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DEFINITY® Communications SystemGeneric 2 and System 85

Wiring

Notice

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Ordering Information

The ordering number for this document is 555-104-530. To order this document, call the AT&T Customer Information Center at 1-800-432-6600 (in Canada, 1-800-255-1242). For more information about AT&T documents, refer to the *Business Communications Systems Publications Catalog* (555-000-010).

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Prepared by

AT&T Technical Publications Department, Denver, Colorado.

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This document follows as closely as possible the guidelines of the AT&T premises distribution system (PDS) as presented in the *Premises Distribtion* Systems *Phase 1.* While the PDS covers all distribution media (copper and fiber), this document is concerned primarily with the simplified design of the main distribution frame (MDF) for AT&T System 85 and DEFINITY® Communications System Generic 2 (hereafter abbreviated as DEFINITY Generic 2 or Generic 2). The MDF as discussed in this document is the major cross-connect field for an installation and is located in or near the equipment room.

This document is intended as a supplement to the AT&T *Premises Distribution System Design Guide* (555-400-602) and does not duplicate information in the PDS guide. This document supplies detail only where the PDS guide does not — that is, on the specifics of designing an MDF and intermediate distribution frames (IDFs) for System 85 and DEFINITY Generic 2. Therefore, the following topics that are covered in the *Premises Distribution System Design Guide* are not covered in this document:

- Information outlets (IO) at the workstations
- Horizontal subsystem (installation cable)
- Riser subsystem (distribution cable)
- Campus subsystem (distribution cable)

INTENDED AUDIENCES

This document is intended primarily for the premises services consultant (PSC) who is charged with designing an MDF and IDF for a System 85 or DEFINITY Generic 2 installation. It also may prove helpful to those who are charged with designing wiring installations for other systems that link to a System 85 or DEFINITY Generic 2, or for sales, marketing, and engineering personnel who want to familiarize themselves with these guidelines.

REASON FOR REISSUE

This document has been reissued to incorporate addenda 1 and 2 into Issue 1. The addenda pages that have been incorporated into this issue contain new or changed information that is indicated by margin rule marks | in text. These are changes to the issue 1 document. These changes include new information about adjunct power and terminal loop lengths, protection devices, synchronization clock, single carrier cabinet module, TN754B and TN746B to port pack listings, and floor templates.

PREREQUISITE SKILLS AND KNOWLEDGE

This document assumes that you are familiar with the PDS installation guidelines and hardware. If you are not, read the *Premises Distribution System Design Guide (555-400-602)* before you read this document.

ORGANIZATION OF THIS GUIDE

This document consists of the following chapters and appendixes:

- Chapter 1, *Overview: System 8.5 and DEFINITY Generic 2 with Traditional Modules* — A brief description of the System 85 and DEFINITY Generic 2 traditional modules' principal components, including remote module interfaces (RMIs) and remote group interfaces (RGIs), and their operation
- Chapter 2, *MDF/IDF Design: System 85 and DEFINITY Generic 2 with Traditional Modules* — Detailed guidelines for designing an MDF and general guidelines for designing an IDF
- Chapter 3, *Electrical Protection: System 85 and DEFINITY Generic 2 with Traditional Modules* — A discussion of primary, enhanced primary, secondary, and combination electrical protectors for the System 85 and DEFINITY Generic 2 with traditional modules including remote modules when distribution cabling is exposed to electrical hazards.
- Chapter 4, *Port Packs/DCP Repeaters: System 85 and DEFINITY Generic 2 with Traditional Modules* — Cross-references between port circuit packs, their terminations on the MDF, and the terminals that they serve, as well as a discussion of Digital Communications Protocol (DCP) repeaters for digital terminals
- Chapter 5, *Installation Example: System 85 and DEFINITY Generic 2 with Traditional Modules* — An example of an MDF designed to accommodate a hypothetical seven-module system 85 or DEFINITY Generic 2 with traditional modules
- Chapter 6, *Overview: DEFINITY Generic 2 with Universal Modules* — A guide to the major differences and important features of DEFINITY Generic 2 with universal modules that are not available in System 85 and DEFINITY Generic 2 with traditional modules
- Chapter 7, *MDF/IDF Design: DEFINITY Generic 2 with Universal Modules* — Designing the MDF and IDF for DEFINITY Generic 2 with universal modules
- Chapter 8, *Electrical Protection: DEFINITY Generic 2 with Universal Modules* — Electrical protection scheme for DEFINITY Generic 2 with universal modules
- Chapter 9, *Port Packs: DEFINTY Generic 2 with Universal Modules* — Port packs and terminals supported in the Generic 2 universal configurations
- Chapter 10, *Installation Example: DEFINITY Generic 2 with Universal Modules* — A sample installation of a DEFINITY Generic 2 with universal modules
- Chapter 11, *BRI: DEFINITY Generic 2 with Universal Modules* — A brief overview of basic rate interface wiring principles, terminals, and power supplies as they apply to DEFINITY Generic 2 with universal modules
- Chapter 12, *Adjunct Power Supplies* — Information and guidelines for adjunct power supplies, loop ranges, and applications for System 85 and DEFINITY Generic 2
- Chapter 13, *Fiber-Optics* — A brief chapter explaining fiber-optics as it applies to the System 85 and DEFINITY Generic 2
- Chapter 14, *Insert Labels* — Partial reproductions of the sheets of insert labels used to identify cable terminations on the MDF and IDFs

A glossary and index appear at the end of this document.

HOW TO USE THIS DOCUMENT

Chapters 1 through 5 apply to System 85 and DEFINITY Generic 2 with traditional modules. Chapters 6 through 11 apply to DEFINITY Generic 2 with universal modules. Chapters 12 through 14 apply to adjunct power supplies, fiber-optics, and insert labels; this information is common to both System 85 and DEFINITY Generic 2.

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- DEFINITY® is a registered trademark of AT&T. In this document, DEFINITY Communications System Generic 2 is often abbreviated to DEFINITY Generic 2, Generic 2, DEFINITY G2, or G2.
- Linx® is a registered trademark of Illinois Tool Works Linx (TTW).
- Delta® is a registered trademark of Porta Systems Corp.

RELATED RESOURCES

Following are a list and brief descriptions of additional documents that you may find helpful.

- *Premises Distribution System Design Guide* (555-400-602). A document for readers who are familiar with distribution systems and the hardware and cabling necessary for their construction Provides step-by-step instruction in designing a PDS for a building or a campus of buildings even when the specific voice or data systems are not known, plus information on specific PDS components and methods. Not intended as a tutorial in PDS.

  NOTE: The *Premises Distibution System Design Guide* (555-400-602) cannot be ordered from the AT&T Customer Information Center. Provided on a proprietary basis to select, certified PDS vendors and to PSCs who attend the PDS design training course.

- *DEFINTY™ Communication System Generic 2 and System 85 Equipment Room Floor Plans and Specifications* (555-104-603). An instruction document for preparing an equipment room floor plan for DEFINITY Generic 2 and System 85. Includes general requirements, customer responsibilities, preparation of the layout, and guidelines for protecting equipment on construction sites.

- *DEFINITY™ Communications System Generic 2 and System 85 Electrical Protection, Grounding, and Exposure Checklist* (555-104-120). A checklist of conditions that must be met to ensure adequate electrical protection for a DEFINITY Generic 2 or System 85 installation. For engineering, plant maintenance, installation, and quality acceptance personnel. Included are electrical protection, grounding, and exposure reference information and checklists.

- *Telecommunication Electrical Protection* (350-060). Information and training material for engineers responsible for the electrical protection of personnel and users of telecommunication networks, systems, and equipment from lightning and power surges, power-line contacts, induction, and ground potential rise.
- *AT&T System 75 Wiring* (555-200-111). A document for planning, designing, and installing a System 75 wiring installation using Z-100, 110, or 66 cross-connect systems.
- *DEFINITY™ Communications System and System 75 and System 85 Terminals and Adjuncts Reference* (555-015-201). Concise physical and functional descriptions of the voice terminals, voice-terminal adjuncts, data modules, and data terminals that can be used with a System 75 or System 85.
- ISDN *Terminal Installation and Tests* (555-021-101). Point-to-point installation information between terminals and the satellite closet. This volume includes information about BRI installation.
- *An Introduction to DEFINITY™ 75/85 Communications System Generic 2* (555-104-020). A general description for prospective customers, account teams, and others who need an overview of DEFINITY Communications System Generic 2. Included are the following major functions that are part of or associated with the system: principal voice and message features and peripherals for users; in-depth descriptions of system components and their capabilities network features and configurations; available methods for managing the system; and AT&T's support for planning and installation, for training, and for maintenance.
- *An Introduction to DEFINITY™ Communications System, Generic 2* (555-104-020). A general description for prospective customers, account teams, and others who need an overview of DEFINITY Generic *2.* Includes information based on desktop, system, network, system management and support points of view. Information on features, peripherals, and system capacity is also covered.
- *DEFINITY™ Communications System Generic and System 85 System Description* (555-104-201). A document intended primarily for sales and technical personnel to provide general technical information on DEFINITY Generic 2 and System 85.
- *DEFINITY™* Communications *System Generic 2 and system 85 Installation* (555-104-104). document for service technicians to instruct them in the installation and connection of switching equipment.
- 800 *Series DSX — General Description, DSX Systems (365-301-102).* Transition procedures explaining:
  - — The installation of new 800-series digital signals cross-onnect (DSX) equipment in new lineups parallel to lineups of older DSX equipment
  - — The installation of new 800-series DSX equipment in new bays adjacent to older DSX equipment in the same lineup
  - — The installation of the new 800-series DSX equipment to replace older DSX equipment
- *DEFINITY™ Communications System and System 75 and System 85 Terminal Installation and Tests* (555-015-104). A procedural document for those who administer, install and test modules, voice terminals, and cross-connect equipment.

HOW TO MAKE COMMENTS ABOUT THIS DOCUMENT

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1. OVERVIEW: SYSTEM 85 AND DEFINITY GENERIC 2 WITH TRADITIONAL MODULES

AT&T System 85 and DEFINITY® Generic 2 Communications System (hereafter abbreviated to *DEFINITY Generic* 2 or Generic 2) with traditional modules are communications systems with multimodule architecture that provide integrated voice and data switching via a state-of-the-art communications processor (called the *common control* or *CC),* a time-multiplexed switch (TMS), and the communications modules. A single System 85 or DEFINlTY Generic 2 with traditional module capability can contain up to 31 modules with each module providing as many as 1536 analog ports. The multimodule architecure uses the TMS as the link between the modules.

A single System 85 or DEFINIIY Generic 2 with traditional modules can support from 300 to 32,000 lines. When a System 85 or DEFINITY Generic 2 with taditional modules is linked in a distributed communications system (DCS) — a network of switches such as other System 85s, DEFINITY Generic 2 with traditional modules, AT&T DIMENSION® PBXs with FP8-3, and AT&T System 75s — the DCS is capable of supporting up to 100,000 lines.

This chapter presents an overview of the components of System 85 and DEFINITY Generic 2 with traditional modules that are major factors in the design of a wiring installation. For more comprehensive information on System 85, see the System 85 *System Description Reference Manual* (555-103-201). For more details on DEFINITY Generic 2s with traditional modules, see the *DEFINITY™ Communications System Generic 2 and System 85 System Description Reference Manual* (555-104-201). See the *DEFINITY Generic 2 with Traditional Module* section at the end of this chapter for a brief list of features supported only by DEFINITY Generic 2 with traditional modules.

MAJOR COMPONENTS FOR SYSTEM 85 AND DEFINITY GENERIC 2 WITH TRADITIONAL MODULES

A System 85 or DEFINITY Generic 2 with traditional module consists of four major operating units: the common control (CC), the module control (MC), the ports, and the TMS.

A System 85 or DEFINITY Generic 2 with traditional module requires from 2 cabinets for a single-module system to as many as 128 cabinets for a multimodule system with the maximum number of lines. When a System 85 or DEFINITY Generic 2 with traditional modules is housed in 2 cabinets, it does not require the TMS function; the MC and port units are combined in 1 cabinet.

