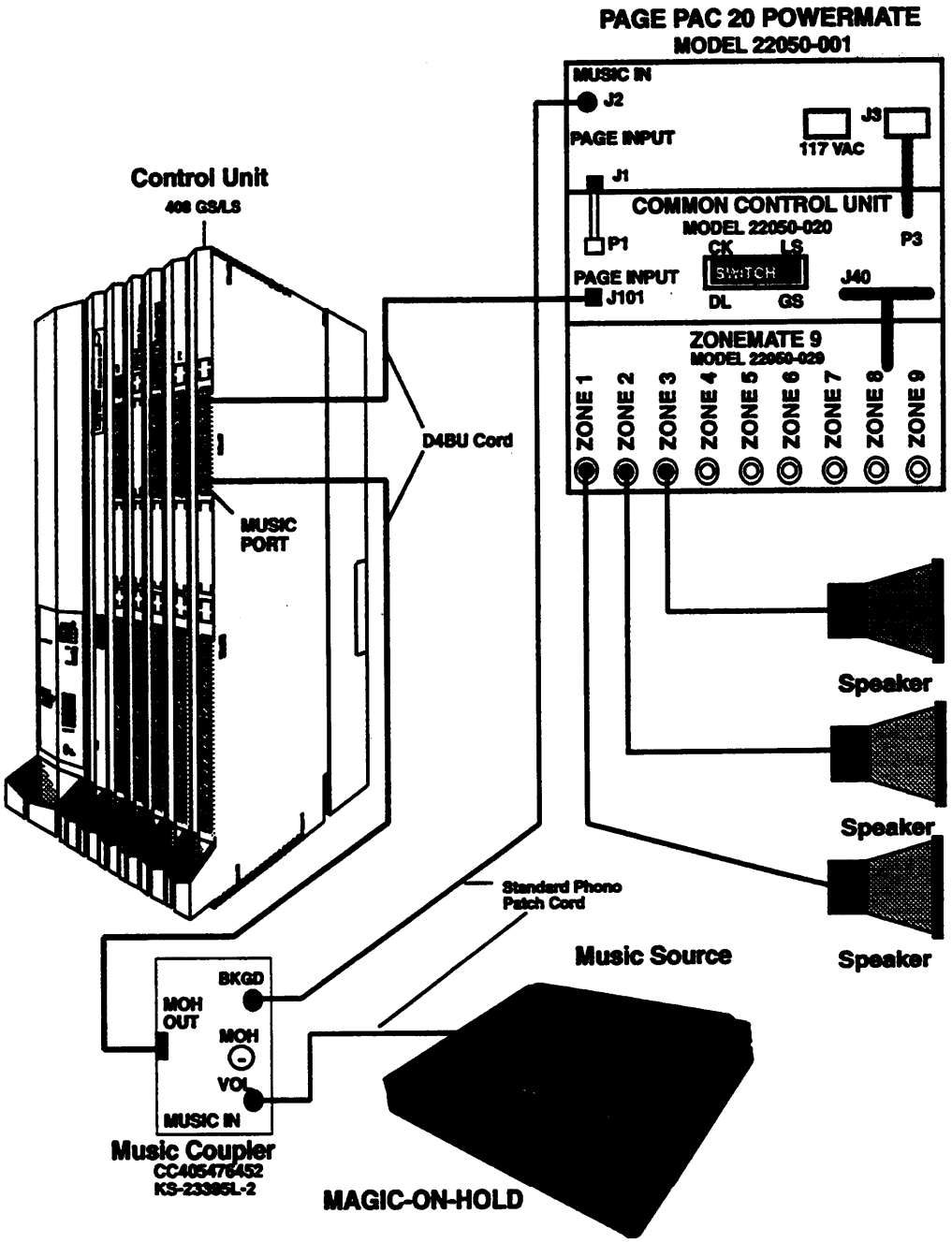


Figure A-9 Multizone Paging with Background Music, MOH, and Talk-Back

Adjuncts

B

The following table summarizes the types and specifications of adjuncts that can be connected to the MERLIN LEGEND Communications System, the available AT&T products and associated ordering codes (PECs), and the appropriate interfaces. A description of each equipment type follows the table.

Table B-1 Adjunct Types and Specifications

Equipment Type	Specifications	AT&T Products	PEC
Alerts (AC)	■ Any audible or visual alert that operates on 20-30-HZ ringing signals ■ A device associated with a specific station (supplemental alert)or that works on a programmed line/trunk port (external alert)	External ringer-loud External ringer	31016 31019
Alerts (DC)	■ Any audible or visual alert that operates on 48-WC ringing signals ■ A device associated with a specific station (supplemental alert) or that works on a programmed line/trunk port (external alert)	Alert bell Alert horn Alert Strobe Alert chime Alert deluxe horn Alert switch	61212 61213 61221 61222 61223 61215
Answer/record machine	■ Industry—standard machine ■ Low-ringer equivalence (less than 0.15 or ≤ 1.0 total REN for T/R port) ■ Ability to recognize 600-ms disconnect signal of other means of automatic disconnect (such as voice reset disconnect timer, fixed recording time)	Model 1330 Answering Machine Model 1531 Remote Answering system Telephone	(1)

Interface					
LS or GS/LS	**T/R**	**MFM**	**GPA**	**SAA**	
Line Jacks	**012 or 008 OPT Station Jack**	**MLX Station Jack**	**ATL Station Jack**	**ATL Station Jack**	**Notes**
	✓	✓	✓		Cannot be connected to a QCC
✓ (1)		✓		✓	(1) Requires Universal Paging Access Module (UPAM) to provide 48 VDC
	✓	✓	✓		Cannot be connected to a QCC (1) Must order through *Sourcebook*

Table B-1 Continued

Equipment Type	Specifications	AT&T Products	PEC
Cordless telephone	■ Must have touch-tone dialing capabilitiy when connected via MFM; rotary or touch-tone dialing can be used on T/R port ■ Single line	5320 cordless Telephone 5200 Cordless Telephone 5500 cordless Telephone	(1)
Credit card verification terminal	■ Must have touch-tone dialing capability when connected via MFM; rotary or touch-tone dialing can be used on T/R port		
Dial dictation	■ A device that requires contact closure can be used on LS/GS line jack only with UPAM		
Direct Station Selector	■ A maximum of two DSSs can be connected to a console ■ A 329A power unit must be added to a console having two DSSs ■ Connects to “DSS” jack on console		3156-DCB (black) 3156-DCW (white)

Interface					
LS or GS/LS	T/R	MFM	GPA	SAA	
Line Jacks	012 or 008 OPT Station Jack	MLX Station Jack	ATL Station Jack	ATL Station Jack	Notes
	✓	✓ (2)	✓		Cannot be connected to a QCC (1) Must order through *Sourcebook* (2) Device originates and receives calls independently of associated telephone when used with an MFM. used with a GPA, the analog telephone dials and receives calls.
	✓	✓ (1)			Cannot be connected to a QCC (1) Device originates and receives calls independently of associated telephone.
✓ (1)	✓	✓	✓		Cannot be connected to a QCC (1) UPAM required

Table B-1 Continued

Equipment Type	Specifications	AT&T Products	PEC
Fax	■ Must have touch-tone dialing capability when Connected via MFM; rotary dialing can be used on T/R port ■ Industry-standard analog interface	AT&T 3410D AT&T 3500D AT&T 3510D AT&T 3520D AT&T 3530D AT&T Fax 4515D AT&T Fax 4525D AT&T Fax 9015 AT&T Fax 9020 AT&T Fax 9022 AT&T Fax 9025FX AT&T Fax 9035FX	3509-PFX 3514-DFX 3510-DFX 3515-ADX 3512-SAF 3517-DFX 3515-DFX 3504 3505-902 3508-902 3502-HFX 3503-SFX
Group Calling delay announcement	■ Industry—standard announcement device ■ Must provide auto-matic disconnect ■ Each calling group can have its own announcement (maximum 32) ■ A device can provide delay annoucement for more than one group	DA-5 Digital Voice Announcer Model 1330 Answering Machine	62523
Hands-free unit	■ For use with analog multiline telephones ■ Connects directly to telephone	S202A	3152-008

Interface					
LS or GS/LS	**T/R**	**MFM**	**GPA**	**SAA**	
Line Jacks	**012 or 008 OPT Station Jack**	**MLX Station Jack**	**ATL Station Jack**	**ATL Station Jack**	**Notes**
	✓	✓ (1)			Cannot be connected to a QCC (1) Device originates and receives fax messages independently of associated telephone when used with an MFM.
	✓	✓ (1)	✓		Cannot be connected to a QCC (1) Device originates and receives calls independently of associated telephone.

Table B-1 Continued

Equipment Type	Specifications	AT&T Products	PEC
Headset for analog multiline telephone		Supra* (1) Starset † II (1) StarMate* E (2)	3122-011 3122-012 3122-013 3122-014 3122-001 3122-002 3122-003 3122-004 3122-204 3122-214
Headset for MLX telephone		Starset II—StarMate-E Supra-StarMate-E	3122-304
Headset adapter	■ Need to program Auto Answer All button for use with 502B, 502C ■ Connects directly to telephone OTHER jack	502C 502B	3164-HFA 62524
Loudspeaker paging	■ External paging system using DTMF signaling is connected to LS or GS line jack ■ CPE paging systems require an interface unit; if CPE has 2-wire input, the BOGEN UPAM-K (58500) can be used	PagePac 20 PagePac 20 with ZoneMata 9 (1) PagePac 20 with ZoneMate 39 (1) PagePac 6 (2) PagePac 6 Plus	5323-005 53505 53506 5323-006 5323-006

* Trademark of Plantronics Corporation.

† Registered trademark of Plantronics Corporation.

Interface					
LS or GS/LS	**T/R**	**MFM**	**GPA**	**SAA**	
Lime Jacks	**012 or 008 OPT Station Jack**	**MLX Station Jack**	**ATL Station Jack**	**ATL station Jack**	**Notes**
					(1) Requires HFAI adapter (2) No headset adapter required
					No headset adapter required
✓ (1)					(1) Bi-directional paging is supported; only one line jack is needed for multizone paging. (2) LS adapter (53518) is required when connected to LS line jack

Table B-1 Continued

Equipment Type	Specifications	AT&T Products	PEC
Message-waiting indicator	■ For single-line sets ■ connects directly to telephone	Z34	31032
Modem	■ If the modem supports touch-tone dialing via the associated data terminal, the key board can be used for dailing ■ If the modem does not support touch-tone dailing, an associated basic (single-line) set can be used for dailing	Modem Model 4000 Modem Model 2224G Modem Model 4024 Modem Model 2298A Modem Model 2296	2212-MUK (1) 2224-CEO (1) 2224-CDO (1) 2296-BAR (1) 2296-BDM (1)
Music-on-Hold*	■ Any FCC-registered 8-ohm music source or recorded announcement device	Magic on Hold	3128-010 (1)
Speakerphone	■ Connect directly to telephone ■ For single-line sets only	4A (1) S203A	3120-02W 3131-008

* If you use equipment that rebroadcasts music or other copyrighted materials, you maybe 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 you can purchase a Magic on Hold system, which does not require you to obtain such a license, from AT&T or an authorized representative.

Interface					
LS or GS/LS	**T/R**	**MFM**	**GPA**	**SAA**	
Line Jacks	**012 or 008 OPT Station Jack**	**MLX station Jack**	**ATL Station Jack**	**ATL Station Jack**	**Notes**
✓ (2)	✓	✓	✓		(1) see sales manual for requirements. (2) For modem model 2224G only
✓ (1)					(1) Music Coupler required 61398
					(1) Requires 2500SM telephone

Table B-1 Continued

Equipment Type	Specifications	AT&T Products	PEC
SMDR printer	■ Connects to upper RS-232 jack on processor module ■ Must be relocated with 50 feet of CU or use ADU to extend distance	AT&T 475 AT&T 476 AT&T 572	3330-475 3330-476 3333-572

Interface					
LS or GS/LS	T/R	MFM	GPA	SAA	
Line Jacks	012 or 008 OPT Station Jack	MLX Station Jack	ATL Station Jack	ATL Station Jack	Notes

Adjunct Descriptions

Answer/Record Machine

Connected to the system through a single-line telephone jack, an MFM port on an MLX telephone, or a GPA on an analog multiline telephone. Use any industry-standard device that recognizes a 600-ins disconnect signal and connect a 267A2 bridging adapter to the telephone. (The 267A2 bridging adapter is not needed when the telephone is built in to the answering machine.)

Answering devices, such as voice-reset disconnect timers and fixed recording timers, that disconnect automatically can also be used.

Cordless Telephone

Attached to the system through a single-line telephone jack or an MFM port on an MLX telephone. When connected through an MFM port, the cordless touch-tone telephone can place and receive calls independently of the MLX telephone. Use with a GPA is not recommended because the cordless telephone cannot dial out through the GPA.

Credit Card Verification Terminal

Connected to the system through a single-line telephone jack or an MFM port on an MLX telephone. Use with a GPA is not recommended because the credit card verification terminal cannot auto dial through the GPA. When connected through an MFM port, the transaction terminal makes and receives calls independently of the associated MLX telephone.

Group Calling Delay Announcement

Connected to the system through a single-line telephone jack, an MFM port on an MLX telephone, or a GPA on an analog multiline telephone. An industry-standard announcement device, such as a DA-5 Digital Voice Announcer, announces to a caller that calling groups are busy or provides Night Service information.

Dial Dictation

Connected to the system through a single-line telephone jack, an MFM port on an MLX telephone, or a GPA on an analog multiline telephone. Dial dictation can also be connected by using a commercially available "trunk adapter" or UPAM with a loop-start (LS) CO line jack and an external power supply unit. Dial dictation equipment requiring contact closure cannot be connected via the UPAM.

Fax Machine

Connected to the system through a single-line telephone jack or an MFM port on an MLX telephone. Use with a GPA is not recommended because the fax machine cannot auto dial through the GPA. The fax machine originates and receives fax calls independently of the associated telephone. Calls are dialed with the fax machine's dialpad or from an associated single-line telephone.

Headset

Connected to a telephone for answering calls automatically without lifting the handset. When a SPIRIT StarMate E Headset is used with a MLX telephone, the headset connects to the same jack as the telephone handset. Analog telephones operate with a 502C adapter connected to the OTHER jack on the telephone, or without an adapter by plugging the headset into the handset jack.

Loudspeaker Paging Systems

Connected to a programmable LS or GS line/trunk port for single-zone or multizone paging. Used to page co-workers and make announcements through loudspeakers. Wiring diagrams for different configurations are included in Appendix A.

Note: Since most paging equipment works with an LS port, programming the port for LS is recommended.

External paging systems, such as PagePac 20 with ZoneMate 9 or ZoneMate 39 paging systems, that use DTMF signaling can be connected to a line jack programmed for paging operation, including hi-directional paging.

Zone paging systems, such as the PagePac series, require one LS jack. Any zone can be used once the paging port is activated.

A UPAM is used to connect the system to paging equipment that is not PagePac or is PagePac without ZoneMate. It can be used on any LS port that is programmed for paging.

Modem

Connected to the system through a single-line telephone jack, an MFM port on an MLX telephone, or a GPA on an analog multiline telephone. Modems are used for converting digital signals to analog, or analog signals to digital, so that digital equipment can transmit data over telephone lines. When connected through an MFM, data calls made from the modem are independent of the associated MLX telephone. Data calls can be dialed from either the data terminal keyboard or an associated single-line telephone.

Music-on-Hold, Magic on Hold

Connected to an LS CO line/trunk port programmed for Music-on-Hold (MOH) (see Appendix A). The system supports one MOH 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 MOH music level.

Notes:

- Since most equipment works with an LS port, programming the port for LS is recommended.
- PagePac 20 equipment can be used with a loudspeaker system to provide music, MOH, and paging without a music coupler.
- If you use equipment that rebroadcasts music or other copyrighted materials, you 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 you can purchase a Magic on Hold system, which does not require that you obtain such a license, from AT&T or an authorized representative.

Supplemental Alerts

Connected to the system through a single-line telephone jack, an MFM port on an MLX telephone, or an SAA on an analog multiline telephone. The MFM and SAA support devices operating on 48 VDC. Alerts operating on 20-30 Hz can be connected to either an MFM or a single-line telephone jack.

Compatible alerts include horns and bells to audibly alert workers, and strobes for use in quiet zones (hospitals and libraries) and noisy areas (factories) and for the hearing-impaired.

Product Ordering Information

C

The following table summarizes the equipment that can be connected to the MERLIN LEGEND Communications System and provides the corresponding ordering codes.

Component	PEC	Comcode	App Code
Control Unit			
Small (Analog)	6141-CUA		
Basic carrier and housing		106388614	403E
Power supply module		105743801	391A1
Processor (small)		105711972	517A23
Feature module (small)		105711998	517A24
408 GS/LS		106064678	517A26
Small (Digital)	6141-CUD		
Basic carrier and housing		106388614	403E
Power supply module		105743801	391A1
Processor (small)		105711972	517A23
Feature module (small)		105711998	517A24
008 MLX		105628010	517A21
800 GS/LS		105627996	517A19

Component	PEC	Comcode	App Code
Small (Digital)	6141-24D		
Basic carrier and housing		106388614	403E
Power supply module		105743801	391A1
Processor (small)		105711972	517A23
Feature module (small)		105711998	517A24
008 MLX (3)		105628010	517A21
800 GS/LS		105627996	517A19
400 GS/LS/TTR		105627988	517A18
Large	6140-CUL		
Basic carrier and housing		106388614	403E
Power supply module		105743801	391A1
Processor (large)		106215155	517A27
Feature module (large)		106064660	517A25
Upgrade from MII to Large (Digital)	6140-UDLA		
Cover		106388234	16A
Processor (large)		106215155	517A27
008 MLX		105628010	517A21
Feature module (large)		106064660	517A25
MLX-20L telephone (choose one):			
Black		105685465	7713D01A-003
White		105685473	7713D01A-264
Expansion cover (zero, one, or two)		106388259	17A
Upgrade from MII to Large	6140-UULA		
Cover		106388234	16A
Processor (large)		106215155	517A27
Feature module (large)		106064660	517A25
Expansion cover (zero, one, or two)		106388259	17A
Upgrade from Small to Large	6140-USLA		
Processor (large)		106215155	517A27
Feature module (large)		106064660	517A25

Component	PEC	Comcode	AppCode
Expansion Unit	61490		
Expansion carrier and housing		106388630	403F
Power supply module		105743801	391A1
Expansion Cover	n/a	106388259	17A
Line/Station Modules			
008 (ATL)	61485	105351092	517B3
008 MLX	61486	105628010	517A21
008 OPT	61489	106387525	517A28
012 (T/R)	61487	106397631	517E13
100D(DS1)	61491	105461560	517B15
400EM (tie trunk)	8303-200	105311401	517A14
400 GS/LS/TTR	61483	105627988	517A18
408 GS/LS	61481	106064678	517A26
800 DID	61488	105628002	517A20
800 GS/LS	61484	105627996	517A19
Vintage Line/Station Modules			
400 (with TTRs)	61379	105408892	517B12
408 LS	61482	105512495	517C1
800 LS	61384	105351100	517B4
Telephones			
Digital/ISDN (MLX) Telephones			
MLX-10 (black)	3156-02B	105685440	7712D01A-003
MLX-10 (white)	3156-02W	105665457	7712D01A-264
MLX-10D (black)	3156-03B	105688303	7712D02A-003
MLX-10D (white)	3156-03W	105688311	7712D02A-264
MLX-20L (black)	3156-05B	105685465	7713D01A-003
MLX-20L (white)	3156-05W	105685473	7713D01A-264
MLX-28D (black)	3156-04B	105688329	7713D02A-003
MLX-28D (white)	3156-04W	105688337	7713D02A-264

Component	PEC	Comcode	App Code
Analog Multiline Telephones (black)			
MLC-5	3168-MLC	105515332	7312H01A-003
BIS-10	3165-10B	105161061	7313H01A-003
BIS-22	3166-22B	105188809	7314H01A-003
BIS-22D	3166-DSB	105630420	7315H01B-003
BIS-34	3167-34D	105167027	7317H01A-003
BIS-34D	3167-DSB	105630529	7317H01B-003
Vintage Analog Multiline Telephones (black)			
5-button	3160-111	105217426	Z7302H01D-003
10-button	3161-172	105217509	Z7303H01D-003
10-button HFAI	3161-161	105371942	Z7309H01C-003
34-button	3162-412	103842050	Z7305H01B-003
34-button Deluxe	3162-417	105217715	Z7305H02D-003
34-button BIS	3162-BIS	103981965	Z7305H03D-003
34-button BIS/DIS	3162-DIS	103981981	Z7305H04C-003
Single-Line Telephones			
Model 7102	3185-MWR		
Black		105335285	7102A01A-003
Misty cream		105330419	7102A01A-215
Model 2500 YMGK (message waiting, recall, touch-tone, desk)	3178-NHL		
Black		105480578	2500YMGK-003
Misty cream		105480560	2500YMGK-215
Model 2500 MMGK (recall, touch-tone, desk)	3101-ETR		
Black		105414130	2500MMGK-003
Misty cream		105414122	2500MMGK-215

Component	PEC	Comcode	AppCode
Single-Line Telephones, continued			
Model 2500 MMGJ (touch-tone, desk)	3101-EBD		
Black		105414155	2500MMGJ-003
Misty cream		105414148	2500MMGJ-215
Model 2554 MMGJ (touch-tone, wall)	3101-EBW		
Black		105480081	2554MMGJ-003
Misty cream		105480032	2554MMGJ-215
Model 500 MM (rotary, desk)	3100-ORD		
Black		103870234	500MM-03
Ivory		103870226	500MM-50
Beige		103870267	500MM-60
Model 554 BMPA (rotary, wall)	3100-ORW		
Black		103823498	554BMPA-3
Ivory		103823506	554BMPA-50
Beige		103823555	554BMPA-60
Consoles			
MERLIN II System Display Console	61392	105229744	7318H01A-003
DSS console (black)	3156-DCB	105685481	604A1-003
DSS console (white)	3156-DCW	105685499	604A1-264
Applications			
Call Accounting System (CAS)			
CAS Plus LEGEND	1201-DR1	406362244	
Custom Tariff *	12010	406158444	
CAS Plus upgrade	12009	406158394	
CAS/H			
CAS/H LEGEND 100S	1201-H10	405799255	
CAS/H LEGEND 200S	1201-H20	405799289	
CAS/H Custom Tariff *	12050	405799420	

*Consult AT&T or an authorized dealer for other area-specific information.

Component	PEC	Comcode	App Code
Application, continued			
Call Accounting Terminal (CAT)			
CAT/B 150S	3600-023	406478800	
CAT/H 150S	3600-024	406478818	
CAT/B update (Custom Tariff) *	36023	406478792	
CAT/H update (Custom Tariff) *	36024	406478784	
Call Management System (CMS)	1207-100		
5 1/4" floppy disk		106496540	
3 1/2" floppy disk		106496532	
Board	8301-100	106198815	
MERLIN LEGEND Integrated Solution II			
AUDIX Voice Power-IS II			
AVP2.1 for LEGEND	1234-VR1	106491608	
LEGEND Integ SW	1234-SR1	106491590	
IVP4SS R1.2	1234-BR1	106491616	
IVP4 Board LEGEND	8306-100	106248651	
Integrated Voice Power Automated Attendant			
SAA LEGEND	1234-AA1	106491624	
IVP4SS R1 .2 LEGEND	1234-BR1	106491616	
IVP4 Board LEGEND	8306-100	106248651	
Call Accounting System-IS II	1201-U12	406478537	
System Programming and Maintenance-IS II	61496	106496565	
MERLIN Attendant	6125-ATT		
Hardware		406221499	
Documentation		106431265	

*Consult AT&T or an authorized dealer for other area-specific information.

Component	PEC	Comcode	AppCode
Applications, continued			
MERLIN MAIL™ Voice Messaging System			
Two-port	6107-005		
MERLIN MAIL unit		406467910	
Remote maintenance device		406466193	
Four-port	6107-006		
MERLIN MAIL unit		406467902	
Remote maintenance device		406466193	
Two-port line card (R2) (upgrade from two to four)	6107-007	406464750	
MERLIN LEGEND System Programming and Maintenance (SPM)-DOS	61495	106492655	
Adjuncts/Adapters			
System Adjuncts/Adapters			
Auxiliary Power Unit 9024	61416	406467142	9024
Channel service units (CSUs)			
ESF T1	2152-ESF	405616293	305010171-001
Cable (8 mod, wire wrp)	21555	406012609	513861312-505
Cable (8 mod, 15-pin sub)	21554	406012591	513823015-50 FT
Stand-alone wall mount	21545	405970104	380-100213-001
551 T1 L1	2152-15T	403768179	305-10097-001
Power unit	21530		
Unit		404242639	KS22911LI
Cord		103985660	DW4A-SE 10FT IP
Stand-alone wall mount	21545	405970104	380-100213-001
Cordless telephones			
Model 5320	3103-CLS	105543516	CS6300U11A-229
DA-5 Digital Voice Announcer	62523	405745811	ANNCR-DA-5SL DI

Component	PEC	Comcode	App Code
System Adjuncts/Adapters, continued			
Electrostatic discharge (ESD) suppression kits			
D181574	n/a	105179329	D181574
D181589	n/a	105201891	D181589
D181590	n/a	105201909	D181590
D181591	n/a	105201917	D181591
D181593	n/a	105201933	D181593
EMI filter			Z200A
IROB unit — analog multiline *	32918	406106583	343 CA 0A 6XIN
IROB unit — MLX *	32919	106417447	505A ASSY 0A WD
ISDN 7500B Data Module	2164-BDM	105657654	Z7500B-L1
Stand-alone power supply	21625	405509852	WP90110L7
Multiple mounting	21626	105441166	Z77A
7500A upgrade kit	21627	105888501	D182208
Magic on Hold player	3128-010	405143827	DECK-MMP/RCA PR
Modem 2224G	2224-CEO	105659965	2224C-L1 D/2
Music coupler	61398	406143925	ASSY-KS23395L3
PagePac 6	5323-006	405701277	22052-006 PG PC
PagePac 6 Plus	5323-008	405701608	22052-000 PG PC6
PagePac 20 Power Mate†	5323-005	403308026	ADP06
with three speakers	5323-001	403308067	ADP06
Ring generator unit	61388	105213201	129B RING GEN
SMDR printers			
475 (80-column, serial)	3330-475	403318942	475-8510BR2
476 (132-column, serial)	3330-476	403818495	476-1550BR2
572 (80-column, serial)	3333-572	406152983	572-9500DR 10IN

* Any multiline off-premises telephone must have an appropriate IROB protector at the control unit location and at the off-premises location.

† Trademark of Plantronics Corporation

Component	PEC	Comcode	App Code
System Adjuncts/Adapter, continued			
Uninterruptible Power Source (UPS)			
500 VA (15 minutes)	2403-050	105610141	515 UPS-005C111
Reserve (1 hour)	24035	105610174	ERC-W/BAT-005E5
Universal Paging Access Module (UPAM)	58500	405891698	KIT-UPAM
TAM B	n/a	405899972	D181900
PRS-48	n/a	405742735	0181900
WMT-1A	n/a	405891680	D181900
ZoneMate 9	53505		
Dialer unit		404057911	DIAL UNIT-9ZONE
Control unit		405024134	CNTL 22050-020
ZoneMate 39	53506		
Dialer unit		404057929	39 ZONE SELECT
Control unit		405024134	CNTL-22050-020C
External Alerts			
Loud external ringer	31016A	103117016	RINGER-L1AMP-49
E1CM-type	31019A		
Gray		102872934	RINGER-E1CM-49
Ivory		102917952	RINGER-E1CM-50
E1CM ringer and parts	61211		D-181233
290A adapter		102992252	290A ADPTR
Ringer		102872934	E1CM-49
Mounting plate		102988466	1049A
Cord		103938494	CORD-D4CH-87-25

Component	PEC	Comcode	App Code
Supplemental Alerts			
Bell	61212A	403349962	BELL-KS23053L1
Horn	61213A	403349970	KS23053L2
Deluxe horn	61223A	406207217	SIG THET4-1
Strobe	61221A	403319197	STROB SCOPE
Chime	61222A	405136060	CHM-CHBT2 S1
Telephone Adapters			
General Purpose Adapter (GPA)	2301-GPA	103977997	Z1C
Multi-Function Module (MFM)	3156-MFM	105736474	540A1
Supplemental Alert Adapter (SAA)	2301-SSA	105031199	ADPTR-856A
Telephone Adjuncts			
Headset adapter	3164-HFA	105752042	ADPTR-502C-003
Headset adapter	62524	105471304	ADPTR-KS23552
Single-line telephones			
4A Speakerphone	3120-02W		4A
Power unit		102139938	PWR UNIT-85B1
Block connector		102434925	BLK CON-82B-49
Adapter for single-line telephone		102813888	ADPTR-223C
Adapter for muitiline telephone		102949013	ADPTR-223D IP
Transmitter		103971891	TRMR-680AF-03
Black		103873873	LSPK-108AA-03
Ivory		103873881	LSPK-108AA-50
Green		103873899	LSPK-108AA-51
Beige		103873907	LSPK-108AA-60
White		103873964	LSPK-108AA-58
S202A Speakerphone	3152-008		
Black		105721088	TEL-S202A-003
Misty cream		105721096	TEL-S202A-215

Component	PEC	Comcode	App Code
Telephone Adjuncts, continued			
S203A Speakerphone	3131-008		
Black		106058340	MOD-S203A-003
Misty cream		106058365	MOD-S203A-215
Bracket		106284011	BRKT-S203 WL ST
Message Waiting Indicator	31032	103966396	Z34A
Hands-Free Unit (HFU)	3163-HFU	103953790	MOD-S102A-185
Headsets			
Analog Multiline Telephones			
Supra	3122-011	403350085	HDST-KS22990L1
	3122-012	403350077	HDST-KS22990L2
	3122-013	403350051	HDST-KS22990L3
StarSet II	3122-001	403241540	HDST-KS22915L1
	3122-002	403241557	HDST-KS22915L2
	3122-003	403241565	HDST-KS22915L3
	3122-004	403350093	HDST-KS23080L1
StarMate E	3122-204	403412307	HDST-KS23080L4
	3122-214	403973431	HDST-KS23080L5P
Digital/ISDN (MLX) Telephones			
StarSet II—StarMate-E	3122-304A	405211723	HDST-KS23080L7
Supra—StarMate-E	n/a	n/a	HDST-KS23080L8
MLX Telephones — Miscellaneous Add-Ons/Replacement Parts			
Handsets and Cords			
Handset (black)	n/a	106050065	K2S1-003
Handset (white)	n/a	106053408	K2S1-264
Handset, amplified hearing	31052		
Black		105581896	K6S2-003
White		106248248	K6S2-264
Misty cream		105581904	K6S2-215

Component	PEC	Comcode	App Code
Handsets and Cords, continued			
Handset, amplified push to listen	31053		
Black		106382344	K8S2-003
White		106382369	K8S2-264
Misty cream		106382351	K8S2-215
Handset cord (9', black)	n/a	105635429	H4DU-003 9FT
Handset cord (9', white)	n/a	105701809	H4DU-264 9'BULK
Handset cord (12', white)	n/a	102402609	H4DU-264 12'IP
Handset cord (12', black)	n/a	102401445	H4DU-3 12FT IP
Handset cord (25', black)	n/a	105523886	H4DU-3 25'
DSS line cord (2')	n/a	106187545	CORD D8AC-87
Desk Stands and Use Trays			
Stand (large, black)	n/a	846320851	STAND-LARGE BL
Stand (large, white)	n/a	846320844	STAND-LARGE WH
Stand (small, black)	n/a	846320810	STAND-SMALL BL
Stand (small, white)	n/a	846320802	STAND-SMALL WH
User tray (black)	n/a	846320240	USER TRAY DWR B
User tray (white)	n/a	846320232	USER TRAY DWR W

Component	PEC	Comcode	App Code
Designation (Button Assignment) Cards and Covers			
Designation card * — MLX-10, MLX-10D	n/a	106448707	KIT-D182459 PRT
Designation card * — MLX-20L	n/a	106448723	KIT-D182461 PRT
Designation card * — MLX-28D	n/a	106448715	KIT-D182460 PRT
Designation card set† — DSS	n/a	106448756	KIT SET DSS
Designation card covers† — DSS (black)	n/a	106448731	KIT-D182462 PRT
Designation card covers† — DSS (white)	n/a	106448749	KIT-D182463 PRT
Designation card set‡ — QCC	n/a	106561673	KIT-D182562 PRT
Designation card covers§ — MLX-10, MLX-10D, MLX-20L	n/a	106448681	KIT-D182457 PRT
Designation card covers§ — MLX-28D	n/a	106448699	KIT-D182458 PRT
Analog Multiline Telephones — Miscellaneous Add-Ons/Replacement Parts			
Desk Stands and Wall Mounts			
Adjustable desk stand, 10-button	32002	103746855	11A
Adjustable desk stand, 34-button	32003	103746863	11C
Fixed desk stand, 5- & 10-button	32004	103746848	10A
Desk stand/wall mount 14A, BIS-10	n/a	103804290	14A-003
Desk stand/wall mount 14B, BIS-22	n/a	103964458	14B-003

* Twelve per package
† Includes both top and bottom cards or covers
‡ Eight cards per kit (four sets)
§ Four per package

Component	PEC	Comcode	App Code
Desk Stands and Wall Mounts, continued			
Desk stand/wall mount 14C, BIS-34	n/a	103979837	14C-003
Fixed desk stand and wall mount, 5-button	32000	103804290	10A
Kit of parts	32000	103995882	D-181230
Wall mount, 10-button	32001	103747846	201A
Kit of parts	32000	103995882	D-181230
Wall mount, 34-button	32006	103747853	203A
Kit of parts	32000	103995882	D-181230
Faceplates			
BIS-10	n/a	105203186	KIT PRTS-D181582
BIS-22	n/a	105336986	KIT PRTS-D181784
BIS-22D	n/a	105690762	D-182210
BIS-34 and BIS-34D	n/a	105203194	D-181583
Button Label Sheets			
10-button BIS	n/a	105336978	D-181785
22-button BIS	n/a	105336960	D-181784
22-button BIS with display	n/a	105690770	D-182211
34-button BIS	n/a	105336956	D-181783
Display console (FM1) (includes one faceplate)	n/a	105299754	D-181727
Display console (FM2 & R3) (includes one faceplate)	n/a	105486252	D-182041
Single-line Telephones — Miscellaneous Add-Ons			
Ground-Start Button			
KS23566L1	31021	405792839	Key-KS23566L1

Component	PEC	Comcode	App Code
Miscellaneous Parts			
Interconnect Wiring Kit			
110AB1-100JP12	n/a	104409396	
110A1 trough	n/a	104407960	
D-Rings	n/a	842139248	
D8W cords	n/a	103786802	
Parts list	n/a	n/a	
SYSTIMAX™ MERLIN® Wiring Kit	3103-MER	106393671	
110A1 trough (5)	n/a	104407960	
110AB1-100JP12 (2) modular block	n/a	104409960	
110AB1 punch down block (1)	n/a	103823845	
D-Rings (6)	n/a	842139248	
110P8A5B patch cords (12 — 4-pair — 5-ft. patch cords)	n/a	846619989	
D8W cords (24 — 14-ft.)	n/a	103786802	
Template	n/a	846613933	
Instruction sheet	n/a	846613941	
Parts list	n/a	846623924	

Unit Load Calculation Work Sheet

D

Use the instructions on the following worksheet to calculate unit load totals for each carrier. Make a copy of the work sheet for each carrier.

UNIT LOAD WORK SHEET

1. Number of modules in carrier (excluding power supply module and processor module): ☐

   - If fewer than 5, auxiliary power is not required.
   - If 5 or 6, continue to step 2.

2. Key or Behind Switch mode only: ❑ Square
   Indicate configuration of lines; then go to step 5. ❑ Modified

3. Hybrid/PBX mode only: ❑ Yes
   Do all modules in the carrier have MLX and/or analog multiline station jacks? ❑ No

   - If no, auxiliary power is not required.
   - 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 telephones connected to modules in the carrier ☐

   Number of MLX-28D telephones 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 45, auxiliary power is not required.
   - If total is 45 or more, continue to step 5.

5. Calculate the estimated unit loads.

Module	Qty	x Unit Load =	Total
008		12.0	
008 MLX		13.5	
008 OPT		8.0	
012		8.4	
100D		0.0	
400		0.0	
400 EM		8.0	
400 GS/LS/TTR		0.0	
408		12.0	
408 GS/LS		12.0	
800		0.0	
800 GS/LS		0.0	
800 DID		8.0	
Total Estimated Unit Load			

- If total is less than 54, auxiliary power is not required.
- If total is 54 or more, continue to step 6.

6. Calculate the actual carrier unit load.

	Qty	x Unit Load		= Total
Equipment		**Hybrid/PBX or Modified**	**Square**	
Network Access Lines*				
DID		1.0	1.0	
DS1		0.0	0.0	
GS/LS		0.0	0.0	
Tie		1.4	1..4	
Telephones				
MLX-10		.9	1.2	
MLX-1OD		.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	
10-Button Basic		0.9	1.1	
10-Button HFAI		1.0	1.2	
34-Button Basic		0.9	1.1	
34-Button DLX		1.2	1.7	
34-Button BIS		1.2	1.4	
34-Button BIS/DIS		1.2	1.4	
Single-Line Telephone		0.6	0.7	
Continued				

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

6. *Continued*

	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 Actual Unit Load	

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

‡ Up to two DSSs (one DSS per MLX-28D or MLX-20L) can be powered from each control unit carrier. For example, a three-carrier system can have six 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, auxiliary power is not required.
- If the total actual unit load is more 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, 800, and 800 GS/LS modules have unit loads of 0.0.) Repeat steps 1-6 to recalculate unit loads for the new configuration.

   Note: Empty slots are not permitted between modules.

   - If the exchange reduces the unit load to 54 or less, auxiliary power is not required.
   - If the exchange does not reduce the unit load to 54, auxiliary power is required. Continue to step 8.

8. Calculate the unit load 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		.9	1.2	
MLX-10D		.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		1.0	1.3	
BIS-34D		1.1	1.5	
MLC-5		1.1	1.5	
10-Button Basic		0.0	0.0	
10-Button HFAI		1.0	1.2	
34-Button Basic		0.9	1.1	
34-Button DLX		1.2	1.7	
34-Button BIS		1.2	1.4	
34-Button BIS/DIS		1.2	1.4	
Single-Line Telephone		0.6	0.7	

Continued

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

8. *Continued*

	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 station and therefore is not added to the unit load calculation.

‡ Up to two DSSs (one DSS per MLX-28D or MLX-20L) can be powered from each control unit carrier. For example, a three-carrier system can have six system operator positions, each with one DSS powered from the control unit.

- If the unit load for slots 5 and 6 is less than or equal to 27, auxiliary power is sufficient for the carrier.
- If the unit load for slots 5 and 6 is more than 27, continue to step 9.

9. Try to exchange modules between carriers to reduce the unit loads. for slots 5 and 6 to 27. (Remember that the 100D, 400, 400 GS/LS, 800, and 800 GS/LS modules have unit loads of 0.0.) Repeat steps 1–8 to recalculate unit loads for new configuration.

   Note: Empty slots are not permitted between modules.

   - If the exchange reduces the unit load for slots 5 and, 6 to 27 or less, auxiliary power is sufficient.
   - If the exchange does not reduce the unit load for slots 5 and 6 to 27, install wall power units for the appropriate number of telephones to reduce the unit load to 27.

General Telephone Programming

E

Use these instructions to program features on MLX and analog multiline telephones.

Programming Methods

Telephones can be programmed by dialing programming codes or, on MLX display phones, by selecting features from the display. An analog multiline telephone cannot be programmed by selecting features from the display.

To program a telephone, you must first enter programming mode and then enter programming codes. As shown in the following tables, the steps for entering the programming mode and codes vary depending on the type of telephone.

Note: Features can also be programmed onto individual telephones through centralized telephone programming. See *System Programming* for more information.

Personal Speed Dial is the only feature that single-line telephone users can program. Therefore, general programming instructions for single-line telephones are not provided.

When a telephone is in program mode, the system considers it busy. No incoming calls will ring at the telephone until it is back in normal call-handling mode.

To Program Analog Multiline Telephones

1. Label the button.

   Note: Skip this step if the feature does not get programmed onto a button.

   a. Remove the clear label covers from the telephone by inserting the end of a paper clip in the notch at the top of the cover.

   b. Write the feature name in the space next to the button to be programmed.

   c. Replace the cover.

2. Begin programming by sliding the T/P switch on the side of the telephone to P.

   The telephone rings repeatedly to signal that the telephone is in programming mode.

3. Select the feature.

   a. Press the button you labeled.

      If you have a display, it shows the name of the feature currently programmed on the button. If no feature is programmed, the display indicates the button is blank.

      Note: If the feature does not get programmed onto a button, press any line button. This does not affect the button in anyway.

   b. Dial the programming code.

      The feature is programmed.

4. End programming by sliding the T/P switch to the center position.

   The telephone stops ringing.

To Program MLX Telephones

1. Label the button.

   Note: Skip this step if the feature does not get programmed onto a button.

   a. Remove the clear label cover from the telephone by pulling upon the tab that extends from the top of the cover.

   b. Write the feature name on the card next to the button to be programmed.

   c. Replace the cover.

2. Begin programming.

   a. Press **Feature.**

   b. Dial **00.**

   The telephone rings repeatedly to signal that the telephone is in program mode.

3. Select the feature.

   a. Press the button you labeled.

   b. Dial the programming code.

   Note: If the feature does not get programmed onto a button, press any line button. This does not affect the button in any way.

   The feature is programmed.

4. End programming.

   a. Press **Feature.**

   b. Dial ∗00.

   The telephone stops ringing.

To Program MLX Display Telephones by Using the Display

1. Label the button to be programmed.

   Note: Skip this step if the feature does not get programmed onto a button.

   a. Remove the clear label cover from the telephone by pulling upon the tab that extends from the top of the cover.

   b. Write the feature name on the card next to the button to be programmed.

   c. Replace the cover.

2. Begin programming

   a. Press **Menu.**

   b. Select **`Ext Program [Prog]`** from the display.

   c. Select **`Start`** from the display.

   The telephone rings repeatedly to signal that the telephone is in program mode.

3. Program the button.

   a. Press the button you labeled.

   Note: If the feature does not get programmed onto a button, press any line button. This does not affect the button in anyway.

   The display identifies the feature currently programmed on the button. If no feature is programmed, the display shows that the button is blank.

   b. Delete the feature currently programmed on the button by selecting **`Delete [Dlete]`** from the display.

   The display shows that the button is now blank.

c. Press the button you labeled again to continue programming.

Note: If the currently programmed feature was not deleted from the button, the new feature programmed onto it will replace it.

d. Select **List Feature [List]** from the display.

The screen lists feature names.

4. Find the feature you want by doing one of the following:
   - If the feature name is on the display, press the button next to or below the name of the feature to be programmed.
   - If the feature name is not on the display, do one of the following:
     — To move through the list of features page by page press **More.**
     — To jump to the screen that displays the feature name, select **Find Feature [Find]** from the display. Select the range of letters from the display that corresponds to the first letter of the feature name (for example, if the feature begins with A, select **ABC).** If the feature is not displayed on the page that you jumped to, press **More.**
5. When you find the feature you want, press the button next to or below it.
6. Respond to any additional prompts on the display.
   - Select the appropriate choice (for example, select **On** or **Off** to turn Inside Coverage on or off).
   - Enter required information (for example, dial a phone number for Auto Dial).

7. End programming by doing one of the following:
   - To return to the Home screen, press **Home.**
   - *The telephone stops ringing.*
   - To return to the Menu screen, press **Menu.**
   - *The telephone stops ringing.*
   - To return to normal call handling, lift and replace the handset.

     The telephone stops ringing.

A Note About Programming MLX Display Telephones

The two methods for programming MLX display telephones are interchangeable. For example, you can enter the programming mode by pressing **Feature** and dialing **00** and then can refer to the display to continue the programming process. Or you can enter programming via the display and then can dial a programming code to select the feature rather than selecting it from the display.

General Feature Use

F

Follow these general instructions to use features on MLX, analog multiline, and single-line telephones. To use a feature:

- press a dedicated feature button
- press a programmed button
- dial a feature code
- select a feature from the display (MLX display telephones only)

Dedicated Feature Buttons

All multiline telephones have a group of dedicated feature buttons that are programmed and labeled at the factory. The functions of these buttons, which include **Conference, Transfer,** and **Speakerphone,** cannot be changed. Press the button for the feature you want to use.

Programmed Buttons

See Appendix E, "General Telephone Programming," for more information on programming features onto line buttons.

Any available line button on multiline telephones can be programmed for one-touch use of a feature.

Note: Some features, such as Auto Dial, must be programmed onto line buttons in order to use them. Other features, such as Privacy, should be programmed onto line buttons so that the LED next to the line button lights to show that the feature is in use.

Feature Codes

Feature codes are 1-, 2-, and 3-digit codes that activate features. To use a feature code, first press the dedicated feature button on MLX telephones or a programmed feature button on analog multiline telephones, or dial # on single-line telephones. This sends a signal to the system that a feature code is about to be dialed. Then dial the code; the feature is activated.

Note: Some features, such as Personal Speed Dial, can be used only by dialing feature codes.