CC

The CC is the communications processor, or master controller; it contains a group of components that control, supervise, and coordinate system operations.

MC

The MC, or communications switching module, is the basic building block of the multimodular architecture. Each MC is capable of supporting up to 1536 analog ports and 256 simultaneous full-duplex conversations.

Remote Modules

System 85 and DEFINITY Generic 2 with traditional modules can have remote modules located up to 25,000 ft away from the CC and TMS. The number of remote modules cannot exceed the number of modules at the central switch location (15 maximum). The call control (including call processing, administration, and maintenance) is multiplexed onto the fiber-optic link; thus all system features are available to remote locations. Remote modules with optically-remoted peripheral interfaces (ORPI) for attendant consoles have a maximum range of 13,000 ft.

The recommended fiber size for remote-module links is the AT&T graded index multimode fiber with a 62.5-micron core and 125-micron outer diameter.

RGI

Small groups of voice and data terminal users at remote locations can be connected to the central switch by a digital service level-1 (DS1) link that uses remote-group interface (RGI) circuit packs as the DS1 interfaces. The RGI circuit packs are installed in the DSl/MFAT carrier of the central module and in the remote-group housing (RGH) at the remote location.

The maximum distance that a remote group can be located from the central module is 100 mi over T1 lines with repeaters. A direct cable connection between the central module and the remote group can be a maximum of 1310 ft with the option switches on the RGI circuit packs properly set. To extend the distance beyond 1310 ft. a channel service unit (CSU) must be installed at each end of the DS1 link.

Remote Module and Remote Group Documents

Detailed information about the configurations, designs, hardware components, and construction of fiber-optic links for remote modules and DS1 links for remote groups appears in *About This Document.*

Port Packs

Port packs are circuit packs that are housed in the carriers in the port and MC cabinets. These circuit packs provide the line and trunk circuits for System 85 and DEFINTTY Generic 2 with traditional modules. The circuit packs also contain the interface that allows the MC to govern the connections.

TMS

The TMS is a time-multiplexed, space-division switch that connects modules for communications in a time-slot information between the modules and the TMS. The TMS processor, on command from the 501CC processor, directs the interconnections between the modules and the TMS.

SYSTEM ADJUNCTS

The installation of most System 85 and DEFINITY Generic 2 traditional modules is accompanied by one or more system adjuncts that provide the customer with administrative or application functions that do not reside on the switch. One adjunct is the AT&T Audio Information Exchange (AUDIX). The other two adjuncts are the applications processors (APs) — the AP16 and the 3B5 AP.

AUDIX

AUDIX is a voice-mail system that can operate with System 85, DEFINITY Generic 2, or PBXs made by other manufacturers. AUDIX enables subscribers to create, store, send, and receive spoken messages and to distribute voice memos using just the telephone. The AUDIX processor uses disk storage for the encoded voice messages.

When AUDIX is operating with a System 85 or DEFINITY Generic 2 with traditional modules, it connects to the data communications interface unit (DCIU) of the switch through synchronous control channels for data transmission and to analog ports for voice transmission. Several PBXs can share one AUDIX adjunct.

More detailed descriptions of AUDIX appear in the *AUDIX Reference Manual* (585-300-201).

APs

The AP16 and 3B5 AP are installed with the System 85s and DEFINITY Generic 2 traditional modules to provide customers with office automation functions and administrative functions for the system. The APs also can provide the office automation functions as standalone units. Both APs are housed in switch-size cabinets.

Auxiliary Cabinet

An auxiliary cabinet is not actually a system adjunct but a cabinet used to house shelf- and rack-mounted peripheral equipment for the system. Auxiliary cabinets usually are located in the equipment room with the adjunct cabinets, but they can be located at other sites to serve equipment such as an AP, that is remotely located.

CROSS-CONNECT FIELDS

Cross-connect fields are a major component in the installation of a System 85 or DEFINITY Generic 2 with a traditional module. They are the termination points for equipment cabling and distribution cabling. Cross-connect fields are also where the connections are made between those termination points in order to establish communications paths throughout the system. Two major cross-connect fields are used with System 85 and DEFINITY Generic 2 with traditional modules — the main distribution frame (MDF) and the intermediate distribution frame (IDF).

The MDF (called the *administration field* in previous documentation) is the largest cross-connect field in a System 85 or DEFINITY Generic *2* with traditional module installation; the MDF can be either frame- or wall-mounted. It is located in, or sometimes near, the equipment room. The MDF is the field on which terminations and cross-connections for central office (CO) trunks, equipment cabling, and distribution cabling are made.

IDF is a term applied to any cross-connect field other than an MDF. The IDF is usually located in a satellite closet or at the building entrance facility (BEF). On the IDF the terminations and cross-connections are made for the distribution cabling from the MDF, from other IDFs, and from the installation cabling from the information outlets (IOs). IDFs are smaller than MDFs and are installed in quantities that are dictated by the overall wiring design.

TERMINALS AND TERMINAL ADJUNCTS

A variety of terminals and terminal adjuncts connect to the System 85 and DEFINITY Generic 2 with traditional modules. When you are designing the wiring installation according to the basic or enhanced premises distribution system (PDS) guidelines, the types of terminals and peripherals being installed at the workstations should have no effect on the overall wiring design. The basic guideline calls for two wiring pairs in the distribution cable, from the MDF to the IDF, and one 4-pair cable in the horizontal wiring, from the IDF to the information outlet (IO) for each workstation. The enhanced guideline calls for three wiring pairs in the distribution cable and two 4-pair cables in the horizontal wiring for each workstation.

When you are designing the wiring installation according to bid-specific requirements, the types and quantities of terminals and peripherals may affect the sizing of the distribution cables. See *About This Document*, for information on where to find detailed information on wiring for specfic terminals and peripherals.

CONNECTIVITY

Figure 1-1, *System 85 and DEFINITY Generic 2 with Traditional Module Connectivity* illustrates the connections for a basic voice path. The path flows from the point where the trunk enters the facility through the major components of the system's building wiring to its termination on a voice terminal at a workstation.

The path starts on a one-pair circuit that runs from the CO to the equipment room. In the equipment room, the wire terminates at the network interface. A connection using jumper wire or patchcord is

made from the network interface to the green field of the MDF.

A cross-connection is made from the green field to the trunk section of the purple field. From the purple field, the path travels along a 25-pair cable to the backplane of a trunk port circuit at the switch.

The switch establishes a talking path between the trunk port circuit and the line port circuit for the desired workstation. The path exits the switch from the line port circuit and proceeds along a cable from the backplane to the section of the purple field for lines on the MDF. The purple field is cross-connected to the white field, the distribution field of the MDF.

The path leaves the white field via a distribution cable that connects to the white field of the IDF. The circuits on the white field of the IDF are cross-connected to the appropriate circuits on the blue field. From the blue field, a 4-pair, twisted wire runs to the IO at the workstation. The voice terminal plugs into the IO.

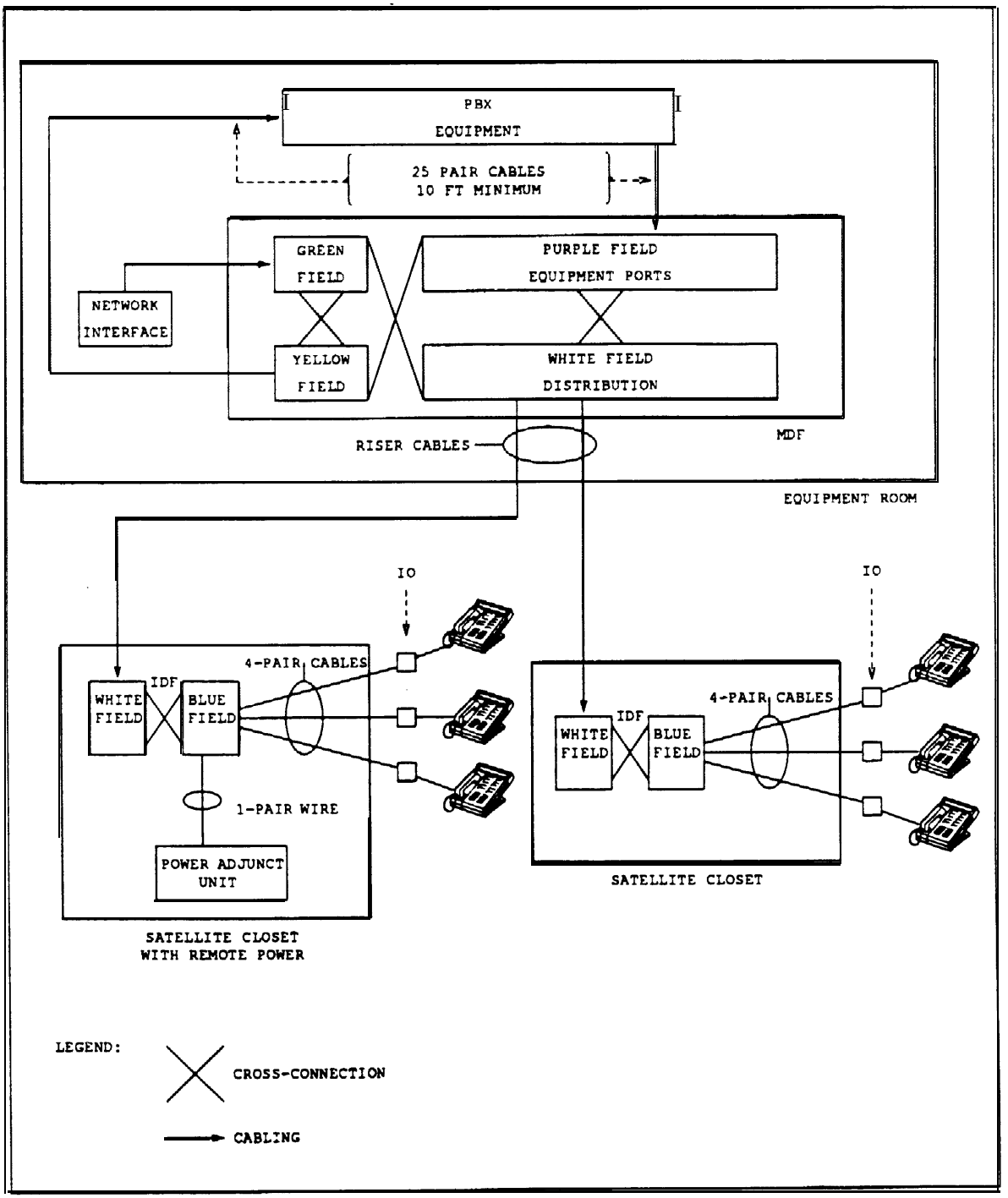


Figure 1-1. System 85 and DEFINITY Generic 2 with Traditional Module Connectivity

GENERIC 2 WITH TRADITIONAL MODULE

For purposes of this document System 85 and DEFINITY Generic 2 with traditional modules are treated the same for connectivity and sizing MDFs and IDFs. They are discussed concurrently in the first five chapters of this document. Where differences exist that affect the activity under discussion, the differences will be identified and explained.

DEFINITY Generic 2 introduces a number of improvements over System 85. These improvements include a single CC/TMS cabinet, a new cache memory circuit, a disk/tape system (DTS), and DEFINITY Manager II , a maintenance and administration system.

DEFINITY Generic 2 functions with both the traditional and universal modules. (DEFINITY Generic 2 system cabinets and the universal module are described in more detail in chapter 6, *Overview: DEFINITY Generic 2 with Universal Modules.)* The traditional module uses DEFINITY Generic *2* system cabinets and System 85 port board technology to provide the following features:

- analog/digital facility test circuit (ADFTC)
- Automatic Identification of Outward Dialing (AIOD)
- Conference — attendant six party
- dedicated switch connections (DSCs) on DS1 boards with transparent signaling
- Ground-start signaling with party test (older CO equipment may only provide trunks that conduct party tests)
- Multifunction hybrid telephones (7200H Series)
- Remote groups

2. MDF/IDF DESIGN: SYSTEM 85 AND DEFINITY GENERIC 2 WITH TRADITIONAL MODULES

This chapter recommends the terminal blocks and frames best suited for constructing a main distribution frame (MDF) for AT&T System 85 and DEEFINITY Generic 2 (hereafter abbreviated to *DEFINITY Generic 2* or *Generic 2)* with traditional modules, presents the guidelines for their design, presents some guidelines for the intermediate distribution frame (IDF) design, and briefly discusses labeling for the MDFs and IDFs.

This chapter also presents some general guidelines, cross-connect hardware recommendations, and frame recommendations for designing IDFs. They are simplified because IDFs, unlike the MDF, vary greatly, and only the most general design guidelines can be applied to them.

RECOMMENDED TERMINAL BLOCKS

The two systems of AT&T cross-connect hardware that can be used to construct the cross-connect fields in the wiring installation for a switch are the 66 system and the 110 system. For a System 85 or DEFINITY Generic 2 with traditional modules, the 110A system, which uses jumper wires, is recommended. The 110P system, which uses patchcords, is available, but its use is not encouraged.

The 110A comes in several models that are called terminal blocks. Each terminal block is composed of a wiring block and a unique combination of connecting blocks. A wiring block is where the equipment, distribution, or central office (CO) cables terminate. The connecting block, which snaps onto the front of the wiring block, is where the jumper wires are attached to establish a path from the pairs in one cable to the pairs in another cable.

In order to simplify the design of wiring installations, only two terminal blocks — the 110AB1-300 and the 110AB1-100 — are recommended for System 85 and DEFINITY Generic 2 with traditional modules. The design information contained in this guide is based upon them. The 300-pair terminal block is preferred for the MDF and either the 100-pair or 300-pair block for the IDF.

The 110AB1-300 terminal block has a 300-pair wiring block, 60 4-pair connecting blocks, 12 5-pair connecting blocks, and six designations strips. You can order this terminal block in connectorized or field-terminated versions.

The 110AB1-100 terminal block has a 100-pair wiring block, 20 4-pair connecting blocks, 4 5-pair connecting blocks, and two designations strips. You can order this terminal block also in connectorized and field-terminated versions.

Table 2-1, *300-Pair Terminal Blocks,* gives the ordering information for 300-pair terminal blocks:

TABLE 2-1. 300-Pair Terminal Blocks

Product Code	Comcode	Height (in)
110AB1-300FT*	104049051	10.79
110AB1-300CT**	104409016	20.37
110AB1-300CTM†	104409024	20.37
110AB1-300CB‡	104408083	20.37
110AB1-3OOCBM§	104408091	20.37

NOTE: The Meanings for the alphabetic suffixes to the model codes are as follows:

*** Field terminated**

**** Connectorized w/female connector**

† Connectorized w/male

‡ Connectorized bottom w/female connector

§ Connectorized bottom w/male

Table 2-2, *100-Pair Terminal Blocks,* gives the ordering information for the 100-pair terminal blocks:

TABLE 2-2. 100-Pair Terminal Blocks

Product Code	Comcode	Height (in)
ll0AB1-l00FT*	103823845	3.59
110AB1-100CT**	104408992	13.29
ll0AB1-l00CTM†	104409008	13.29
ll0AB1-l00CB‡	104408026	13.29
ll0AB1-l00CBM§	104408075	13.29

NOTE: The meanings for the alphabetic suffixes to the model codes are as follows:

*** Field Terminated**

**** Connectorized w/female connector**

† Connectorized w/male

‡ Connectorized bottom w/female connector

§ Connectorized bottom w/male

When you are expanding an existing IDF or MDF that was constructed of terminal blocks other than the ones previously described, maintain uniformity in the field by using the same blocks for the expansion that were used for the initial installation. For new installations, use the terminal blocks described in this document.

NOTE: Do not design an installation that uses patchcords with 110A cross-connect blocks.

Height Requirement for Terminal-Block Columns

When you lay out the columns of terminal blocks for the MDF, place no more than 1500 pairs (five 300-pair blocks in a column) for either frame- or wall-mounted installations. (See figure 2-1, *Maximum Column 1500 Pairs (Five 300-Pair Terminal BIocks).)* Higher columns are hard to reach and make connecting and disconnecting jumper wires difficult. Also, if horizontal space is limited, you can use 1800-pair columns for small installations, keeping in mind that this height could present problems.

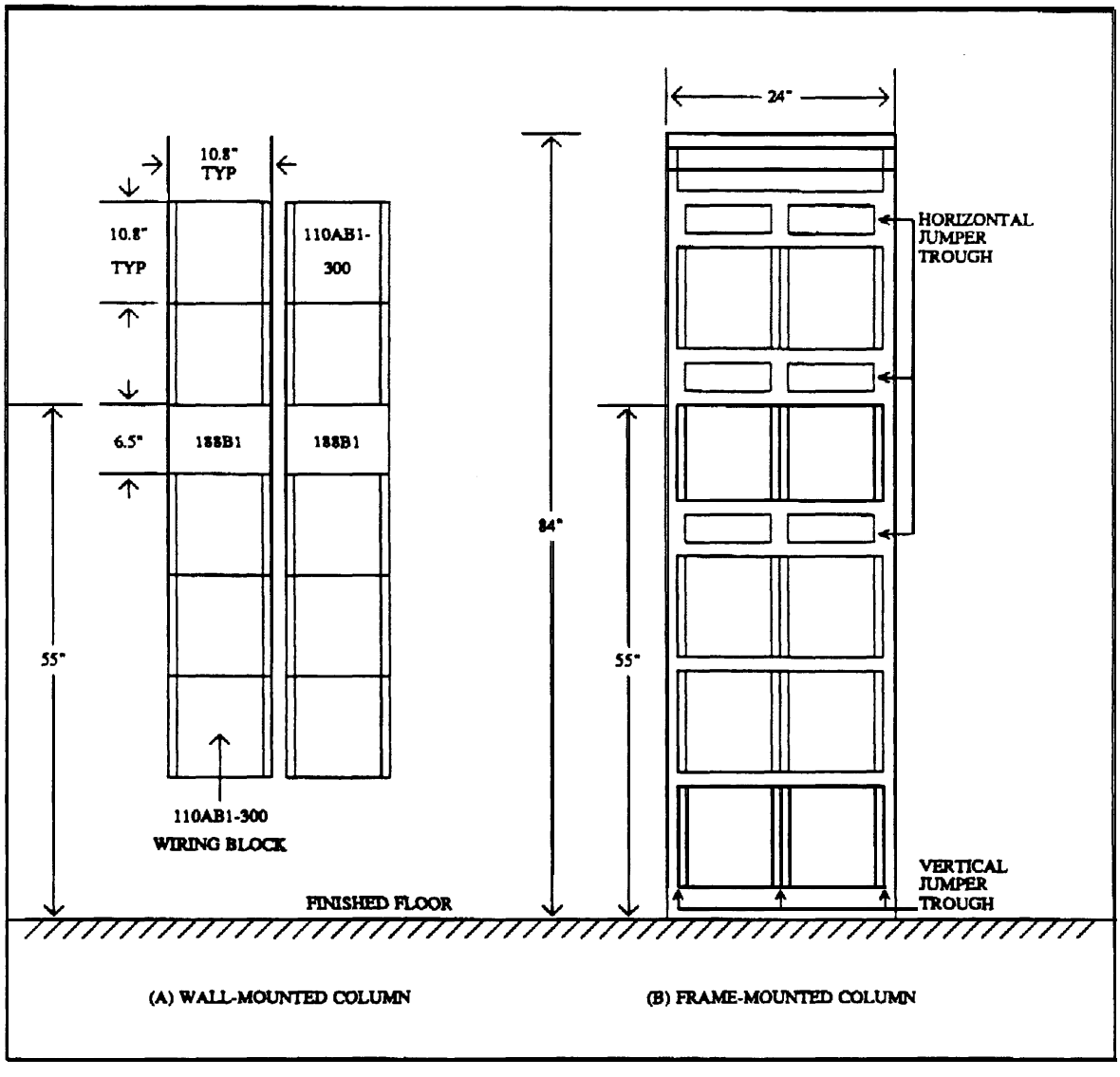
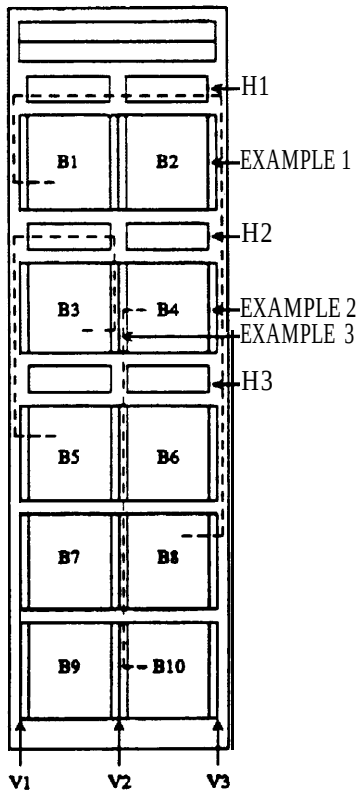


Figure 2-1. Maximum Column 1500 Pairs (Five 300-Pair Terminal Blocks)

Connecting Jumper Wires

To facilitate cross-connections, connect jumper wires as follows:

- Use the layout and instructions shown in figure 2-2, *Jumper Placement*, for the 110A terminal blocks. (Figure 2-2 illustrates a layout for frame mounting, but the layout applies to wall mounting as well.)
- Use only the number of jumpers required for a connection. There is no advantage in using a 3-pair for a 2-pair circuit.
- Make sure that 80% of the jumpers are less than 20 ft long. This can be done in the largest of installations, as described under *Designing the MDF* in this chapter.
- Maintain clean contacts on the terminal blocks by using a spudger tool (110 tool; comcode 405423260). Do this by:
  - — Removing jumpers with a perpendicular motion from the ccnnecting block
  - — Always using the spudger to clean the contacts immediately after you remove the jumper wires



Jumper Placement Rules:

- Index Strips consist of a right and a left half. Dress pairs l to 12 to the left and dress pairs 13 to 25 to the right.
- Eliminate "spider webs" and use all horizontal wireways equally.
- Use small amounts of diagonal dress in the horizontal wireway system, if needed, but avoid diagonal dress during system installation.

Examples:

- Block Bl, row 7, pair 10 to block B8, row 2, pair 24.

  B1 left, V1 up, H1 right, V3 down, B8 left.
- Block B4, row 6, pair 8 to block B10, row 2, pair 12.

  B4 left, V2 down, B10 right.
- Block B3, row 11, pair 16 to block B5, row 1, pair 1.

  B3 right, V2 up, H2 left, V1 down, B5 right.

Figure 2-2. Jumper Placement

RECOMMENDED FRAMES FOR TERMINAL BLOCKS

The extra large building entrance terminal (XLBET) frame, which is manufactured at the AT&T Los Angeles Service Center, can be used for the MDF. The frame comes in single- and double-sided versions that are 84 in. high, 10 in, deep (single-sided), 23 in. deep and 24 in. wide. (All frame illustrations shown in this document are the standard 84-in. high frame. You can use taller frames in special circumstances as explained below in *Customization.)*

Several characteristics make the AT&T frames preferable for use in a System 85 or DEFINTTY Generic 2 installation. These are as follows:

- *Frontal connectorization.* AT&T frames have specially designed connector panels located at the front and top.

  NOTE: Connector mating on any type of trough or ladder rack is prohibited.

- *Color selection.* AT&T frames are manufactured in the same colors as AT&T equipment cabinets. The color match of the frames and cabinets considerably enhances the appearance of an installation.

- *Ordering simplicity.* AT&T frames are easy to order: you submit one comcode to obtain the frame and the terminal blocks, which come assembled as a complete unit. You only order ladder racks and insert labels separately.