The Display

For MLX telephones with displays, select features from the Feature screen and the Menu screen. See "Display" in Chapter 2 of the *System Reference* for more information on using features with the display.

Programming Special Characters

G

When users program a Personal Directory listing, Auto Dial number, or Personal Speed Dial code, they are storing a sequence of numbers to be dialed automatically. Some sequences require special characters to separate the digits and start a function. For example, certain characters can signal the system to **pause** and wait for a response to the dialed digits or to **stop** so the user can enter a credit card number or password.

Special characters count toward the maximum number of digits allowed in a stored dialing sequence.

Press	Display Shows	It Means	Description
Hold	**p**	Pause	When a pause is needed to allow the system to respond after an initial set of numbers have been dialed, press **Hold** to insert a 1.5 second delay before the remaining digits in the sequence are dialed. For example, press **Hold** between programming a long-distance telephone number and a calling card number. You can insert as many pauses as needed in the sequence.

Press	Display Shows	It Means	Description
Drop	**s**	Stop	**Drop** inserts a stop within the dialing sequence so the user can enter specific digits, such as a credit card number, an authorization code, or a password. For example, when you are programming the sequence of numbers onto an Auto Dial button or into the Personal Directory, press **Drop** where numbers need to be manually dialed. These numbers can be a credit card number or password that changes often. To use, press the Auto Dial button or choose the Directory listing. The system will process the programmed numbers and then wait at the Drop signal for you to manually dial. Press the Auto Dial button or select the Directory listing again to continue automatic dialing.

Press	Display Shows	It Means	Description
Conf	f	Recall	**Conf** sends a brief disconnect signal interpreted as a switch-hook flash. Recall must be the first entry in the sequence of programmed numbers to signal a special command or direction. Some local facility providers use Recall for custom features.
##	#	End of Dialing	# # speeds call processing by the system. Use it at the end of a programmed sequence of numbers to signal that no more numbers follow.

System Programming Console Overlay

H

The MERLIN LEGEND Communications System can be programmed from either an MLX-20L telephone used as a system programming console or from a PC with System Programming & Maintenance (SPM) software.

Using a system programming console may involve the dialpad, some of the labeled function buttons on the lower part of the console, and the 20 line and feature buttons in the center of the console. The programming functions of the line and feature buttons are on the overlay for the console, as shown in Figure H-1.

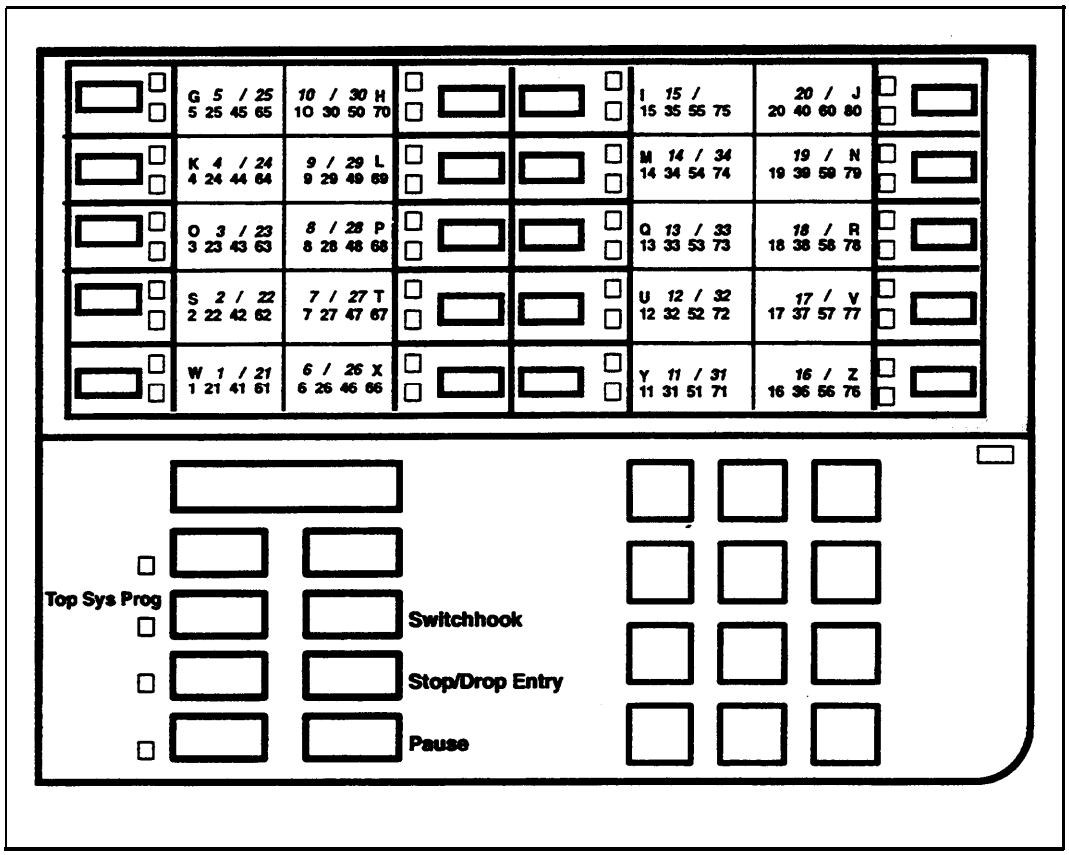


Figure H-1 Console Overlay

On a PC with SPM, the screen is arranged to represent the console, as a comparison of Figures H-2 and H-3 shows.

The window at the top of the SPM screen matches the console's display. The columns to the left and right of the window show keys that work in the same way as the buttons on either side of the console's display.

The bottom of the SPM screen simulates the 20 buttons in the center of the console and are identified on the screen as LINE 01, LINE 02, and so forth. The outside columns to the left and right of the "line buttons" show the keys that work in the same way as the line buttons. For example, pressing the Shift and F1 keys simultaneously is the same as pressing the lower left button on the console. The letters R and G simulate the red

and green lights beside these buttons. For example, to simulate that a red LED is on, the letter R appears on the screen next to the line button.

The labels on the top right side of the SPM screen **(Drop, Transfer, Hold)** correspond to the buttons on the lower left side of the telephone.

See Chapter 4 “Programming Procedures” for instructions on programming from a system programming console or from a PC with SPM.

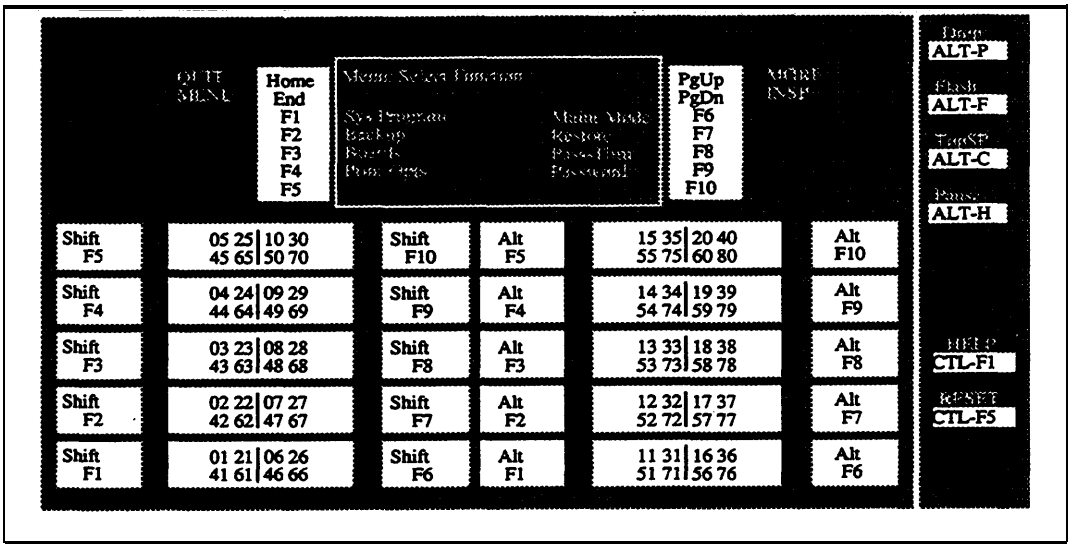


Figure H-2 SPM Screen

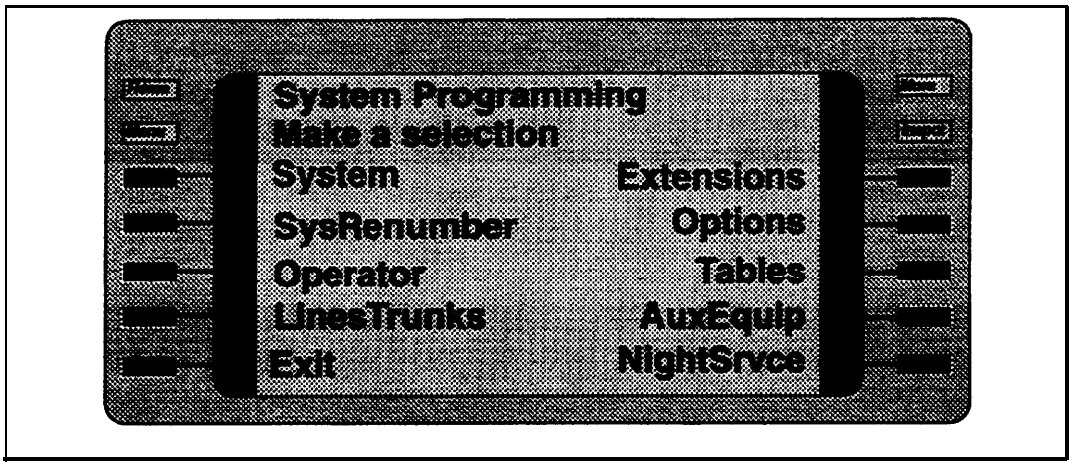


Figure H-3 System Programming Console Display

System Programming Reports

I

This appendix describes the contents and shows examples of system programming reports. You can generate these reports by selecting the “Print” option from the System Programming Menu. If you are using a PC with SPM, you must direct the reports to the PC port by selecting "Print-Opts" from the SPM Main Menu and then selecting “PC port” from the Printer Options screen. When reports are directed to the PC port, you can print them on a printer connected to your PC (hard copy) or as a print file on either a hard disk or floppy disk. To view a print file, you must exit SPM and use DOS commands. If you are programming from a remote location, exiting SPM also disconnects you from the control unit modem.

Note: The System Programming & Maintenance report should not be printed while the system is handling more than 100 calls per hour.

Table I-1 System Information

Report Name: System Information

Print Menu Choice SysSet-up

Description: System-wide information such as return intervals, system mode, system programming port, slot assignments, and Remote Access barrier codes and restrictions.

Sample Report:

SYSTEM INFORMATION

Current Date: 11/26/90
Current Time: 09:45:10

System :	Mode	AutoMaintBusy	AutoBusyTie
:	Hybrid/PBX	Enable	Enable

Direct Line Operators : 20 24
Queued Call Operators : 10 14
SysProg Port : 13 Password : COLT
Transfer : Type Audible OneTouch(Compl) ReturnTimer
: Ring MusicOnHold Transfer (Auto) 4 rings

Paging System Lines	:	809
Music on Hold Line	:	810
Camp On Time	:	10 sec
Call Park Return Time	:	10 sec
Delay Rings	:	2
Auto Callback Rings	:	3
Extension Status (ESS)	:	Group Call / CMS
ESS Operators	:	20 24

Continued

Table I-1 Continued

SMDR: Min.Call Time : 20 sec	CallReport In/Out	Format Basic	
Intercom Dial Tone	: Inside		
Reminder Service Cancel	: 18:00		
Behind Switch Code: :	Drop	Transfer	Conference
Recall timer	: 450 msec		
Rotary Line Cut Thru	: Delay		
Unassigned Extension	: 10		
Slot # 1: 008 MLX			
Slot # 2: 408 GS/LS			
.			
.			
Slot # 17: Not Used			

Table I-2 Dial Plan

Report Name: Dial Plan

Print Menu Choice: Dial Plan

Description: Extensions assigned to pools, paging zones, calling groups, lines/trunks, and stations. Labels for lines/trunks and stations.

Sample Report:

DIAL PLAN FOR POOLS
POOL # 1: 70
.
POOL # 11: 899

DIAL PLAN FOR TELEPHONE PAGING ZONES
TPZ # 1: 793
.
TPZ # 7: 799

DIAL PLAN FOR DIRECT GROUP CALLING GROUPS
DCGG # 1: 770 SALES
.
DGCC # 32: 7929

SYSTEM DIAL PLAN

DIAL PLAN FOR LINES/TRUNKS
LINE # 1: 801 CO LINE #2: 802 CO
LINE # 3: 803 WATS LINE # 4: 804 WATS

(Information is included for all available line/trunk jacks in control unit.)

DIAL PLAN FOR STATIONS
STN # 1: 10 WAYNE STN # 2: 11 MIKE
STN # 4 12 CONF STN # 5: 13 MARY

(Information is included for all available station jacks in control unit.)

Table I-3 Label Information

Report Name: Label Information

Print Menu Choice: Labels

Description: Labels assigned to stations and posted messages, and names and telephone numbers included in MLX-20L user's Personal Directory.

Sample Report:

LABEL INFORMATION

EXECUTIVE TELEPHONE # 10: Personal Directory

Name	Number	Display
TRAVEL AGENCY	555-1212	YES
HOME	555-1611	NO

EXECUTIVE TELEPHONE # 15: Personal Directory Not Used
(shown if all entries in directory are empty)

(Information is included for all MLX-20L telephones connected to the system.)

MSG #	POSTED MESSAGE
1	DO NOT DISTURB
2	OUT TO LUNCH
3	AT HOME
.	
.	
20	CUSTOM MSG20

Table I-4 Trunk Information

Report Name: Trunk Information

Print Menu Choice: Trunk Info

Description: Options (e.g., type, signal, etc.) assigned to the lines, DS1 facilities, and other outside lines or trunks.

Sample Report:

TIE TRUNK INFORMATION

TRUNK 820 Slot/Port: 3/ 2 TIE-PBX

Direction : 2 Way E&M Signal : Type 1S Dialtone : Local
InType : Immed InMode : Rotary AnsSuypvr : 300 ms
OutType : Immed Outmode : Rotary Disconnect: 200 ms

DID TRUNK INFORMATION

Trk	SS/PP	Blk	DiscTime	Type	ExpDig	DelDig	AddDig	Signal	InvDest
805	5/ 1	1	500ms	Wink	3	0		Rotary	BkupExt
806	5/ 2	1	500ms	Wink	3	0		Rotary	BkupExt

(Information is included for all DID trunk jacks in the control unit.)

GS/LS TRUNK INFORMATION

Trk	SS/PP	Type	OutMode	RelDisc	ChannelUnit
814	3/ 5	Ground	TouchTone	No	ForeignExchange

(Information is included for all LS/GS line/trunk jacks in the control unit.)

GENERAL TRUNK INFORMATION

Trk	SS/PP	RemAccess	PoolTIPrfx	HldDsc	Prncipal	QCC Prty	QCC Oper
801	3/ 1	No	Remote 770	No	Long 25	4	10

(Information is included for all line/trunk jacks in the control unit.)

Table I-5 DS1 Information

Report Name: DS1 Information

Print Menu Choice: T1 Info

Description: Options (e.g., line, signal, etc.) assigned to T1 trunks or lines.

Sample Report:

DS1 SLOT ATTRIBUTES

Slot	Type	Format	Supp	Signal	LineComp	ClksyncSrc	Active
3	T1	D4	B8ZS	Rob_Bit 3	Prim	Loop	Yes

Table I-6 PRI Information

Report Name: PRI Information

Print Menu Choice: PRI Info

Description: PRI trunks/lines assigned to B-channel groups.

Note: B-channel group numbers are from 1-69 and each may have up to 23 channel IDs. Empty B-channel groups are not printed.

Sample Report:

PRI INFORMATION

BchnlGrp # 1 Slot: 2 TestTelNum : 5055551611 NtwkSvc: MegacomWATS

Channel ID: 01 02 03 04 05 06 07 08 09 10
11 12 13 14 15 16 17 18 19 20
21 22 23

Line	PhoneNumber	NumberToSend
807	5055551122	5055551122

Table I-7 Remote Access

Report Name: Remote Access

Print Menu Choice: RmoteAccess

Description: Remote Access dial code, class of restriction, barrier code information.

Sample Report:

REMOTE ACCESS (DISA) INFORMATION

GENERAL OPTIONS: ACCESS CODE : 889
Barrier Code required for Non-TIE DISA Lines : Yes
Barrier Code required for TIE DISA lines : No
Automatic Queuing enabled for DISA lines : No

SYSTEM DEFAULT CLASS OF RESTRICTIONS (NON-TIE)
Restriction : OUTWARD RESTRICTED
ARS Restriction Level : 3
Allowed Lists : 1 2
Disallowed Lists : 1 2

SYSTEM DEFAULT CLASS OF RESTRICTIONS (TIE)
Restriction : UNRESTRICTED
ARS Restriction Level : 4
Allowed Lists : 1 2
Disallowed Lists : 1 2

BARRIER CODE ADMINISTRATION
Barrier Code Number : 1
Barrier Digits : 1234
Restriction : UNRESTRICTED
ARS Restriction Level : 4
Allowed lists : 1 2
Disallowed Lists : 1 2

(Information for unassigned barrier codes is not printed.)

Table I-8 Operator Information

Report Name: Operator Information

Print Menu Choice: Oper Info

Description: For each operator position, the logical ID, extension number, label, type (DLC or QCC), and all general system operator options such as back-up positions, etc.

Sample Report:

OPERATOR INFORMATION

OPERATOR POSITIONS

PORT ADDR.	EXT #	LABEL	TYPE	CALL ALERT (QCC ONLY)
3/ 5	10	MIRIAM	QCC	YES

GENERAL OPTIONS
Length of hold reminder timer : 20 sec
DLC Automatic hold enabled : YES

DIRECT STATION SELECTOR (DSS) OPTIONS:

BUTTON NUMBER	FIRST DIAL CODE
1	0
2	50
3	100

Operator Call Park codes: 881 882 883 884 885 886 887 888

Continued

Table I-8 Continued

QCC OPERATOR OPTIONS:

GENERAL OPTIONS:

Listed Directory Number for queue : 800
Held calls return to queue : YES
Automatic hold enabled : YES
Calls-in-queue alarm threshold : 10
Time until priorities are elevated : 6 sec
Message Center Operators : 15
One Touch Extend : AUTOMATIC
Rings before extended calls return : 4
Backup operator station : 770

QCC CALL TYPES:

CALL TYPE	PRIORITY	OPERATORS
Dial 0 Operator	4	10 14 20 24
Follow Forward	4	N/A
Unassigned DID	4	10 14
Listed Directory Number	4	10 14
Operator's Extension	4	N/A
Returning	4	10 14 20 24
Group Coverage		
Group 1	4	10 14 20 24
Group 2	4	10 14 20 24
.		
.		
Group 30	4	

Table I-9 Allowed Lists

Report Name: Allowed Lists

Print Menu Choice: AllowList

Description Telephone numbers included in Allowed Lists. Lists are numbered 0-7 and entries are numbered 0–9.

Sample Report:

ALLOWED LISTS

List: 0

Entry 0: 505555
Entry 1: 303555
Entry 2: 602555
.
.
Entry 9: ------

.
.

List: 7

Entry 0: ------
Entry 1: ------
Entty 2: ------
.
.
Entry 9: ------

(All lists including those with no entries are shown.)

Table I-10 Access to Allowed Lists

Report Name: Access to Allowed Lists

Print Menu Choice: AllowListTo

Description: Telephones to which Allowed Lists are assigned. Lists are numbered from 0–7. If the Allowed List is assigned to Remote Access users and barrier codes are used, the barrier codes are numbered from 0-16. If no barrier codes are used, 17 means the Allowed List is assigned to tie-trunk users and 18 means the Allowed List is assigned to non-tie-trunk users.

Sample Report:

ACCESS TO ALLOWED LISTS

FOR REMOTE ACCESS 17 & 18 MEAN TIE AND NON-TIE RESTRICTIONS

List: 0 STNS 15 16 17 18 19 20 21

RACC 0 2 3 4 5 17 18

(Empty lists and empty entries on lists are not printed.)

Table I-11 Disallowed Lists

Report Name: Disallowed Lists

Print Menu Choice: DisallowList

Description: Telephone numbers included in Disallowed Lists. Lists are numbered 0-7 and entries are numbered 0–9.

Sample Report:

DISALLOWED LISTS

List: 0

Entry 0: 5055551611
Entry 1: PPP976
Entry 2: 6025551234
.
.
Entry 9: ------

.
.

List: 7

Entry 0: ------
Entry 1: ------
Entry 2: -----
.
.
Entry 9: ------

(All lists including those with no entries are shown.)

Table I-12 Disallowed List To

Report Name: Disallowed List To

Print Menu Choice: DisallowTo

Description: Telephones to which Disallowed lists are assigned. Lists are numbered from 0–7. If the Disallowed List is assigned to Remote Access users and barrier codes are used, the barrier codes are numbered from 0–16. If no barrier codes are used for Remote Access, 17 means the Disallowed List is assigned to tie-trunk users and 18 means the Disallowed List is assigned to non-tie-trunk users.

Sample Report:

ACCESS TO DISALLOWED LISTS

FOR REMOTE ACCESS 17 & 18 MEAN TIE AND NON-TIE RESTRICTIONS

List 0 STNS 15 16 17 18 19 20 21

RACC 0 2 3 4 5 17 18

(Empty lists and empty entries on lists are not printed.)

Table I-13 ARS

Report Name: ARS

Print Menu Choice: ARS

Description: Table type, area codes and exchanges, subpattern A and subpattern B routes, FRL, absorb digit, delete digit, Dial 0 tables, and N11 tables.

Sample Report:

AUTOMATIC ROUTE SELECTION

ARS IS: ACTIVE ACCESS CODE: 9
TABLE 1: Area Code

01)303 02)505 03)602 03)619

Pool Pattern	Absorb	Other Digits	FRL	Start
1)70	2	12345	3 08:00	A
2)890			3 08:00	A

Pool Pattern	Absorb	Other Digits	FRL	Start
1)891		12345	3 17:00	B
2)70			3 17:00	B

(Above tables are numbered from 1–16. Empty tables, lines, and entries are not printed.)

Continued

Table I-13 Continued

TABLE 17: Default Toll Output Table

Pool	Absorb	Other Digits	FRL	Start	Pattern
1)70	2	12345	3	08:00	A
2)893			3	08:00	A

Pool	Absorb	Other Digits	FRL	Start	Pattern
1)891		12345	3	17:00	B
2)70			3	17:00	B

TABLE 18: Default Local Output Table

Pool	Absorb	Other Digits	FRL	Start	Pattern
1)70	2	12345	3	08:00	A
2)894			3	08:00	

Pool	Absorb	Other Digits	FRL	Start	Pattern
1)895	12345		3	17:00	B
2)70			3	17:00	

(Default tables 17 and 18 are also printed when ARS is not active.)

TABLE 19: Dial 0 Output Table

Pool	Absorb	Other Digits	FRL	Start	Pattern
1)70	2	12345	3		
2)894			3		

(Default Table 19 is also printed when ARS is not active. The "Start" column is not used in this table.)

TABLE 20: N11 Output Table

01)411 02)611 03)811 04)911

Pool	Absorb	Other Digits	FRL	Start	Pattern
1)70		12345	3		

(Default Table 20 is also printed when ARS is not active. The “Start” column is not used in this table. The entry in the "Pool” column is always the dial-out code of the main pool.)

Table I-14 Extension Directory

Report Name: Extension Directory

Print Menu Choice: Ext Info

Description: Slot/port, extensions, telephone type, button contents, features assigned, labels and restrictions, etc., included in Extension Directory.

Sample Report:

EXTENSION DIRECTORY LISTING

Port Addr	Ext #	Label	F C E	H A S	R B W	M C D	V I G	R S R	A R S	Port Addr	Ext #	Label	F C E	H A S	R B W	M C D	V I G	R S R	A R S
3/	515	WAYNE	N	Y	Y	N	1	U	3	3/	616	ANN	N	Y	Y	N	1	U	3

(The column headings for these columns are read from top to bottom.)

(Information is included for all available station jacks in the control unit.)

Table I-15 System Directory

Report Name: System Directory

Print Menu Choice: PblicDirect

Description: System Speed Dial number, telephone number, and label included in System Directory.

Sample Report:

SYSTEM DIRECTORY

Code	Name	Number	Display
600	Western Sup	15055551611	YES
601	Xanadu Inc.	15055552299	NO

(Speed Dial codes without names and telephone numbers are not printed.)

Table I-16 Group Paging

Report Name: Group Paging

Print Menu Choice: Group Page

Description: Extension number for each group and the extension number for each telephone assigned to the group.

Sample Report:

GROUP PAGING

Group # 793 STNS: 10 15 18 19 22

(Paging groups without members are not printed.)

Table I-17 Extension Information

Report Name: Extension Information

Print Menu Choice: Ext Info

Description: Type of equipment connected, features assigned to station, and features assigned to each button on the station.

Sample Report:

EXTENSION INFORMATION

Extn	SS/PP	Type
	3/ 1	NT2 Executive

Pool Access :	70 890 891	
Auto Callback		: ON
Call Waiting		: OFF
Coverage Inside		: ON
Abbreviated Ring		: ON
Line Preference		: ON
Shared SA Ring		: OFF
Receive Voice Calls		: ON

Button 34	*21	Blank
Button 33	*21	Blank
Button 32	*21	Blank
Button 30	*21	Blank
Button 29	*21	Blank
Button 28	*21	Blank
Button 27	*21	Blank
Button 26	*21	Blank
Button 25	*21	Blank

Continued

Table I-17 Continued

Button 24	*21	Blank
Button 23	*21	Blank
Button 22	*21	Blank
Button 20	*21	Blank
Button 21	*21	Blank
Button 19	*21	Blank
Button 18	*21	Blank
Button 17	*21	Blank
Button 16	*21	Blank
Button 15	*21	9,1,5055551611
Button 14		
Button 13		
Button 12	*40	15 -N
Button 11		
Button 10		
Button 9		
Button 8		
Button 7		
Button 6		
Button 5		
Button 4		Line 802 -D
Button 3		Line 801 -I
Button 2	*16	SysAcc Voice -I
Button 1	*16	SysAcc Ring -I

Table I-18 Group Coverage

Report Name: Group Coverage

Print Menu Choice: GrpCoverage

Description: Extension number for each group and the extension number for each telephone assigned to the group.

Sample Report:

GROUP COVERAGE INFORMATION

GROUP #: 1 SENDERS: 15 16 17 18 19 20 21

(Coverage groups with no senders are not printed.)

Table I-19 Group Calling

Report Name: Group Calling

Print Menu Choice: Grp Calling

Description: Group calling options (e.g., hunt, type, message waiting, station, etc.), the extension number for each telephone assigned to the group, and the lines or trunks assigned to the group.

Sample Report:

DIRECT GROUP CALLING INFORMATION

GROUP NO : 770 Group Type : AutoLogin
Call Distribution Type : CIRCUIAR
Delay Announcement Ext # : 35
Message Waiting Station : 26
Calls_in_queue Threshold : 5
External Alert ext # :
Overflow Threshold : 20
Overflow to DGC group : LDN
Group Coverage: 1 2 3

No.	EXT #	LABEL
1	23	WAYNE
2	27	CAROL
.		
.		
20		

LINES: 807 808 809 810

(Calling groups without members are not printed.)

Table I-20 Night Service

Report Name: Night Service

Print Menu Choice: Nightservce

Description: The password required, time-of-day and Emergency Allowed List extension numbers.

Sample Report:

NIGHT SERVICE INFORMATION

OPERATOR 10 STNS: 10 15 16 27 33 34 35 37

OPERATOR 14 STNS: 14 42 43 45
(Night Service groups without extensions assigned are not printed.)

Password: 3456

Current Day: Monday

	Turn off at:	Turn on at:
Sunday		
Monday	08:00	17:00
Tuesday	08:00	17:00
Wednesday	08:00	17:00
Thursday	08:00	17:00
Friday	08:00	17:00
Saturday	:	:

(Time does not print if Night Service with time set is not programmed.)

Emergency Allowed List:
0) 911
1) 5551611
2) 0
.
.
9)
NS Excluded STNS:
12 13 14 15 16 17 22 23 25

Table I-21 Call Pickup

Report Name: Call Pickup

Print Menu Choice: Call Pickup

Description: Extension numbers for telephones assigned to each group. Pickup groups are numbered 1–30.

Sample Report:

GROUP CALL PICKUP

Group # 1 STNS: 14 15 17 19 23 25 27

(Pickup groups without members assigned are not printed.)

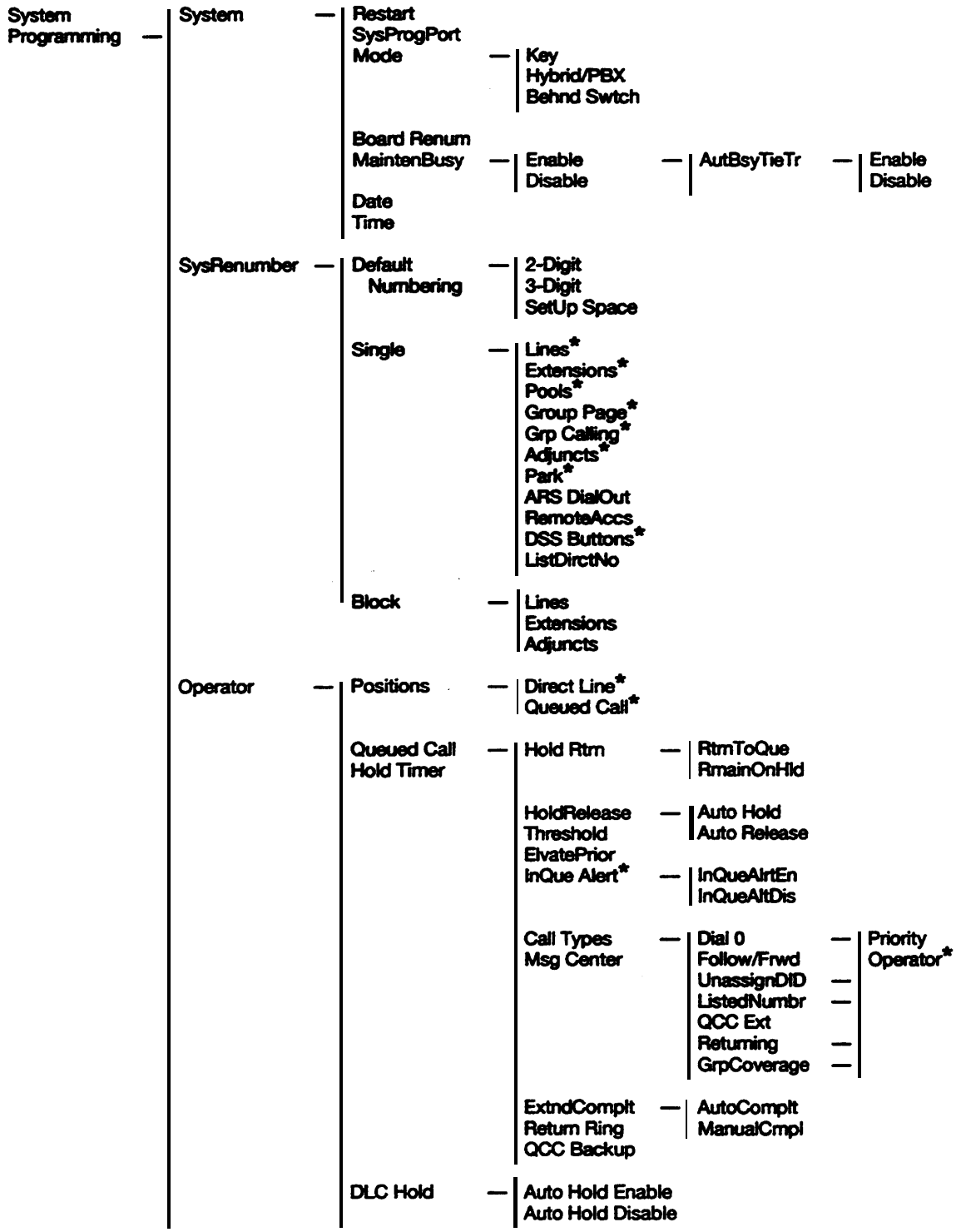
System Programming Menu Hierarchy

J

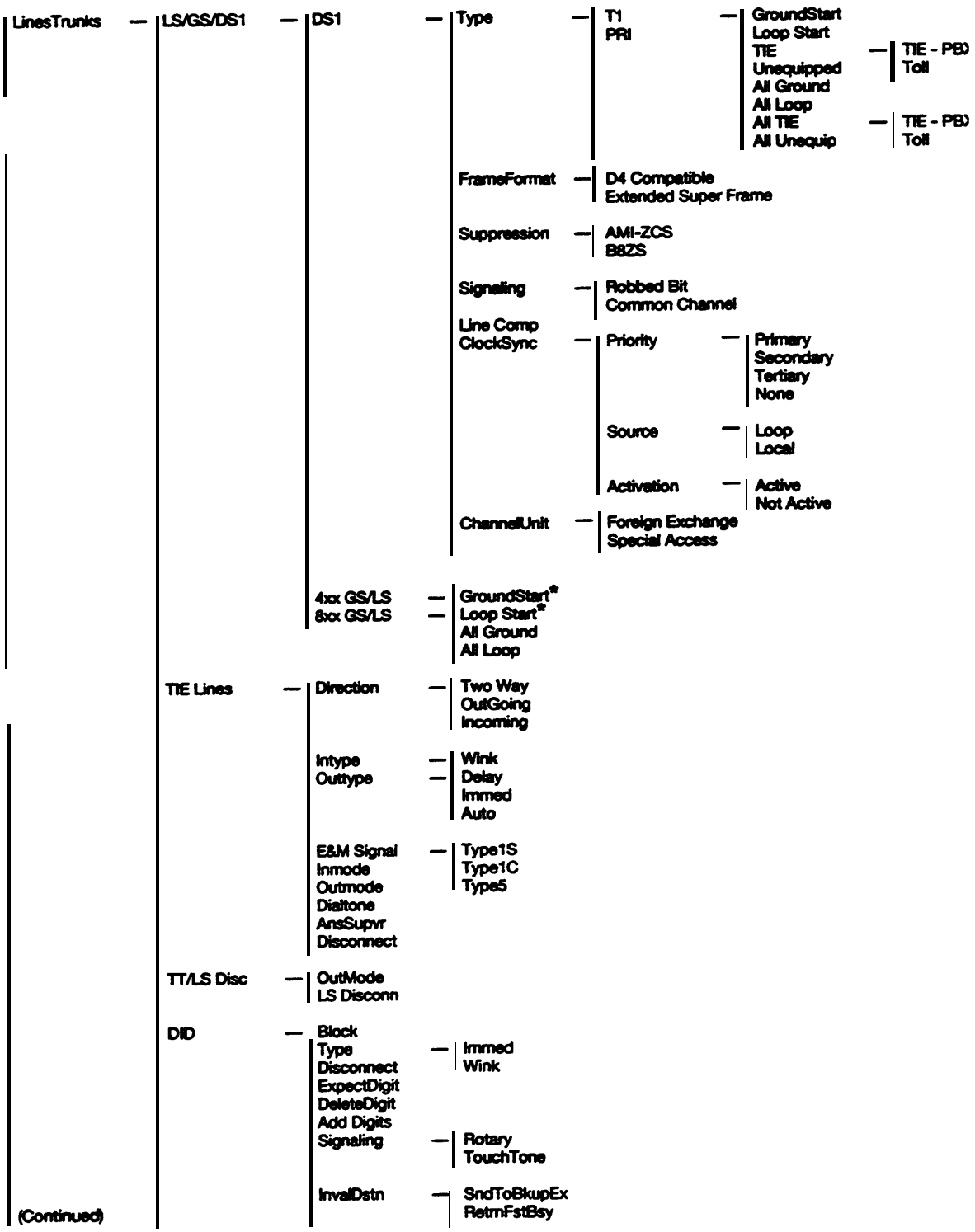
The system programming menu hierarchy is the sequence of menu screens that appear when you program the communications system. On the first menu screen, the choice of an item leads to either a secondary menu screen or a data-entry screen. A secondary menu screen may lead to still another menu screen, and soon up to six separate screens, as shown on the following pages.

You can use the Inspect feature in system programming to display the telephone or line/trunk numbers that are programmed with a specific feature. Inspect is helpful when you must assign a feature to many lines/trunks or extensions and you do not have a Direct Station Selector (DSS) attached to the system programming console, or when you are programming a PC with SPM.

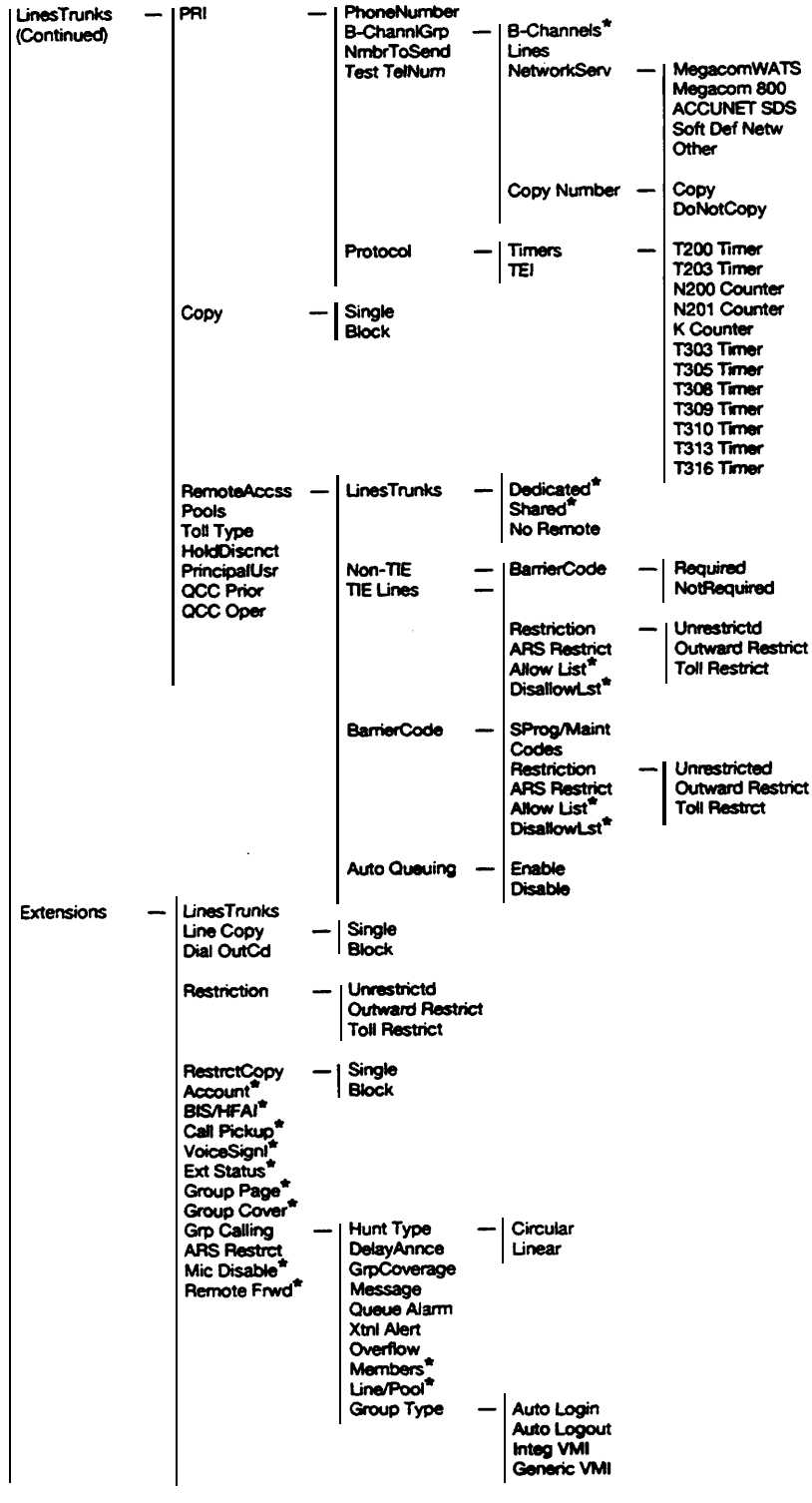
Inspect can be used with the menu options which have an asterisk (*) next to them. To use Inspect in system programming, choose an eligible option, and press **Inspct** or **PgDn.**



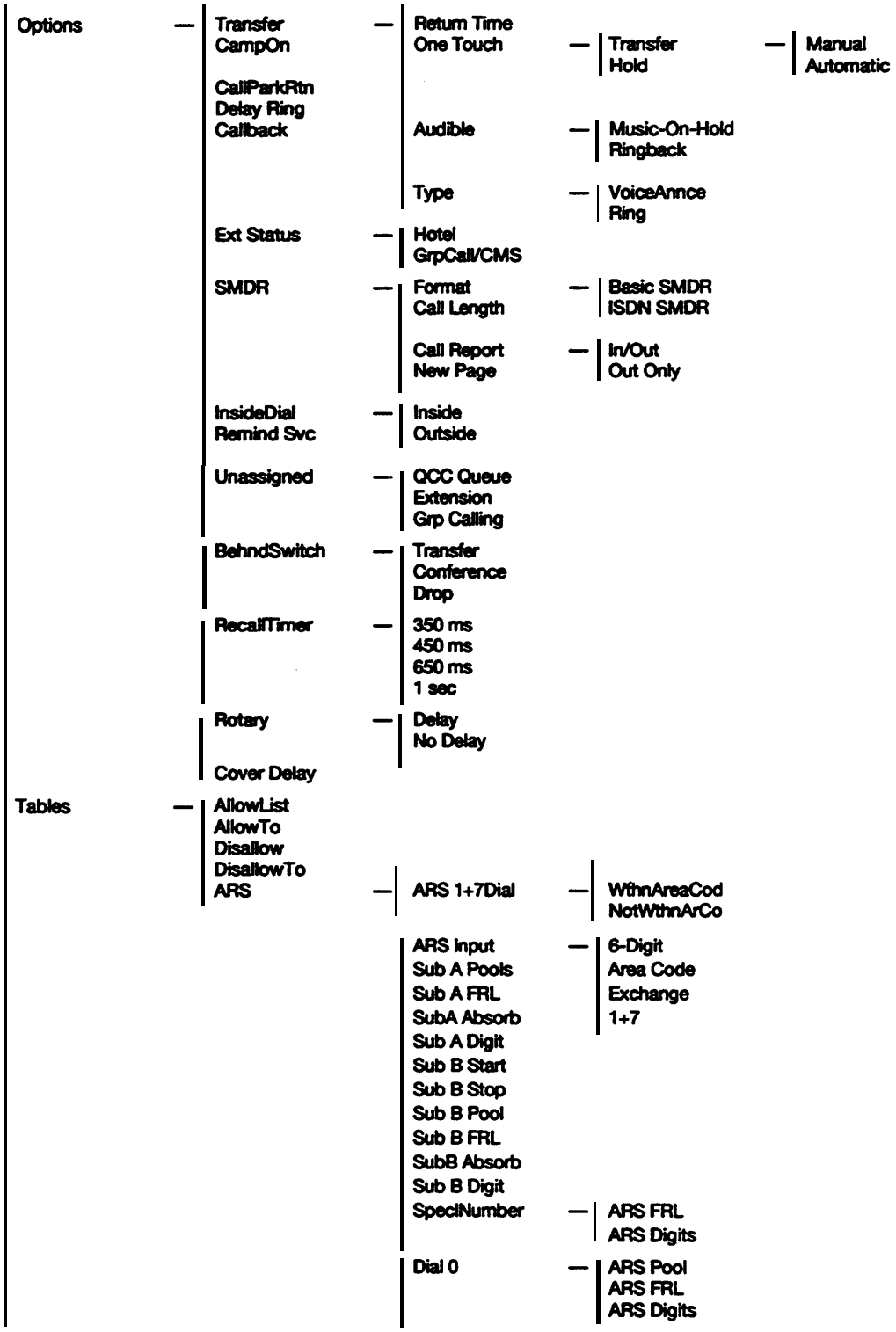
* The Inspect feature can be used with this menu option. Press **Inspct** or **PgDn.**



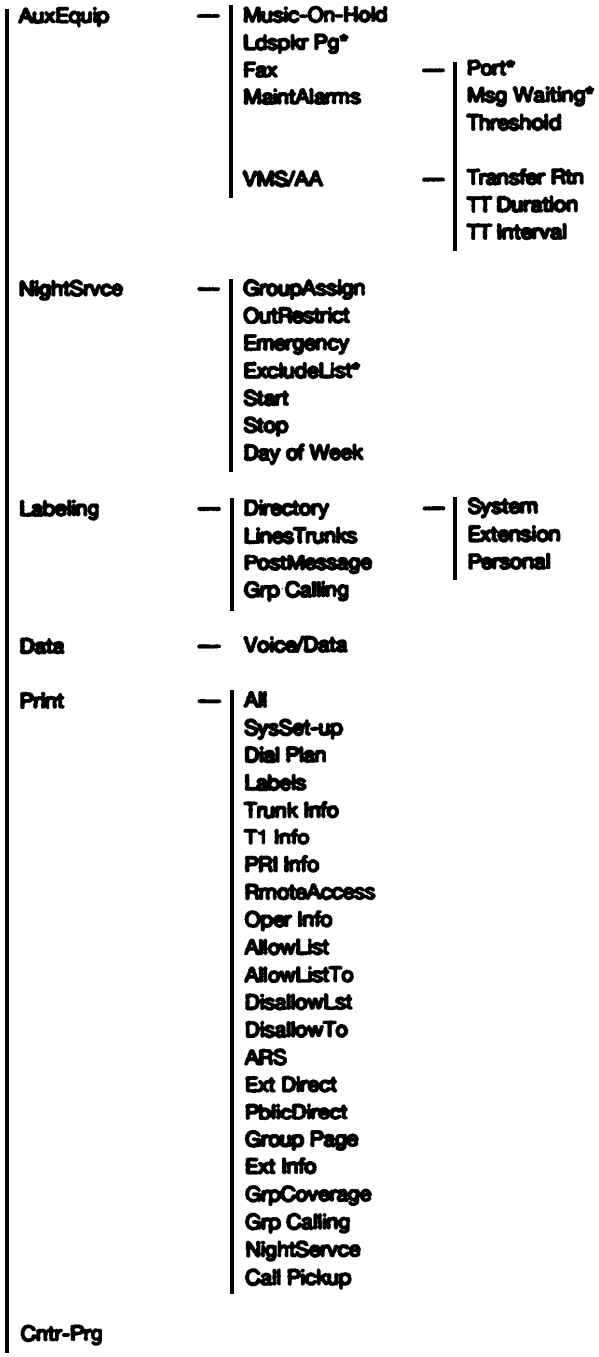
* The Inspect feature can be used with this menu option. Press **Inspct** or **PgDn.**



* The Inspect festufe can be used with this menu option. Press **Inspct** or **PgDn.**



* The Inspect feature can be used with this menu option. Press **Inspct** or **PgDn.**



* The Inspect feature can be used with this menu option. Press **Inspct** or **PgDn.**

Two-Digit Numbering Plan

K

The following figure and text explain the two-digit numbering plan.