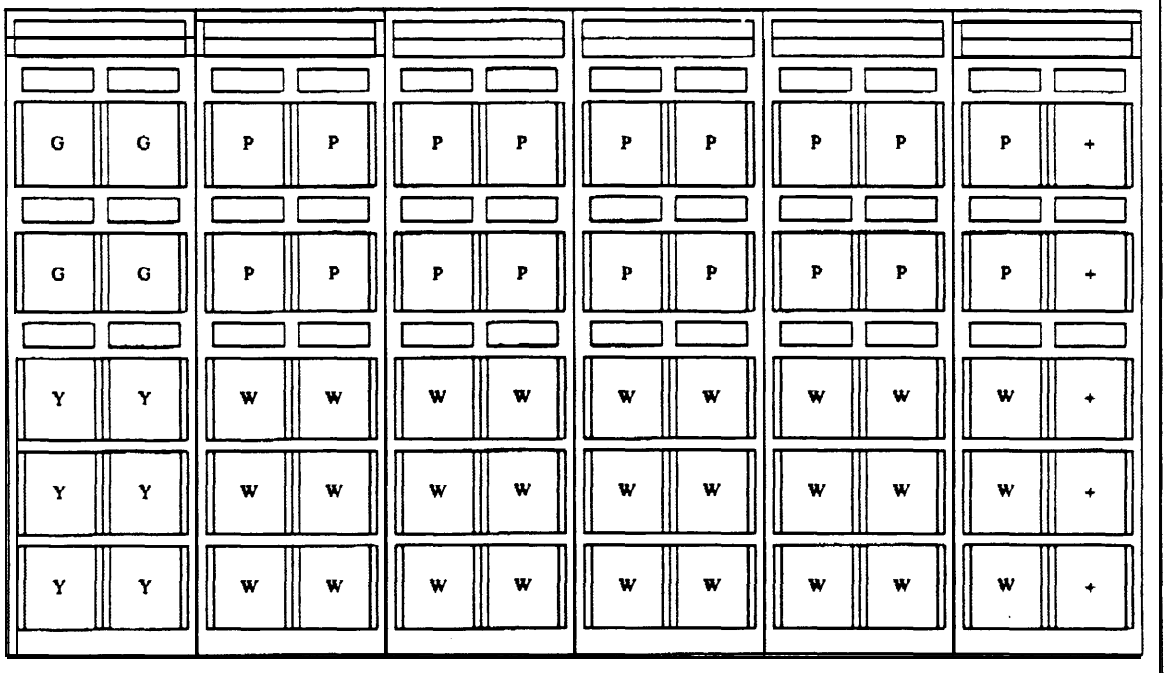
- *Customization.* You can order AT&T frames in special heights to accommodate connector panels, for equipment rooms with high ceilings, or for equipment rooms with raised floors. You also can order frames fitted with mountings to hold protector units.

Whenever possible, use the XLBET frames, either self-supported or wall-mounted, for the MDF. The benefits and advantages, for both the customer and AT&T, of easier ordering, better aesthetics, and easier connecting and disconnecting of jumper wires more than offset the slightly higher cost over wall modules. For systems larger than three modules, try to design the MDF with self-supported frames. Self-supported frames allow the most flexibility for handling jumper wires and permit the most efficient cable terminations. But whether the frame is wall mounted or self supported, attempt to use one of the two types of XLBET frames discussed below.

Type-1 Frame

The type-1 frame shown in figure 2-3, *Six Type-1 Frames with 18,000-Pair Capacity*, is the most widely used. You can terminate 3000 cable pairs on each side. Cross-connections on the type-1 are made between the top and the bottom of the tie. This means that all equipment cables are connected to the top half of the frame and all disribution cables to the bottom half. Exceptions occur only at the green (CO) and yellow (miscellaneous) fields.

The type-1 frame is most suited for lineups not exceeding nine frames, but it can be used for much larger lineups. (A discussion of its use in large lineups appears under *Designing the MDF* in this chapter.) Use the type-1 for small installations and for installations that require direct wall mounting.



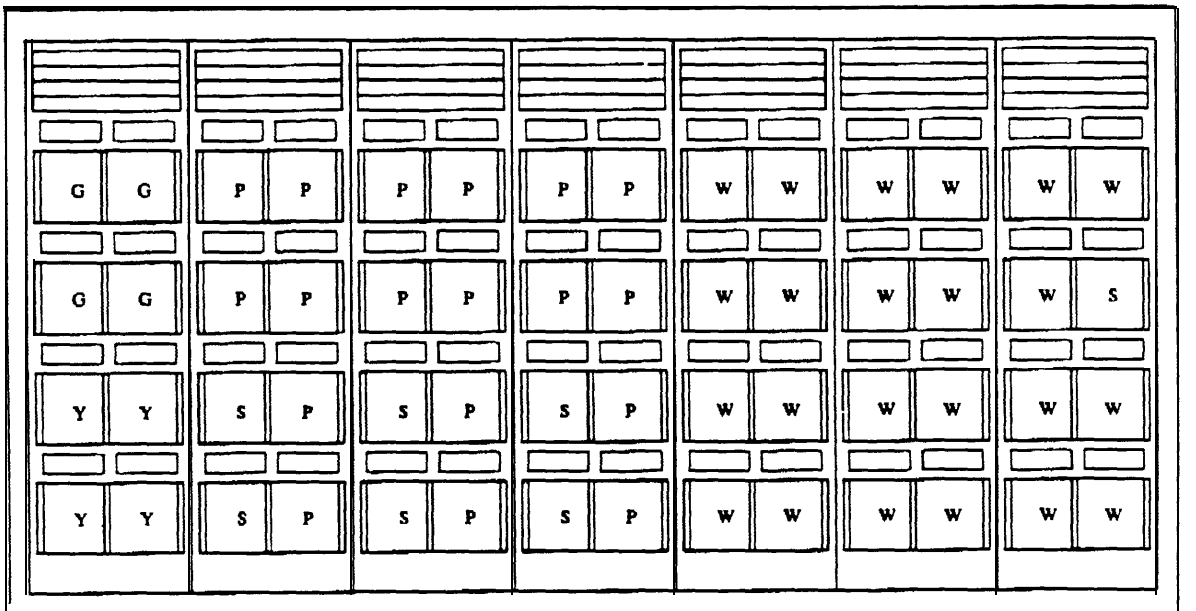
LEGEND:
G— GREEN, NETWORK FIELD
Y — YELLOW, AUXILIARYY AND MISCELLANEOUS FIELD
W — WHITE. DISTRIBUTION FIELD
P — PURPLE EQUIPMENT FIELD
+— SPARE WITHOUT CROSS-CONNECT BLOCKS

Figure 2-3. Six Type-1 Frames with 18,000-Pair Capacity

Type-2 Frame

The type-2 frame shown in figure 2-4, *Seven Type-2 Frames with 16,800-Pair Capacity,* is a special frame with added jumper capacity. You can terminate 2400 pairs on each of its sides. Cross-connections on the type-2 can be made either from top to bottom or from side to side, depending on the size and shape of the installation.

Use the type-2 frame for large installations that require more than nine frames in a lineup.



LEGEND:
G — GREEN, NETWORK FIELD
Y — YELLOW, AUXILIARY AND MISCELLANEOUS FIELD
W — WHITE, DISTRIBUTION FIELD
P — PURPLE EQUIPMENT FIELD
S — SPARE WITH CROSS-CONNECT BLOCKS

Figure 2-4. Seven Type-2 Frames with 16,800-Pair Capacity

Ordering

The service center ships all frames with terminal blocks as one comcode. Frames ordered for 110A hardware come with 110AB1-300 terminal blocks, clear designation strips, and wireways installed. However, you must specify the 110C-4 connecting block, which is recommended for a System 85 or DEFINITY Generic 2 traditional system installation. You also must order insert labels and ladder racks separately.

Order type-1 frames and connectors according to table 2-3, *Type-1 Frame Ordering lnformation;* ordering information for the type-2 frame is in table 7-4, *Type-2 Frame Ordering Information.*

TABLE 2-3. Type-1 Frame Ordering Information

Comcode	Top	Bottom	Remarks
105 367 692	1200-pair connectorized with 110C-4 blocks	1800-pair field terminated. Specify the block type.	Single sided.
105 367 718	2400-pair connectorized with 110C-4 blocks	3600-pair field tcrminated. Specify the block type.	Double sided.
105 174 148	600-pair connectorization	—	Kit for the above frames. Order one for single-sided and two for double-sided.
105 689 475	3000-pair field terminated	—	110C connector must be ordered separately.
105 728 414	6000-pair field terminated	—	110C connector must be ordered separately.

DESIGNING THE MDF

Designing the MDF is a two-step process: first, determine the size of the MDF, second, construct the MDF. As you proceed with the design, keep in mind that function is more important than cost in reaching a final decision since it is possible for the final installation to be inexpensive but nonfunctional. A design that imposes operational limits to save costs may prove less desirable in the long run. Use your site analysis to compare alternatives and arrive at the best solution in terms of both function and cost.

Since the design of the MDF affects the design of the equipment room, be sure that your completed design for the MDF is compatible with your equipment room plans or with the room that you have selected for the MDF location. (When designing the MDF for a raised-floor installation, follow the instructions under *Designing the MDF for a Raised Floor* in this chapter.) Figure 2-5, *Overall Equipment Wiring Plan,* shows the overall equipment wiring plan for R2V1 through R2V4 based upon the standard star configuration.

Sizing the MDF

The MDF is the largest cross-connect field of the wiring installation. It is where the incoming trunk cables terminate and cross-connect to the trunk ports of the switch and where the building distribution cables cross-connect to the line ports of the switch. The MDF consists of four fields: network services/CO trunks (green), auxiliary and miscellaneous (yellow), distribution (white), and equipment (purple).

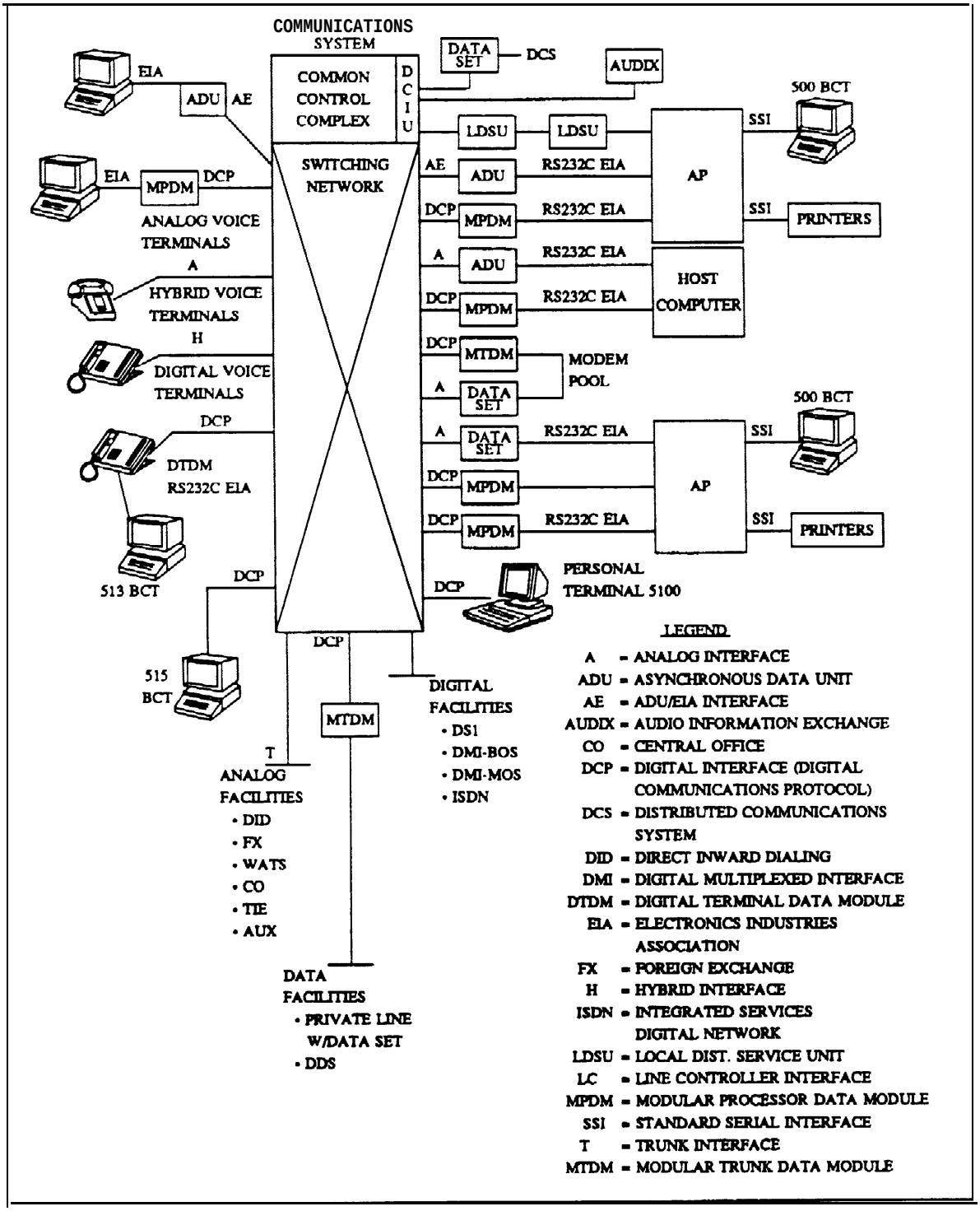


Figure 2-5. Overall Equipment Wiring Plan

Two factors govern the size of the MDF: the number of cable pairs to be terminated and the type of cross-connect hardware used. Since the recommended cross-connect hardware for System 85 and DEFINITY Generic 2 traditional system is the 110A, you only need to calculate the number of cable pairs that must terminate on the MDF and calculate the number of 110A cross-connect blocks needed to terminate those pairs to arrive at the size of the MDF.

This section helps you calculate the number of cable pairs terminating at the MDF by determining what effect the four major fields of the MDF have on its size. These four fields are as follows:

- Network services (CO trunks) field with green labels
- Auxiliary equipment and miscellaneous field with yellow labels
- Equipment (switch) port field with purple labels
- Distribution field with white labels

A fifth field, with blue labels, may be required for some installations. It terminates 4-pair insulation cables that connect the MDF directly to the IOs at the workstations.

The guidelines for sizing each field follow.

Network Services (CO Trunks) Field

The network services field, which uses green labels, is where the cabling from the CO terminates. Cabling for analog network services is cross-connected to the green field from an RJ21X or an RJ2GX interface. This cabling requires sneak-current protection in addition to the standard electrical protection that the telephone company provides.

The total number of pairs in the network services cable is governed by the number of pairs that the customer needs to connect to the network. It is also governed by the number of pairs that the telephone company supplies . For example, if the customer needs to connect 750 pairs to the network, and the telephone company supplies a 900-pair cable, the green field must be sized to terminate 900 pairs. All 900 pairs require protection.

For some installations, digital signal level-l (DS1) transmission capabilities also may be needed. When the DS1 connection is part of the installation, then a digital signal cross-connect (DSX) may be required. If a DSX is required, use the 800-series DSX as described in *800-Series DSX — General Description, DSX Systems* (365-301-102).

Auxiliary Equipment and Miscellaneous Field

The auxiliary field, which uses yellow labels, is where the cables terminate from auxiliary equipment. This includes emergency transfer units, recorded announcement units, recorded dictation units, loudspeaker paging-units, and radio-paging units. The auxiliary field also accommodates miscellaneous cabling that is not associated with ports, such as cables from common control (CC) cabinets, console cables, and alarm cables. Therefore, the size of the yellow field varies depending on the amount of auxiliary equipment installed and the number of miscellaneous cables terminated.

Allocate space on the yellow field for the termination of a minimum of 300 pairs. Allocate additional space in 300-pair groups for each auxiliary cabinet installed with the system. Increase the field size

beyond these minimums as actual needs dictate.

Equipment (Switch) Port Field

The equipment port field, which uses purple labels, is where the cables from the equipment ports terminate. Two factors govern its size. The first is the type, usage, and number of port carriers; the second is module needs, since all ports from an equipment module must be colocated.

System *85* uses two types of port carriers and a maximum of 12 port carriers in one module. One carrier is the universal port carrier, which is coded J58888A. It has eight 25-pair cables. The other carrier is the DS1/MFAT carrier, which is coded J58888N. Depending on how it is used, it has two, four, or sixteen 25-pair cables. The DS1/MFAT carrier has two 25-pair cables when the carrier is holding ANN11 (DS1 line/trunk interface) circuit packs. It has four 25-pair cables when it is holding ANN15 (RGI) circuit packs. It has sixteen 25-pair cables when it is holding standard port circuit packs.

Modules usually contain the same number of port carriers. To calculate the number of wiring blocks required for the entire port field, multiply the number of modules by the number of wiring blocks required to serve one module. Allow for the termination of 1800 pairs for the port field. Increase or decrease the number in 300-pair increments according to actual needs.

Distribution Field

The distribution field, which uses white labels, is where all of the distribution cables terminate. Distribution cables are the cables that run from the MDF in the equipment room to the IDF in the closets. (They are sometimes called "house," "backbone," "riser," "campus," or "black" cables. This document calls them "distribution cables.")

The *Premises Distribution System Design Guide* (555-400-602) presents several approaches to sizing the distribution cables based upon the needs of the customer. These approaches apply to the sizing of distribution cables for a System 85, with the exception of the following guidelines:

- Size the distribution cable so that each workstation is allotted a minimum of two cable pairs.
- Allow the 25th pair in each 25-pair bundle to serve as a spare.
- Allot four cable pairs for each workstation if the customer requests single-point administration and/or plans to use 110P hardware.
- Terminate large numbers of spare pairs requested by the customer on a specially designated area of the MDF. This guideline is for efficiency since the spare pairs artificially increase the size of the distribution field.

Installation Cable Field

The installation cable field, which uses blue labels, is where cables from the information outlets (IOs) terminate directly to the MDF. (Remote-module MDFs require fields labeled purple and blue when installation cables are connected directly to them.) When the installation cable terminates in the equipment room, size it and plan for its termination as you would for closet terminations. That is, allot one 4-pair D-inside-wiring (DIW) cable for each workstation. Allot two 4-pair DIW cables for workstations that use a separate IO for a data connection.

NOTE: When a blue field is used, the blue field cross-connects directly to the purple field and not to the white field.

Terminate only six 4-pair DIW cables to each index strip of a 110AB1-300 wiring block (the 25th pair is unused), which means that you can terminate a maximum of 72 four-pair DIW cables on each 300-pair wiring block.

Although the termination of 72 four-pair DIW cables leaves 12 unused pairs, you must add an additional block to terminate more pairs. For example, to terminate 75 four-pair DIW cables, you would use two blocks instead of one.

Constructing the MDF

Once you have calculated the number of cable pairs needed for each of the MDF areas and converted them to the number of 300-pair blocks needed, decide the following:

- Where to locate the MDF
- How to mount the terminal blocks
- How to arrange the terminal blocks
- How to connect to the terminal blocks

Locating the MDF

Locate MDF as close to the switch cabinets as possible. The preferred location is in the equipment room, but if space is not available, locate it in a separate area within 20 to 30 ft of the equipment room. Orient the MDF so that the distribution cables can be routed to it as directly as possible.

Mounting the Terminal Blocks

You can mount the MDF hardware in one of the following three ways:

- Directly to a wall
- On a wall-mounted frame
- On a self-supported frame

Use the table 2-4, *Mounting Methods,* which suggests which method to use for a given number of modules, as a mounting guide for System 85 and DEFINITY Generic 2 with traditional modules. But remember that the space available for the MDF may affect your decision.

TABLE 2-4. Mounting Methods

No. of Modules	Method of Mounting		
	Wall	Wall Frame	Self-Supporting
1 - 5	X	X	
6 - 10		X	X
10 & up			X

Frame mounting of the terminal blocks for installations of all module sizes is desirable, but those of 10 modules or more must be frame mounted.

Arranging the Terminal Blocks

Arrange the terminal blocks with the following factors in mind:

- Cable terminations to the fields and how the fields cross-connect
- The type of port fields and the necessity for short jumper lengths
- Possible zone configurations

These factors are discussed in the sections that follow.

Cable Terminations and Cross-Connections. Terminate the equipment port cables close to the distribution cables, as suggested in figure 2-6, *Four-Area MDF,* to make connecting and disconnecting the jumper wires as easy as possible; adjust the field design if it is more appropriate for a particular application.

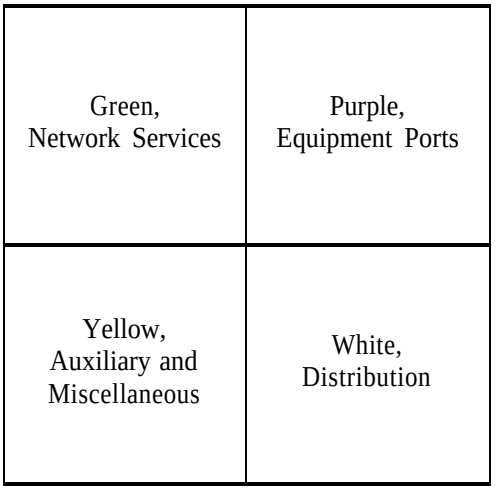


Figure 2-6. Four-Area MDF

Add two more fields to the arrangement when 4-pair installation cables, spare cables, or cables dedicated to PBXs other than System 85 or DEFINITY Generic 2 with traditional modules are terminated on the MDF.

Port Fields and Short Jumper-Wire Lengths. For most installations, combine the line and trunk fields to accommodate the universal port carrier, as shown in figure 2-7, *Combined Trunk and Line Ports.*

Use the arrangement in figure 2-8, *Separated Trunk and Line Ports,* if you are using 110P cross-connect hardware in the installation or if managing jumper wires becomes difficult due to a large number of analog trunks cross-connected between the green and purple fields. In figure 2-8 trunk cables from the same module are separated from line cables; the separation requires slightly more space for terminations on the MDF. *(Zone Configurations* provides additional guidelines for large installations.)