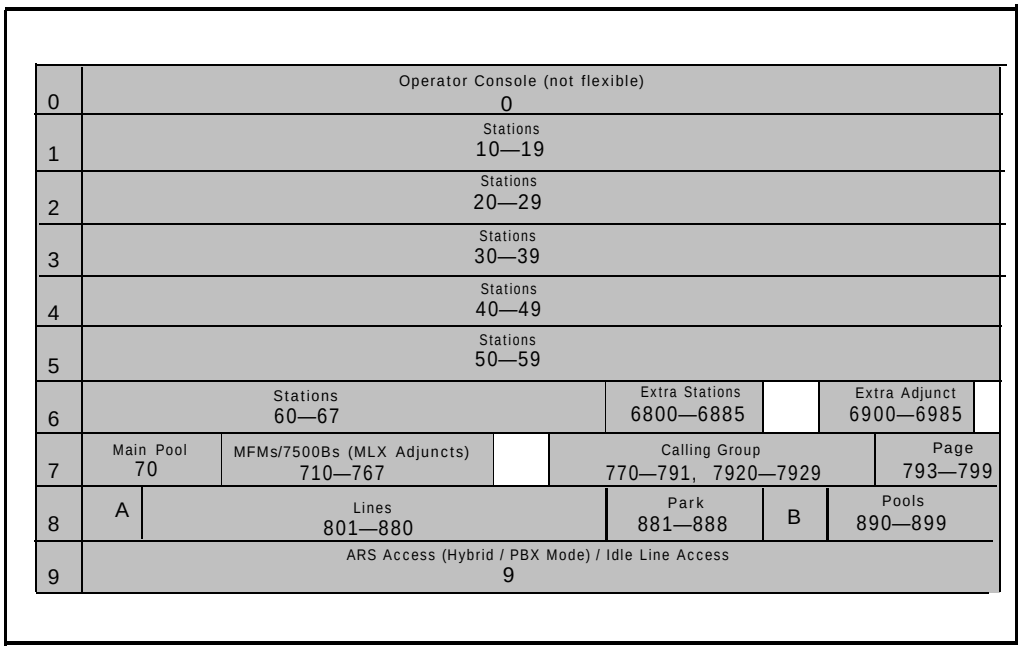


Figure K-1 Two-Digit Numbering Plan

A = 800—Listed Directory Number (QCC Queue)
B = 889—Remote Access

The numbers in the figure are arranged in blocks according to the first digit. The type of equipment, jack, or feature to which they are assigned is indicated in the block.

Each of the first 58 station jacks is assigned a two-digit extension number beginning with extension 10 and ending with extension 67. The rest of the stations (68–144) are assigned four-digit extension numbers 6800–6885. Extra adjuncts are assigned as extensions 6900–6985.

The extension numbers shown for MFMs/7500Bs (710-767) are reserved for digital station jacks. These numbers are automatically assigned by the system to ISDN 7500B Data Modules or to adjuncts (such as a data terminal, answering machine, or fax) connected to an MLX telephone using a Multi-Function Module (MFM).

For the first 58 digital station jacks, the actual extension number assigned to the adjunct is the extension number assigned to the MLX telephone preceded by a 7. For example, if the extension number assigned for an MLX telephone is 25, the extension number assigned for the adjunct on that telephone is 725. In this example, a call can be placed to the telephone by dialing extension 25 or to the adjunct by dialing extension 725.

Note: The extension numbers are reserved whether or not an adjunct is connected to an MLX telephone. If you reassign the extension number of the telephone, the system does not automatically change the extension of the MFM or data module.

If the system has fewer than 50 stations and you want to keep the two-digit numbering plan, determine whether you want to reassign any of the numbers that are automatically assigned by the system.

The unshaded areas of the two-digit numbering plan in Figure K-1 show the extension numbers you can reassign (6800-6885). This means that you can change selected extension numbers to one of the available numbers in the range 6800-6885. If the available numbers do not meet your needs, you should consider the three-digit numbering plan.

System Technician's Run Sheet

L

When you install a new MERLIN LEGEND Communications System or when you change any existing station wiring, record information about the station wiring on the System Technician's Run Sheet. Figure L-1 shows the first page of the System Technician's Run Sheet, and the text that follows explains how to complete it.

Logical ID	Type	Wire No.	Old Ext. No.	New Ext. No.	Miscellaneous	Person Location or Function
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						

Figure L-1 System Technician's Run Sheet

The following explains the information you enter in the columns on the System Technician's Run Sheet. The number in the Logical ID column refers to the number of the station jack in the control unit.

1. On the first line of the "Type" column, enter the type of device (such as an MLX-20L telephone) connected to the station jack. On the second line, enter any attached adjuncts (such as an answering machine).
2. In the "Wire No." column, enter the number of the wire as indicated by the label on the wire.
3. In the "Old Ext. No." column, if the wire run is being changed, enter the extension number of the old station. If you are working with a new installation, leave this space blank.
4. In the "New Ext. No." column, enter the extension number of the station. This includes new installations.
5. In the "Miscellaneous" column, enter any information particular to that station.
6. In the "Person, Location, or Function" column, enter the name of the person at, the location of, or the function of (such as fax machine) the station.

Abbreviations

ACW	After Call Work (CMS)
Amps	amperes
ANI	automatic number identification
ARS	Automatic Route Selection
ASCAP	American Society of Composers, Artists, and Producers
AUDIX	Audio Information Exchange
AVP	AUDIX Voice Power
B8ZS	bipolar 8 zero substitution
BIS	built-in speakerphone
BMI	Broadcast Music Incorporated
BTMI	basic telephone modem interface
CAS	Call Accounting System
CAT	Call Accounting Terminal
CCITT	Comitee Consultatif International Telephonique et Telegraphique
CCS	common-channel signaling
CIB	customer information bulletin
CMS	Call Management System
CO	central office
comcode	component code
CSC	Customer Service Center
CU	control unit
dB	decibel
DCE	data communications equipment
DCP	Digital Communications Protocol
DFT	direct facility termination
DID	direct inward dialing
DIP	dual in-line package
DLC	direct-line console
DNIS	Dialed Number Identification Service
DOS	disk operating system
DSO	Digital Signal 0
DS1	Digital Signal 1
DSS	Direct Station Selector
DTE	data terminal equipment
DXS	direct extension selector
EIA	Electronic Industries Association
E&M	ear and mouth (receive & transmit)
EPROM	erasable and programmable read-only memory
FACE	Forced Account Code Entry
fax	facsimile
FCC	Federal Communications Commission
FRL	Facility Restriction level
FX	foreign exchange
GPA	General Purpose Adapter
HFAI	Hands Free Answer on Intercom

HFU	hands-free unit
ICOM	Intercom
I/O	input/output
IROB	in-range out-of-building
IS II	Integrated Solution II
ISDN	Integrated Services Digital Network
IVP	Integrated Voice Power Automated Attendant
kbps	kilobits per second
LAN	local area network
LDN	listed directory number
LED	light-emitting diode
LS	loop-start
Mbps	megabits per second
MET	multibutton electronic telephones
MFM	Multi-Function Module
MIS	management information system
modem	modulator-demodulator
MOH	Music-on-Hold
NSAC	National Service Assistance Center
OPT	off-premises telephone
OPX	off-premises extension
PBX	private branch exchange
PC	personal computer
PEC	price element code
PFT	power failure transfer
PRI	primary rate interface
QCC	queued call console
RAM	random access memory
RBS	robbed-bit signaling
SA	System Access
SAA	Supplemental Alert Adapter
SMDR	Station Message Detail Recording
SPM	System Programming and Maintenance
SSN	Switched Services Network
T/R	tip and ring
TDM	time-division multiplex
TEI	terminal equipment identifier
TTR	touch-tone receiver
UPAM	Universal Paging Access Module
UPS	uninterruptible power supply
VA	volt-ampere
VAC	Volts AC
VMI	voice messaging interface
V.T.	voice terminal
WATS	wide area telecommunications service
ZCS	zero code suppression

Glossary

A

access line
A connection from the customer to the local telephone company that provides access to the public network. Also called local loop.

account code
A 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 communications line, for example, must each have a unique address.

adjunct
Optional equipment used with the communications system such as an alerting device that connects to a multiline telephone or to a station jack.

administration port reassignment
Reassignment of the system programming position to any of the first five station jacks on the first 006 MLX module in the communications system control unit.

alternate mark inversion (AMI)
A line coding format in which a binary 1 is represented by a positive or negative pulse, a binary 0 is represented by no line signal, and subsequent binary 1's must alternate in polarity or there will be a bipolar violation. AMI is used in the DS1 interface.

analog transmission
A mode of transmission in which information is represented in continuously variable physical quantities such as amplitude, frequency, phase, or resistance. See also *digital transmission.*

application
Software and/or hardware that adds functional capabilities to the communications system. For example, the Call Management System (CMS) is a DOS-based application that simulates the actions of a system operator by answering calls and distributing them to individual telephones.

asynchronous data transmission
A method of transmitting a short bit stream of data, such as printable characters represented by a 7- or 8-bit ASCII code. Each string of data bits is preceded by a start bit and followed by a stop bit, permitting data to be transmitted at irregular intervals. See also *synchronous data transmission.*

AT&T Switched Network (ASN)
AT&T telecommunications services provided through an Integrated Digital Services Network Primary Rate Interface (ISDN-PRI) line or trunk: Accunet® switched digital service, Megacom® WATS, Megacom 800, Software Defined Network (SDN), MultiQuest, and Shared Access for Switch Services (SASS).

Audix Voice Power Package (AVP)
A voice-processing application, part of Integrated Solution II, that provides automated attendant, call answering, voice-mail, message drop, and information services for use with the communications system.

automatic number identification (ANI)
The process of automatically identifying a caller's billing number and transmitting that number from the caller's local central office (CO) to another point on or off the public network. INFO-2 (INformation Forwarding-2) is AT&T's ANI service.

automatic-ringdown tie trunk
See *automatic-start tie trunk.*

automatic-start tie trunk
A tie trunk on which incoming calls are routed to an operator or other designated destination without a start signal. Also called automatic-ringdown tie trunk or auto-in tie trunk.

auxiliary power unit
A device that provides additional power to the communications system.

B

B channel
For an Integrated Services Digital Network (ISDN), a 64-kbps channel that carries a variety of digital information streams, such as voice at 64-kbps, data at up to 64 kpbs, wideband voice encoded at 64 kpbs, and voice at less than 64 kbps, alone or combined with other digital information streams. Also called bearer channel.

bandwidth
The difference, expressed in hertz, between the highest and lowest frequencies in a range of frequencies that determine channel capacity.

barrier code
A password used to limit access to the Remote Access feature of the communications system.

basic carrier
A piece of hardware that holds and connects the processor module; power supply module; and up to five line, trunk, or station modules in the communications system. See also *expansion carrier.*

Basic Rate Interface (BRI)
A standard Integrated Services Digital Network (ISDN) frame format that specifies the protocol used between the communications system and a terminal. BRI runs at 192 kbps and provides two 64-kbps voice or B channels and one 16-kbps signaling or D channel per port. The remaining 48 kbps are used for framing and D-channel contention.

baud
In telecommunications applications, a unit of transmission speed equal to the number of signal events per second. See also *bit rate* and *bits per second.*

Behind Switch
A mode of operation in which the communications system control unit is connected to (is "behind") another communications system.

binary code
An electrical representation of quantities or symbols expressed in the base-2 number system.

bipolar 8 zero substitution (B8ZS)
A line-coding format that encodes a string of 8 zeros in a unique binary sequence using bipolar violation. See also *bipolar signsland bipolar violation.*

bipolar signal
A digital signal in which pulses (ones) alternate between positive and negative. See also *alternate mark inversion, bipolar 8 zero substitution,* and *bipolar violation.*

bipolar violation
A condition that occurs when two positive or two negative pulses are received in succession. See also *alternate mark inversion, bipolar 8 zero substitution,* and *bipolar signal.*

bit (binary digit)
One unit of information in binary notation, having two possible values: zero or one.

bit rate
The speed at which bits are transmitted, usually expressed in bits per second. Also called data rate. See also *baud* and *bits per second.*

bits per second (bps)
The number of binary units of information that are transmitted or received per second. See also *baud* and *bit rate.*

blocking
A condition in which end-to-end connections cannot be made on calls because of a full load on all possible services and facilities.

broadband
A transmission path having a bandwidth greater than a voice-grade channel.

bus
A multiconductor electrical path used to transfer information over a common connection from any of several sources to any of several destinations.

button
A key on the face of a telephone or console that is used to access a line, activate a feature, or enter a code on a communications system.

byte
A sequence of bits (usually eight) processed together. "Octet" is used instead of "byte" in CCITT (International Telegraph and Telephone Consultative Committee) documentation.

C

Call Accounting System (CAS)
A vendor-supplied DOS or UNIX-based application that monitors and manages telecommunications costs.

Call Accounting Terminal (CAT)
A vendor-supplied stand-alone unit with a built-in microprocessor and data buffer that provides simple call accounting at a low cost.

Callback queue
The queue used to hold Callback callers who have requested a busy pool or extension.

calling group
A team of agents who answer the same types of calls.

Call Management System (CMS)
A DOS-based application that simulates the actions of a system operator by answering and distributing calls. CMS also produces management reports for call analysis.

campus cable
Cable that runs between buildings connected to the same communications system.

central office (CO)
The location of telephone switching equipment that provides local telephone service and access to toll facilities for long-distance calling.

central processor
The part of a computer that interprets and executes instructions. Also called central processing unit.

Centrex
A set of communications system features a user can subscribe to on telephone lines from the local telephone company.

channel
A telecommunications transmission path for voice and/or data.

channel service unit (CSU)
Equipment used at a customer's premises to provide DS1 facility terminations and signaling compatibility.

checksum
The sum of ones in a sequence of ones and zeros; used to detect or correct errors in data transmission.

circuit-switched data call
A data call made via a connection exclusively established and maintained between data stations for the duration of the data call.

clock synchronization
The operation of digital facilities from a common clock.

coaxial cable
A cable consisting of one conductor, usually a small copper tube or wire, within and insulated from another conductor of large diameter, usually copper tubing or copper braid.

codec (coder-decoder)
A 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.

CO line/trunk jack
A jack that connects an outside line/trunk to the communications system control unit.

common-channel signaling (CCS)
Signaling in which one channel of a group of channels carries signaling information for each of the remaining channels, permitting each of the remaining channels to be used to nearly full capacity. In the system's DS1 module, channel 24 can be designated as the signaling channel for channels 1–23 by selecting "common channel" for emulated service when programming the system. CCS must be used for ISDN-PRI service.

communications system
The software-controlled processor complex that interprets dialing pulses, tones, and/or keyboard characters and makes the proper interconnections both inside and outside the system. The communications system itself consists of a digital computer, software, a storage device, and carriers with special hardware to perform the actual connections. A communications system provides voice and/or data communications services, including access to public and private networks, for telephones and data terminals on a customer's premises.

companding
The compression or expansion of the quantizing scale to reduce distortion. See also *quantizing.*

control unit
The housing, carriers, power supply module, processor module, and line/trunk and station modules of a communications system.

conversion resource
See *modem pool.*

cyclic redundancy check (CRC)
An error-detection code used on DS1 facilities with the extended superframe framing (ESF) format.

D

D channel
The 16-kbps or 64-kbps channel carrying signaling or data on an Integrated Services Digital Network Basic Rate Interface (ISDN-BRI) or 64-kbps channel carrying signaling or data on an ISDN Primary Rate Interface (ISDN-PRI).

D4 framing format
A framing format consisting of a sequence of individual frames of 24 eight-bit slots, and 1 signal bit (193 bits) in a 12-frame superframe. See also *extended super frame format.*

data communications equipment (DCE)
Equipment such as modems or data modules used to establish, maintain, and terminate a connection between the communications system and data terminal equipment (DTE), such as printers, host computers, or workstations.

data hunt group (DHG)
A group of analog or digital data stations that share a common access code. Calls are connected in a round-robin fashion to the first available data station in the group.

data rate
See *bit rate.*

data terminal
An input/output (I/O) device that can be connected to the communications system control unit via an interface.

data terminal equipment (DTE)
The equipment that makes up the endpoints in a connection over a data circuit—for example, a data terminal, host computer, or printer.

dedicated feature buttons
The imprinted feature buttons on a telephone: Conf or Conference, Drop, HFAI (Hands Free Answer on Intercom), Hold, Mute or Microphone, Speaker or Speakerphone, Transfer, Message, and Recall.

delay-dial-start tie trunk
A type of tie trunk on which the originating end of the tie trunk transmits an off-hook signal to the receiving end and waits for the receiving end to send an off-hook signal followed by an on-hook signal. Also called a dial-repeating tie trunk.

dial access
See *feature code.*

dial-out code
A code (usually a 9) dialed by single-line telephone users and multiline telephone users with System Access (SA) buttons to get an outside line.

DID (direct inward dialing) trunk
An incoming trunk that receives dialed digits from the local exchange, allowing the communications system to connect directly to a station without assistance from the system operator.

digital
The representation of information in discrete elements such as off and on or 0 and 1. See also *analog transmission.*

Digital Communications Protocol (DCP)
An AT&T proprietary protocol used to transmit both digitized voice and data over the same communications link. A DCP link is made up of two 64-kbps information (1) channels and one signaling (S) channel similar to the B and D channels used in an Integrated Services Digital Network (ISDN).

digital switch element (DSE)
A device in each jack on each module in the communications system control unit that interfaces with the TDM (time-division multiplex) bus.

digital transmission
A mode of transmission in which the information to be transmitted is first converted to digital form and then transmitted as a serial stream of pulses. See also *analog transmission.*

DIP (dual in-line package) switch
A switch on a 400EM module used to select the signaling format for tie-line transmission. DIP switches are also used on other equipment for setting hardware options.

direct facility termination (DFT)
A central office (CO) line/trunk that terminates directly on one or more telephones; in PBX mode a DFT cannot be part of a trunk pool.

direct inward dialing (DID)
A service that transmits the called station number to the communications system from the central office (CO) and routes incoming calls directly to the called station, calling group, or outgoing trunk pool, bypassing the system operator.

Direct Station Selector (DSS)
A 60-button adjunct that enhances the call-handling capabilities of an MLX-20L™ telephone or MLX-28D™ telephone when used as an operator console.

display buttons
The buttons on an MLX display telephone used to access the telephone's display.

door answering unit
A device that is connected to a basic telephone jack and used at an unattended station or front desk.

DS0 (Digital Signal 0)
A single 64-kbps voice or data channel.

DS1 (Digital Signal 1)
A bit-oriented signaling (BOS) interface that multiplexes 24 64-kbps channels into a single 1.544-Mbps stream.

dual-tone multifrequency (DTMF) signaling
Touch-tone signaling from telephones using the voice transmission path. The code for DTMF signaling provides 12 distinct signals, each composed of two voice-band frequencies.

E

E and M signaling
Tie-trunk supervisory signaling, used between two communications systems, in which information is transferred through two-state voltage conditions (on the E and M leads) for analog applications and through two bits for digital applications.

EIA (Electronic Industries Association)
A trade association of the electronics industry that sets electrical and functional standards.

electronic switching system (ESS)
A class of modern switching central office (CO) 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.

endpoint
The final destination in the path of an electrical or telecommunications signal.

expansion carrier
A carrier added to the control unit when the basic carrier cannot house all the modules needed. An expansion carrier houses a power supply module and up to six additional line/trunk and station modules.

extended superframe format (ESF)
A framing format consisting of individual frames of 24 eight-bit slots and 1 signal bit (193 bits) in a 24-frame extended superframe. See also D4 *framing format.*

F

facility
The equipment constituting a telecommunications path between the communications system and the central office (CO).

factory setting
The default state of a device or feature if the user does not choose an optional setting.

fax (facsimile)
A processor the result of a process in which graphic material is scanned and the information converted into electrical signal waves to produce an exact likeness.

feature
A function or service provided by a hardware or software product.

feature code
A code entered on a dialpad to activate a feature. For example, a user might press the feature button or might dial #33.

Feature screen
A display screen on digital/ISDN display telephones that provides quick access to commonly used features.

foil shield
A copper foil sheet for power units on expansion carriers that is used to prevent excessive noise on the module immediately to the right of the power supply module in each expansion carrier.

frame
One of several segments of an analog or digital signal that has a repetitive characteristic. For example, a DS1 frame consists of a framing bit and 24 octets, which equals 193 bits.

frequency generator
A circuit pack added to the power unit module that generates a high-voltage, 20-30-Hz signal to ring a telephone. Also called a ring generator.

FX (foreign exchange)
A central office (CO) other than the one providing local access to the public network.

G

General Purpose Adapter (GPA)
A device that connects an analog multiline telephone to optional equipment such as an answering machine or a fax machine.

glare
The loud dual-tone multi-frequency (DTMF) signal an incoming caller hears when another caller tries to call out on a line/trunk at the same time the call is coming in on that line/trunk.

ground-start (GS) Iine/trunk
A line/trunk on which, after verifying that the line/trunk is idle (no ground on tip), the communications system transmits a request for service (puts ground on ring) to a distant central office (CO).

H

headset
An ultralight earpiece and microphone for hands-free telephone operation.

Home screen
"home base" of the display screen on digital/ISDN telephones, which shows time, date, and call information, and when a feature is in use.

house cable
Cable that runs from the equipment room to a small, walk-in closet (called a satellite closet) elsewhere in the building.

Hybrid/PBX
A mode of operation in which the communications system uses trunk pools and Automatic Route Selection (ARS) in addition to personal lines—that is, direct facility terminations (DFTs) on line buttons. The Hybrid/PBX mode also provides a single interface to users for both internal and external calling.

I

immediate-start tie trunk
A tie trunk on which no start signal is necessary and dialing can begin immediately after the tie trunk is seized.

in-band signaling
See robbed-bit signaling.

inside dial tone
A tone users hear when they are connected to an intercom line.

Inspect screen
A display screen on digital/ISDN telephones that allows users to preview incoming calls and see a list of the features programmed on line buttons.

integrated access
The use by customers of voice, data, images, and fax simultaneously on an Integrated Services Digital Network (ISDN).

Integrated Services Digital Network (ISDN)
A 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-network interfaces defined by the CCITT (International Telegraph and Telephone Consultative Committee). Through these internationally accepted standard interfaces, ISDN provides digital circuit-switched or packet-switched connections within the network and to other ISDNs to provide national and international digital connectivity.

Integrated Solution II (IS II)
One or more UNIX-based applications for improving voice and data communications and automating office operations.

Integrated Voice Power Automated Attendant
An IS II application that automatically answers incoming calls with a recorded announcement and directs callers to a department, an extension, or the system operator.

interface
Hardware, software, or both that links systems, programs, or devices.

I/O (input/output) device
Equipment that can be attached to a computer internally or externally for managing a computer system's input and output of information.

IROB (in-range out-of-building) protector
A surge protection device for off-premises telephones at a location within 1000 feet of cable distance from the communications system control unit.

ISDN 7500B Data Module
A data communications device that allows connection between RS-232 data terminal equipment (DTE) and the communications system control unit via MLX station jacks on the 008 MLX module. The ISDN 7500B Data Module is used together with a modem in a modem pool to change digital data signals to analog signals, and vice versa, which allows transmission between digital and analog data stations.

J

jack
A device, accessed by inserting a plug, that is used to terminate the permanent wiring of a circuit.

K

Key
A mode of operation in which the communications system uses direct facility terminations (DFTs) on line buttons with a separate path for internal calling.

L

LED (light-emitting diode)
A semiconductor device that produces light when voltage is applied. LEDs show the operational status of hardware components, the results of maintenance tests, the alarm status of circuit packs, and the activation of telephone features.

line coding
The pattern data assumes as it is transmitted over a communications channel.

line compensation
An adjustment for the amount of cable loss in decibels (dBs), based on the length of cable between a DS1 module and a channel service unit (CSU) or other far-end connection point.

line/trunk and station module
A module on which the jacks for connecting central office (CO) lines/trunks and/or the jacks for connecting the stations are located.

line and trunk assignment
The assignment of lines and trunks connected to the communications system control unit to specific buttons on each telephone.

local area network (LAN)
A networking arrangement designed for a limited geographical area.

local host computer access
A method for connecting a station jack to an on-site computer for data-only calls through a modem or data module.

logical ID
A numbering sequence used to identify station and line/trunk locations on the communications system control unit.

loop-start (LS) line/trunk
A line/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 from the central office (CO) signals an incoming call.

M

Magic on Hold®
A customized Music-on-Hold (MOH) system that promotes the customer's products and services.

Megacom®
AT&T's tariffed digital WATS (wide area telecommunications service) offering for outward calling.

Megacom 800
AT&T's tariffed digital 800 service for inward calling.

MERLIN® Attendant
An application with equipment that connects to one or more tip/ring station ports and automatically answers incoming calls with a recorded announcement. In response to touch-tone digits dialed by the caller, MERLIN Attendant directs the caller to a department, an extension, or the system operator.

MERLIN MAIL® Voice Messaging System
An application that provides automated attendant, call answering, and voice-mail services on the communications system.

MLX-10™/MLX-10D™ telephone
A 10-button telephone offered with or without a 2-line by 24-character, menu-driven display.

MLX-20L™ telephone
A telephone with 20 programmable line or feature buttons and a 7-line by 24-character, menu-driven display.

MLX-28D™ telephone
A telephone with 28 programmable line or feature buttons and a 2-line by 24-character, menu-driven display.

modem
A device that converts digital data signals to analog signals for transmission over telephone lines. The analog signals are converted back to the original digital data signals by another modem at the other end of the line.

modem pool
A pair, or group of pairs, of modems and data modules with interconnected RS-232 interfaces that converts digital signals to analog, or analog signals to digital, thereby allowing users with Integrated Digital Services Network (ISDN) digital data stations to communicate with users who have analog stations.

Multi-Function Module (MFM)
An adapter that provides a tip/ring interface for the connection of optional equipment such as answering machines, external alerts, and fax machines to an MLX telephone. The optional equipment and the MLX telephone operate simultaneously and independently. The MFM is installed inside the MLX telephone.

multiplexing
A process in which a transmission channel is divided into two or more 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 (MOH)
Magic on Hold® or a customer-provided music source connected to the communications system via a loop-start (LS) jack. Most MOH equipment is designed for LS operation.

Note: If you use equipment that rebroadcasts music or other copyrighted materials, you may be required to obtain a copyright license from and pay fees to a third party such as the American Society of Composers, Artists, and Producers (ASCAP) or Broadcast Music Incorporated (BMI). Or you can purchase a Magic on Hold system, which does not require such a license, from AT&T or your authorized AT&T dealer.

N

network
A 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-premises telephone
A telephone located in a building other than where the control unit is located.

ones density
The requirement for channelized DSI service to the public network that eight consecutive zeros cannot be in a digital data stream.

outcalling
A feature of the MERLIN MAIL™ Voice Messaging System application. When outcalling is activated, the user is automatically called by the system at a programmed number when a new message is received in his or her mailbox.

out-of-band signaling
Signaling that uses the same path as voice-frequency transmission and in which the signaling is outside the band used for voice frequencies.

P

parity
The addition of a bit to a bit string so that the total number of 1's is odd or even. Parity can be used to detect and correct transmission errors.

pass through
A connection from an internal modem to a programming port on the communications system.

personal line
A central office (CO) line that rings only at the user's telephone.

pool
On a Hybrid/PBX system, a grouping of outside trunks that users can choose with multiple pool buttons or by dialing access codes on an SA (System Access) button on the telephone. Pools are also used by the Automatic Route Selection (ARS) feature to choose the cheapest method to route a call.

port
A point of access into a communications system, computer, network, or other electronic device.

power supply module
A device that directs electricity to modules and telephones on the communications system. One power supply module is needed for each carrier, and an auxiliary power unit is added if the module exceeds capacity.

Primary Rate Interface (PRI)
A standard Integrated Services Digital Network (ISDN) access interface that specifies the protocol used between two or more communications systems. PRI runs at 1.544 Mbps and, as used in North America, provides twenty-three 64-kbps B channels (voice or data) and one 64-kbps D channel (signaling). The D channel is the 24th channel of the interface and contains multiplexed signaling information for the other 23 channels.

prime line
An individual extension number assigned to a telephone in a Behind Switch system. 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
The module in the second slot of the basic carrier that contains the software that runs the communications system.

protocol
A set of conventions governing the format and timing of message exchanges between devices, such as a multiline analog telephone and the communications system control unit.

public network
A network that is commonly accessible for local or long-distance calling. Also called public switched telephone network (PSTN).

pulse amplitude modulation (PAM)
A modulation technique in which an analog signal, such as speech, modulates a carrier signal consisting of a series of precisely timed pulses of equal amplitude. See also *pulse code modulation.*

pulse code modulation (PCM)
An extension of pulse amplitude modulation (PAM) in which each PAM pulse is quantized and encoded into a 8-bit code to represent the amplitude of each PAM pulse. See also *pulse amplitude modulation.*

Q

quantizing
The process of converting a pulse amplitude modulation (PAM) sample into a discrete number of amplitude values.

R

RAM (random access memory)
Computer memory in which an individual byte or range of bytes can be addressed and read or changed without affecting other parts of the memory.

riser cable
Cable that runs between floors in a multistory building and connects wire closets.

robbed-bit signaling (RBS)
Signaling in which the least significant bit (LSB) 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.

RS-232
A physical interface, specified by the EIA (Electronics Industries Association), that transmits and receives asynchronous data at speeds of up to 19.2 kbps over cable distances of 50 feet.

S

signaling
The sending of control and status information between devices to set up, maintain, or take down a connection.

simplex signaling
The transmission of signals in one direction only across a telecommunications channel.

single-line telephone
An industry-standard, touch-tone or rotary telephone that only handles one line/trunk and is connected to the communications system via a jack on a basic telephone module.

SMDR printer
A printer used for Station Message Detail Recording (SMDR) that is connected to the communications system via an RS-232 jack on the processor module.

Software Defined Network (SDN)
An AT&T private networking service created by specialized software within the public network.

special character
A pause, stop, or end-of-dialing signal in a programmed dialing sequence such as an Auto Dial or Personal Speed Dial number.

Square Key
A way of configuring the communication system in Key mode so that all lines appear on all telephones.

station
The endpoint on the internal side of the communications system. A station can be a telephone with or without an adjunct or can be a data terminal with a modem (analog) or an ISDN 7500B Data Module (digital) attached.

station jack
An analog, digital, or tip/ring (T/R) interface on the control unit module for connecting telephones and other equipment.

Supplemental Alert Adapter (SAA)
A device that permits 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.

switched service network (SSN)
A network consisting of terminals, transmission lines, and at least one exchange on which a user can communicate with any other user at any time.

switchhook flash
Operation of the telephone switchhook in which the on-hook period is in the range of 250-500 ms.

synchronous data transmission
A method for continuous digital data stream in which the transmission of each binary bit is synchronized with a master clock.

system acceptance test
A test of all trunks, telephones, data terminals, and features after installation to ensure they are working correctly.

system date
The date that appears on display telephones and Station Message Detail Recording (SMDR) reports.

System Programming & Maintenance (SPM)
A DOS-or UNIX®-based application for programming and maintaining the communications system.

system renumbering
A process used to change the extension numbers assigned to stations, adjuncts, calling groups, paging groups, Call Park zones, and Remote Access.

system time
The time that appears on display telephones and is printed on Station Message Detail Recording (SMDR) reports.

T

T1
A digital transmission carrier path that in North America transmits at the DS1 rate of 1.544 Mbps.

telephone power supply unit
Equipment that provides power to an individual telephone.

tie trunk
A private line directly connecting two communications systems.

time-division multiplexing (TDM)
A process where the transmission channel is divided.

timer
A built-in timing device in a display telephone.

time-slot interchanger
An element of a time-division switching network that separates and switches time-division multiplexed (TDM) signals.

tip/ring (T/R)
The contacts and associated conductors of a single-line telephone plug or jack.

touch-tone gate
An operation used to determine if a call is from a touch-tone or rotary telephone.

touch-tone receiver (TTR)
A device used to decode touch-tones dialed from single-line telephones or Remote Access telephones.

U

uninterruptible power supply (UPS)
A device that connects to the communications system to provide 117 VAC to the equipment when the commercial power source fails.

unit load
A measure of the power load drain of a module, telephone, or adjunct.

V

voice-band channel
A transmission channel, generally the 300-3400-Hz frequency band.

voice-only
A station that is set up for making and receiving voice calls but not data calls.

voice signal pair
A pair of leads on an analog multiline telephone station used for the Voice Announce to Busy feature.

W

WATS (wide area telecommunications service)
A service that allows calls to certain areas for a flat-rate charge based on expected usage.

wink-start tie trunk
A 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.

Z

zero code suppression (ZCS)
A binary coding scheme that ensures a data stream contains at least a minimum number of information bits (ones) for receiver synchronization.

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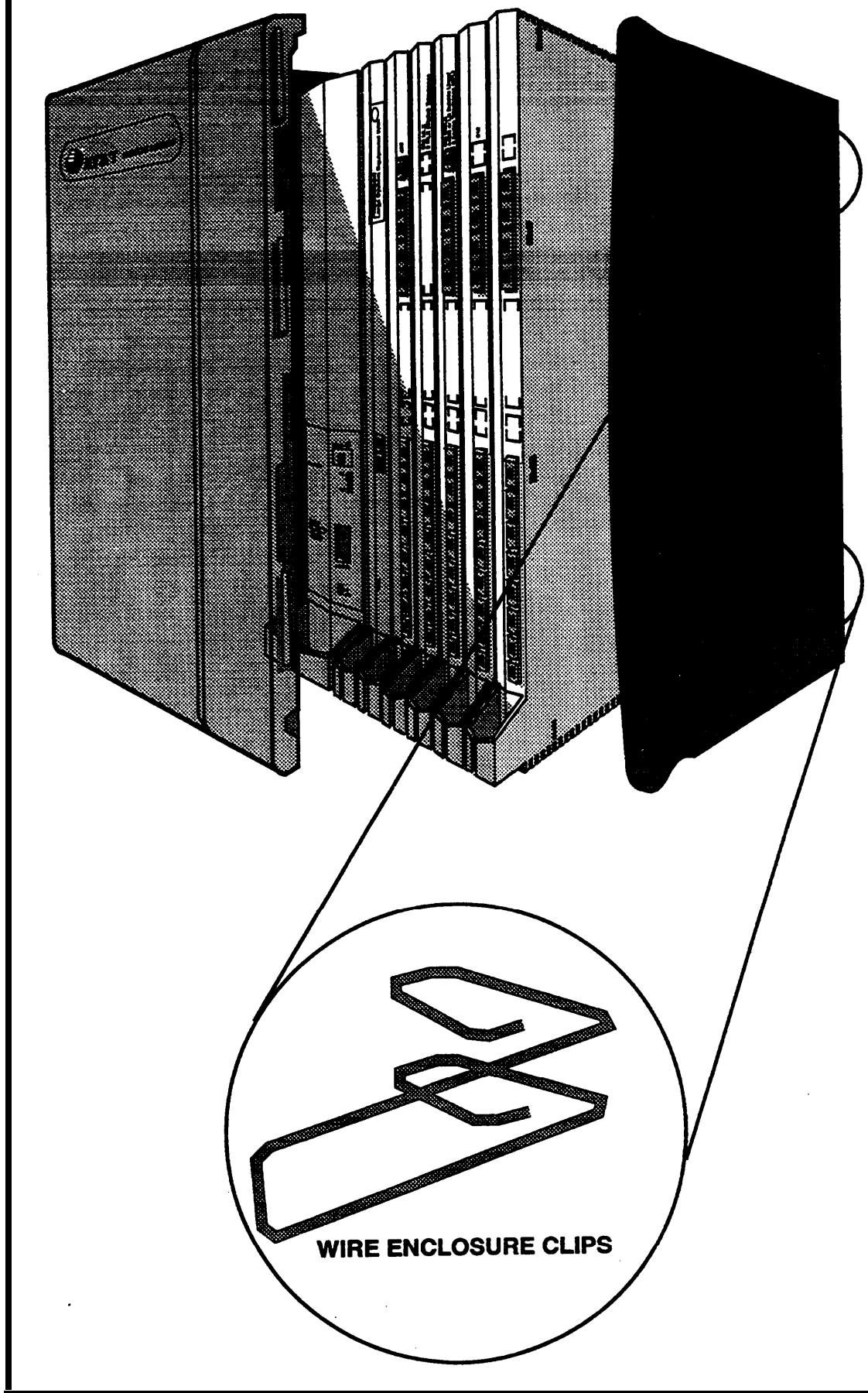
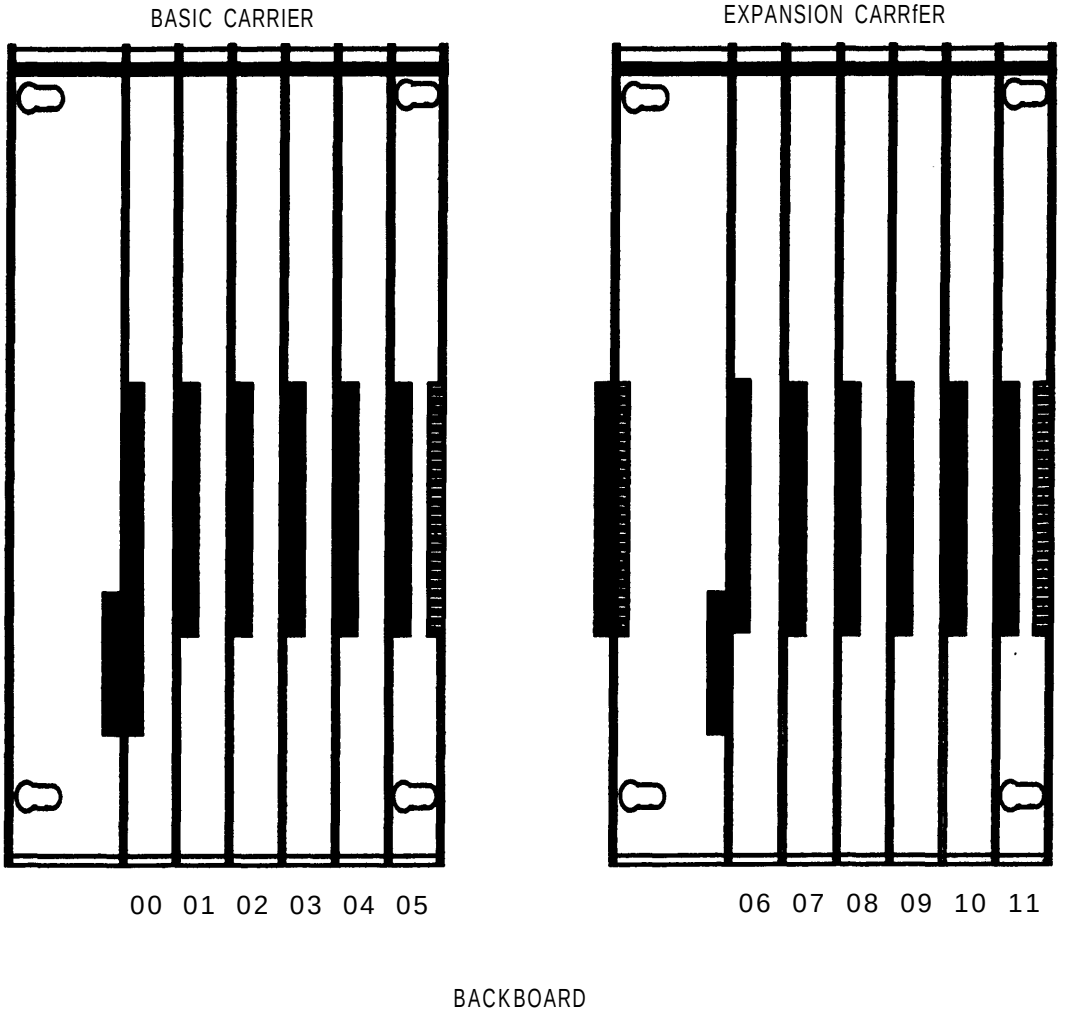
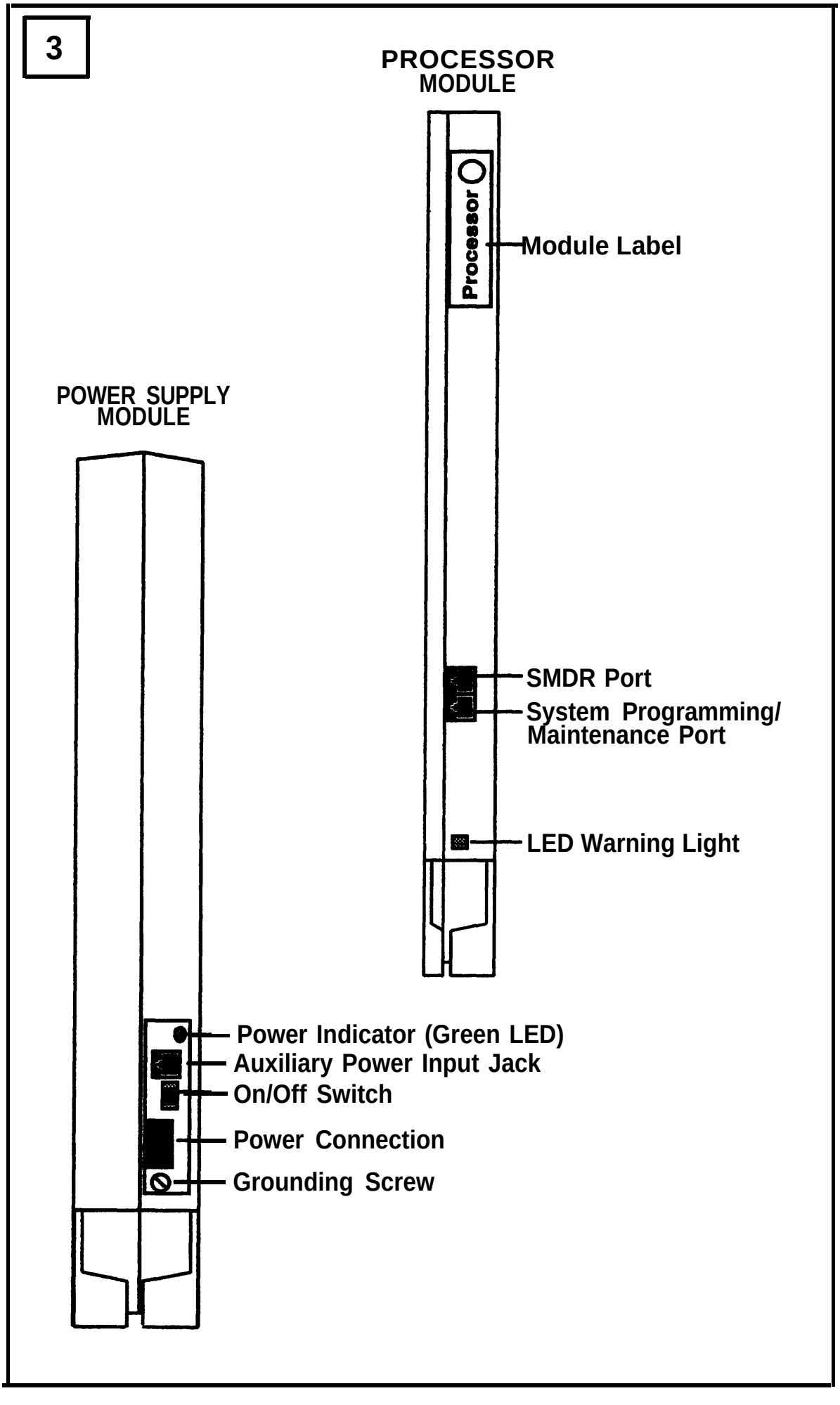
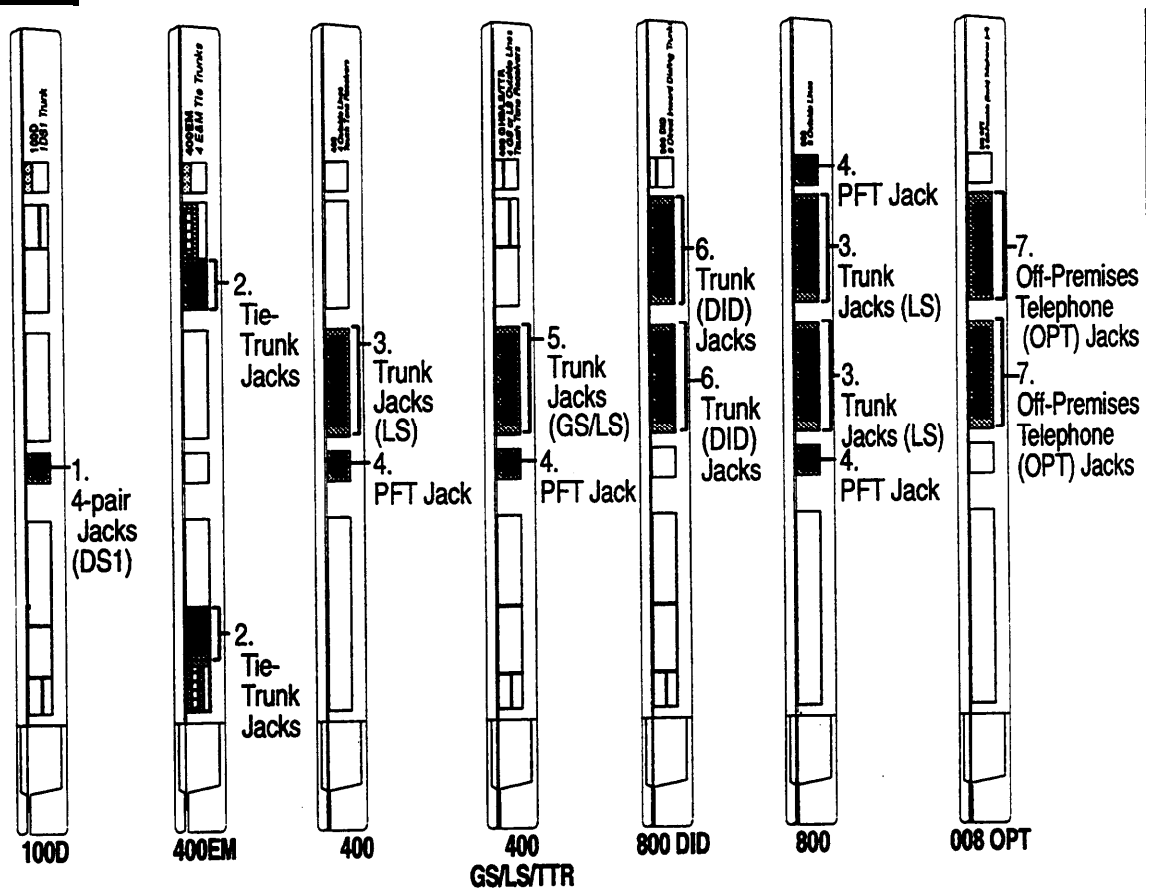