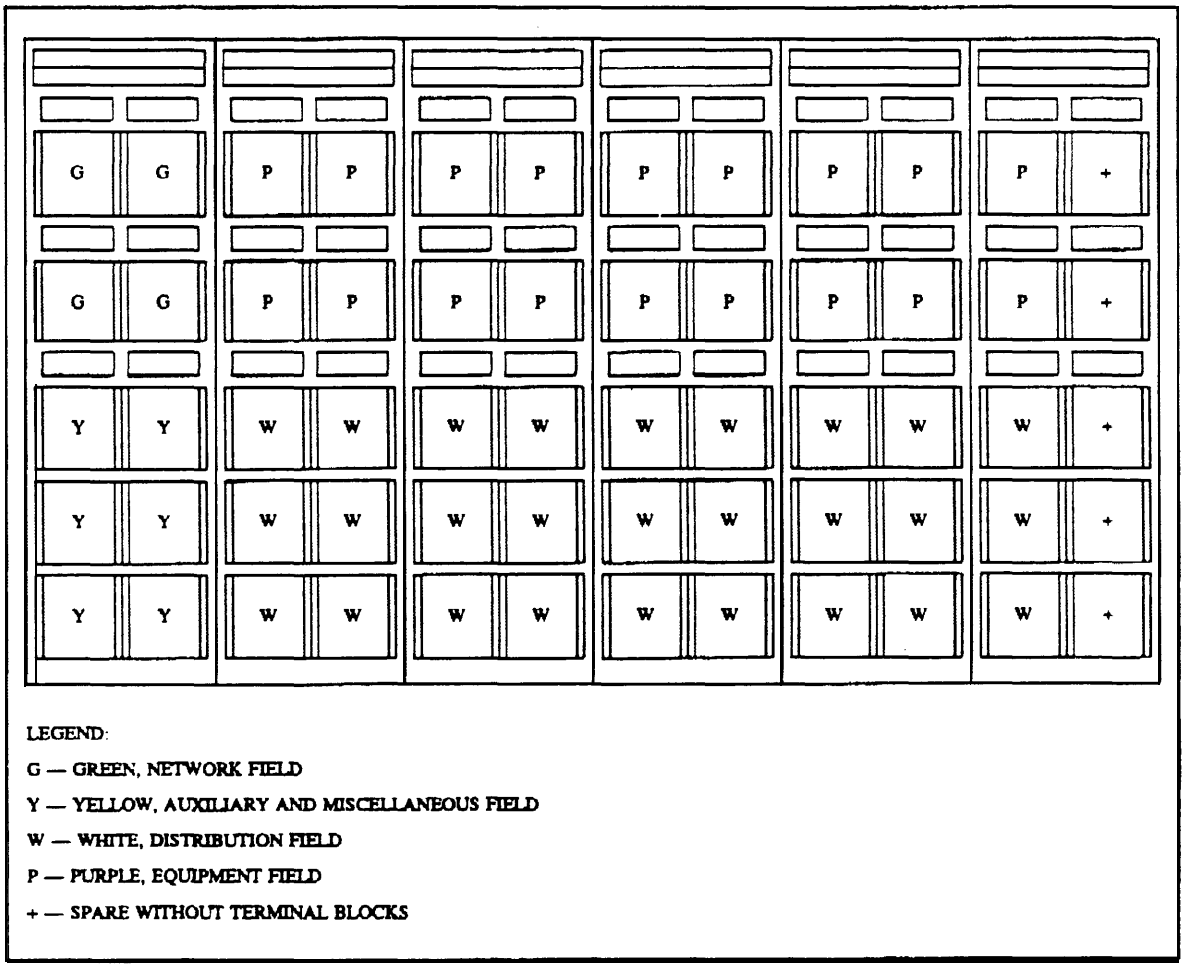
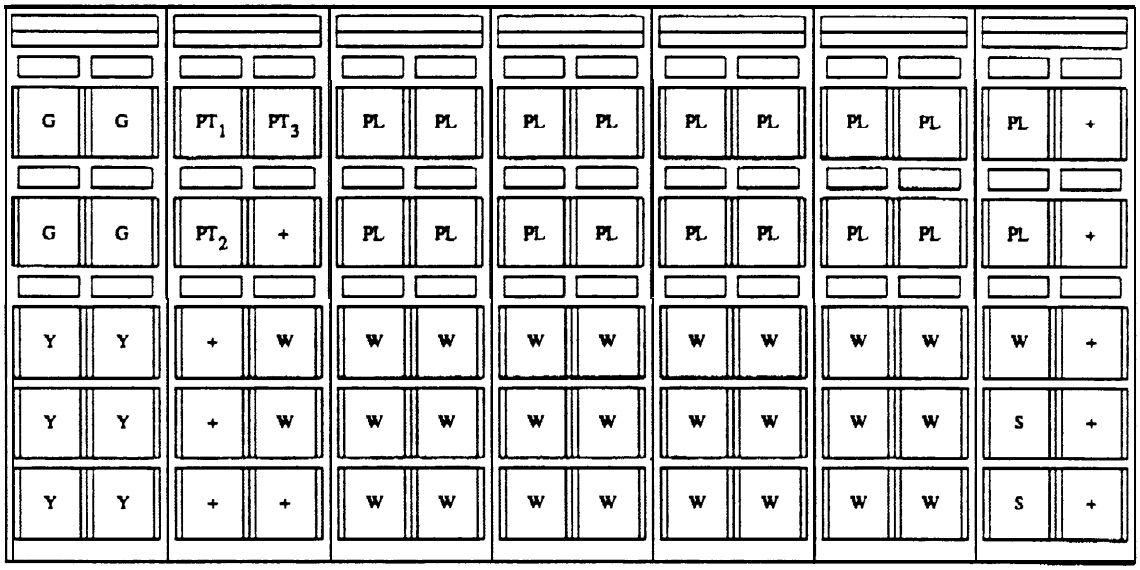


Figure 2-7. Combined Trunk and Line Ports



LEGEND:
G — GREEN. NETWORK FIELD
Y — YELLOW, AUXILIARY AND MISCELLANEOUS FIELD
W — WHITE, DISTIBUTION FIELD
PT — PURPLE TRUNK FIELD
PL — PURPLE LINE FIELD
+ — SPARE WITHOUT TERMINAL BLOCKS
S — SPARE WITH TERMINAL BLOCKS

Figure 2-8. Separated Trunk and Line Ports

Zone Configurations. When a large number of frames are required to construct an MDF, the task of connecting and disconnecting jumper wires can become difficult for two reasons. First, jumper wires of awkwardly long lengths are neeed to make cross-connections between the extreme ends of the frame lineup. Second, the necessity to make cross-connections between the ends of the frame lineup can cause an overflow of jumper wires in the troughs of the middle frames.

To avoid these problems, divide frame lineups into zones if they exceed 16 ft and terminate more than 5 modules. A zone is a section of the MDF with a maximum horizontal distance of 16 ft. Cross-connections can be made only between the cables that terminate within the same zone. This keeps the jumper wires short and easily manageable.

When the MDF is more than 16 ft wide and terminates cabling from 6 or more modules, you must:

- Divide the cable terminations from the modules among the zones according to table 2-5, *Module Allocation per Zone with Type-1 Frame* or table 2-6, *Module Allocation per Zone with Type-2 Frame,* (depending upon the type of frame you are using).

- Divide the terminations of the distribution cables among the zones in 100-pair increments.

The type-1 frame (described under *Recommended Frames for Terminal Blocks* earlier in this chapter) may be used for a zoned MDF that is terminating up to 10 modules. Table 2-5, *Module Allocation per Zone with Type-1 Frame,* shows the number of modules allocated per zone when you design an MDF with a type-1 frame. Each type-1 frame can accommodate 3000 jumper pairs per side. Figure 2-9. *Zone Arrangement of Type-1 Frame — Plan View,* and figure 2-10, *Zone Arrangement of Type-1 Frame — Front View, Zone 2,* show a type-1 frame used in a zone arrangement

TABLE 2-5. Module Allocation per Zone with Type-1 Frame

Number of Modules	Number of Zones	Number of Modules for Zone
1-5	1	1-5
6	2	3,3
7	2	3,4
8	2	4,4
9	2	4,5
10	2	5,5

NOTE: Custom-engineer all installations over 10 modules.

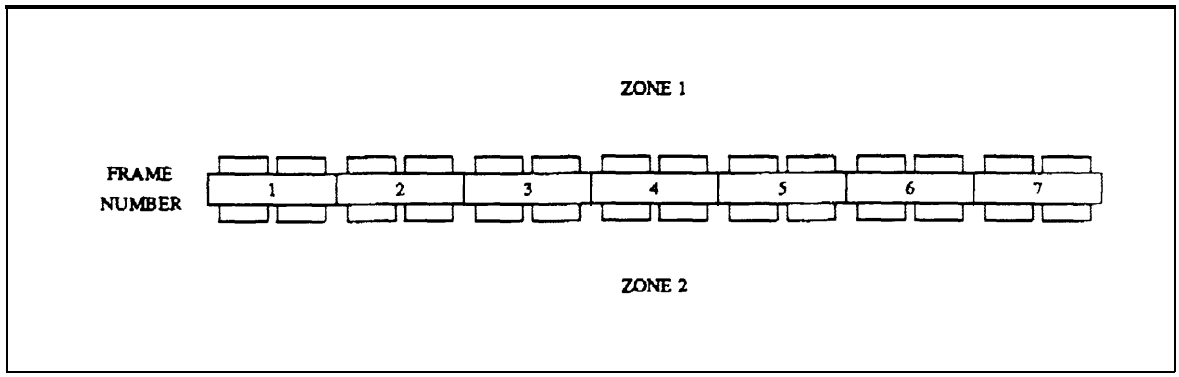


Figure 2-9. Zone Arrangement of Type-1 Frame — Plan View

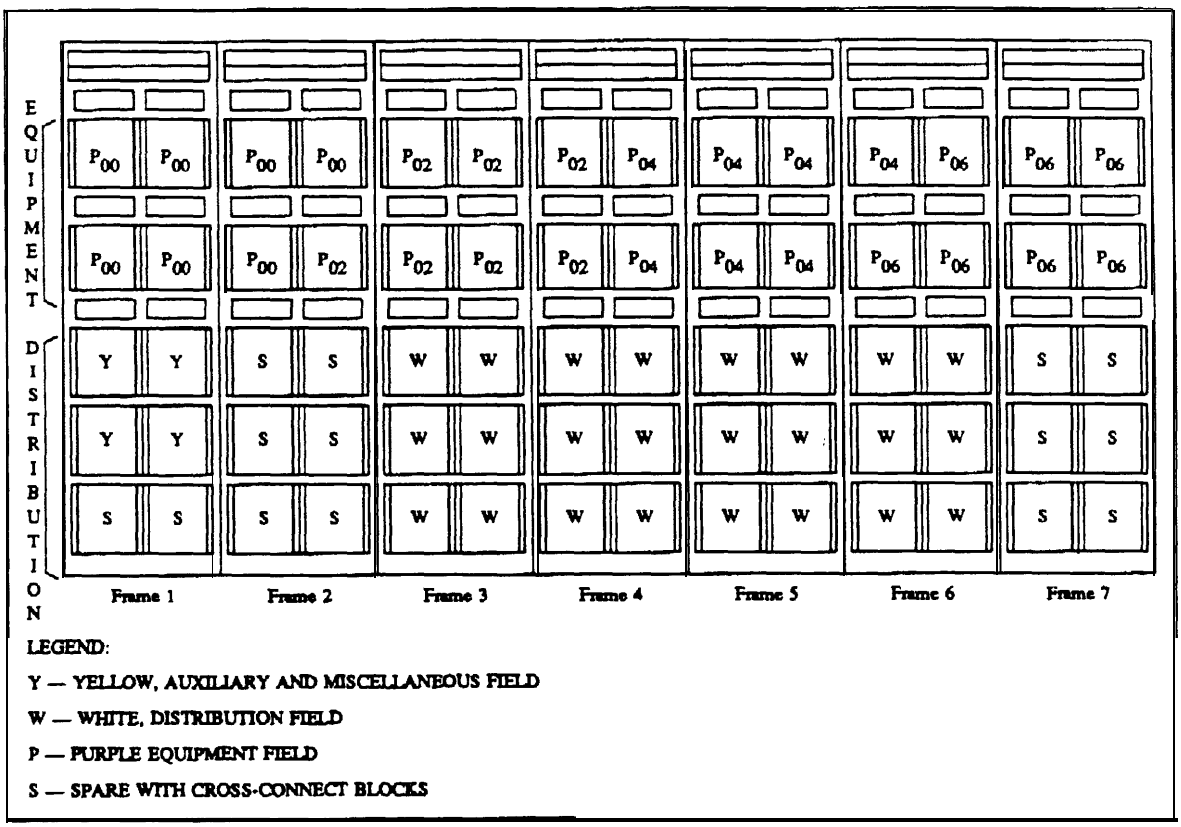


Figure 2-10. Zone Arrangement of Type-1 Frame — Front View, Zone 2

Use the type-2 frame (described under *Recommended Frames for Terminal Blocks* earlier in this chapter) to design a zoned MDF that is terminating up to 16 modules. Table 2-6, *Module Allocation per Zone with Type-2 Frame,* shows the number of modules allocated per zone when you design an MDF with a type-2 frame. Each type-2 frame can accommodate 4000 jumper pairs per side. Figure 2-11. *Zone Arrangement of Type-2 Frame — Plan View,* and figure 2-12, *Zone Arrangement of Type-2 Frame — Front View, Zone 2,* show a type-2 frame used in a zone arrangement.

TABLE 2-6. Module Allocation per Zone with Type-2 Frame

Number of Modules	Number of zones	Number of Modules for Zone
1-8	1	1-8
9	2	4,5
10	2	5,5
11	2	5,6
12	2	6,6
13	2	6,7
14	2	7,7
15	2	7,8
16	2	8,8

NOTE: Custom-engineer all installations over 16 modules.