BASIC CARRIER
EXPANSION CARRfER
00 01 02 03 04 05
06 07 08 09 10 11
BACKBOARD

3


PROCESSOR MODULE
Processor
Module Label
POWER SUPPLY MODULE
SMDR Port
System Programming/ Maintenance Port
LED Warning Light
Power Indicator (Green LED)
Auxiliary Power Input Jack
On/Off Switch
Power Connection
Grounding Screw

4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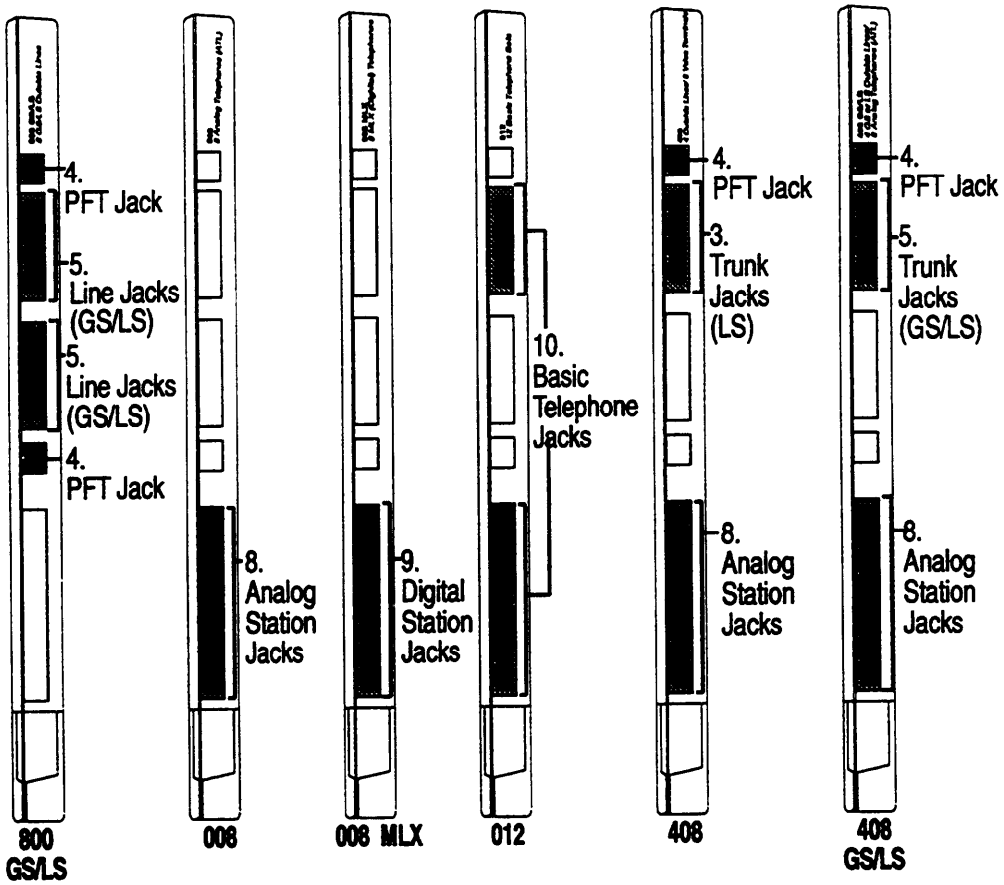
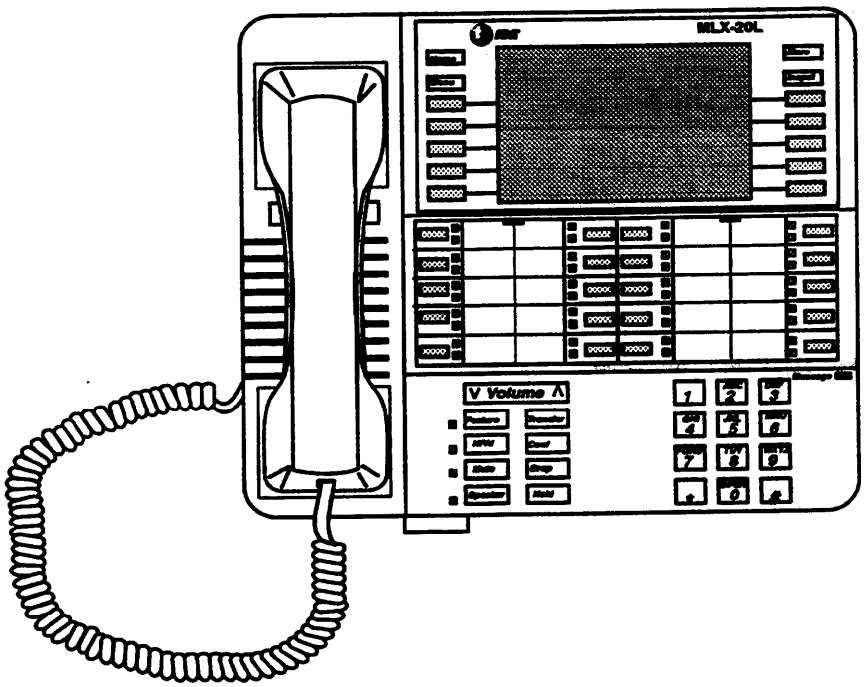
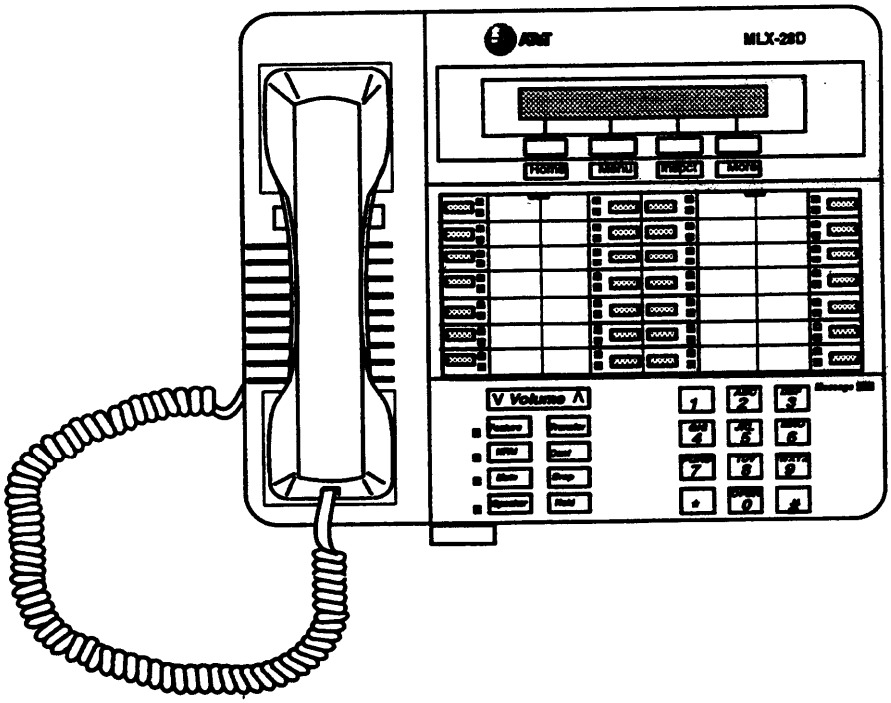
2. Tie-Trunk Jacks
2. Tie-Trunk Jacks
400EM
3. Trunk Jacks (LS)
4. PFT Jack
400
5. Trunk Jacks (GS/LS)
4. PFT Jack
400 GS/LS/TTR
6. Trunk (DID) Jacks
6. Trunk (DID) Jacks
800 DID
4. PFT Jack
3. Trunk Jacks (LS)
3. Trunk Jacks (LS)
4. PFT Jack
800
7. Off-Premises Telephone (OPT) Jacks
7. Off-Premises Telephone (OPT) Jacks
008 OPT


4. PFT Jack
5. Line Jacks (GS/LS)
5. Line Jacks (GS/LS)
4. PFT Jack
800 GS/LS
8. Analog Station Jacks
008
9. Digital Station Jacks
008 MLX
10. Basic Telephone Jacks
012
4. PFT Jack
3. Trunk Jacks (LS)
8. Analog Station Jacks
408
4. PFT Jack
5. Trunk Jacks (GS/LS)
8. Analog Station Jacks
408 GS/LS

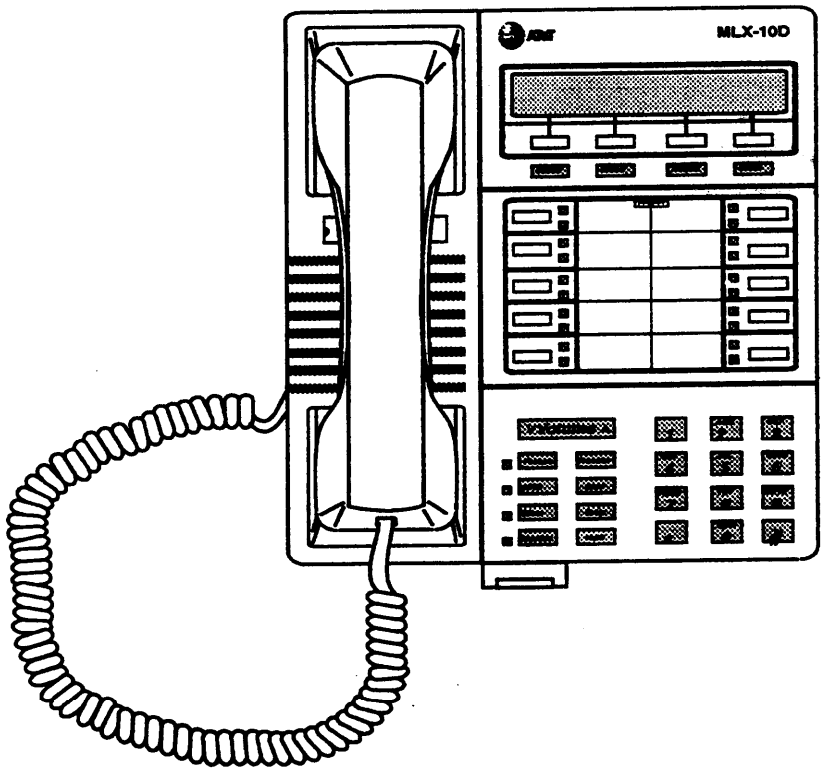
5



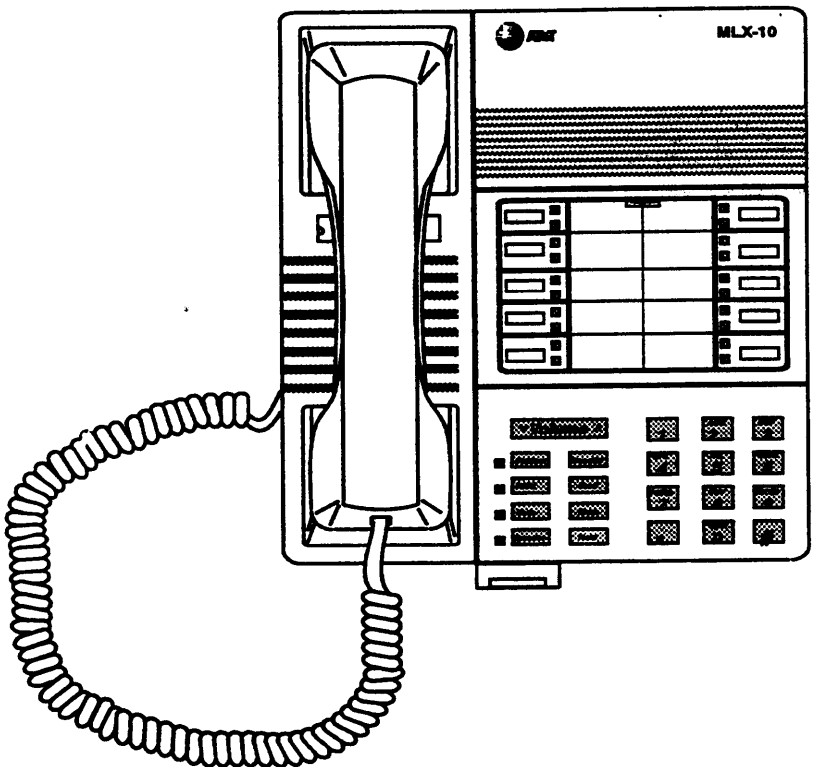
6



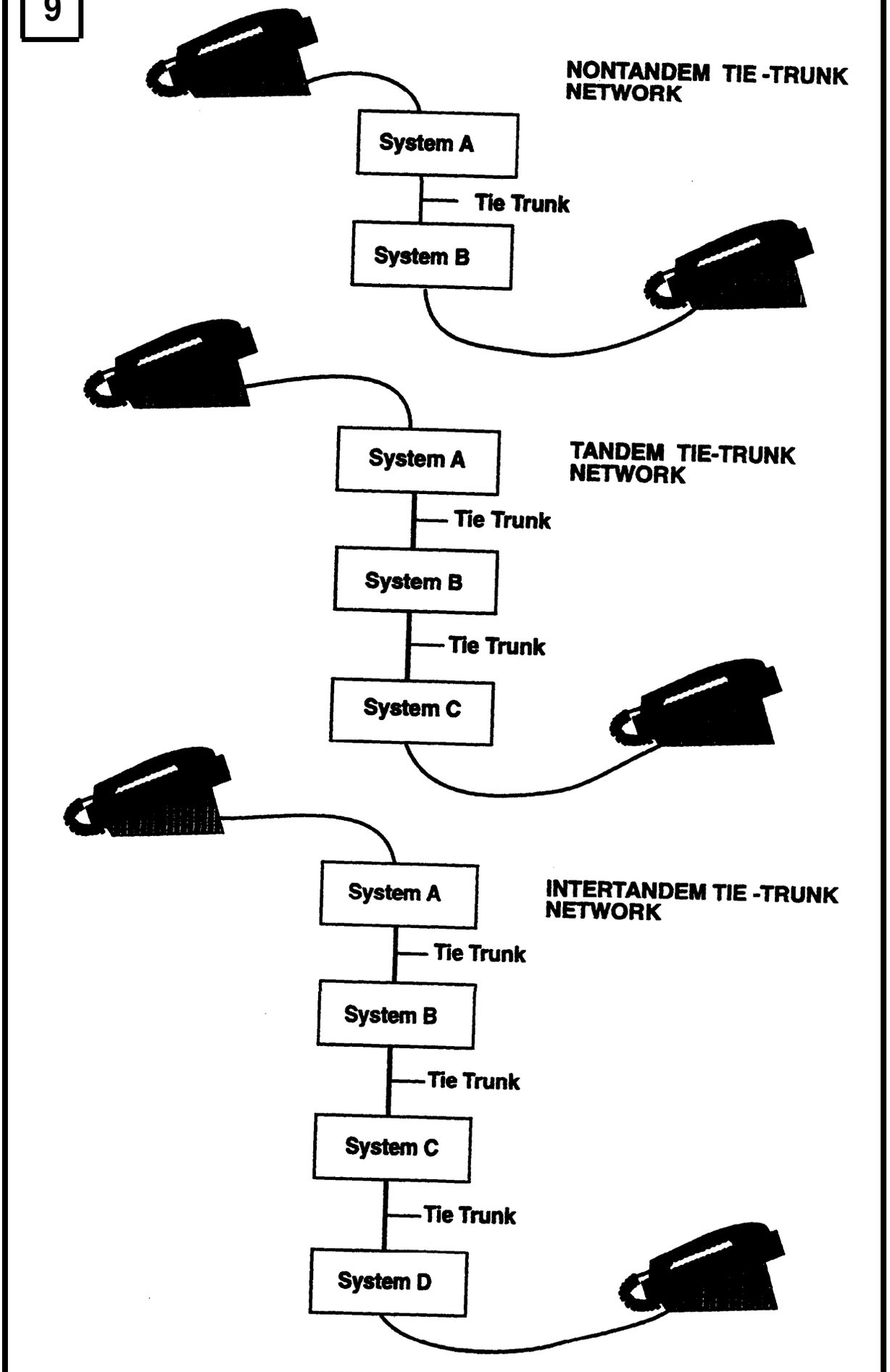
7

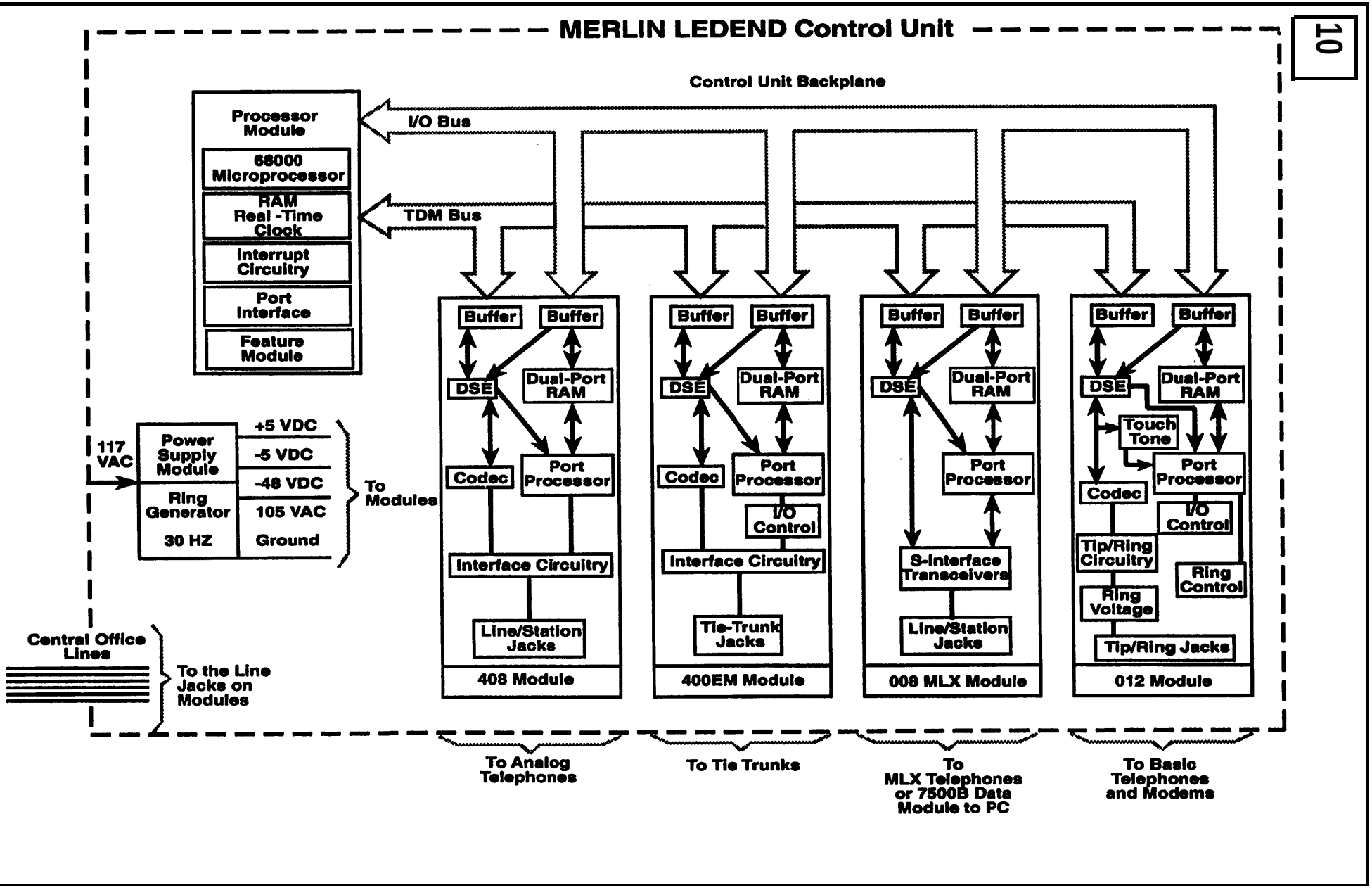


8



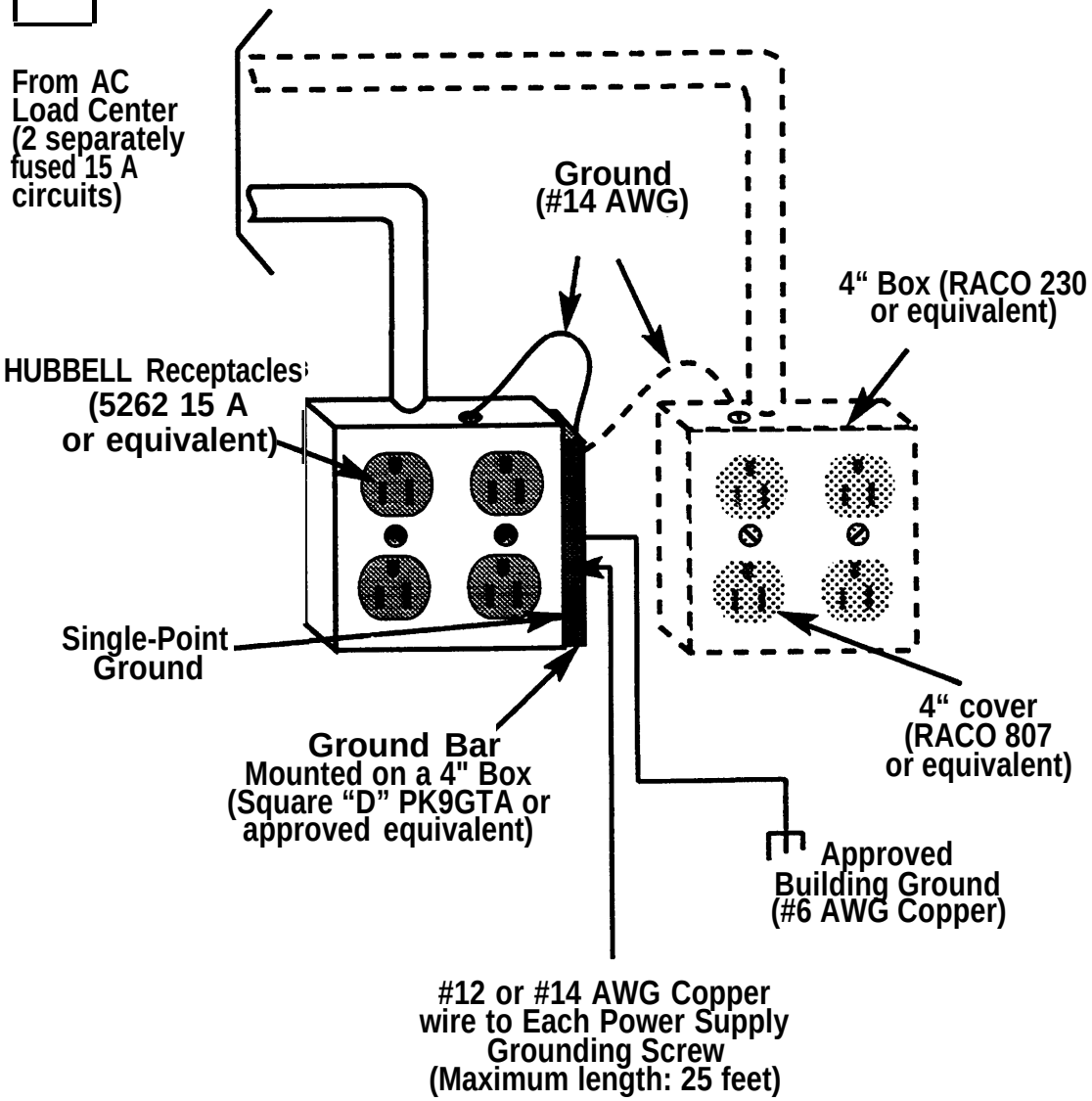
9


NONTANDEM TIE -TRUNK NETWORK
System A
Tie Trunk
System B
TANDEM TIE-TRUNK NETWORK
System A
Tie Trunk
System B
Tie Trunk
System C
INTERTANDEM TIE -TRUNK NETWORK
System A
Tie Trunk
System B
Tie Trunk
System C
Tie Trunk
System D

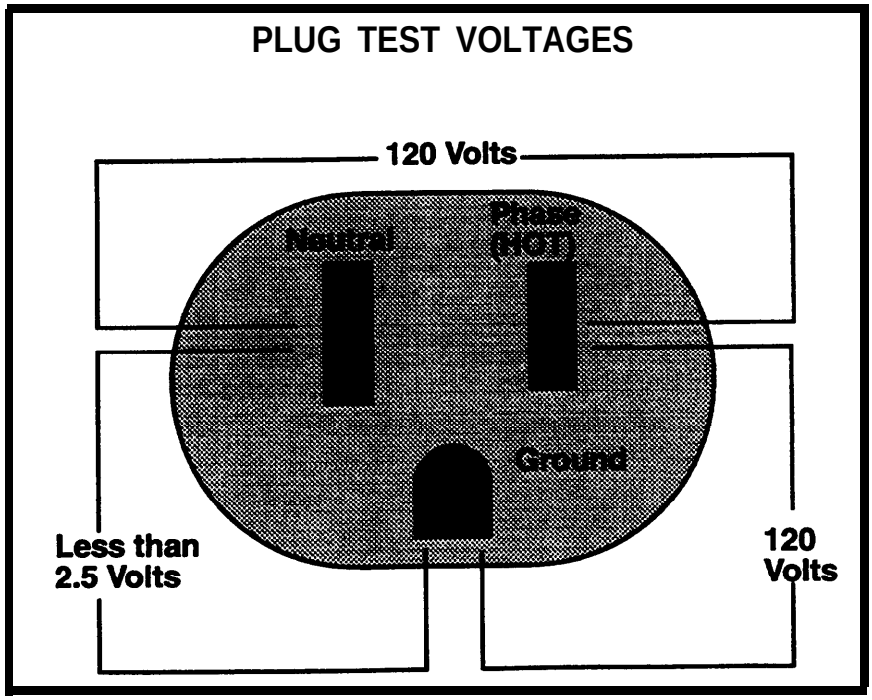

MERLIN LEDEND Control Unit
Control Unit Backplane
Processor Module
68000 Microprocessor
RAM Real -Time Clock
Interrupt Circuitry
Port Interface
Feature Module
I/O Bus
TDM Bus
117 VAC
Power Supply Module
Ring Generator
30 HZ
+5 VDC
-5 VDC
-48 VDC
105 VAC
Ground
To Modules
Central Office Lines
To the Line Jacks on Modules
Buffer
DSE
Dual-Port RAM
Codec
Port Processor
Interface Circuitry
Line/Station Jacks
408 Module
I/O Control
Tie-Trunk Jacks
400EM Module
S-Interface Transceivers
008 MLX Module
Touch Tone
Tip/Ring Circuitry
Ring Control
Ring Voltage
Tip/Ring Jacks
012 Module
To Analog Telephones
To Tie Trunks
To MLX Telephones or 7500B Data Module to PC
To Basic Telephones and Modems

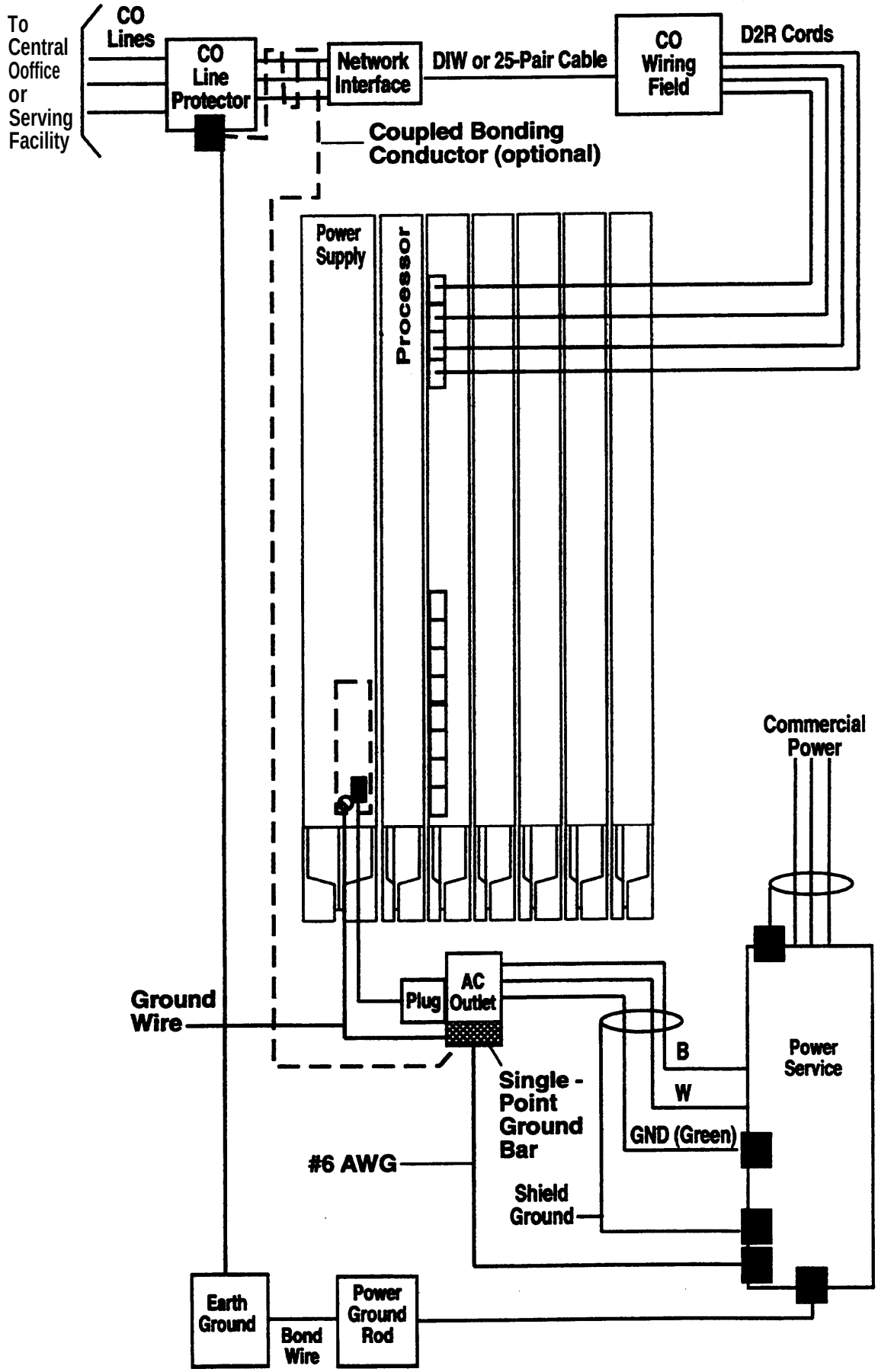
11

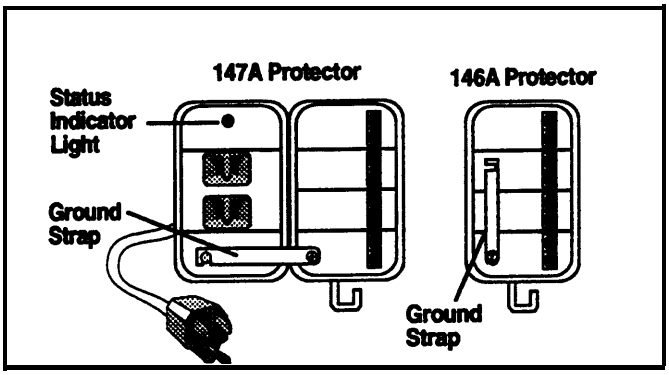
TYPICAL AC GROUNDING

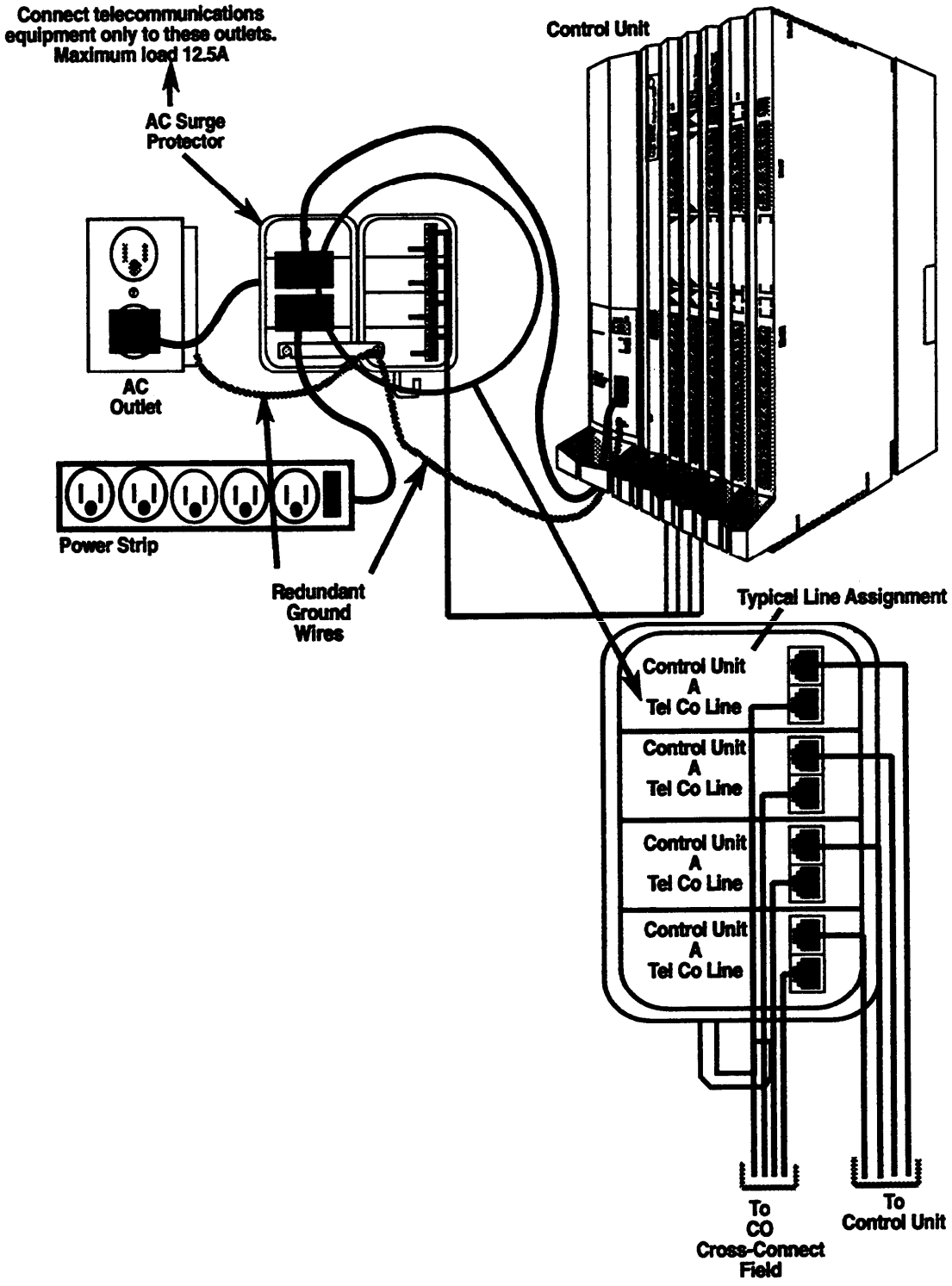


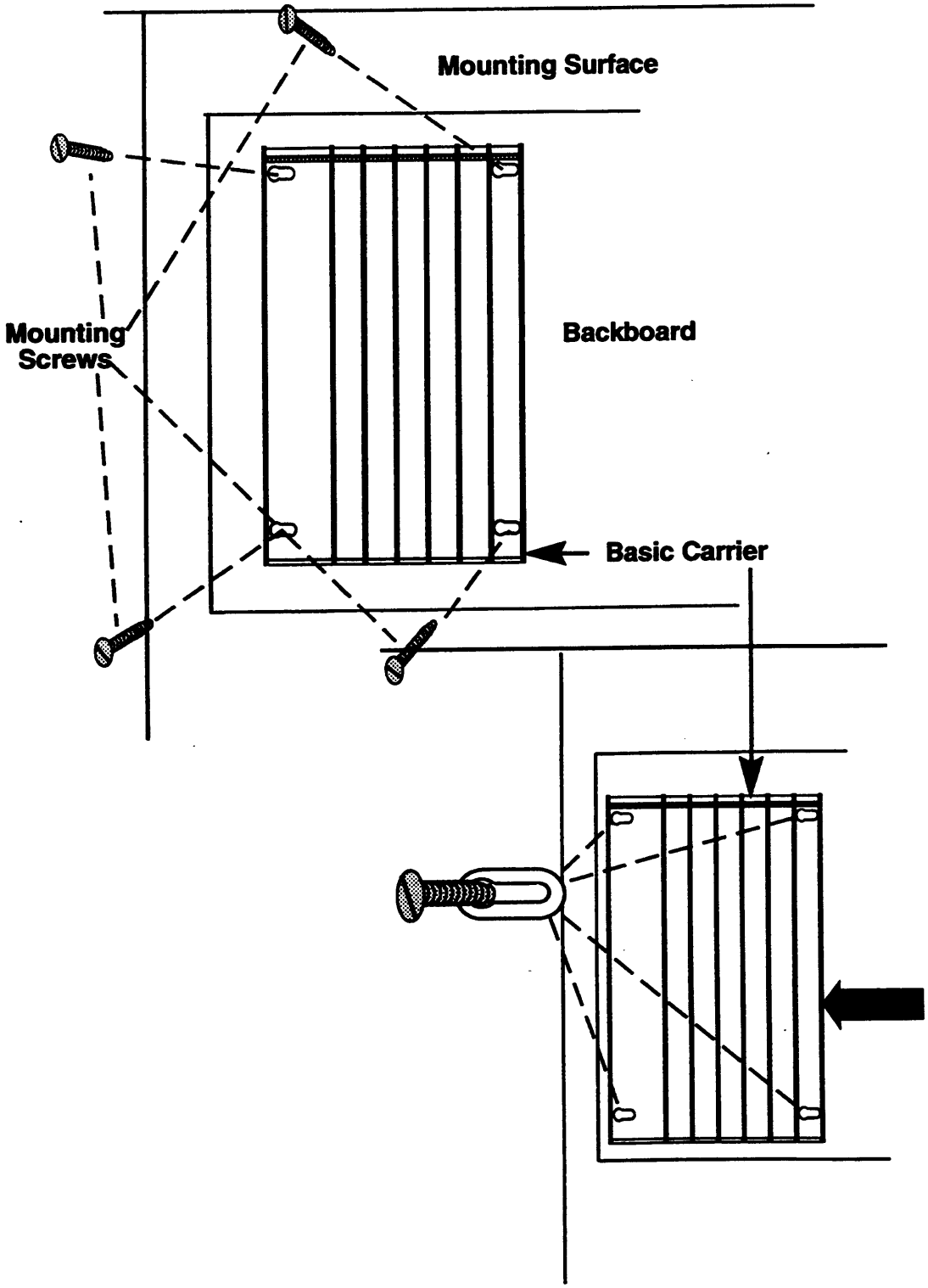
PLUG TEST VOLTAGES

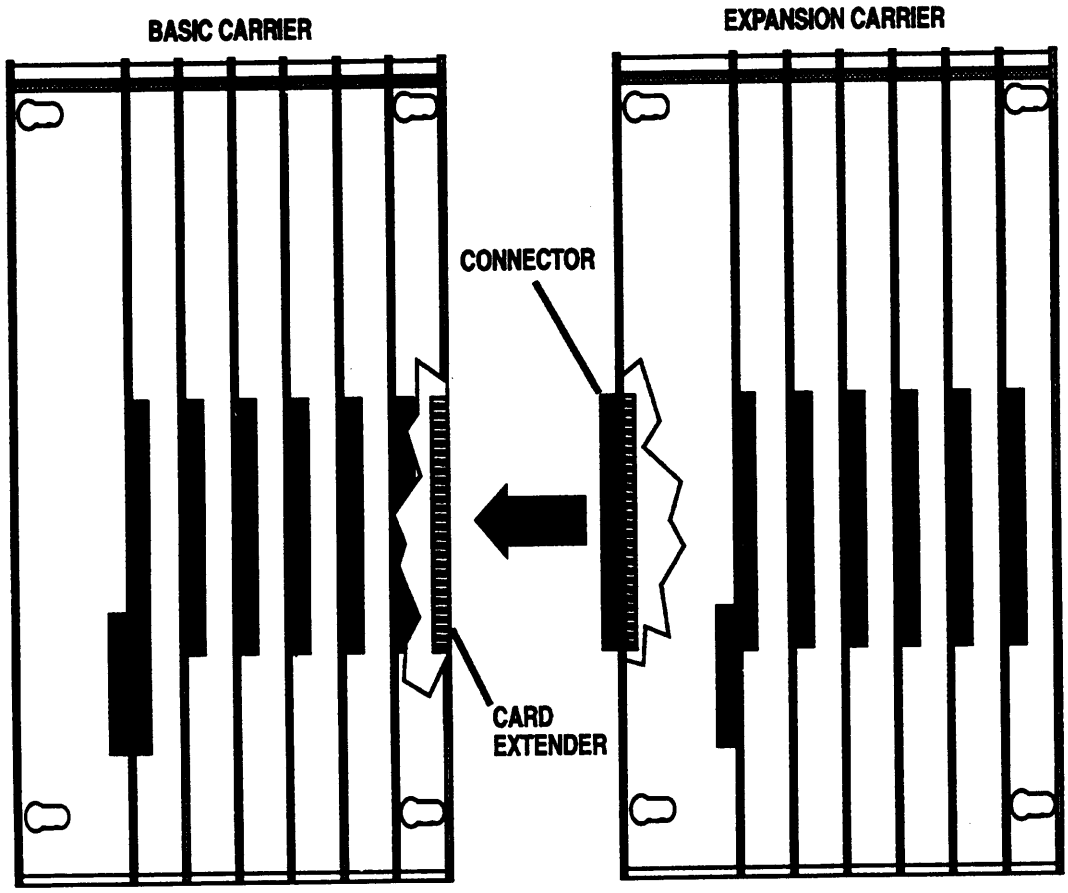



To Central Ooffice or Serving Facility
CO Lines
CO Line Protector
Network Interface
DIW or 25-Pair Cable
CO Wiring Field
D2R Cords
Coupled Bonding Conductor (optional)
Power Supply
Processor
Commercial Power
Ground Wire
Plug
AC Outlet
B
W
GND (Green)
Power Service
Single - Point Ground Bar
#6 AWG
Shield Ground
Earth Ground
Bond Wire
Power Ground Rod

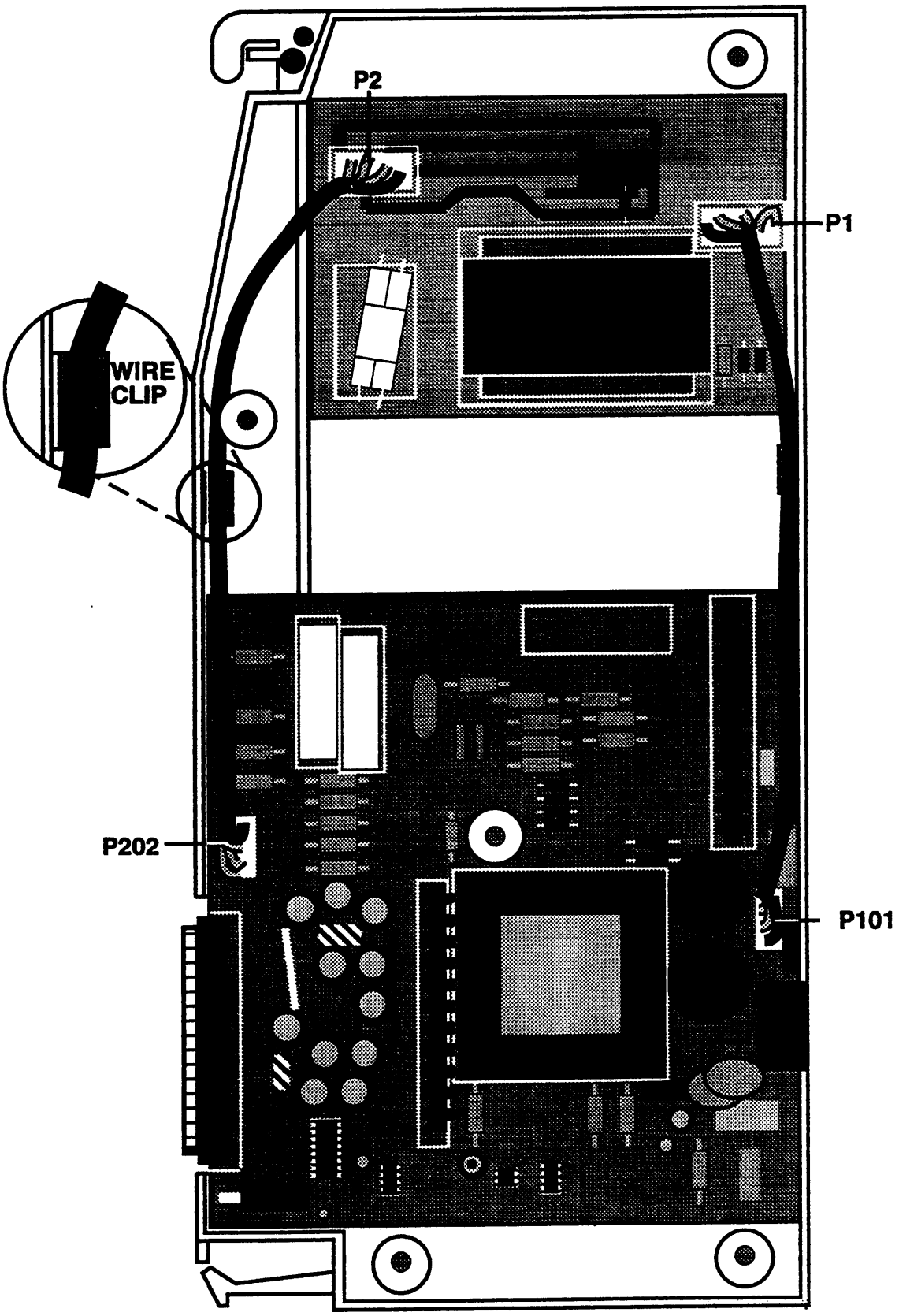

147A Protector
146A Protector
Status Indicator Light
Ground Strap
Ground Strap

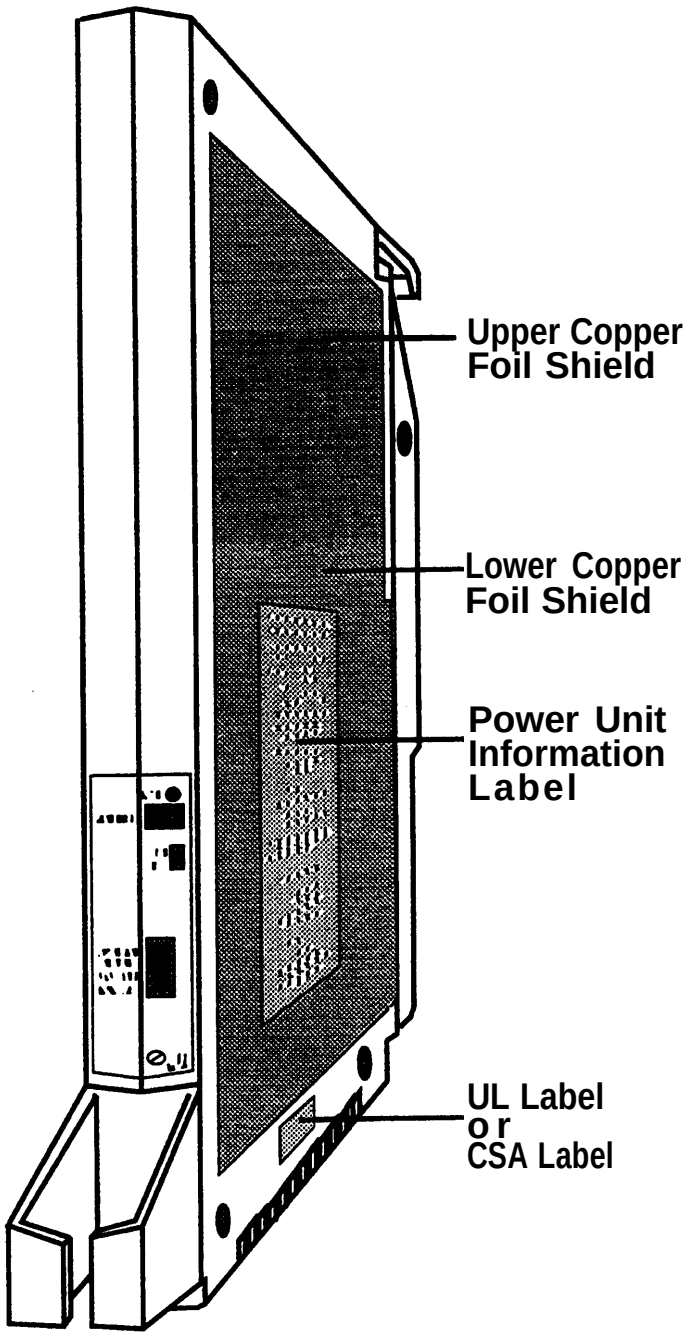

Connect telecommunications equipment only to these outlets. Maximum load 12.5A
AC Surge Protector
Control Unit
AC Outlet
Power Strip
Redundant Ground Wires
Typical Line Assignment
Control Unit A Tel Co Line
Control Unit A Tel Co Line
Control Unit A Tel Co Line
Control Unit A Tel Co Line
To CO Cross-Connect Field
To Control Unit

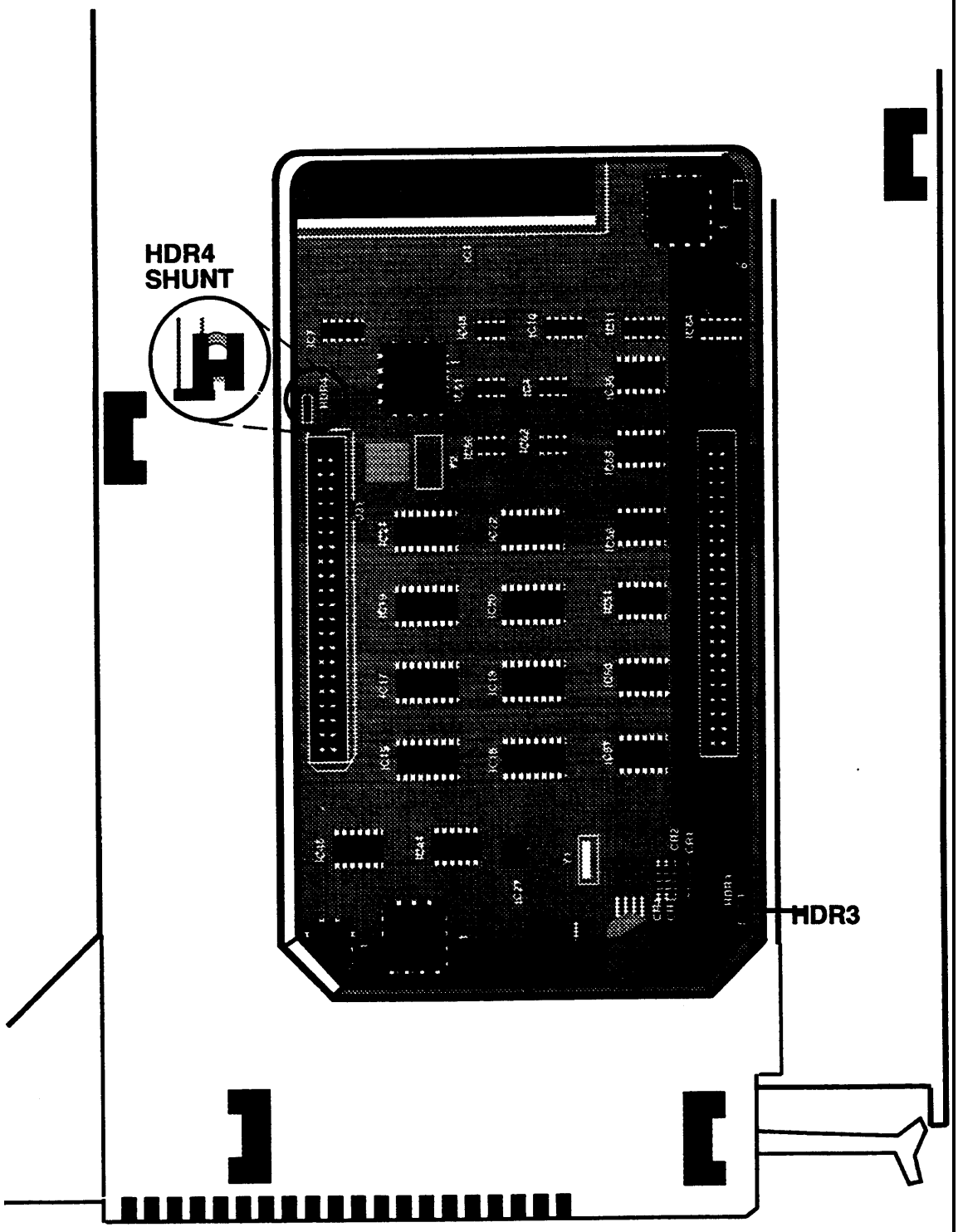

Mounting Surface
Mounting Screws
Backboard
Basic Carrier



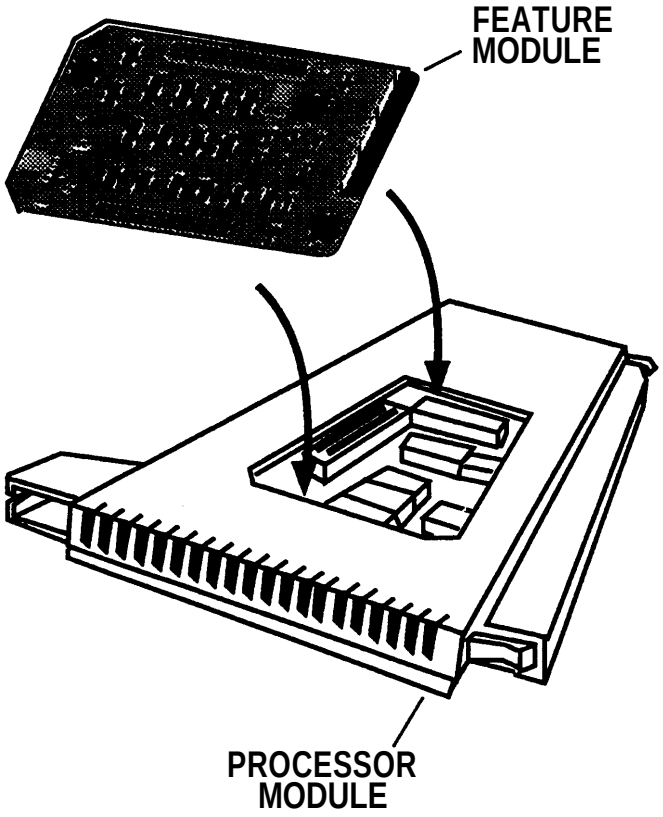
BACKBOARD


P2
P1
WIRE CLIP
P202
P101

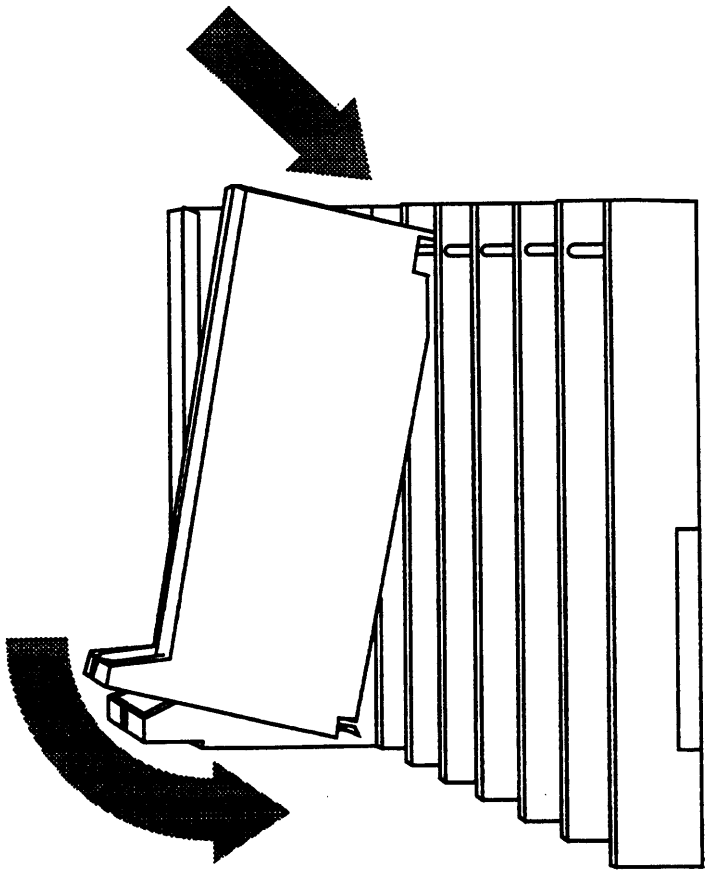

Upper Copper
Foil Shield
Lower Copper
Foil Shield
Power Unit
Information
Label
UL Label
or
CSA Label

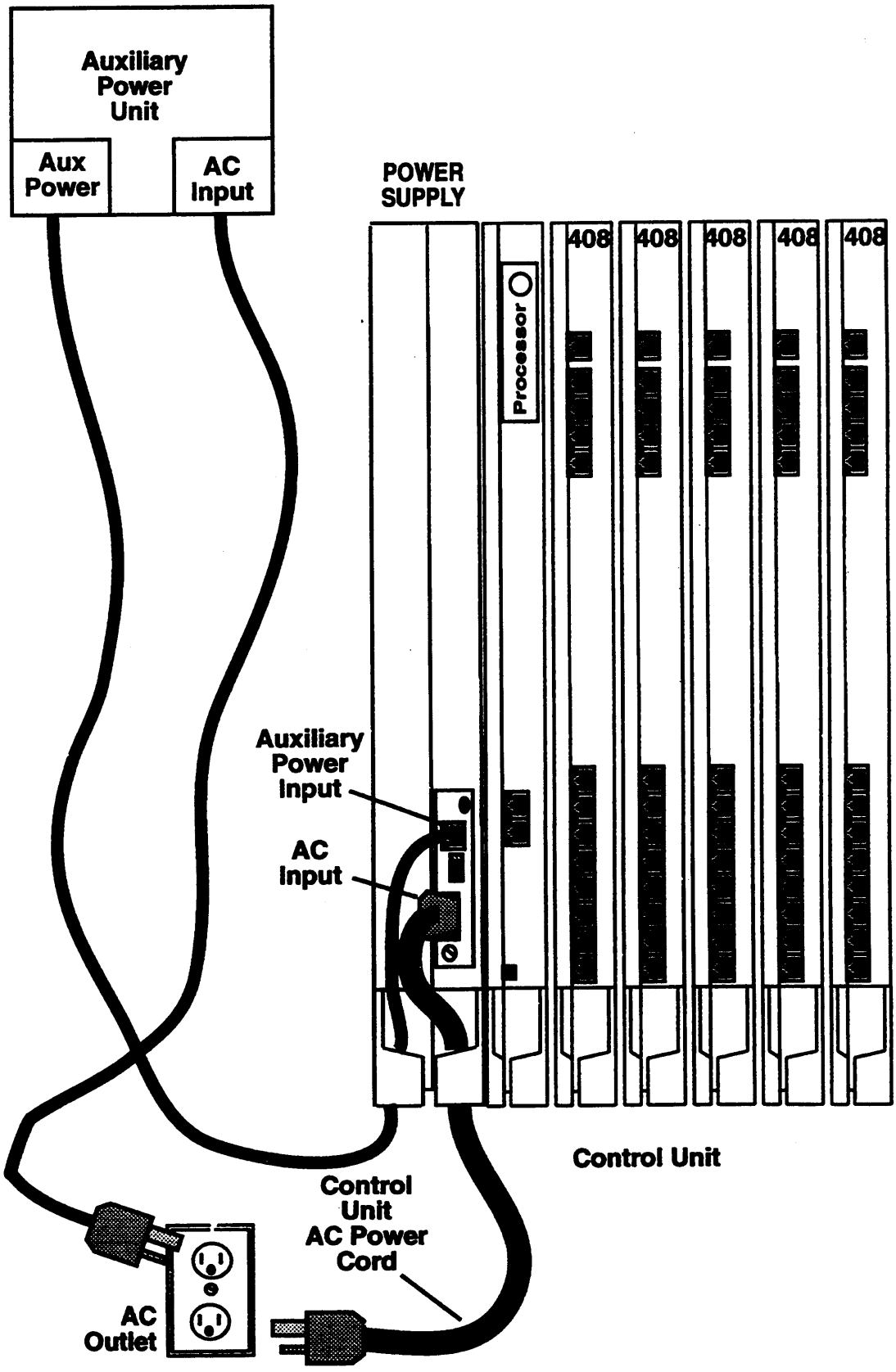

HDR4
SHUNT
HDR3

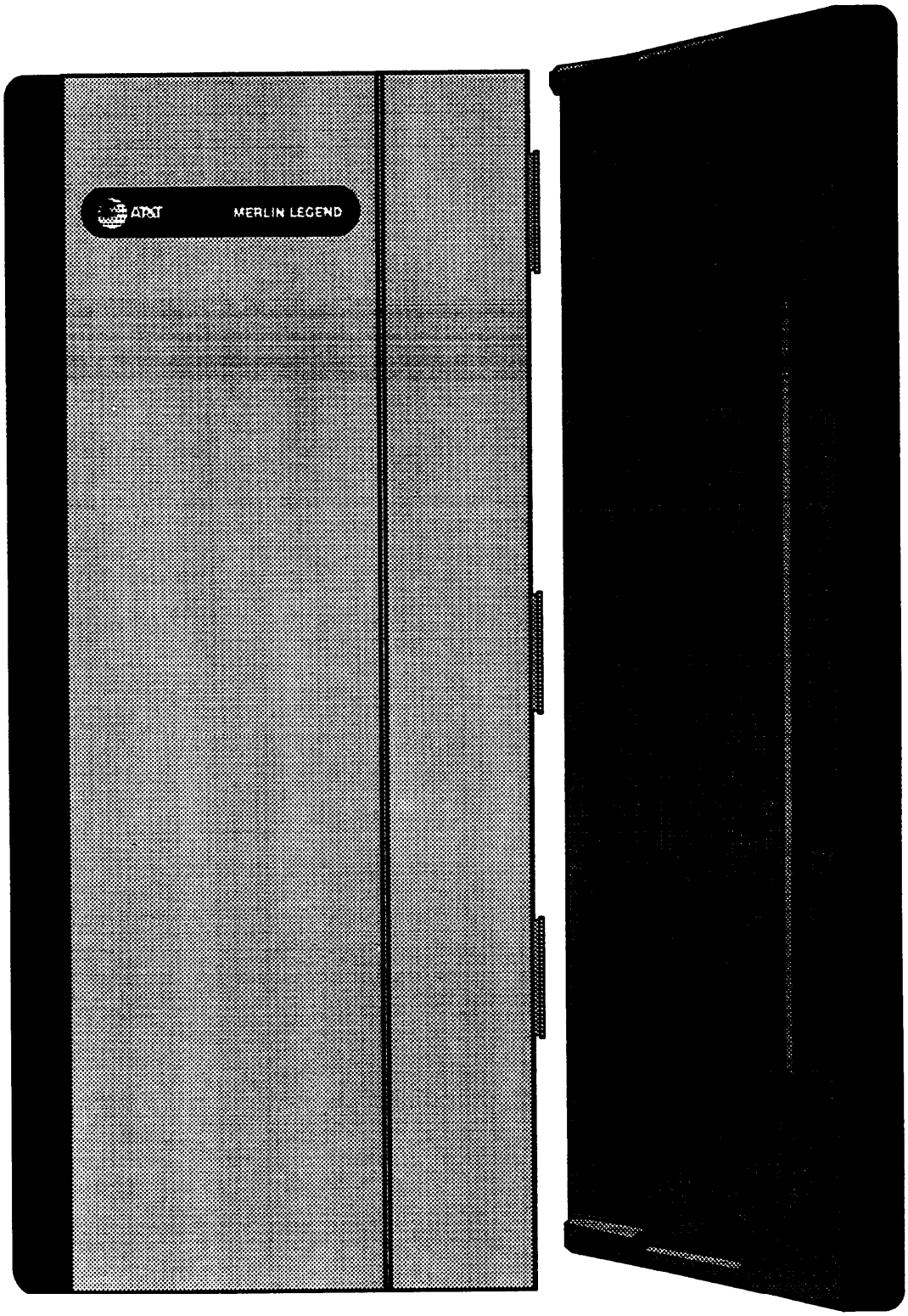
19



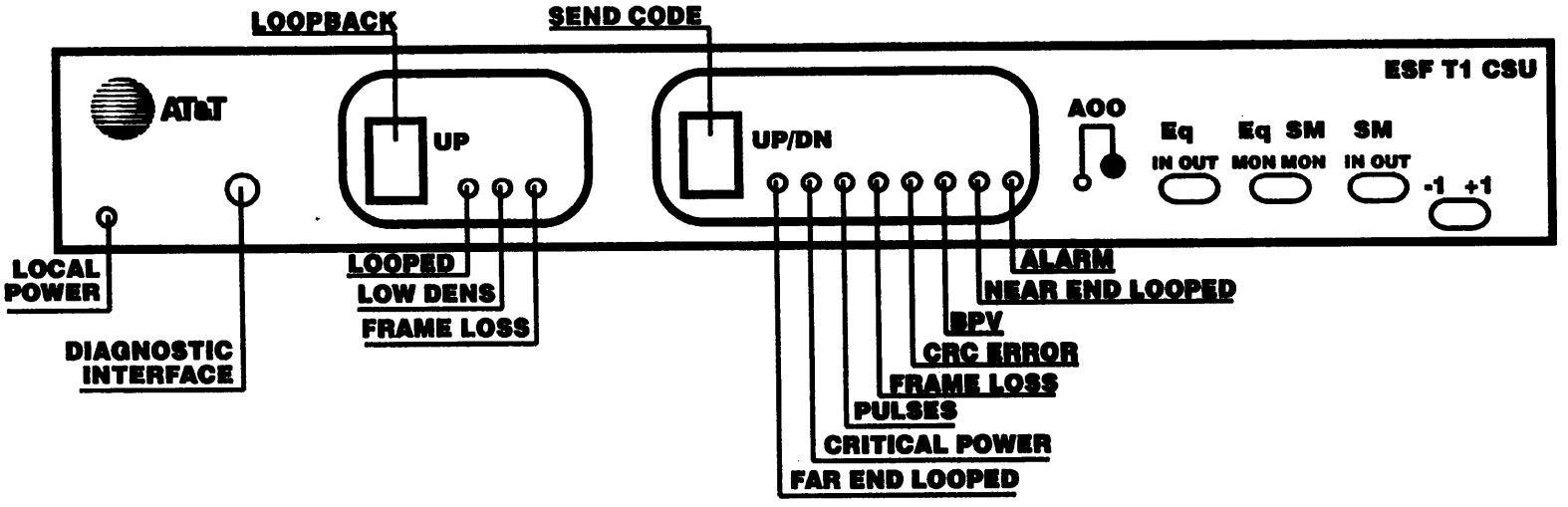
20

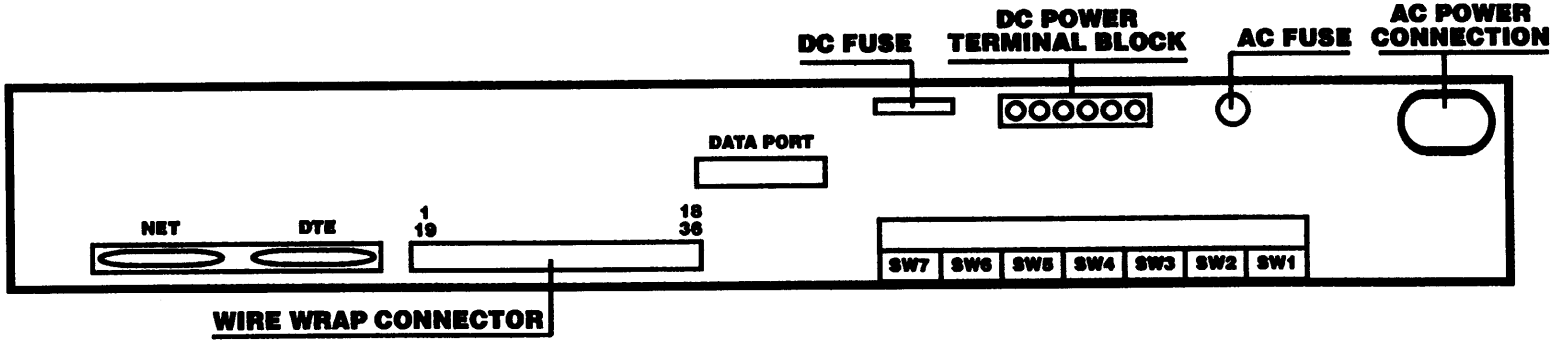



Auxiliary
Power
Unit
Aux
Power
AC
Input
POWER
SUPPLY
Processor
408
408
408
408
408
Auxiliary
Power
Input
AC
Input
Control Unit
Control
Unit
AC Power
Cord
AC
Outlet

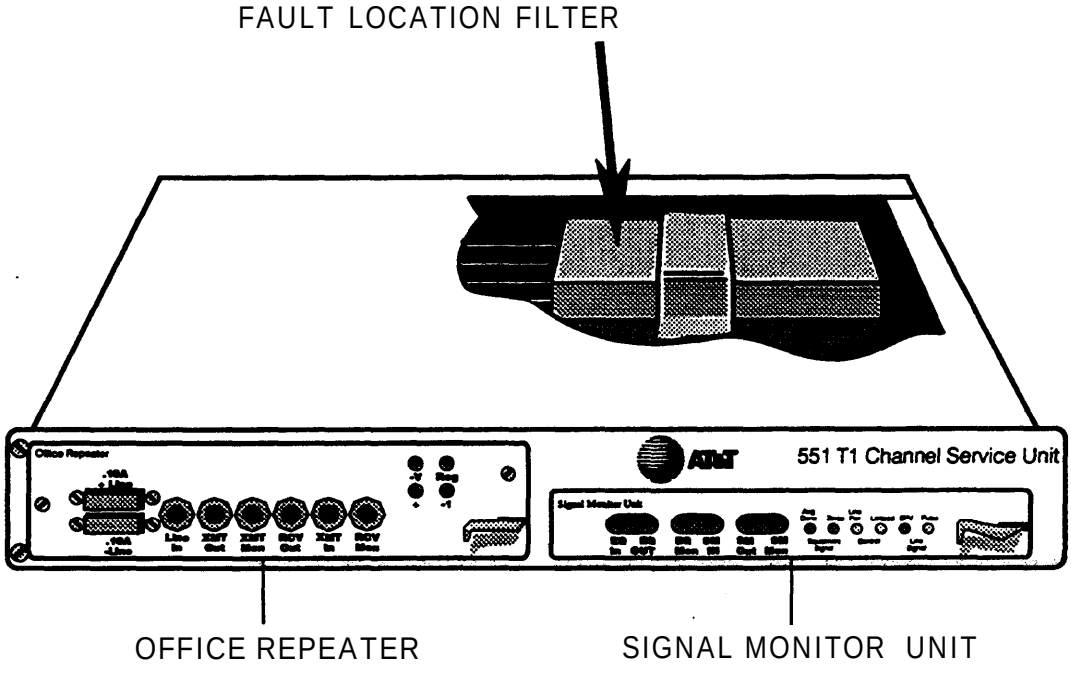

AT&T
MERLIN LEGEND

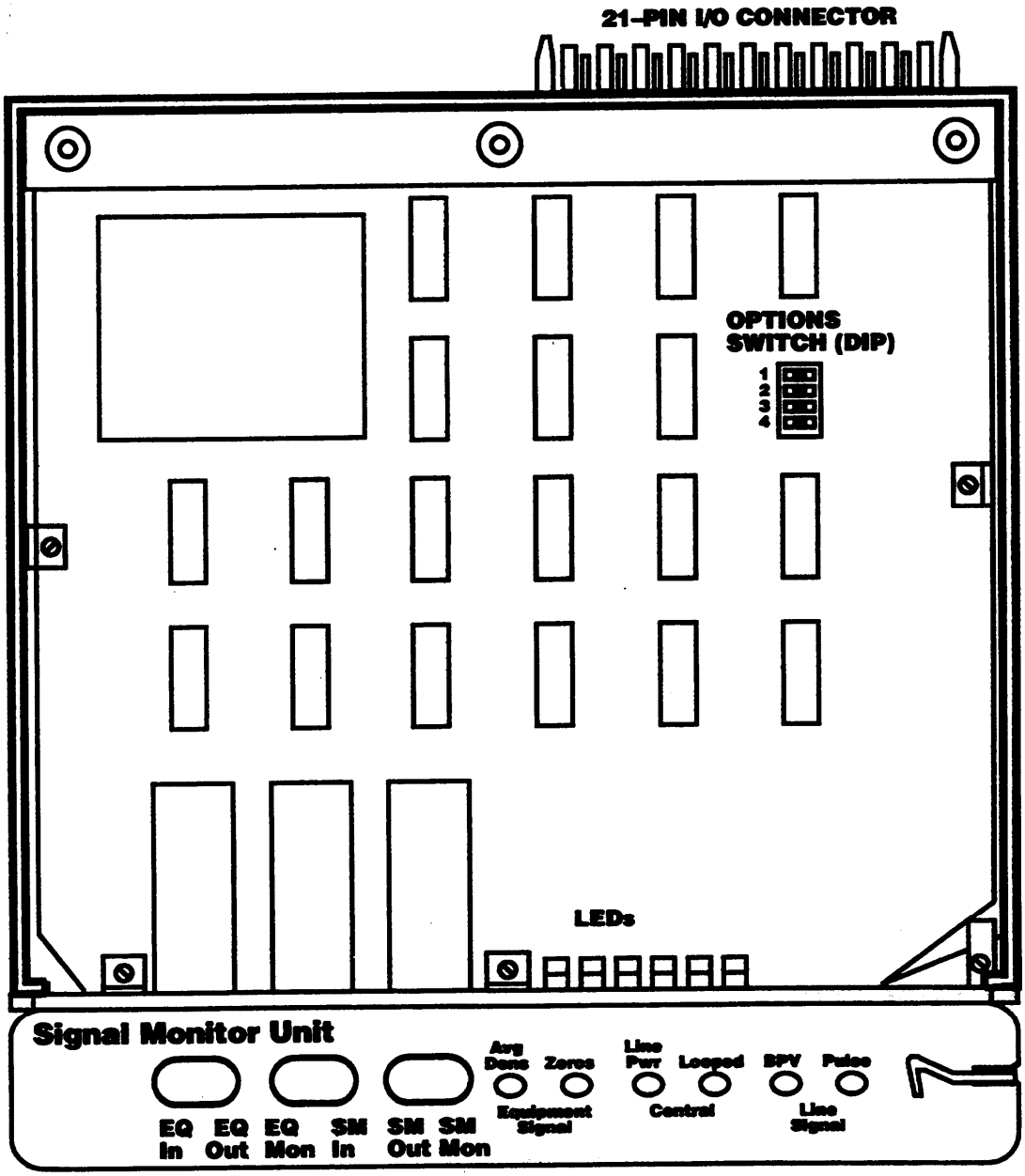
FRONT

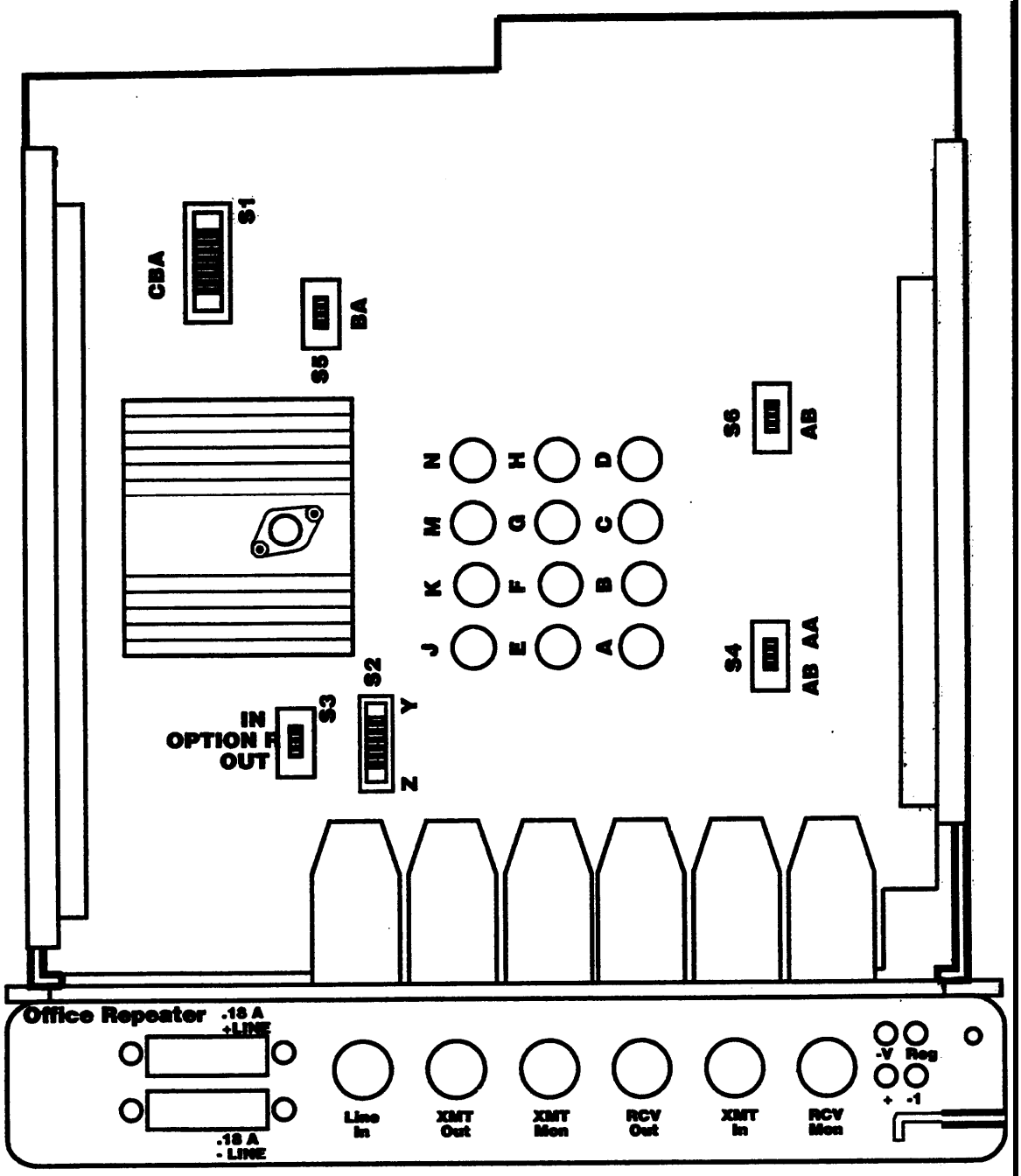

LOOPBACK
SEND CODE
ESF T1 CSU
AT&T
UP
UP/DN
AOO
Eq
IN OUT
Eq
MON
SM
MON
SM
IN OUT
-1
+1
LOCAL POWER
DIAGNOSTIC INTERFACE
LOOPED
LOW DENS
FRAME LOSS
ALARM
NEAR END LOOPED
BPV
CRC ERROR
FRAME LOSS
PULSES
CRITICAL POWER
FAR END LOOPED

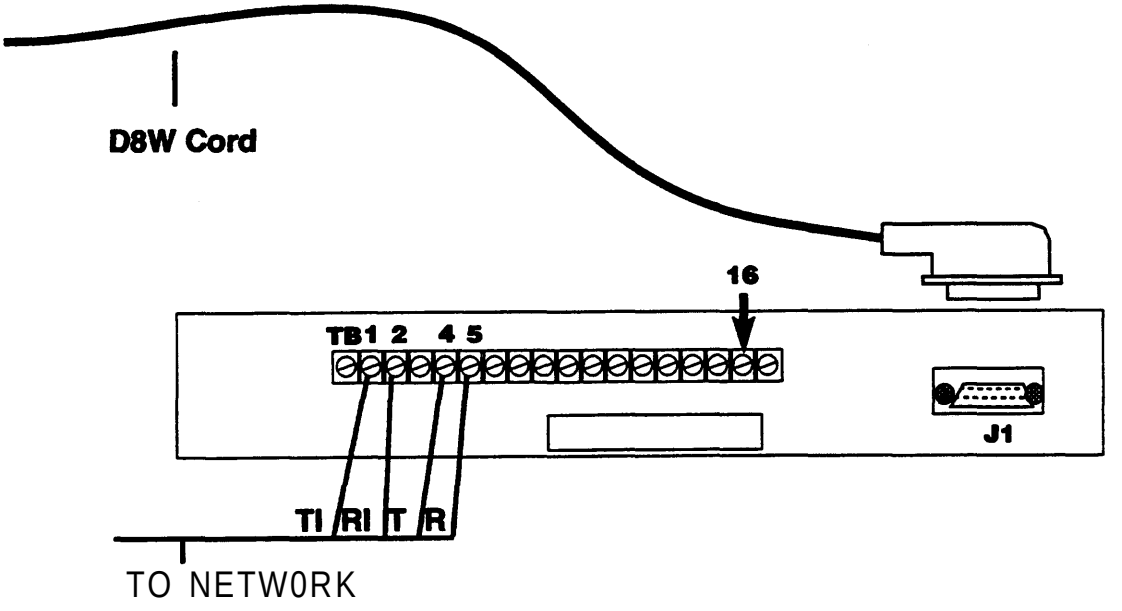

DC FUSE
DC POWER TERMINAL BLOCK
AC FUSE
AC POWER CONNECTION
DATA PORT
NET
DTE
1
19
18
36
SW7
SW6
SW5
SW4
SW3
SW2
SW1
WIRE WRAP CONNECTOR

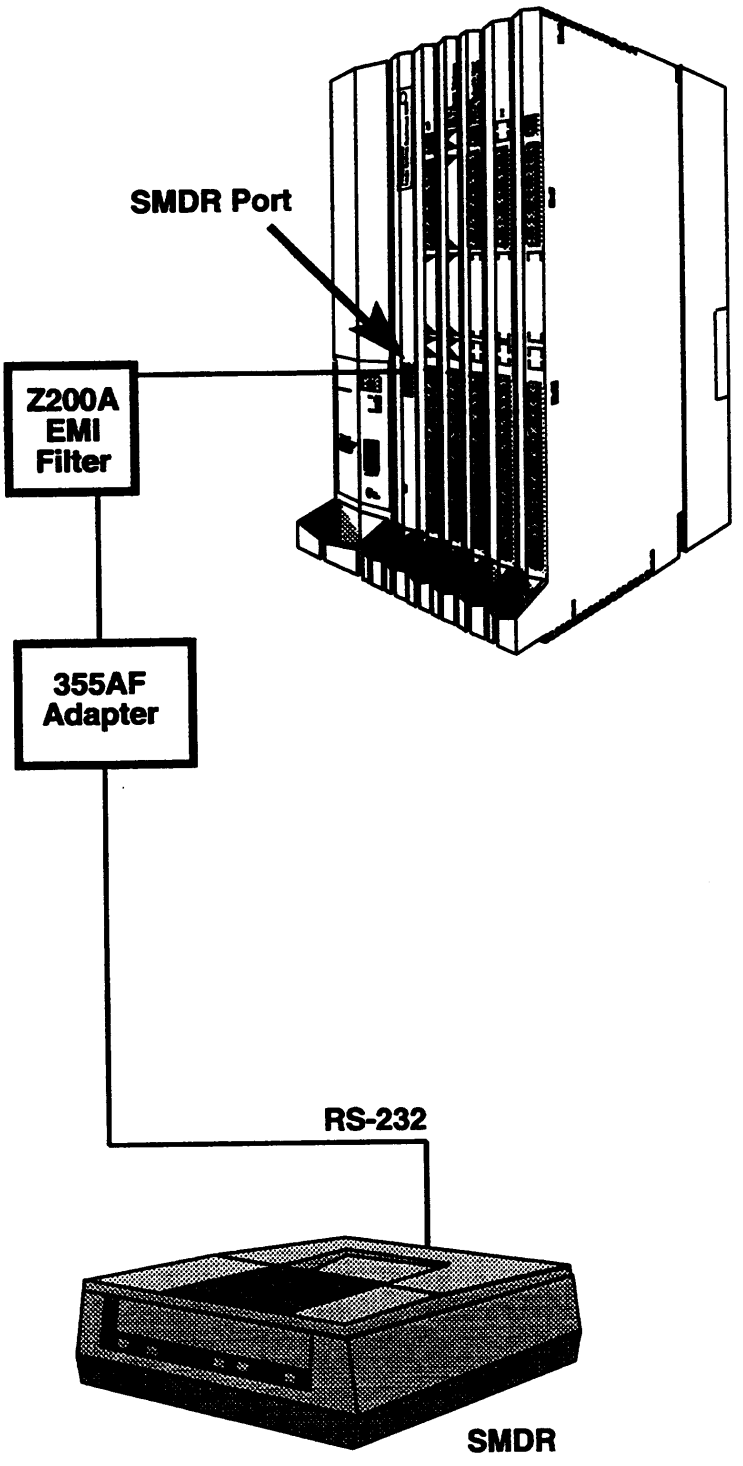
REAR


FAULT LOCATION FILTER
551 T1 Channel Service Unit
OFFICE REPEATER
SIGNAL MONITOR UNIT