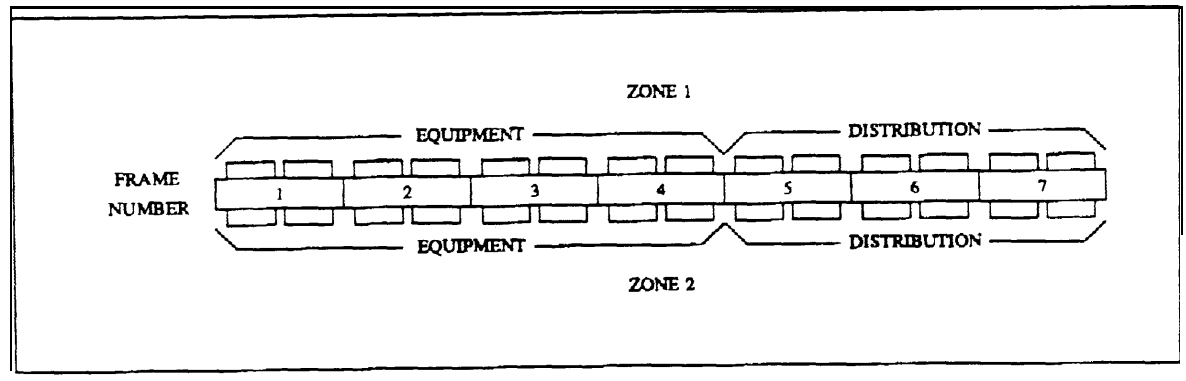


Figure 2-11. Zone Arrangement of Type-2 Frame — Plan View

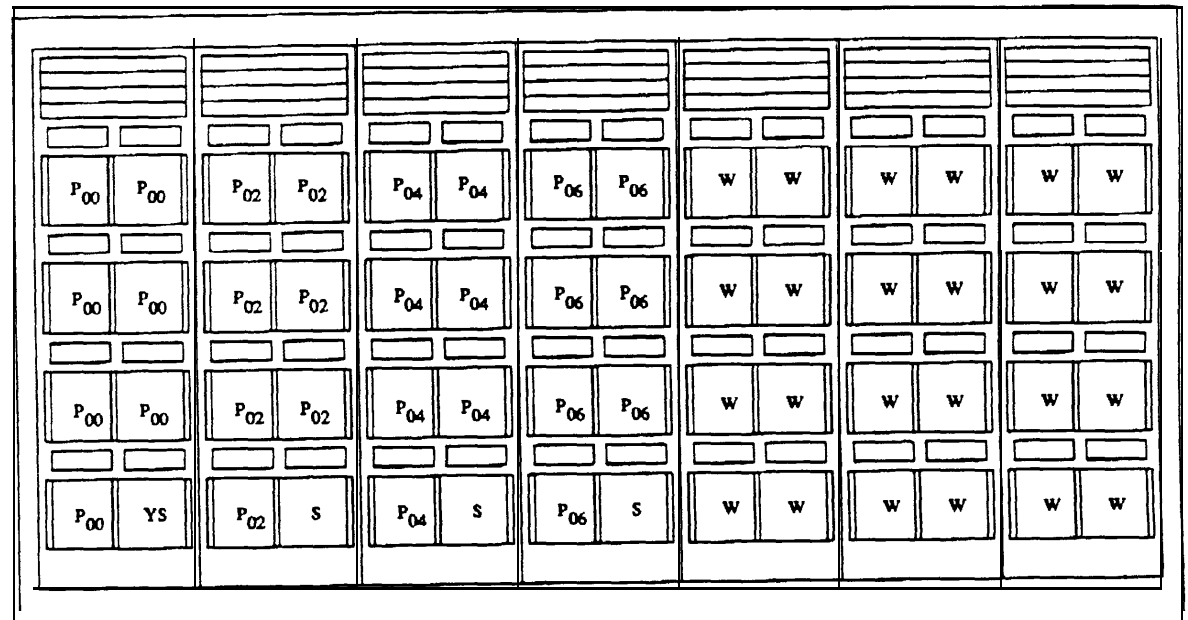


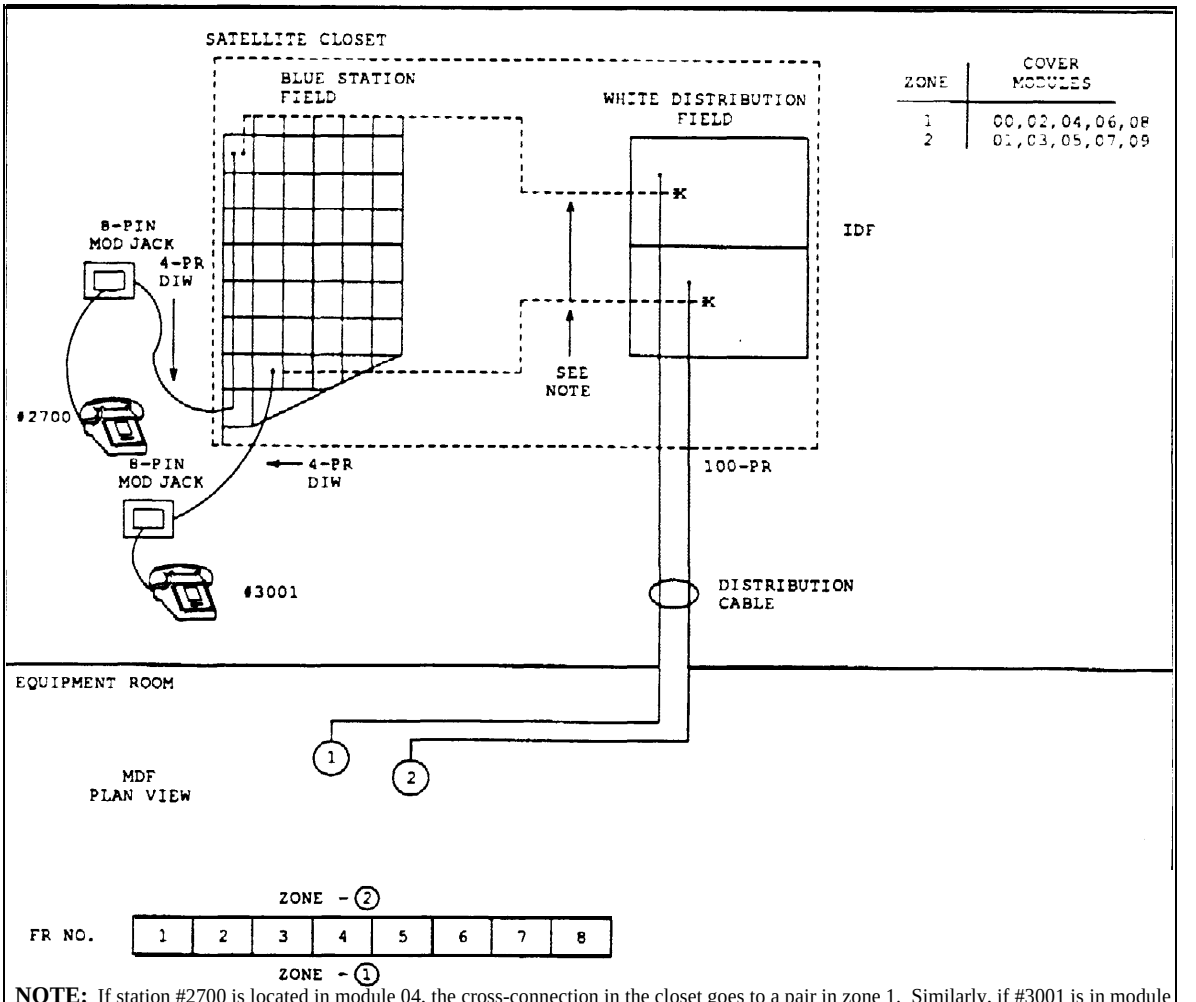
Figure 2-12. Zone Arrangement of Type-2 Frame — Front View, Zone 2

In addition to the preceding guidelines, observe these rules when designing zones:

- Mount the hardware on frames. For one-zone installations, wall-mounted frames may be used. For two-zone installations, double-sided, self-supporting frames must be used.
- Divide the distribution cables (in 100-pair increments) as equally between zones as possible. For example, assume that an installation has two zones and a 300-pair distribution cable. You would terminate 100 pairs at one zone and 200 pairs at the other.
- Do not add extra cable pairs to a distribution cable to achieve an equal number of terminations at all zones. That is, do not add 100 pairs to the 300-pair cable in order to terminate 200 pairs at both zones.
- Do not spread the equipment ports at the MDF.

When you use zones in the equipment room, the proper cross connections at the IDF are crucial. Figure 2-13, *Closet Cross-Connects Using Type-1 Frames,* illustrates IDF cross-connections of distribution cables originating from two different zones in the equipment room. Make sure that you label the IDF cross-connections as follows:

- IO number for an extension
- Equipment line location (ELL) number for that extension
- Module number for that ELL



NOTE: If station #2700 is located in module 04, the cross-connection in the closet goes to a pair in zone 1. Similarly, if #3001 is in module 07, the cross-connection in the closet goes to a pair in zone 2. Using this rule, it is possible to keep the jumpers short at the equipment room cross-connect field.

Figure 2-13. Closet Cross-Connects Using Type- 1 Frames

Connecting to Terminal Blocks

The 110A and 110P cross-connect hardware are available with connectors or without connectors for field termination of cables. The determination of whether to use cross-connect hardware with or without connectors is best made at the site, but in general, the following guidelines apply:

- Use cross-connect hardware without connectors for field terminations for distribution cables.
- Use cross-connect hardware without connectors for field terminations for equipment cables for systems over 10 modules.

- Use cross-connect hardware with connectors for equipment cables for systems of 1 to 5 modules.

NOTE: The connector gender of the shielded cables supplied with System 85 R2V4 and earlier systems is male-to-male (M-M). The connector gender of the shielded cables supplied with DEFINITY Generic 2 with traditional modules is male-to-female (M-F).

If connector-type, cross-connect hardware is used for connecting equipment cables, make sure that you order the correct hardware.

Synchronization Clock

The synchronization clock provides enhanced network synchronization and improved transmission performance in digital networks.

The clock can be connected to either duplicated or unduplicated systems. An unduplicated module or TMS requires wall field space for 125 pair (5 cables) in consecutive blocks; a duplicated module or TMS require space for 150 pair (6 cables) in consecutive blocks.

The clock should be connected to the auxiliary equipment and miscellaneous field, that is, the yellow portion of the wall field. There are three ways to establish the yellow wall field cross connection. In order of preference they are as follows:

- Yellow field—Use a portion of this field that has not been dedicated to other equipment.
- Spare field—Convert spare field space to a yellow field dedicated to the clock.
- Custom installation—As a last resort, install a 110A-300 block dedicated to the clock on or near the MDF.

DESIGNING THE MDF FOR A RAISED FLOOR

A modern communications system is perceived by the customer to look like a computer installation. For this reason, some customers request that the communications systems installed in the equipment rooms be installed on raised flooring to conceal unsightly cabling and I/O ductwork. Also, where communications systems are installed beside computer installations, the communications systems wiring must be out of sight to conform to the computer's installation wiring.

Using the raised-floor design may make installation time longer for systems of two modules or more and the same amount of time for single-module systems. Changes and additions also may take more time than the normal installations if cabling is involved. Several factors contribute to the increased time: some are logistical, such as removing tiles, some are engineering, such as detail design or structural considerations for frame mounting, and some relate to the installation of cables, such as storage of cable slack or dressing of cables via holes in the floor.

If you are required to design a raised-flooring MDF, use the following guidelines.