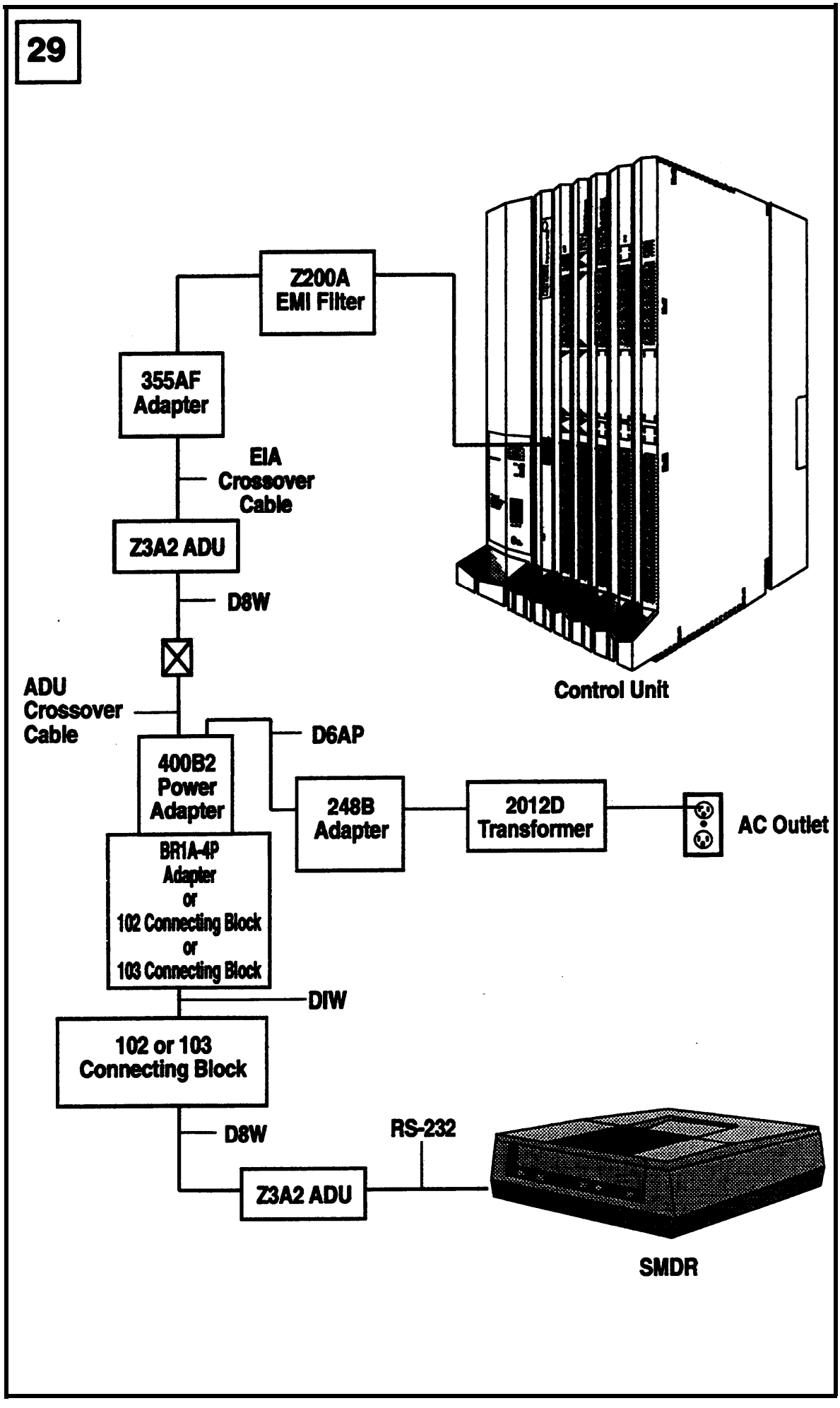

21-PIN I/O CONNECTOR
OPTIONS SWITCH (DIP)
1
2
3
4
LEDs
Signal Monitor Unit
EQ In
EQ Out
EQ Mon
SM In
SM Out
SM Mon
Avg Data
Zeros
Equipment Signal
Line Pwr
Looped
Control
BPV
Pulse
Line Signal

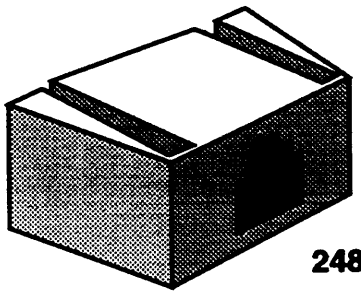

S1
CBA
S5
BA
S6
AB
N
H
D
M
G
C
K
F
B
J
E
A
S4
AB AA
S2
Y
S3
IN
OPTION R
OUT
N
Office Repeater
.18 A
+LINE
.18 A
- LINE
Line
In
XMT
Out
XMT
Mon
RCV
Out
XMT
In
RCV
Mon
-V
Reg
+
-1


D8W Cord
16
TB1 2 4 5
J1
TI RI T R
TO NETW0RK

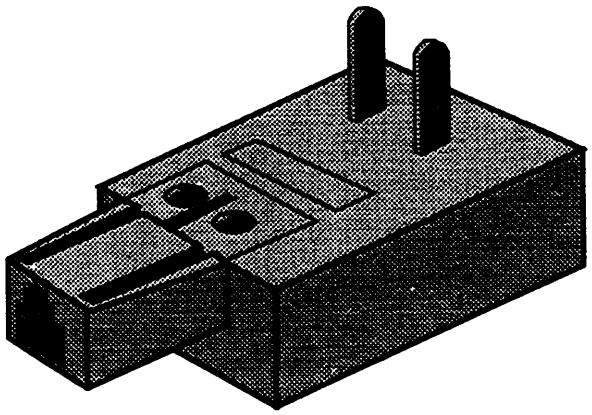

SMDR Port
Z200A
EMI
Filter
355AF
Adapter
RS-232
SMDR

29

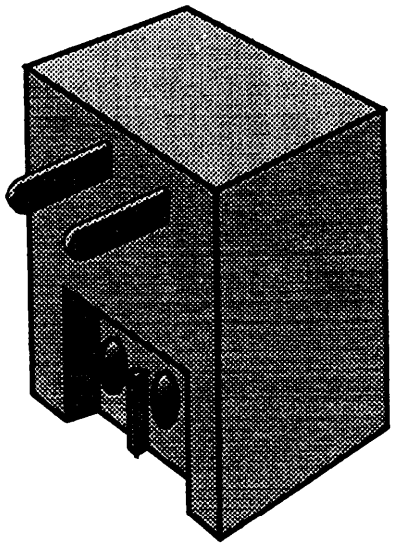

Z200A
EMI Filter
355AF
Adapter
EIA
Crossover
Cable
Z3A2 ADU
D8W
ADU
Crossover
Cable
D6AP
400B2
Power
Adapter
248B
Adapter
2012D
Transformer
AC Outlet
BR1A-4P
Adapter
or
102 Connecting Block
or
103 Connecting Block
DIW
102 or 103
Connecting Block
D8W
RS-232
Z3A2 ADU
Control Unit
SMDR



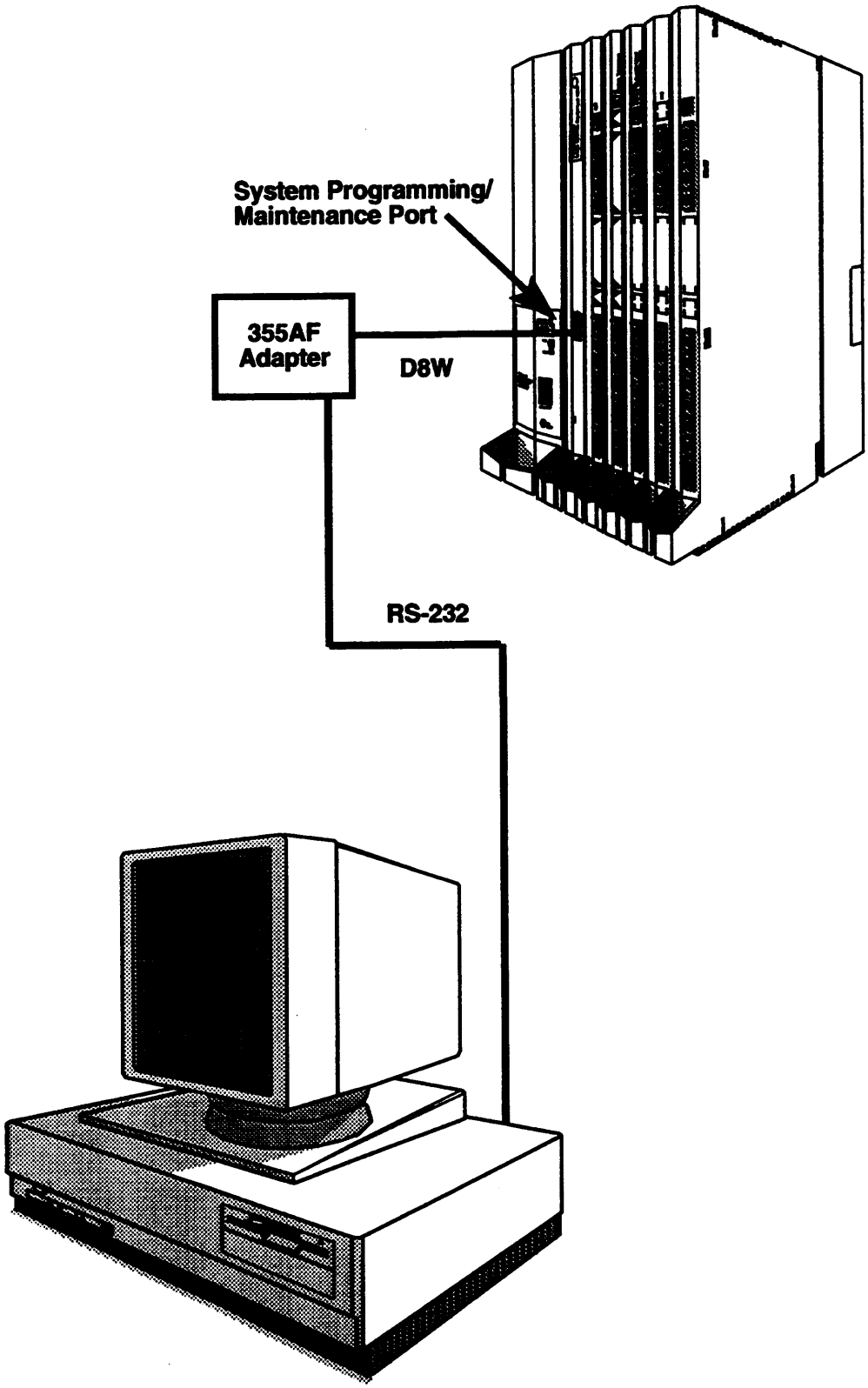
248B ADAPTER



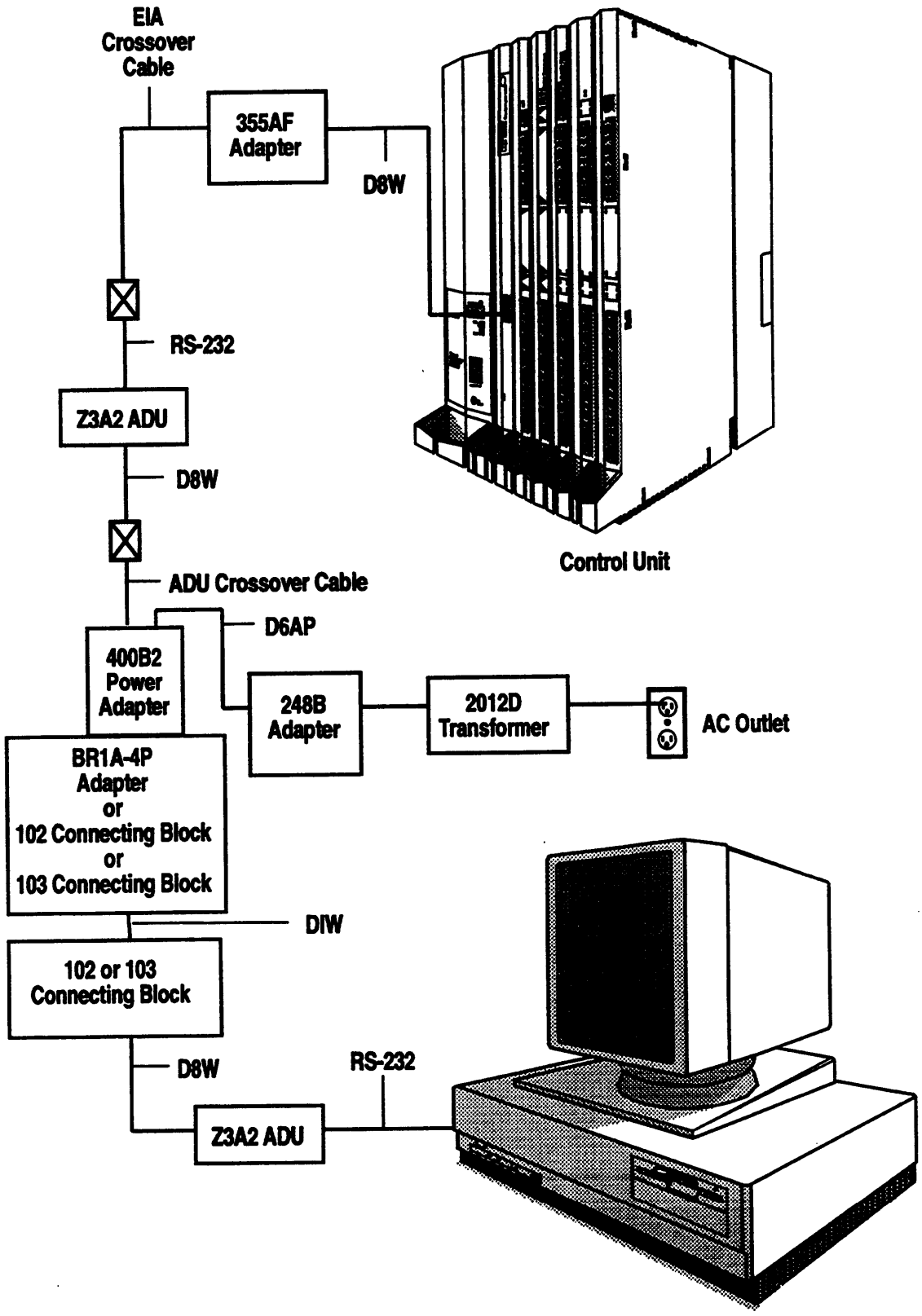
TRANSFORMER
WITH 248B ADAPTER



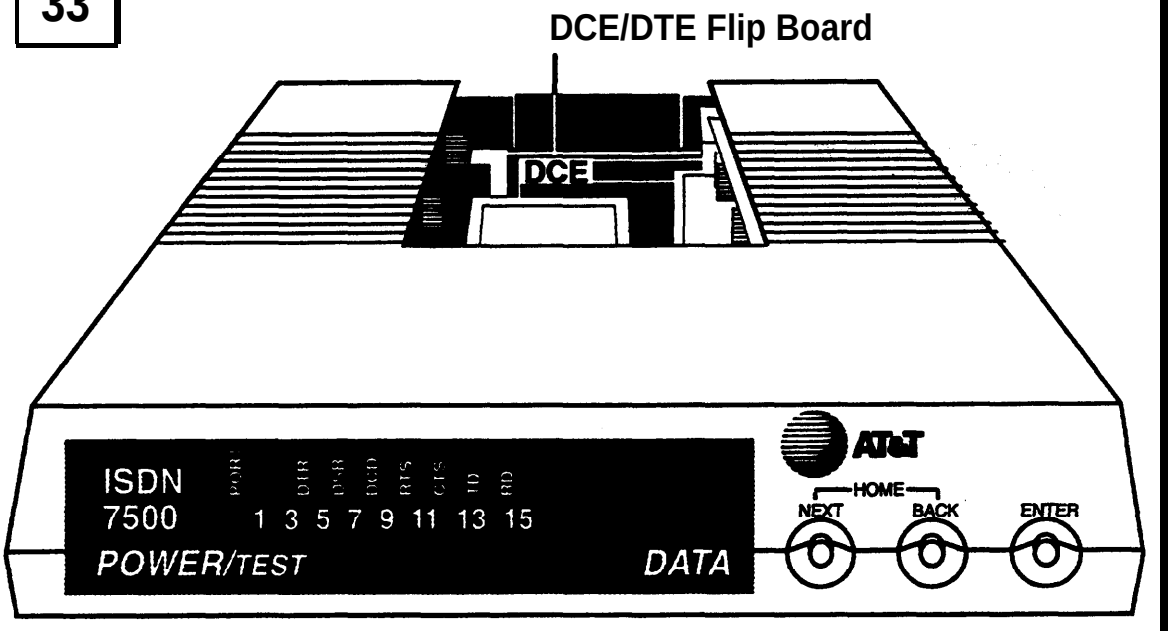
2012D TRANSFORMER


System Programming/
Maintenance Port
355AF
Adapter
D8W
RS-232

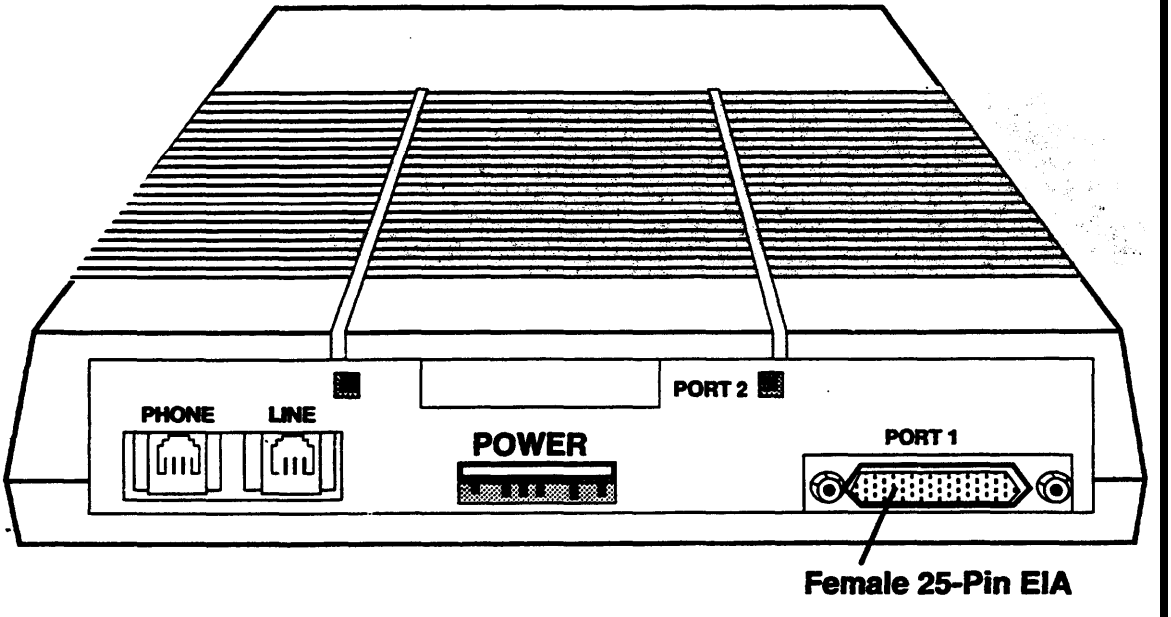
32

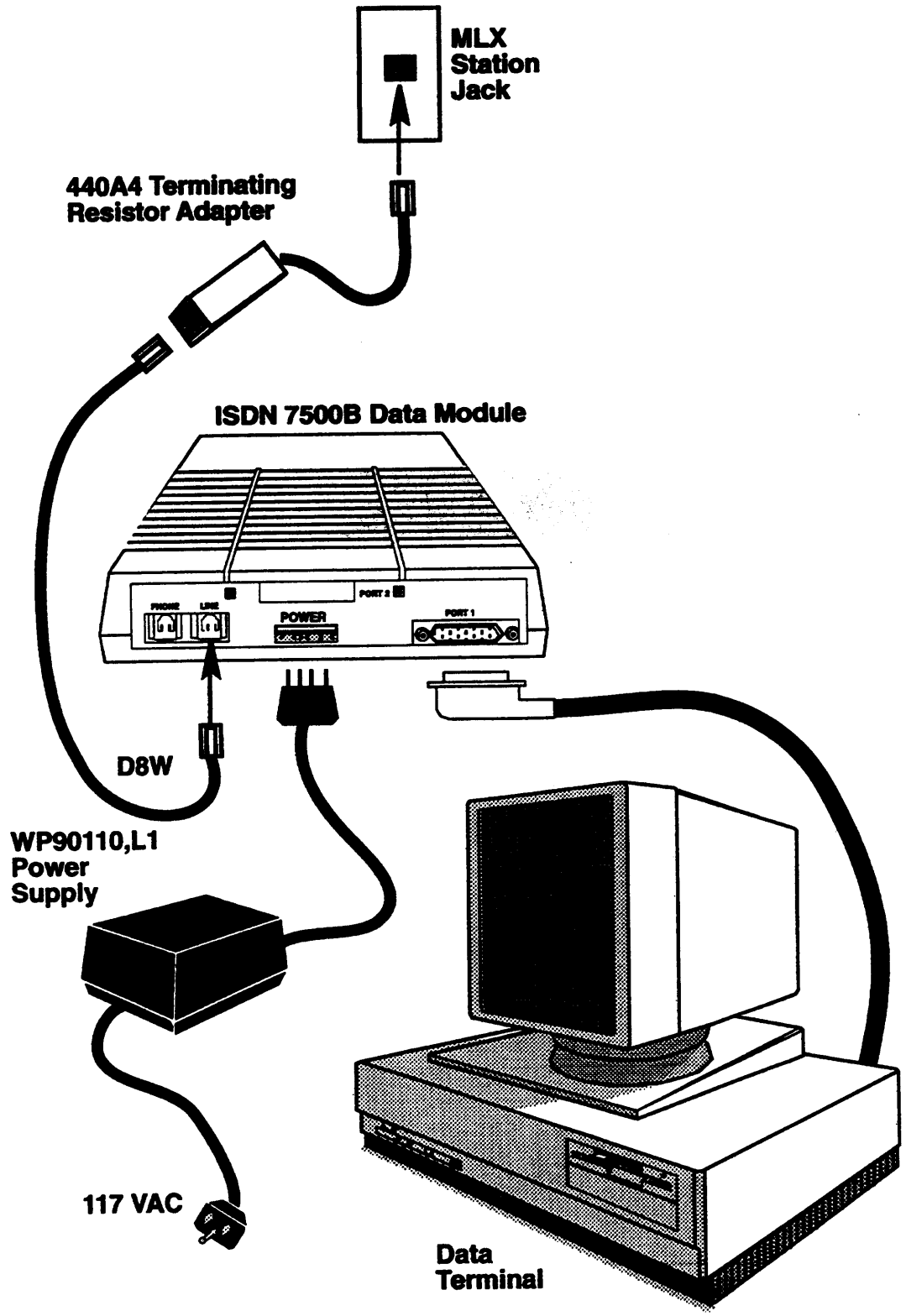

EIA
Crossover
Cable
355AF
Adapter
D8W
RS-232
Z3A2 ADU
D8W
ADU Crossover Cable
D6AP
400B2
Power
Adapter
248B
Adapter
2012D
Transformer
AC Outlet
BR1A-4P
Adapter
or
102 Connecting Block
or
103 Connecting Block
DIW
102 or 103
Connecting Block
D8W
RS-232
Z3A2 ADU
Control Unit

33

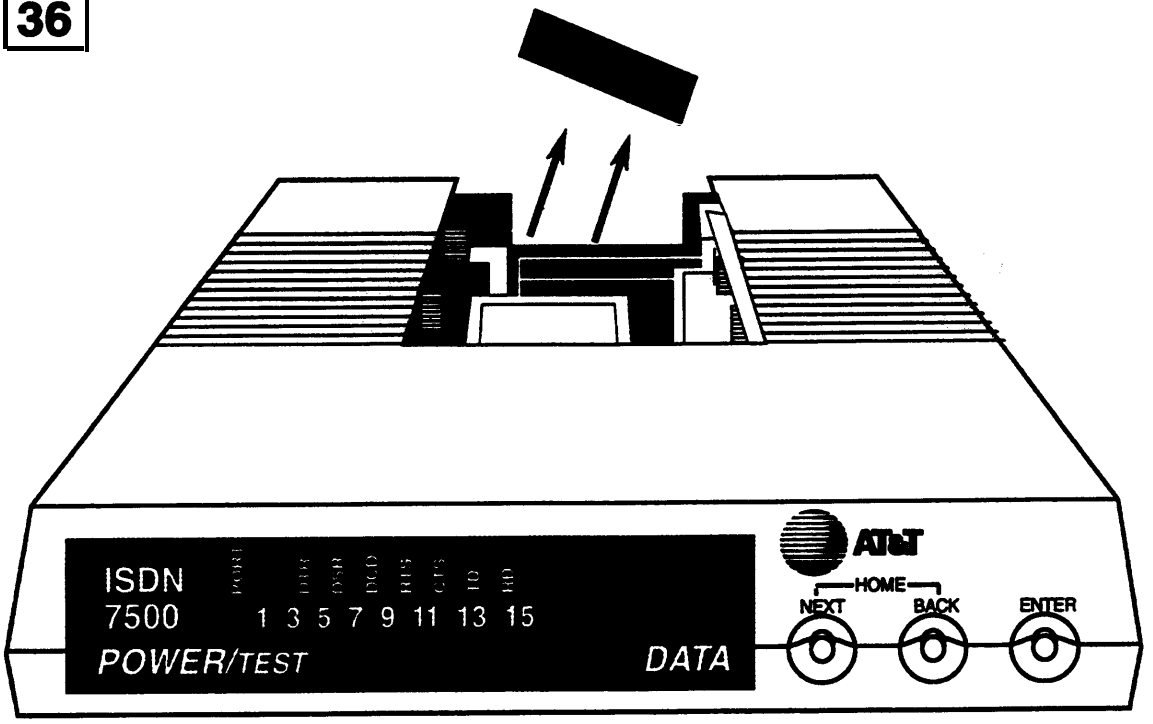

DCE/DTE Flip Board
DCE
ISDN
7500
1 3 5 7 9 11 13 15
POWER/TEST
DATA
AT&T
HOME
NEXT
BACK
ENTER

34

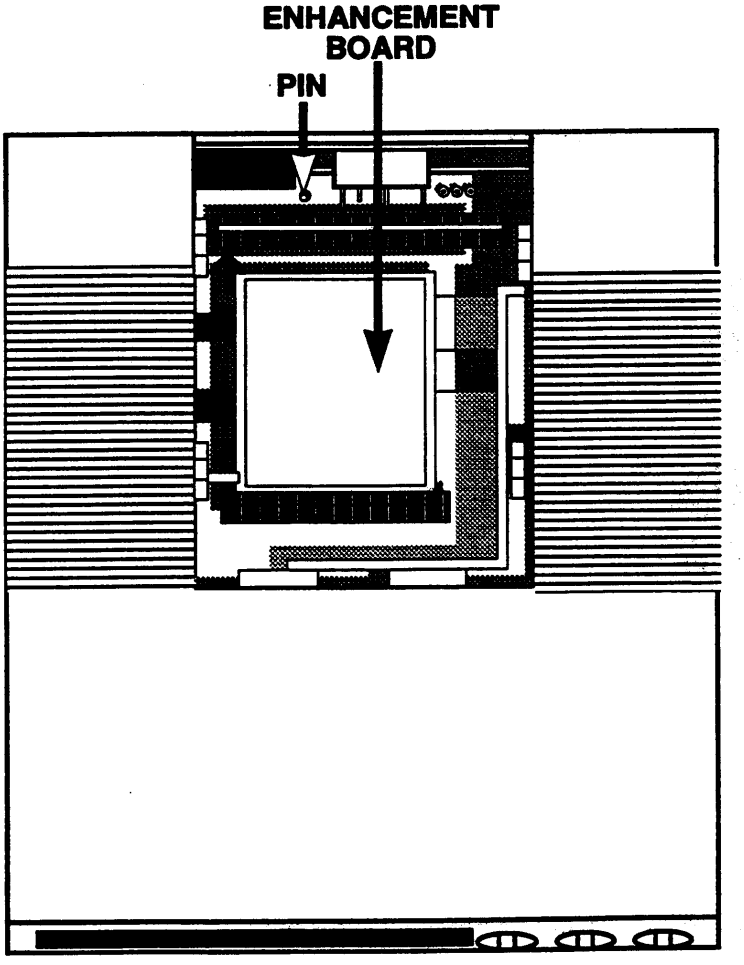

PHONE
LINE
POWER
PORT 2
PORT 1
Female 25-Pin EIA


MLX
Station
Jack
440A4 Terminating
Resistor Adapter
ISDN 7500B Data Module
POWER
D8W
WP90110,L1
Power
Supply
117 VAC
Data
Terminal

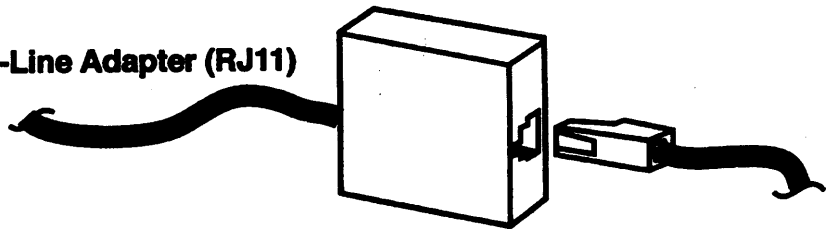
36


ISDN
7500
1 3 5 7 9 11 13 15
POWER/TEST
DATA
AT&T
HOME
NEXT
BACK
ENTER

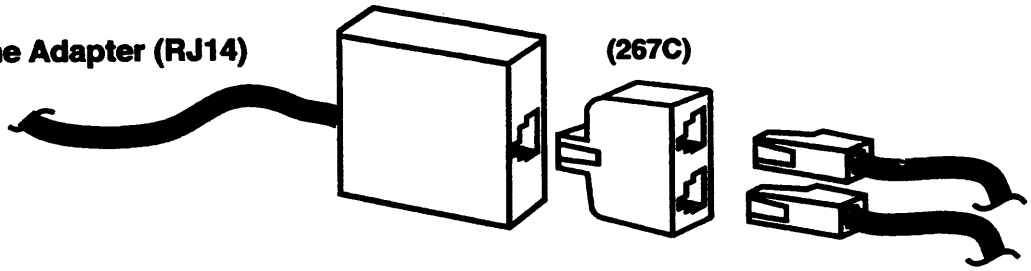
37


ENHANCEMENT
BOARD
PIN

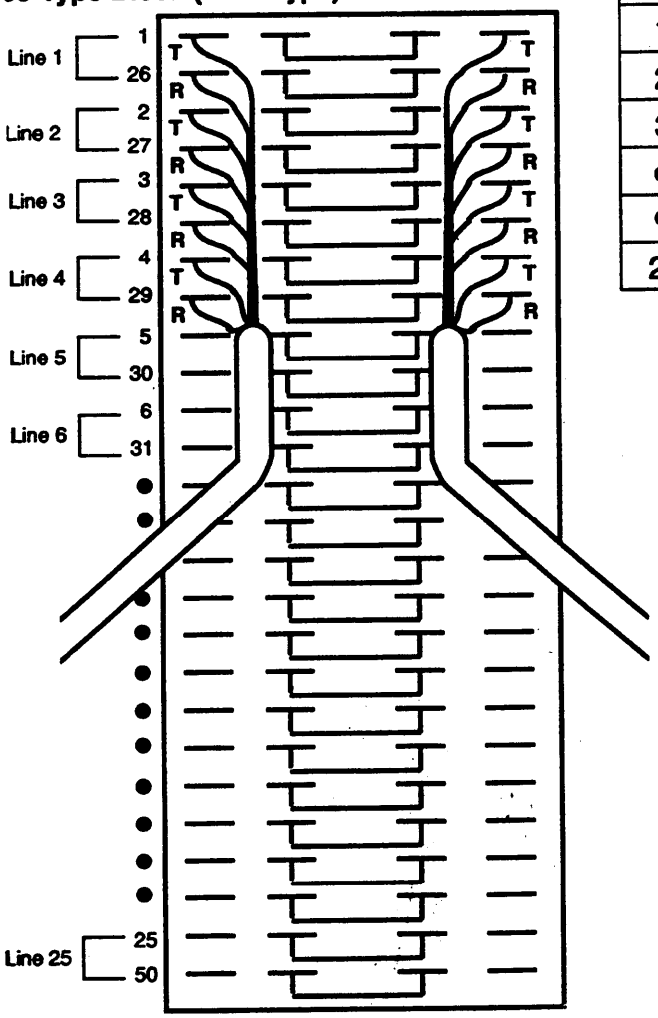
Single-Line Adapter (RJ11)



2-Line Adapter (RJ14) **(267C)**

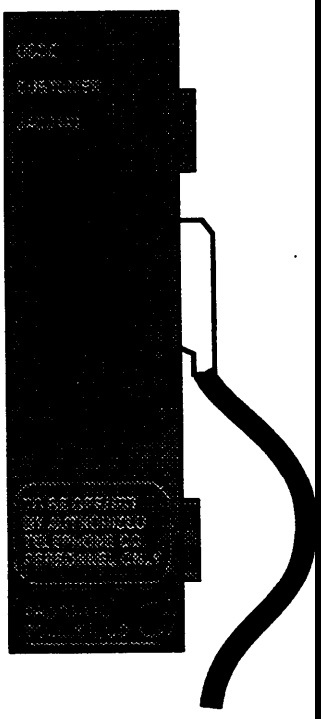


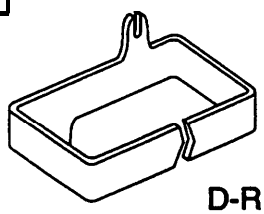
66-Type Block (RJ21-type) 25-Line Interface



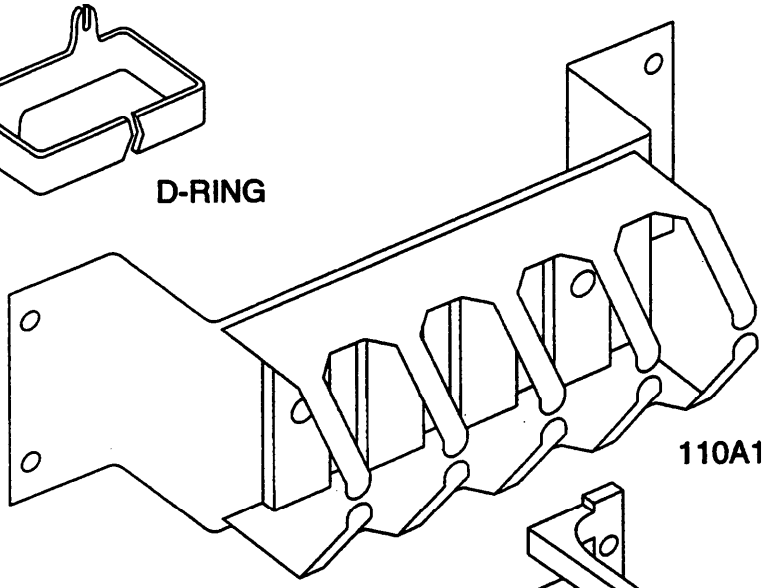
Line	Tip	Ring	Phone Number
1	1	26	555-3827
2	2	27	555-3828
3	3	28	555-3829
•	•	•	• • •
•	•	•	• • •
25	25	50	555-3851

RJ21X

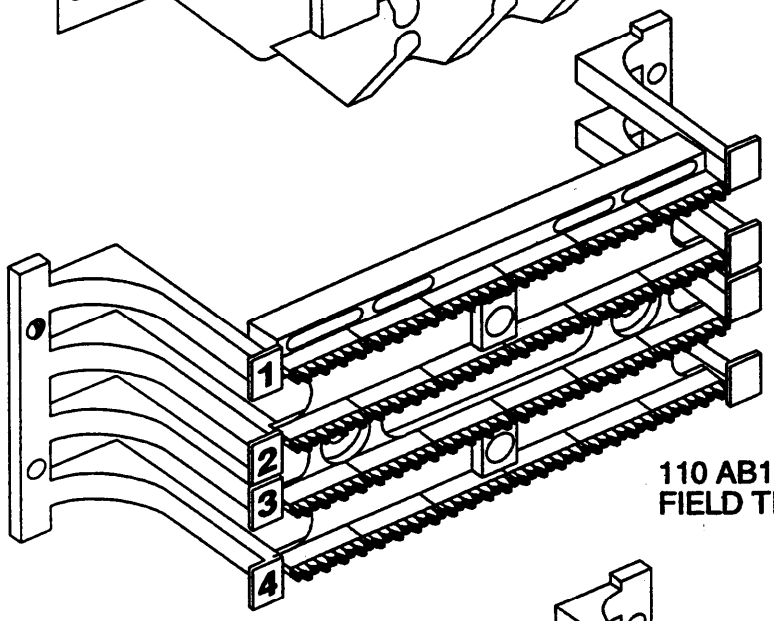




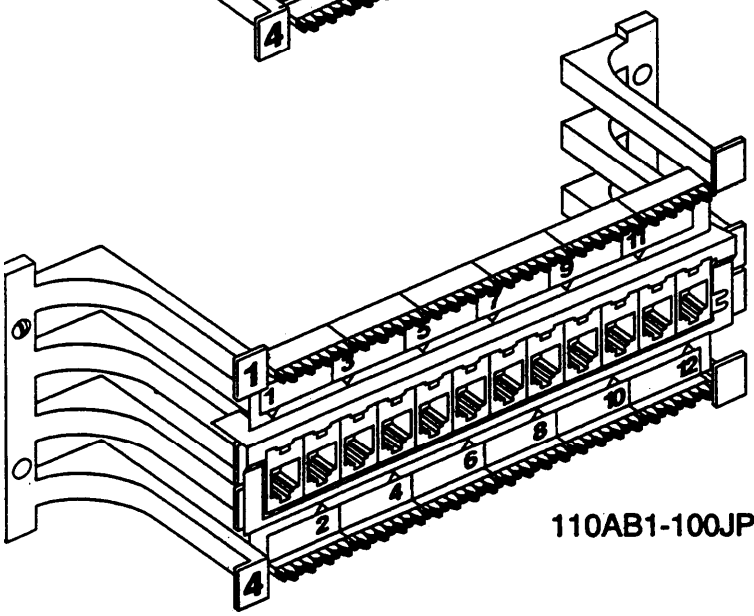
D-RING



110A1 WIRE TROUGH

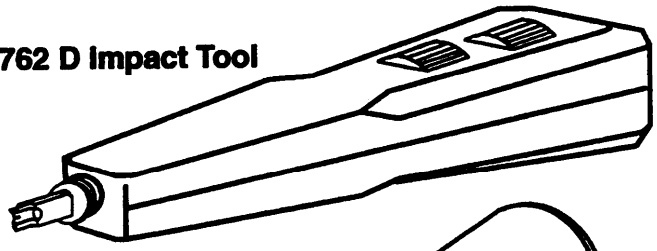


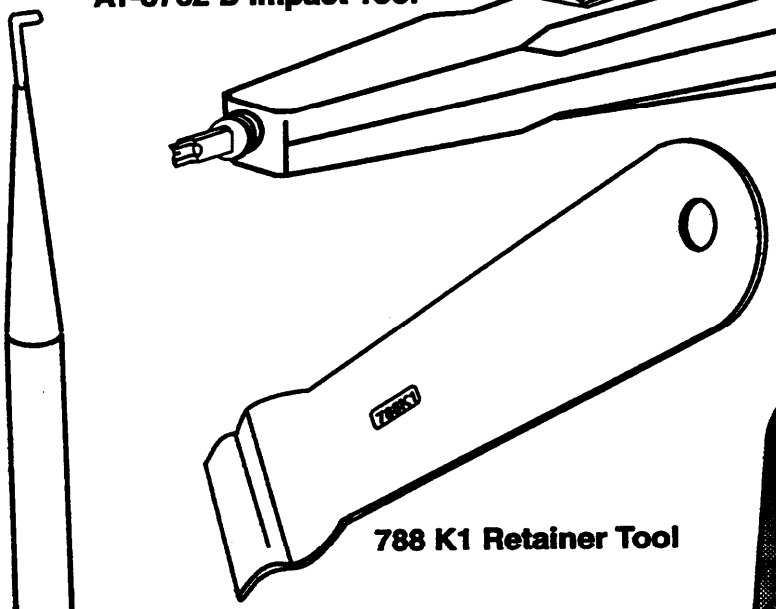
110 AB1-100FT
FIELD TERMINAL BLOCK



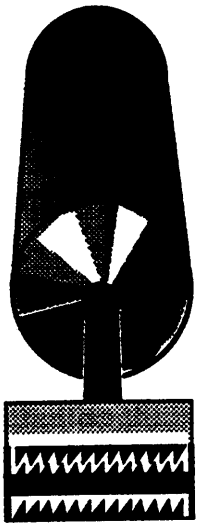
110AB1-100JP12 TERMINAL BLOCK

AT-8762 D Impact Tool



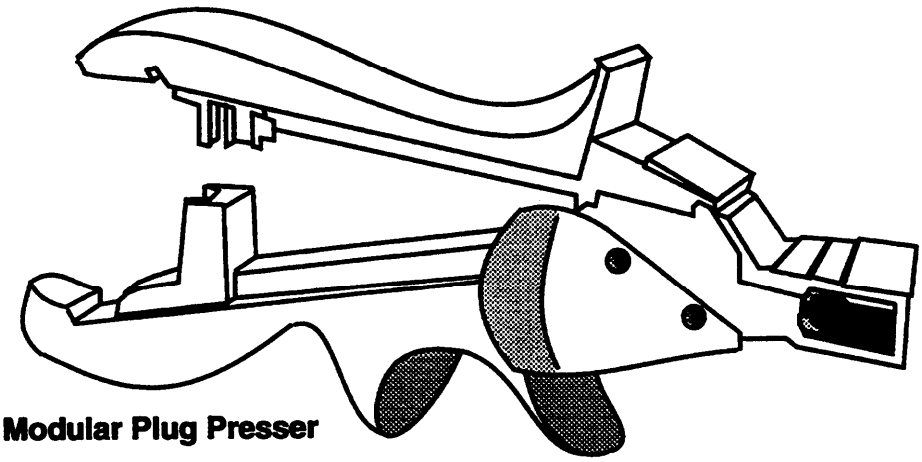


788 K1 Retainer Tool

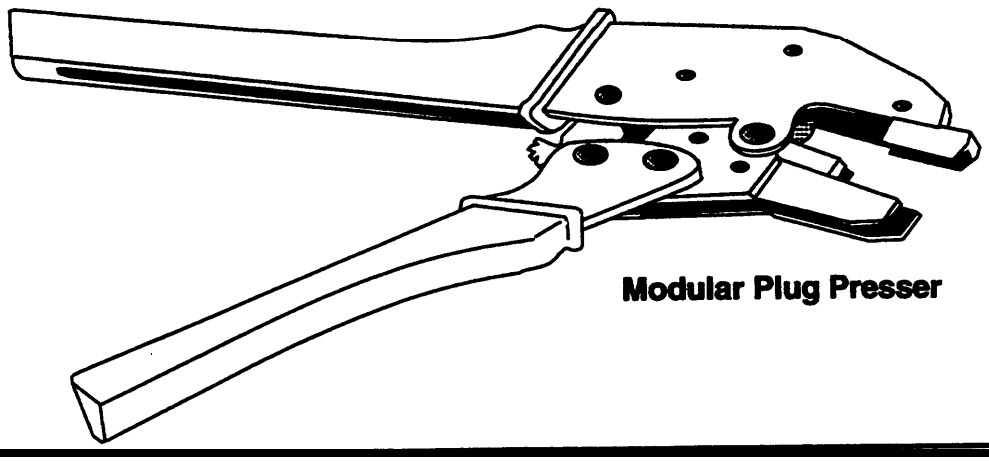


Spudger

110 Impact Tool 788J1

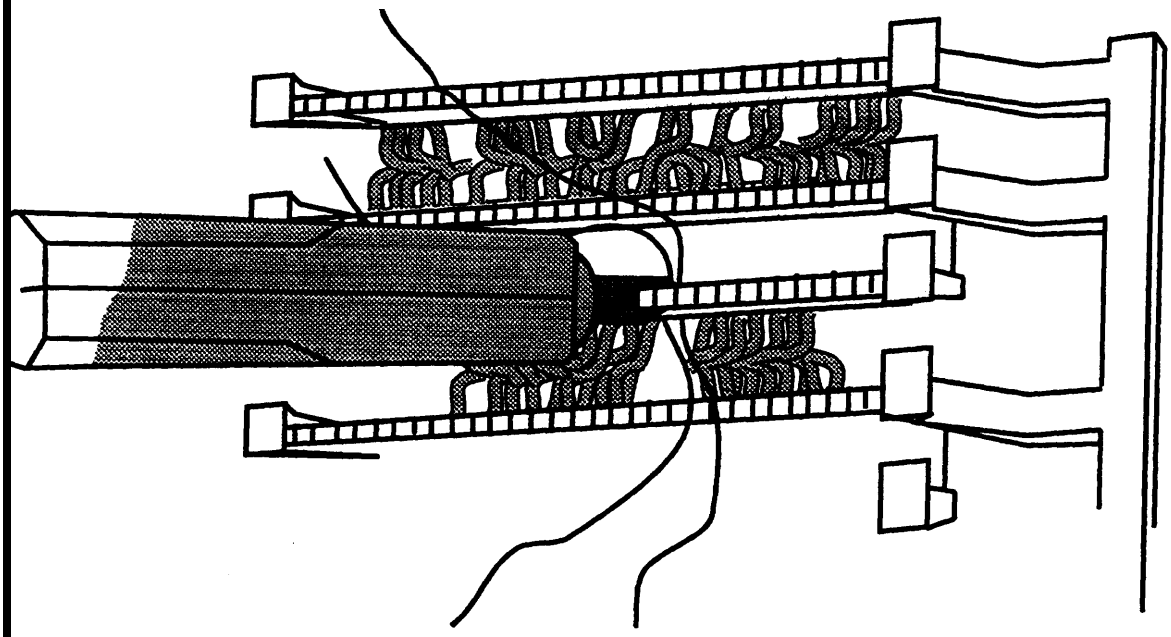


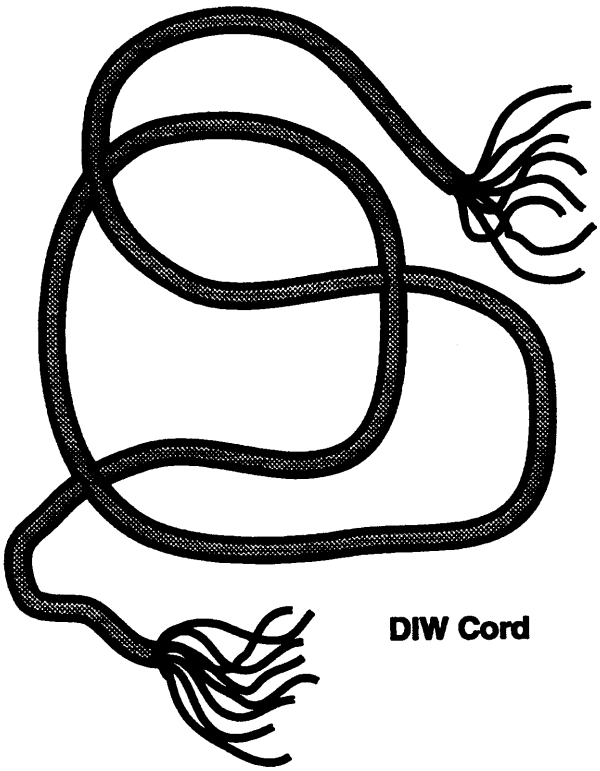
Modular Plug Presser



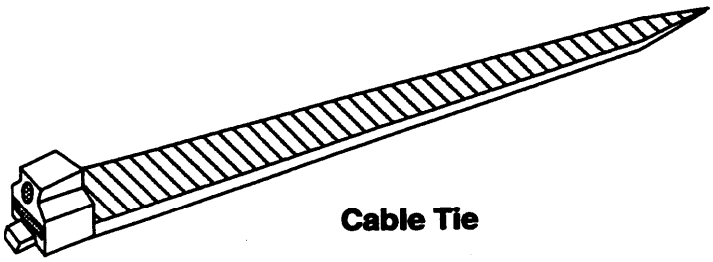
Modular Plug Presser

41

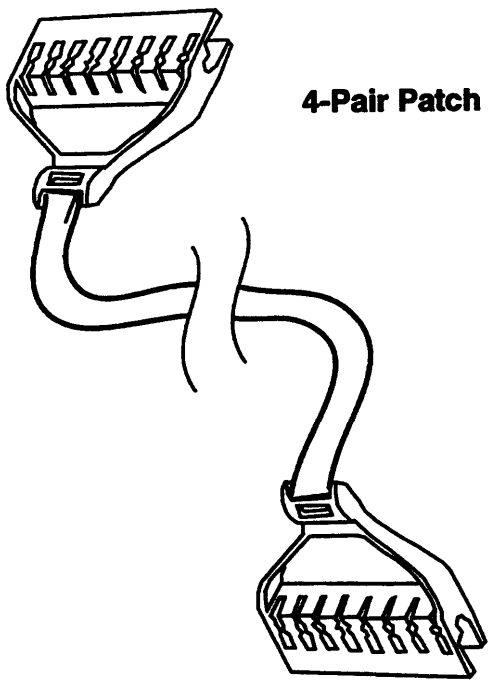




DIW Cord

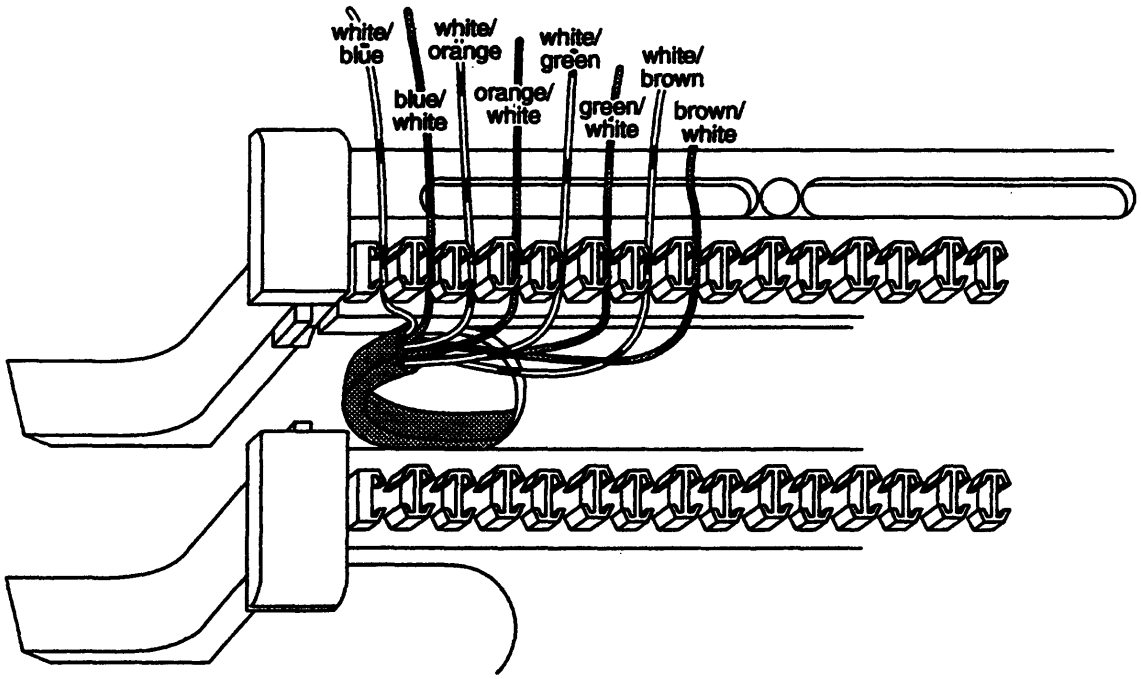


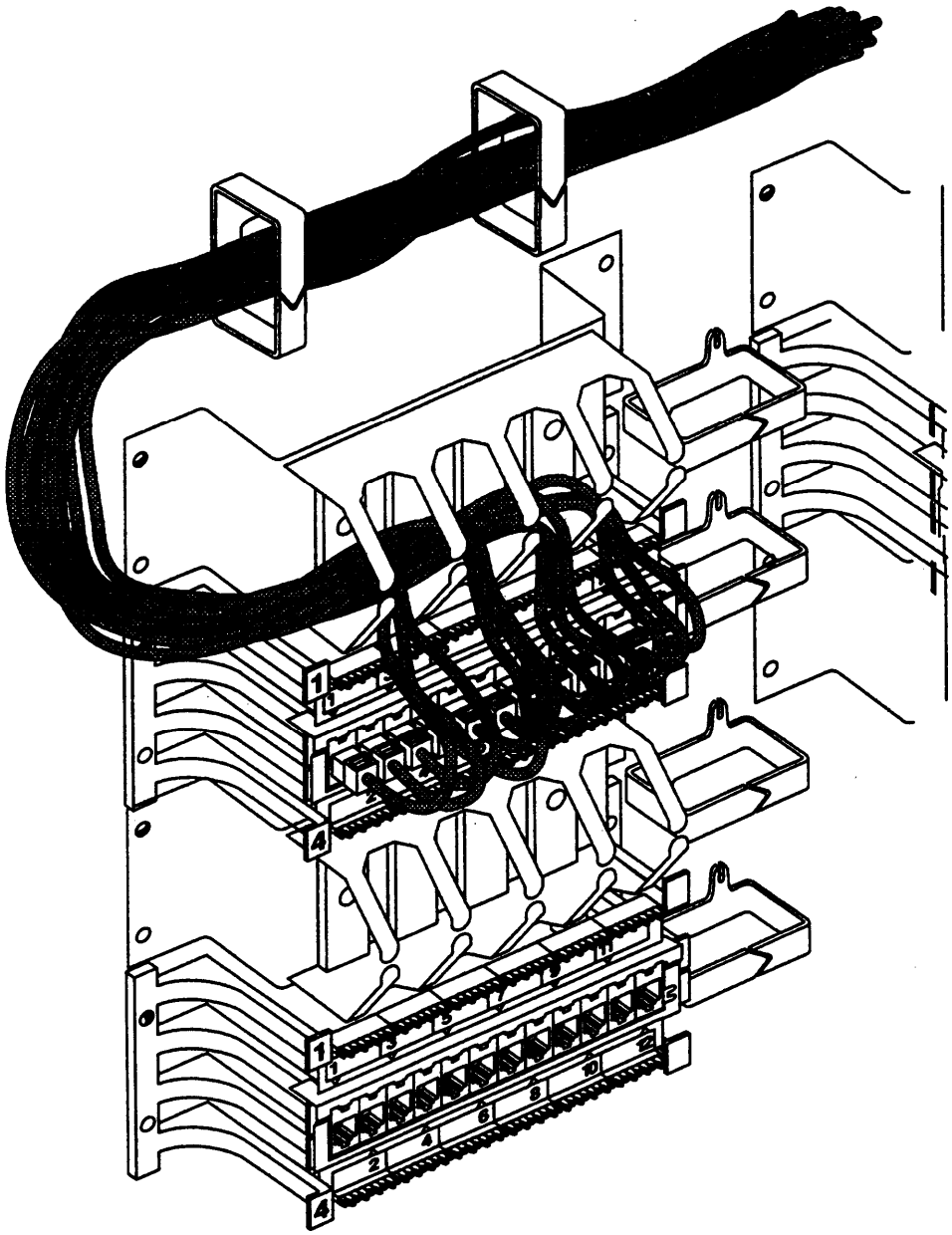
Cable Tie

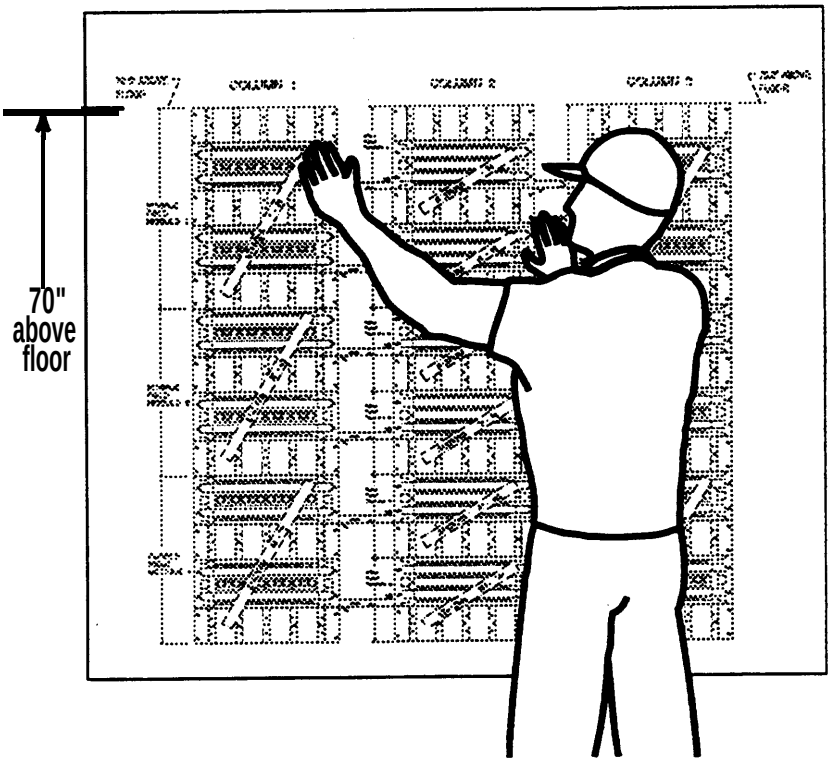


4-Pair Patch Cord

43

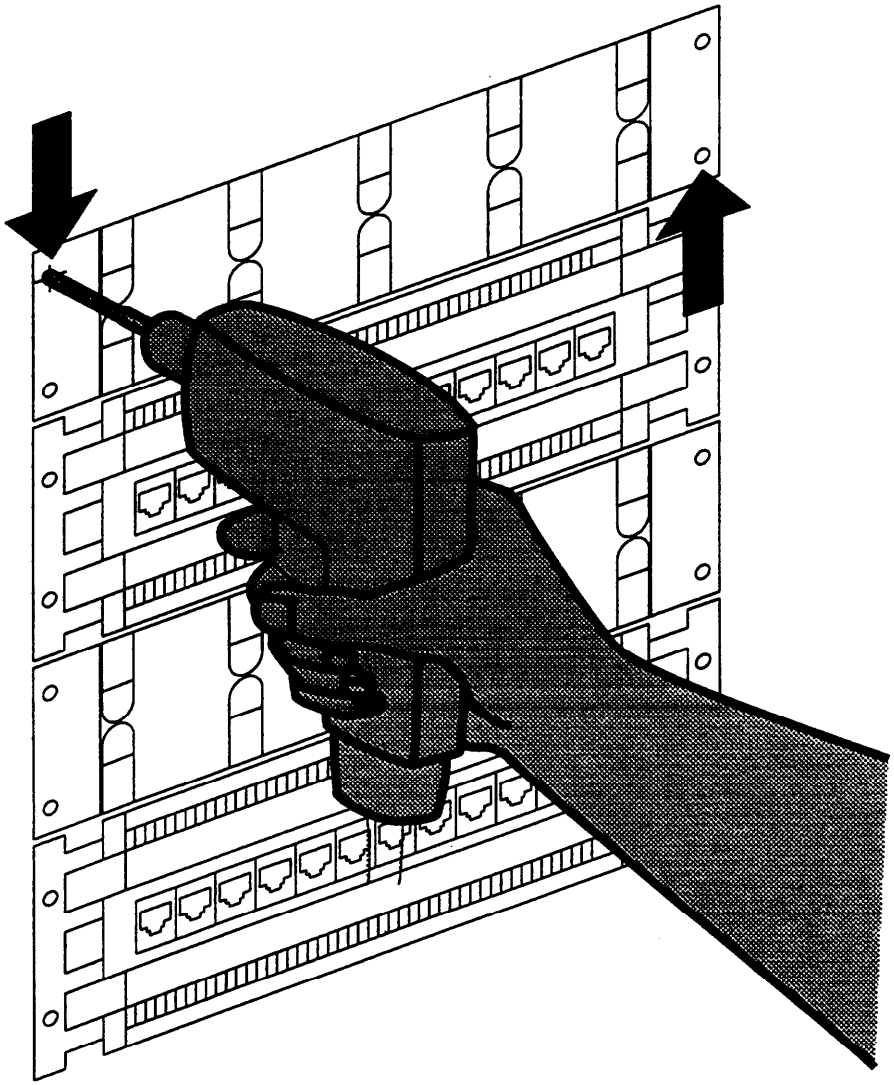

white/
blue
blue/
white
white/
orange
orange/
white
white/
green
green/
white
white/
brown
brown/
white

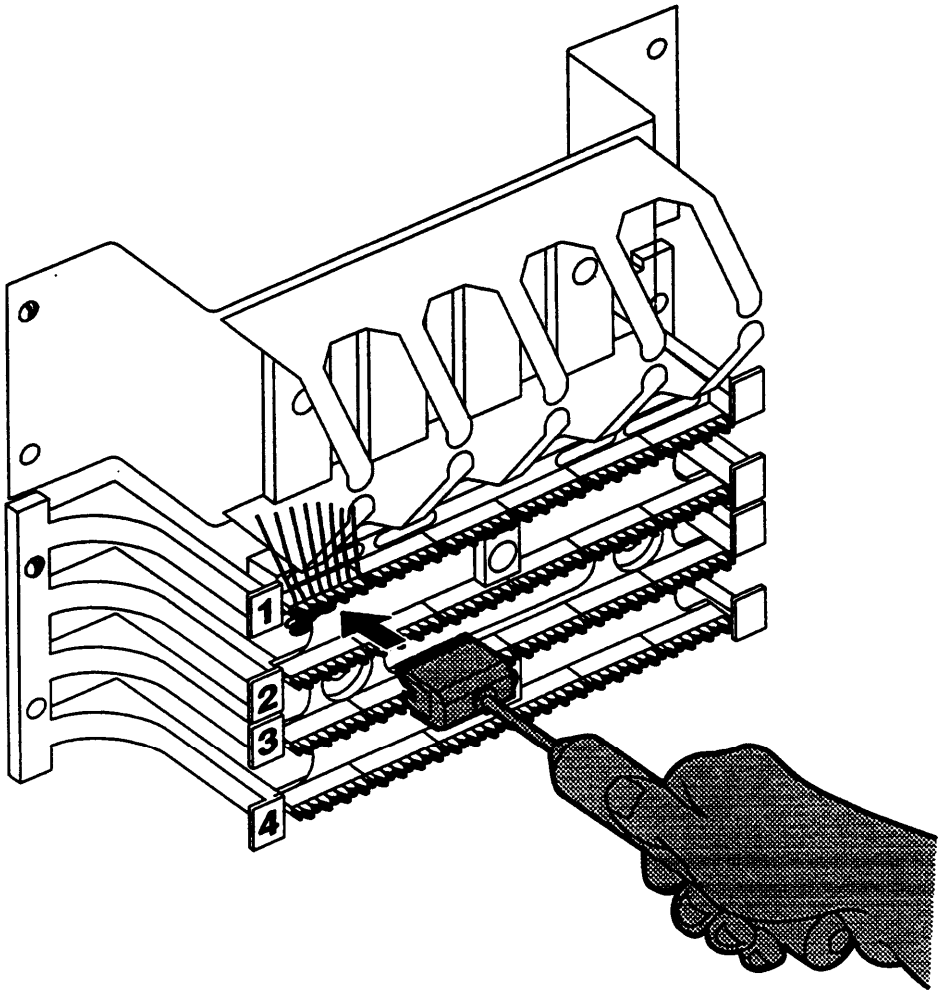

1
4
1
4

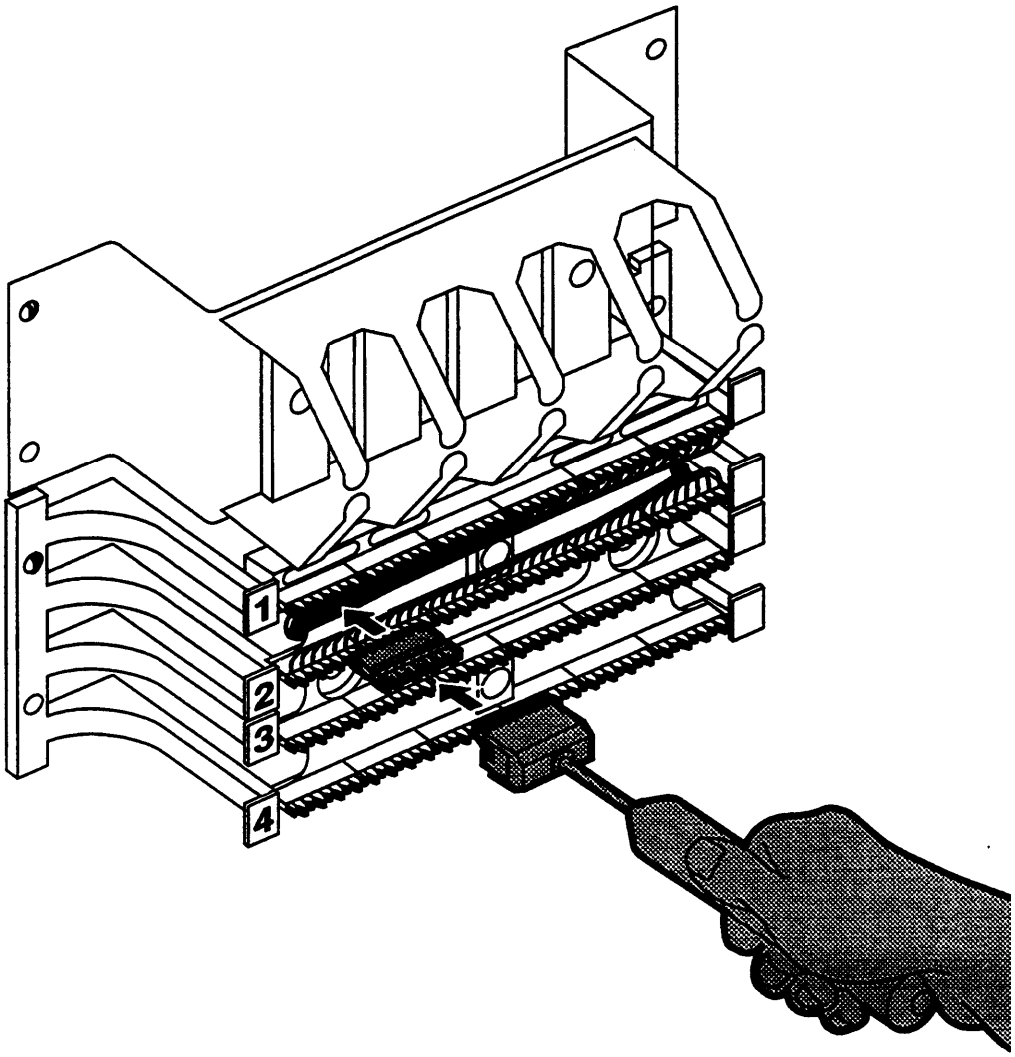

70"
above
floor

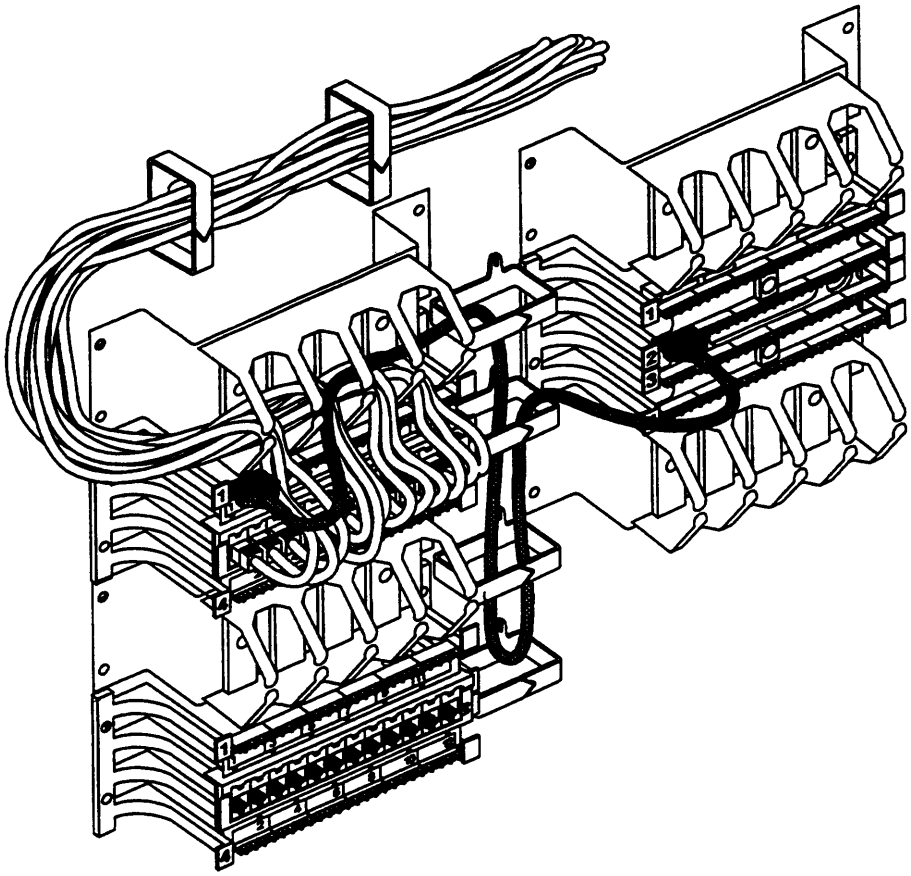
46

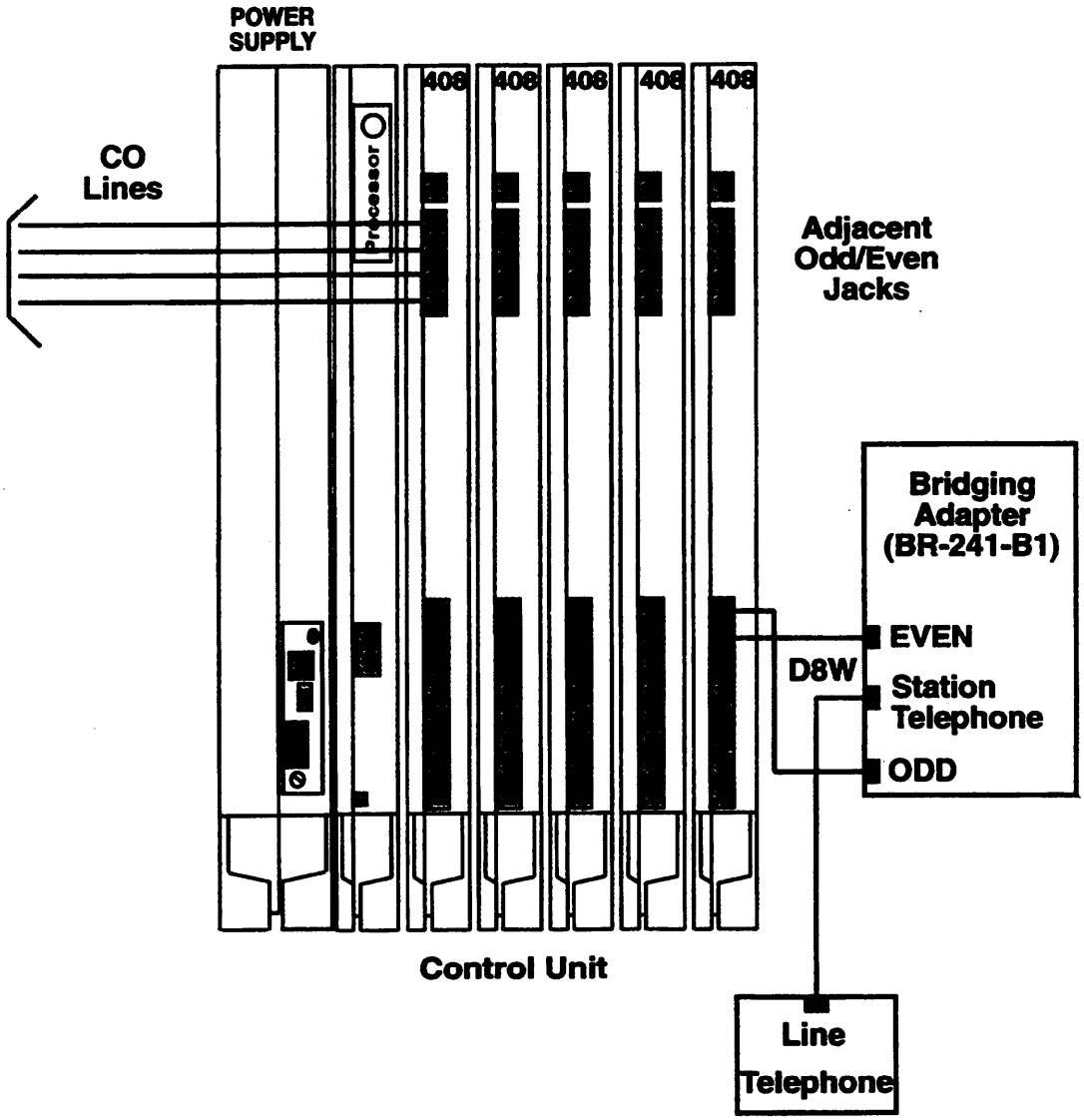
Green
1
Yellow
2
Beige
3
Green
1
Yellow
2
Beige
3
Pink
4
Grey
5
White
6
Pink
4
Grey
5
White
6



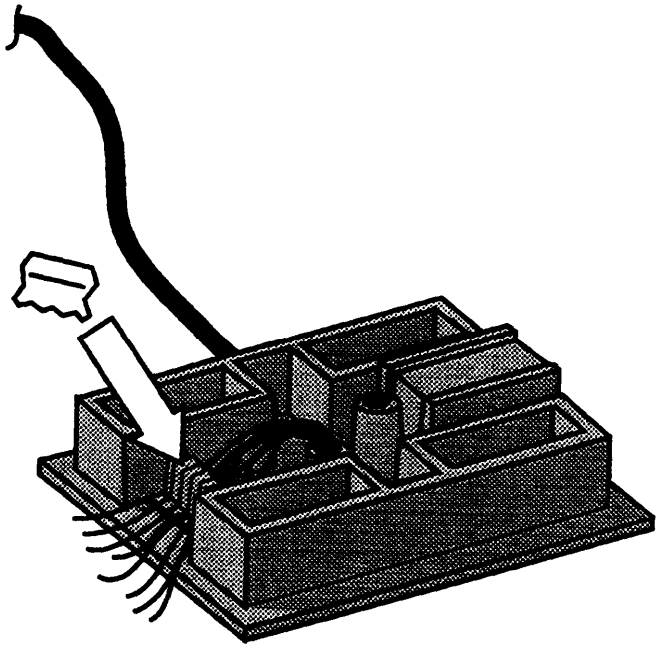

1
2
3
4


1
2
3
4



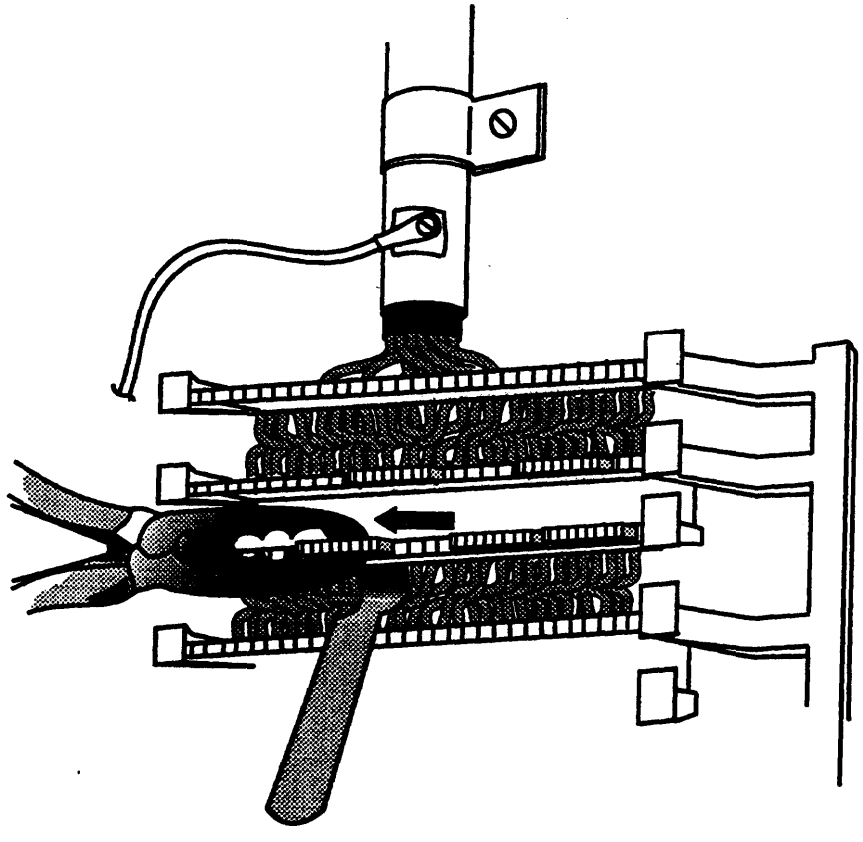

POWER SUPPLY
408
408
408
408
408
Processor
CO Lines
Adjacent Odd/Even Jacks
Bridging Adapter (BR-241-B1)
EVEN
D8W
Station Telephone
ODD
Control Unit
Line Telephone

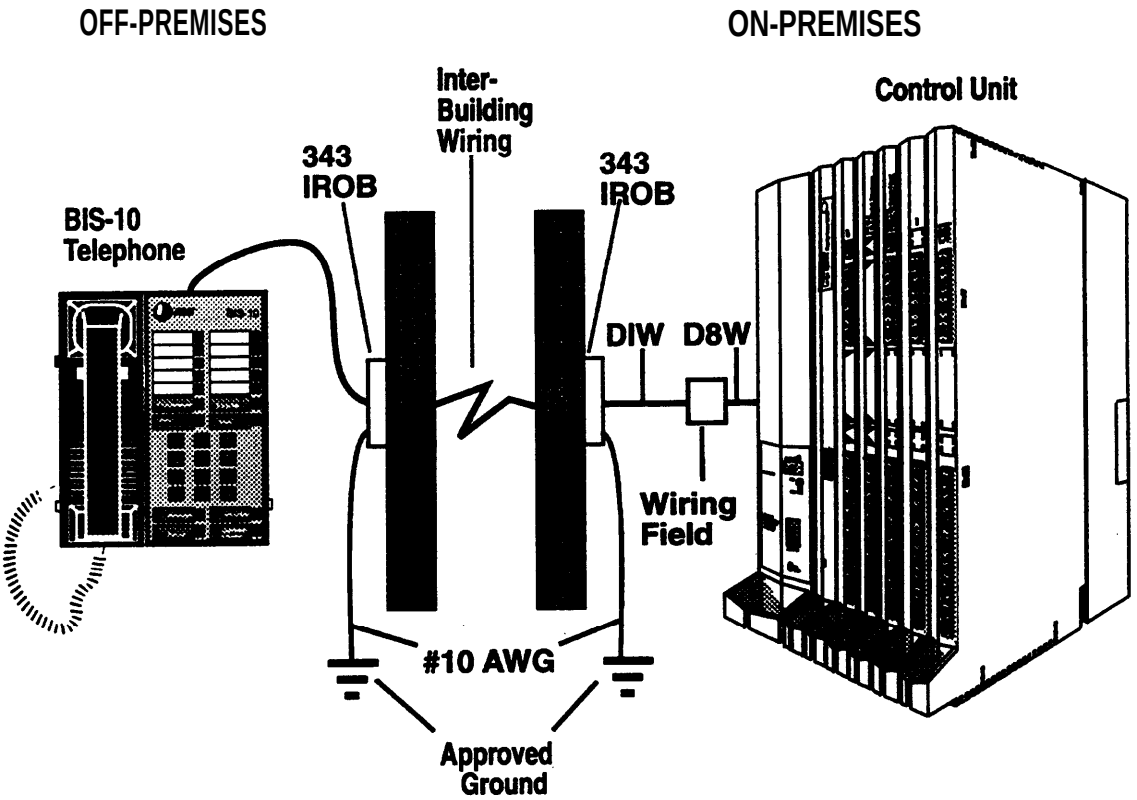
52



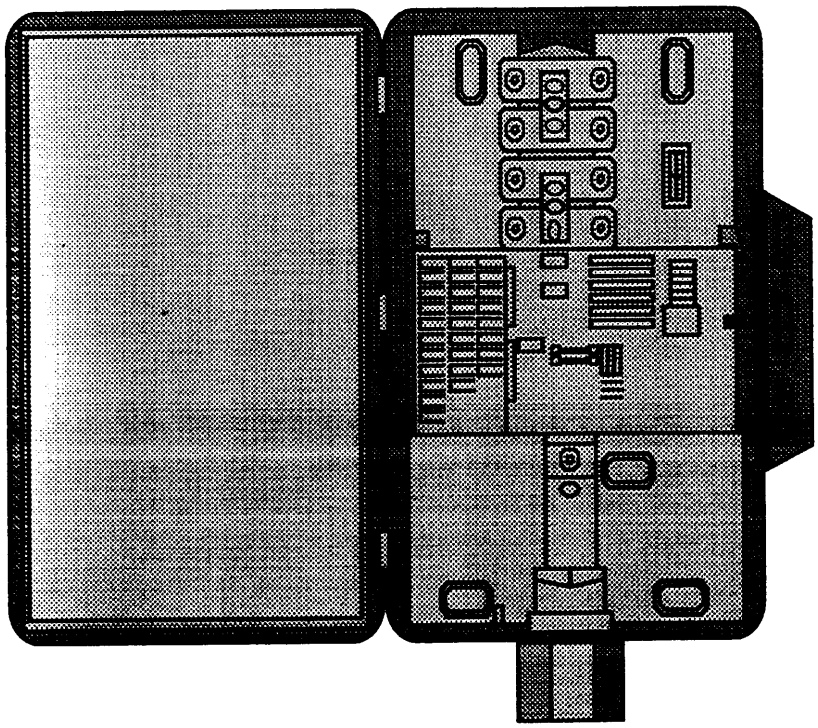
Termination Clips

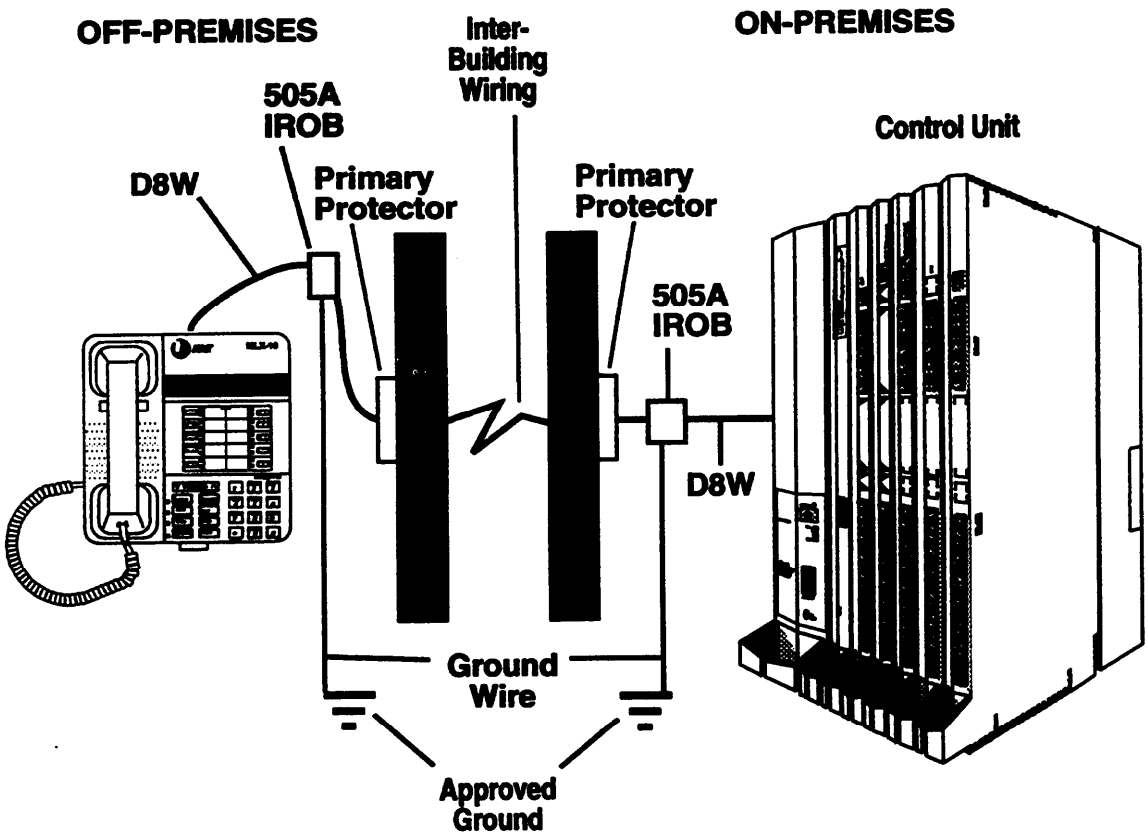
53

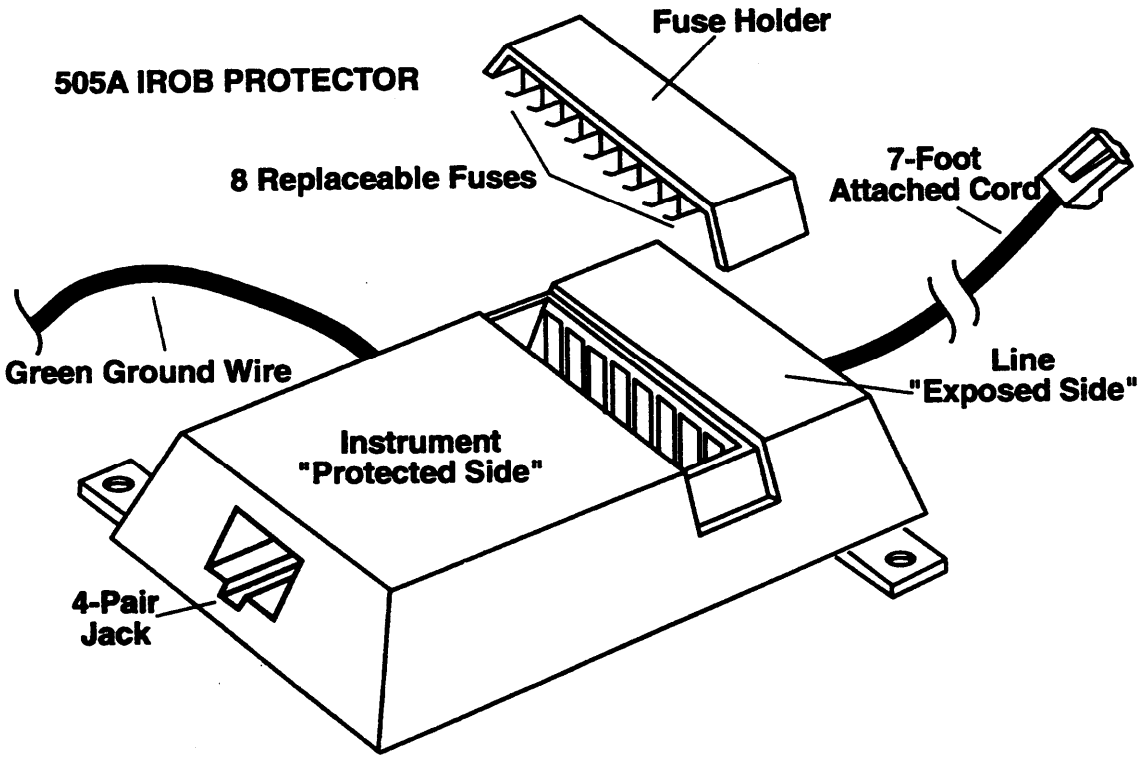




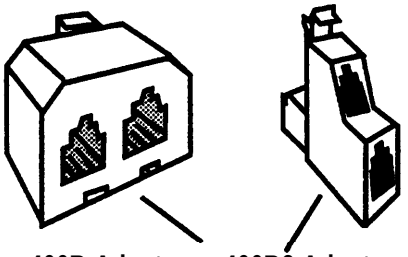
IROB Protector



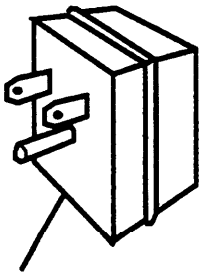

OFF-PREMISES
Inter-
Building
Wiring
ON-PREMISES
505A
IROB
Control Unit
D8W
Primary
Protector
Primary
Protector
505A
IROB
D8W
Ground
Wire
Approved
Ground


505A IROB PROTECTOR
Fuse Holder
8 Replaceable Fuses
7-Foot
Attached Cord
Green Ground Wire
Line
"Exposed Side"
Instrument
"Protected Side"
4-Pair
Jack

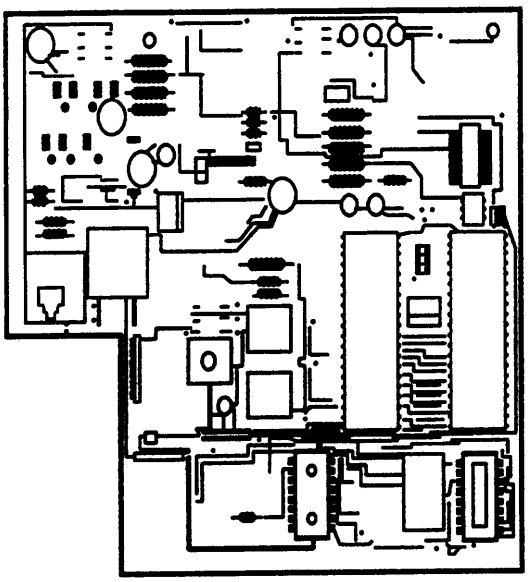
56



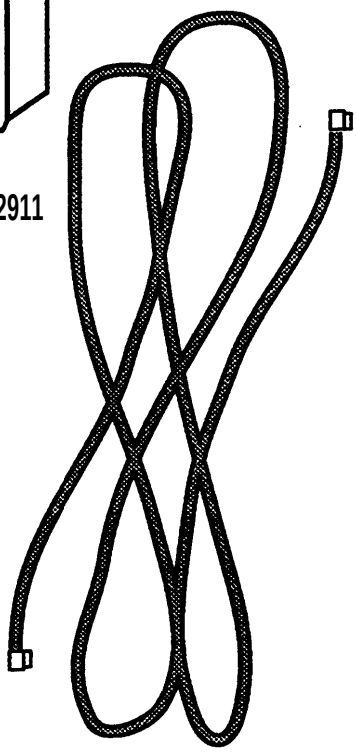
400B Adapter or 400B2 Adapter



Power Supply (KS22911

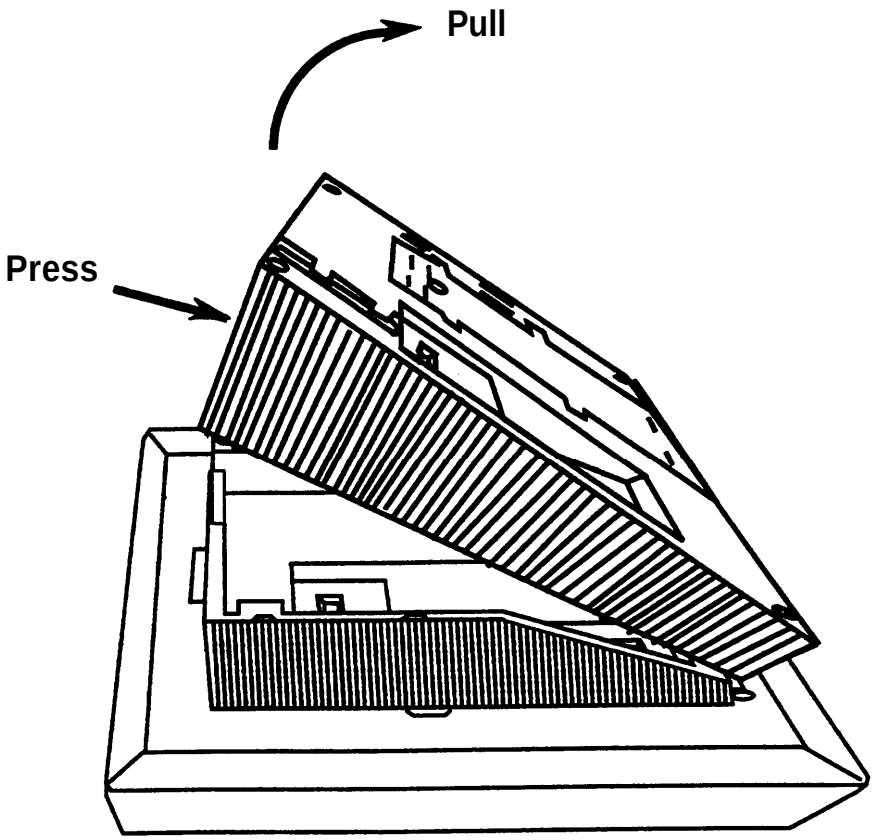


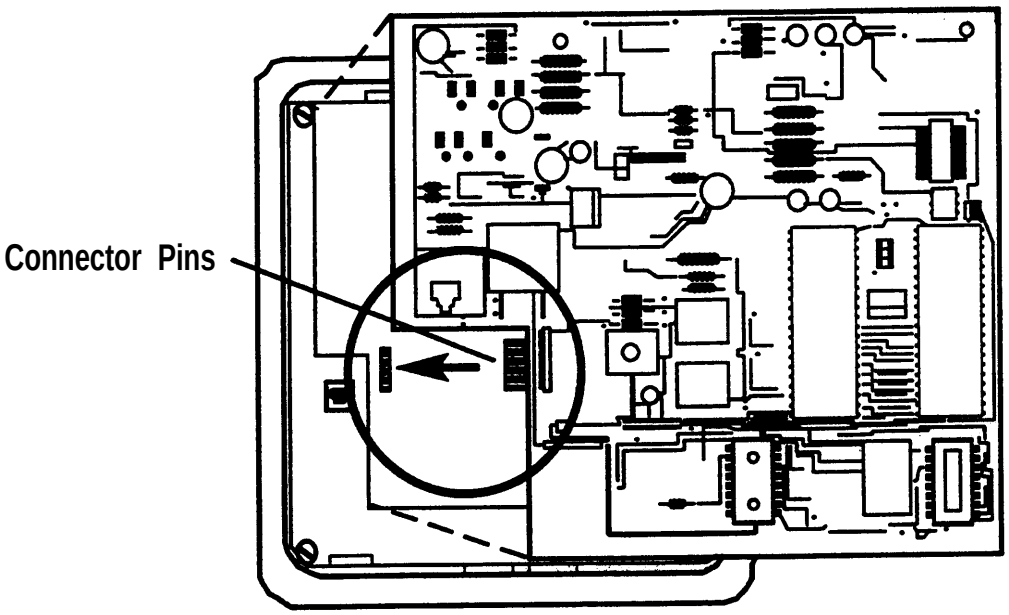
Multi-Function Module

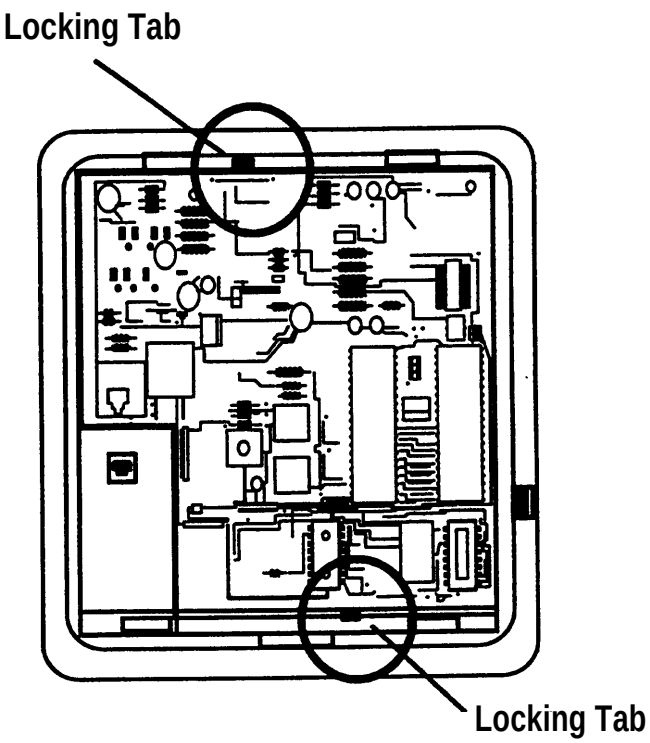


D6AP Cord (7 feet long)

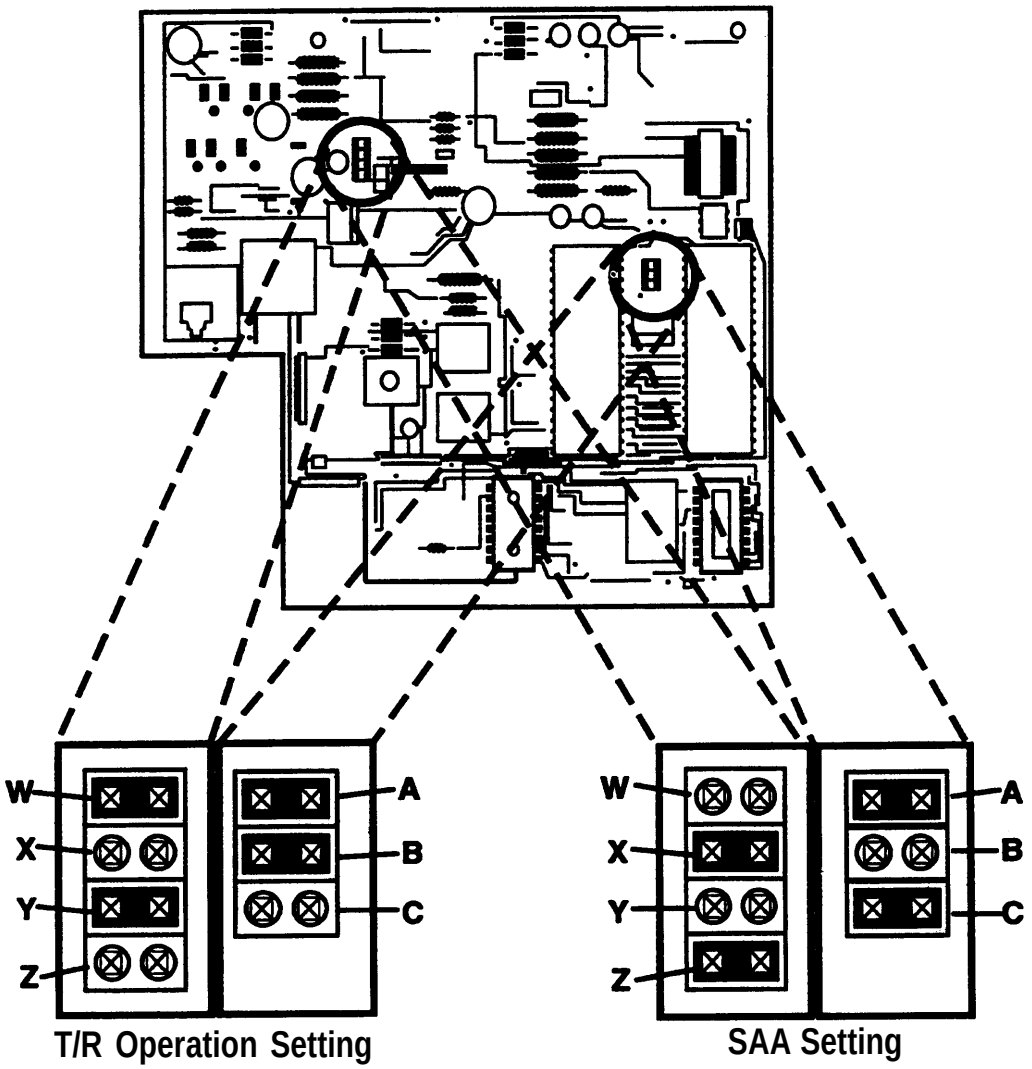
57




Connector Pins


Locking Tab
Locking Tab

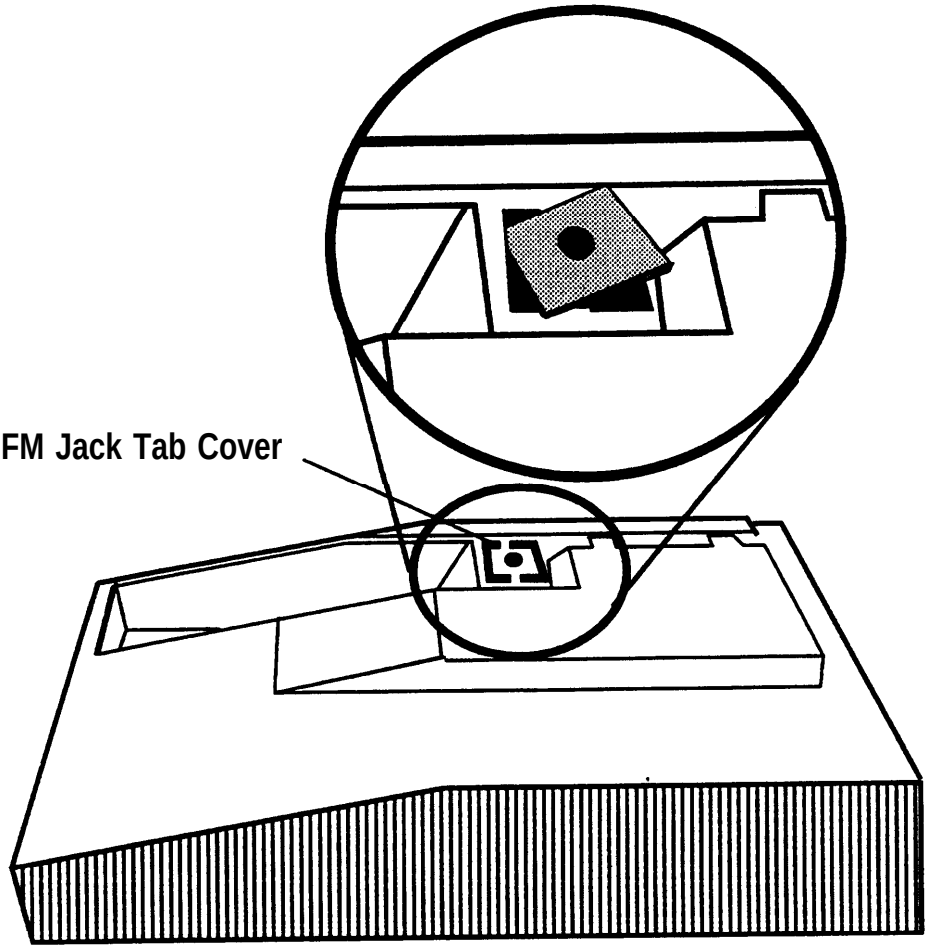
Multi-Function Module



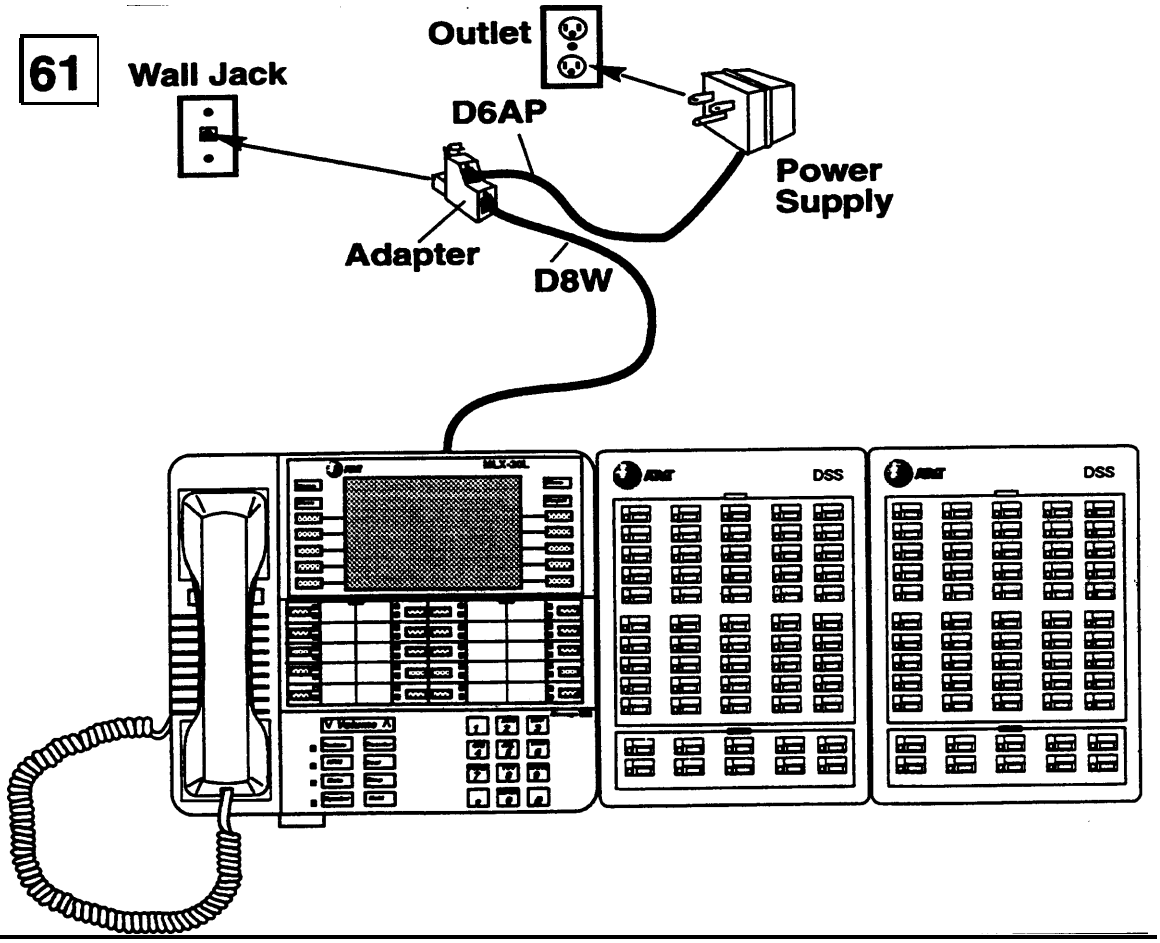
T/R Operation Setting

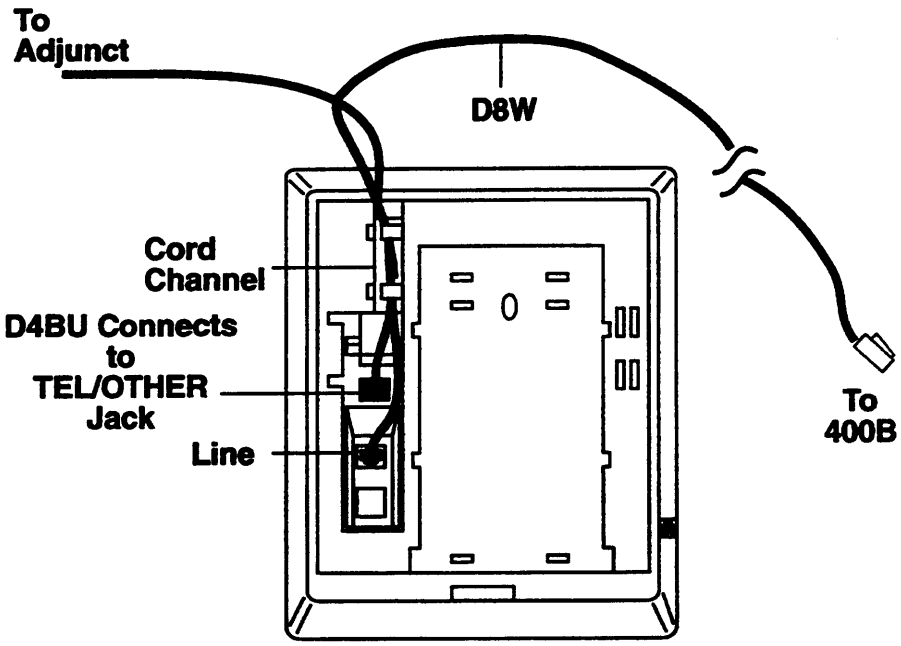
SAA Setting

60

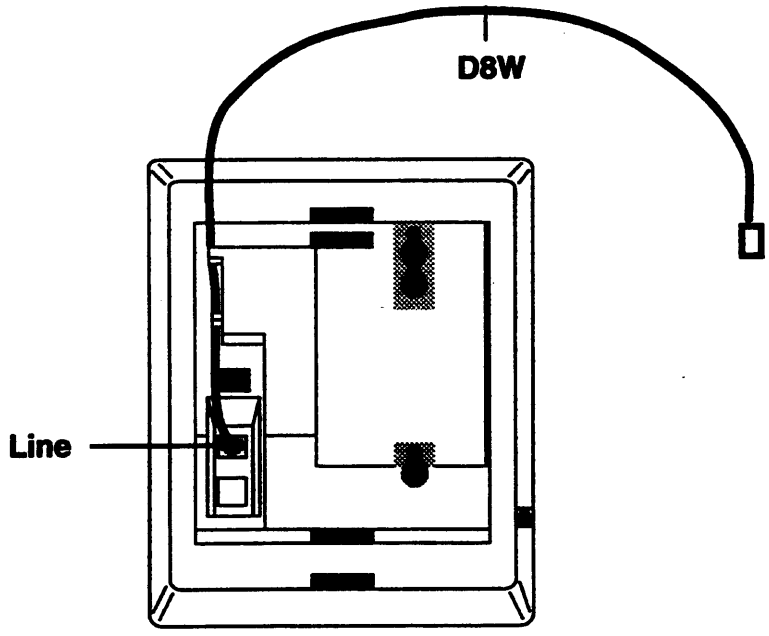

MFM Jack Tab Cover

61

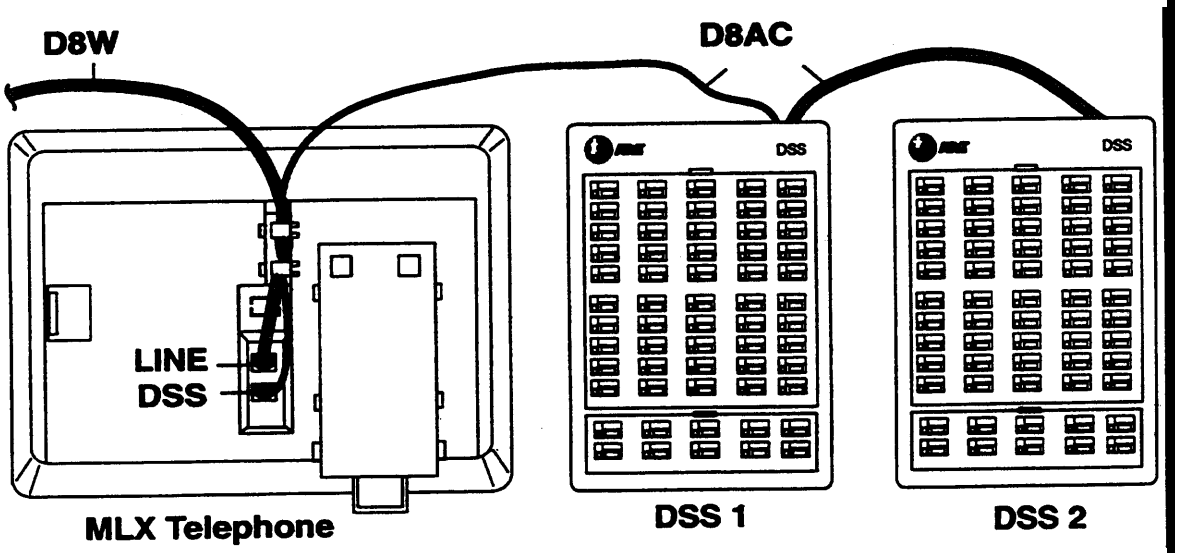

Outlet
Wall Jack
D6AP
Power Supply
Adapter
D8W
DSS
DSS

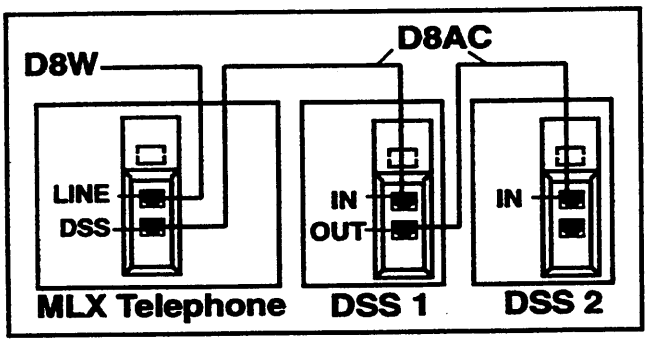


MLX-10™
Desk Telephone

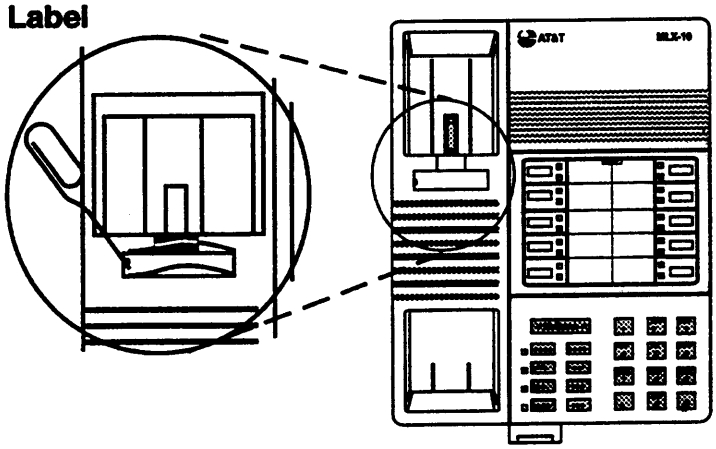


MLX-10™
Wall-Mounted
Telephone

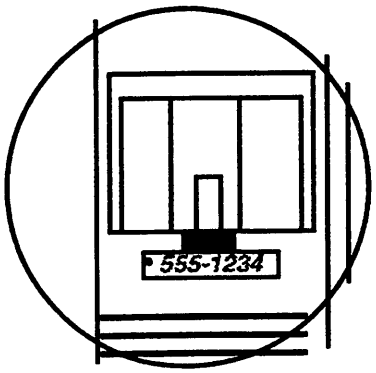

D8W
D8AC
LINE
DSS
DSS
DSS
MLX Telephone
DSS 1
DSS 2


D8W
D8AC
LINE
DSS
IN
OUT
IN
MLX Telephone
DSS 1
DSS 2

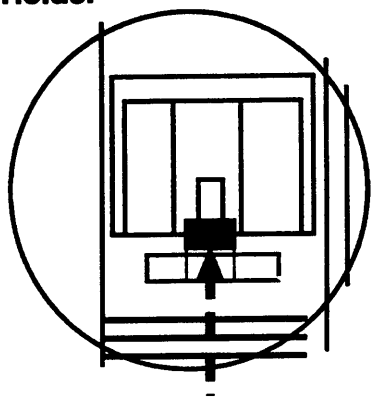
Removing the Extension Label



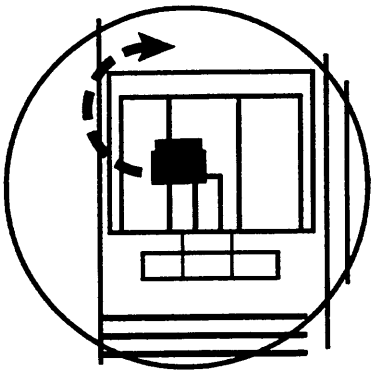
Labeling the Extension



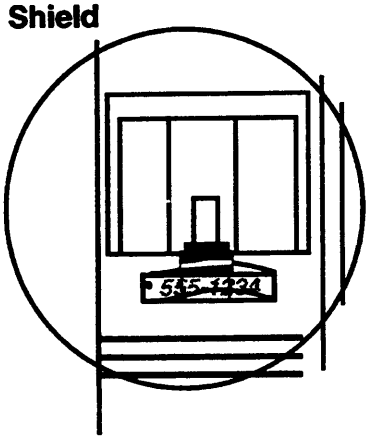
Removing the Handset Holder

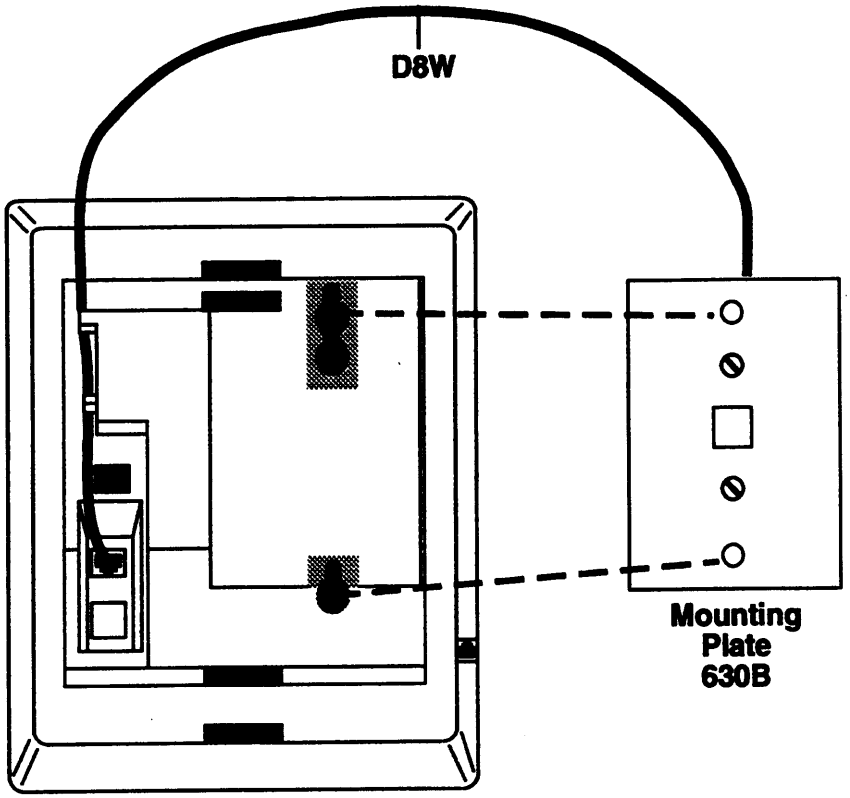


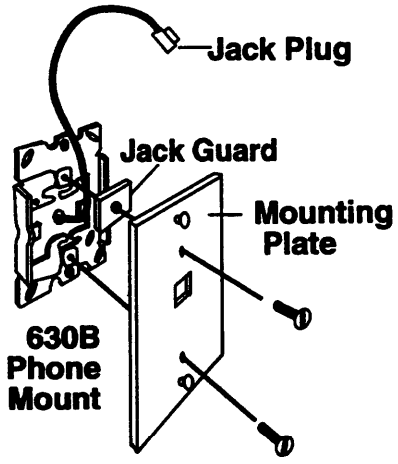
Rotating the Handset Holder



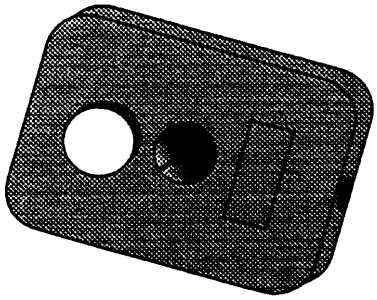
Replacing the Extension Label Shield




D8W
Mounting
Plate
630B

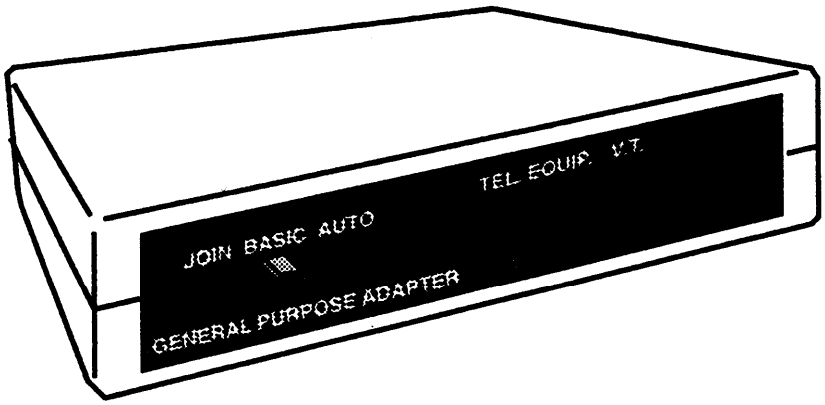

Jack Plug
Jack Guard
Mounting
Plate
630B
Phone
Mount

66



Ground-Start Button

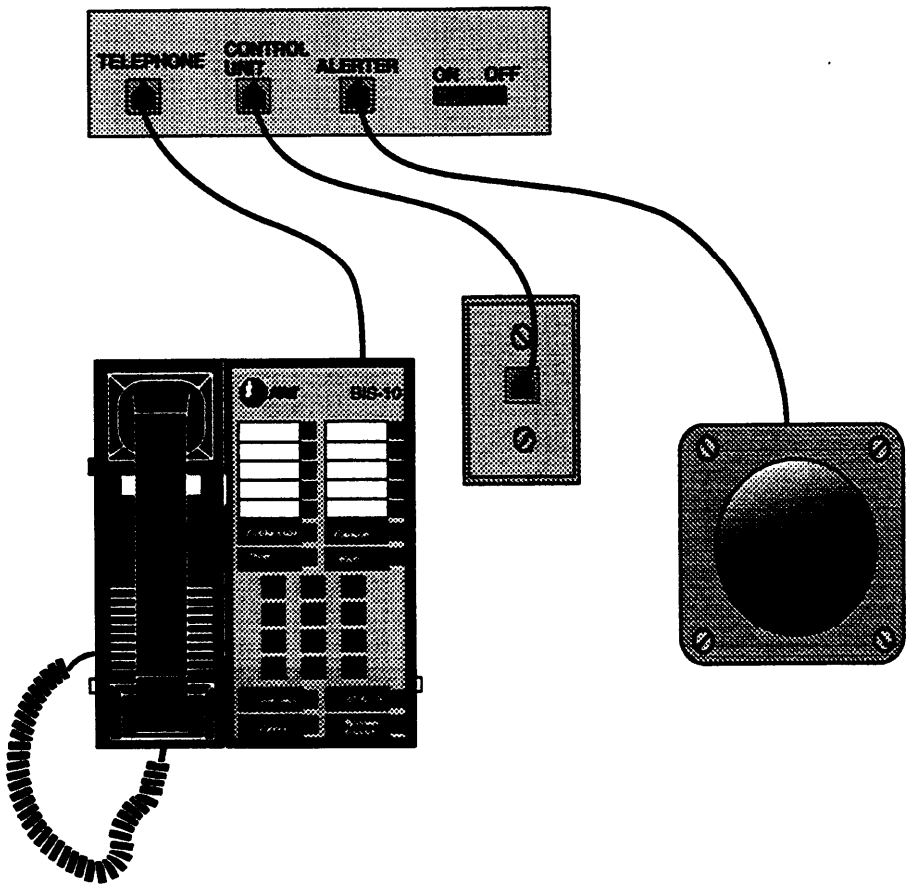
67

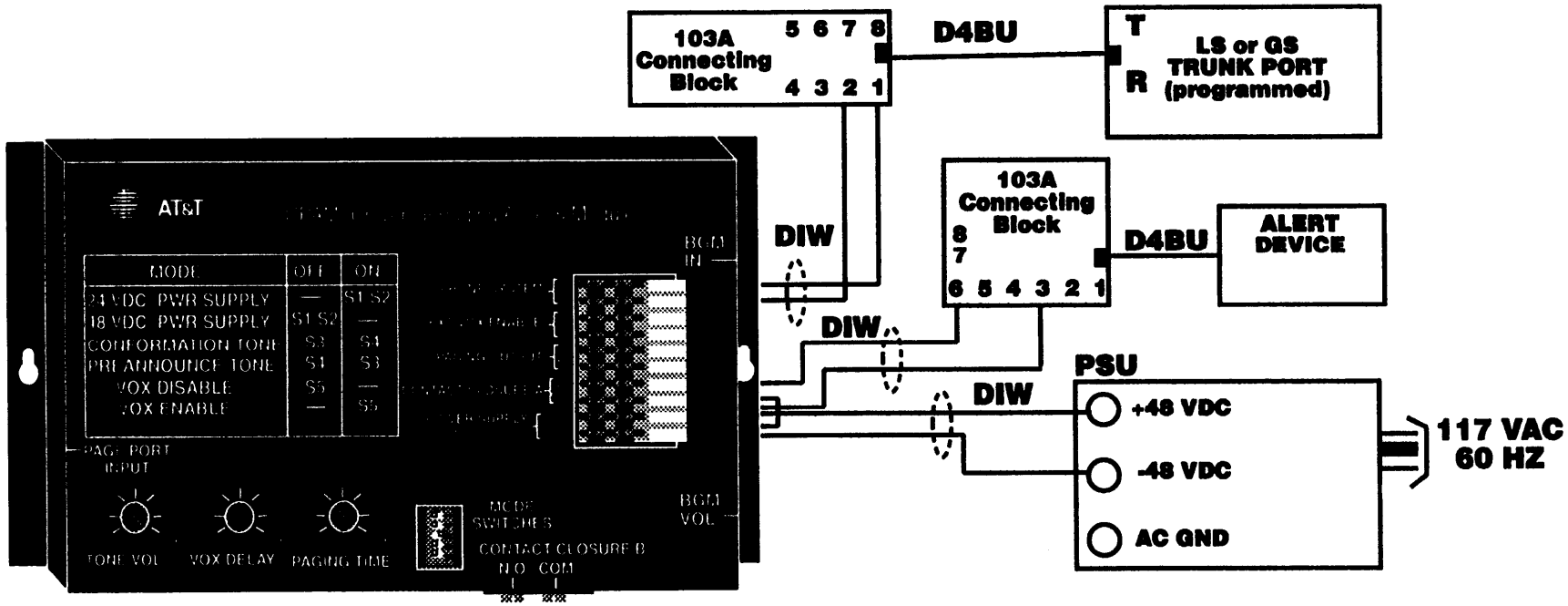


General Purpose Adapter

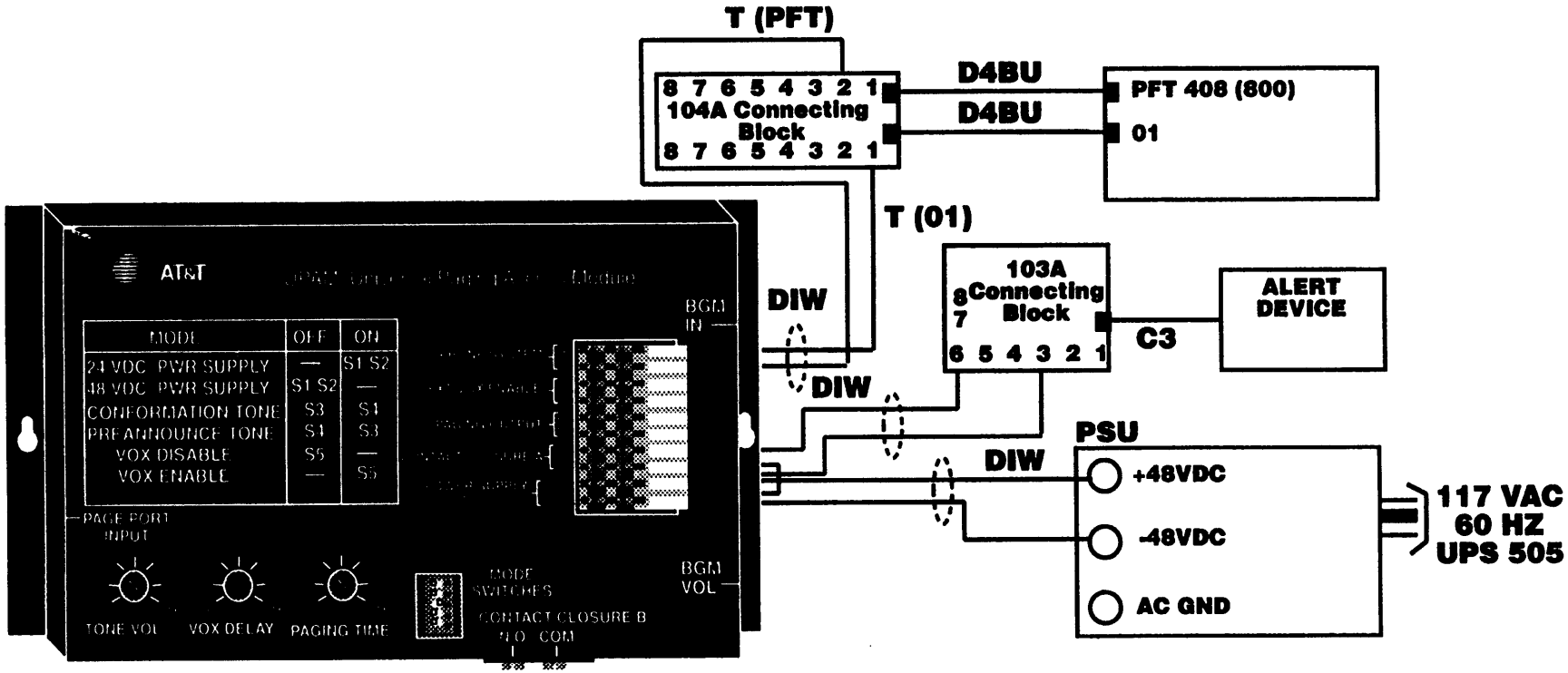
68

Supplemental Alert Adapter

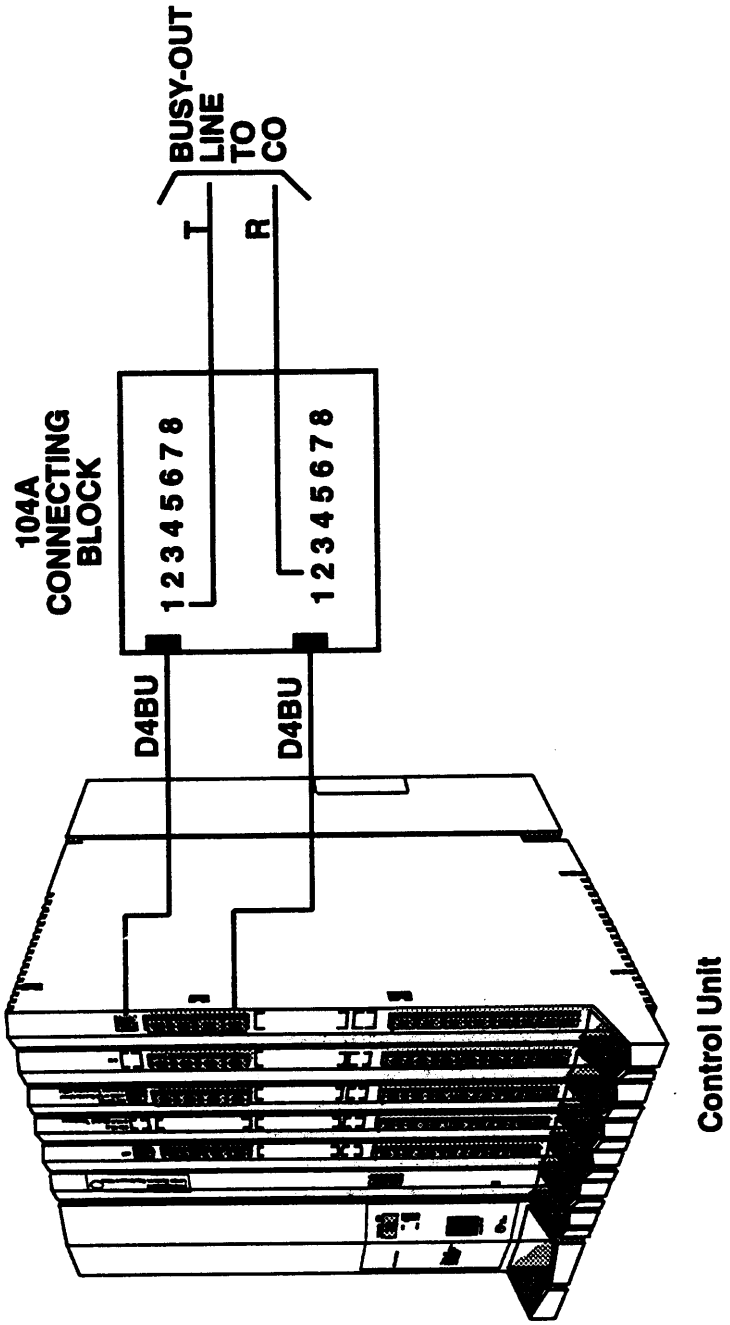


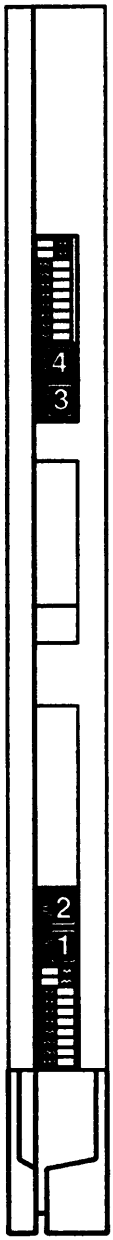


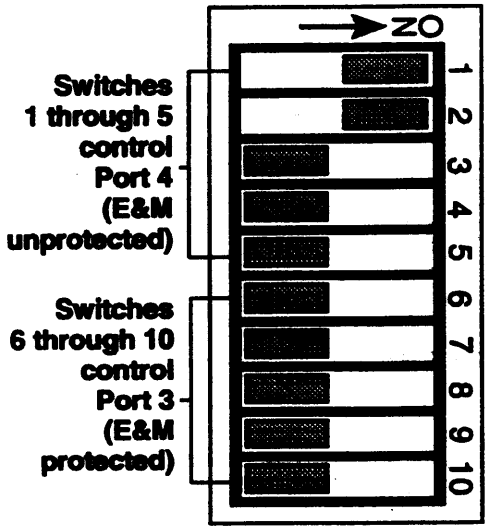
Set Mode Switches S1 & S2 OFF (for 48–V operation)

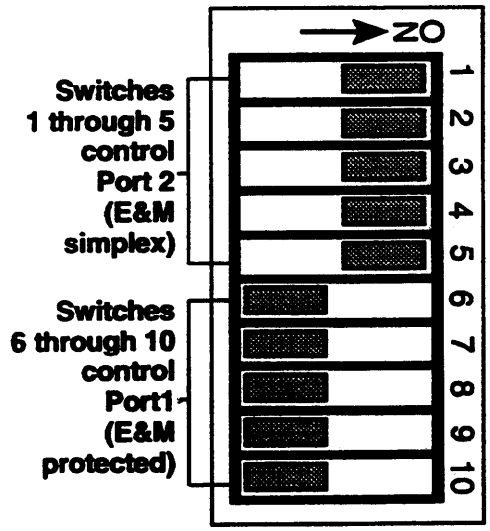


Set Mode Switches S1 & S2 OFF (for 48 V operation)


BUSY-OUT LINE TO CO
T
R
104A CONNECTING BLOCK
1 2 3 4 5 6 7 8
1 2 3 4 5 6 7 8
D4BU
D4BU
Control Unit







Port	Switch Position	E&M		Simplex
		Unprotected	Protected	
4 or 2	1	On	Off	n/a
	2	On	Off	n/a
	3	Off	Off	On
	4	Off	Off	On
	5	Off	Off	On
3 or 1	6	On	Off	n/a
	7	On	Off	n/a
	8	Off	Off	On
	9	Off	Off	On
	10	Off	Off	On

NOTES