Before designing the layout of an MDF over a raised floor, take into account the following three issues that can affect the design:

- The use of raised floor space as an air plenum. The National Electric Code (NEC) prohibits the placement of cables that use ordinary covering materials, such as polyvinyl chloride (PVC) or polyethylene, in the building air plenums. However, when the raised floor is used as an air plenum, the plenum typically serves only the raised-floor room, which permits the use of cables with ordinary cover materials in that space. On the other hand, if the local codes forbid the use of ordinary covering materials for the installation that you are planning, use ducts for such cables as the input/output (I/O) cables, which connect the switch to the MDF.
- Space availability under the floor. There should be adequate space for ducts and cables to be installed and what is under the raised floor — for example, electrical conduits, air conditioning ducts, water pipes.
- Modification of the floor tiles. Cutouts in floor tiles will have to be made to accommodate the MDF. Discuss this with the customer. Contact the National Engineering Center (NEC) regarding final requirements for cutouts in floor tiles. See figure 2-14, *Floor Template - 18 Inch Tile (L472366),* figure 2-15, *Floor Template - 24 Inch Tile (L472367),* and figure 2-16, *Floor Template - Cabinet Lineup (L472368).*

Once you have resolved these issues, use the following guidelines for designing cable routings, frame installations, and the floor plan.

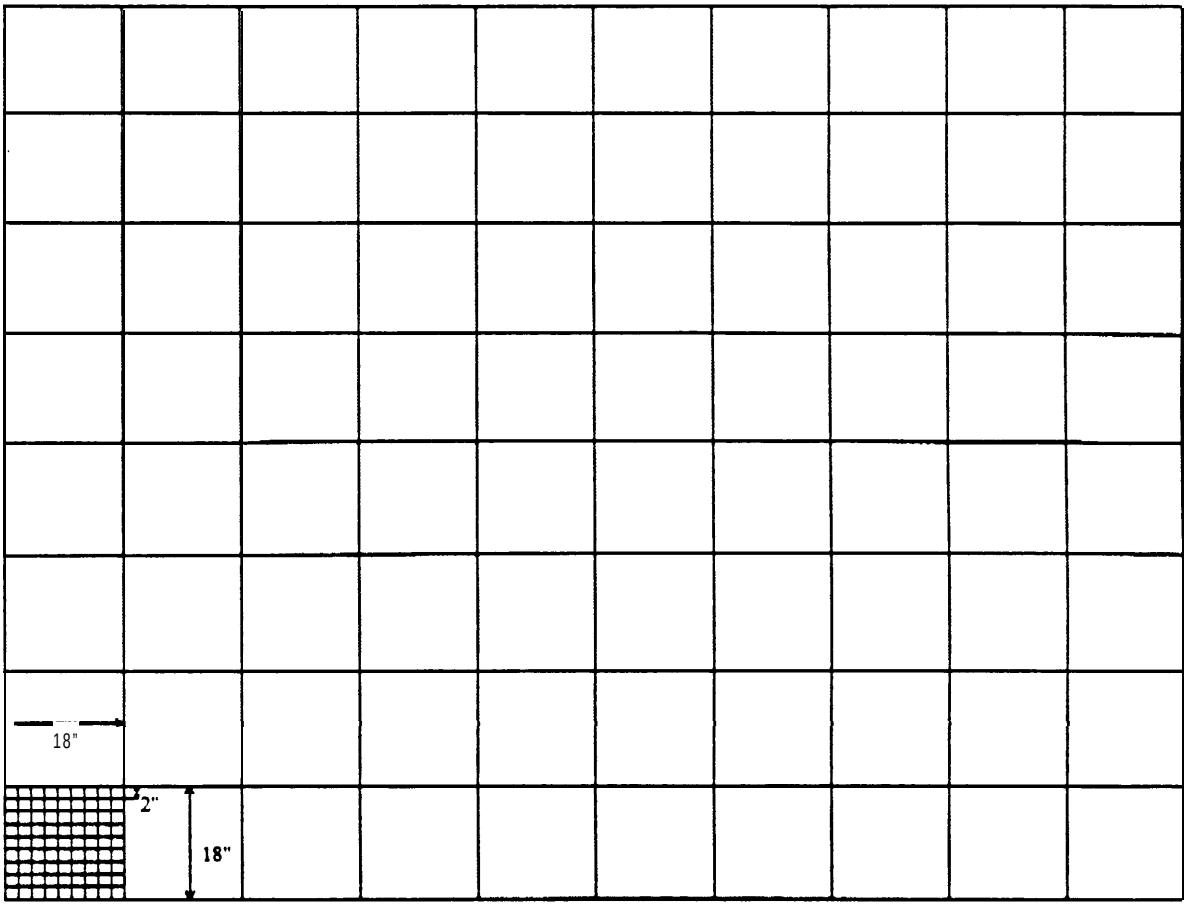


Figure 2-14. Floor Template - 18 Inch Tile (L472366)

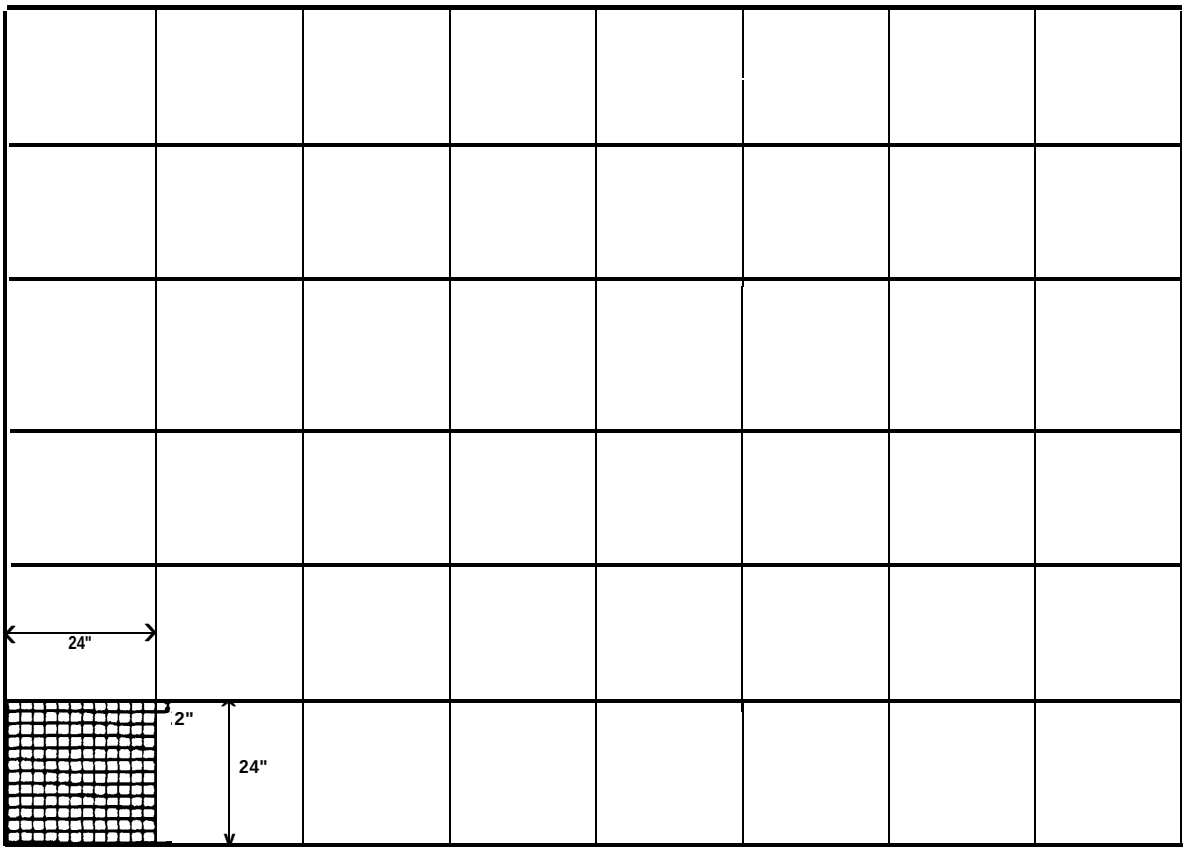


Figure 2-15. Floor Template - 24 Inch Tile (L472367)

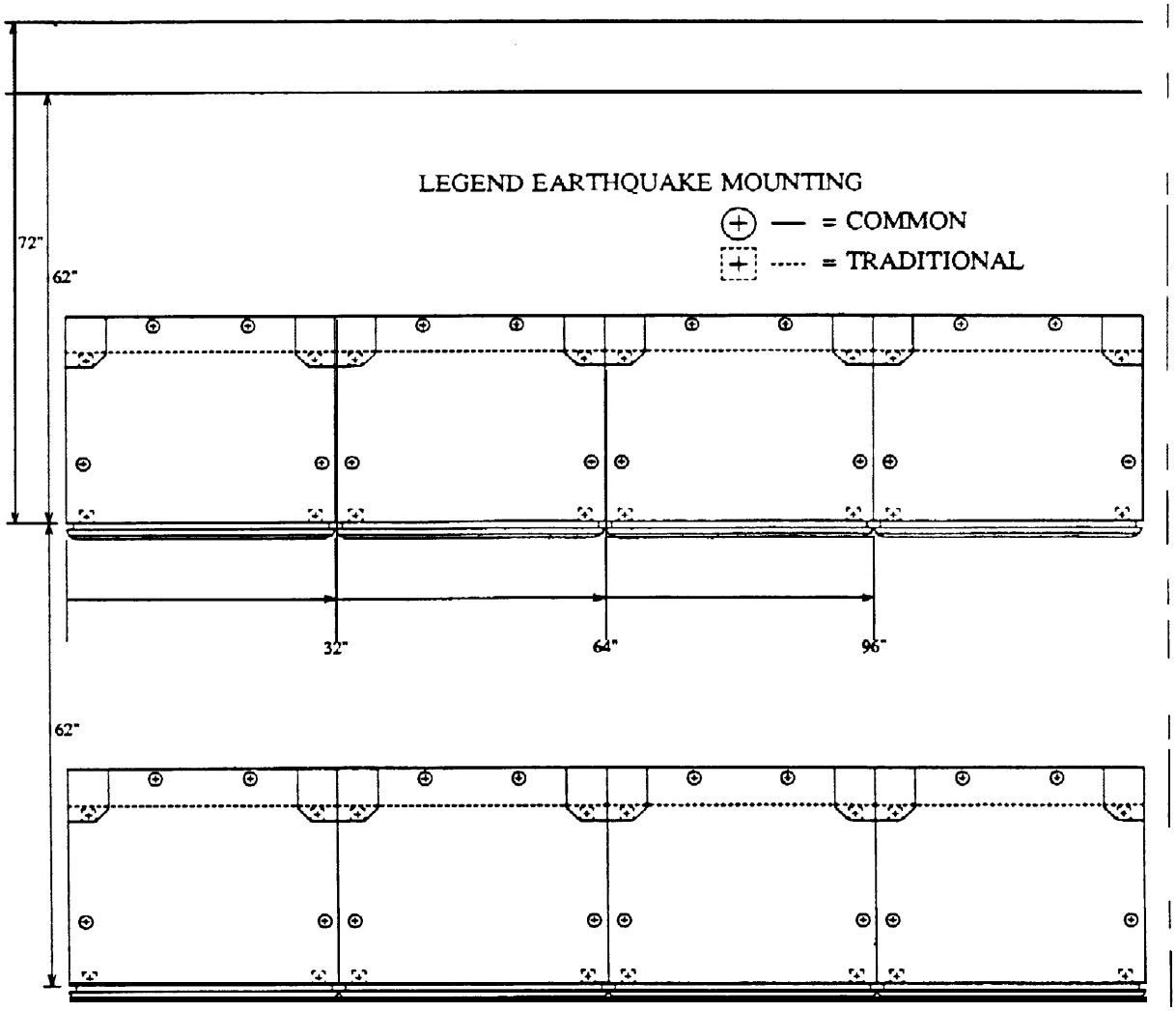


Figure 2-16. Floor Template - Cabinet Lineup (L472368)

Cable Routing

Take special care to ensure that cables from different modules do not cross at the MDF and that distribution cables are not crossed over module cables. Make sure that the cables routed under the raised floor are dressed and that they are done so with a minimum of slack to prevent tangled cables that can obstruct access to other under-floor equipment. The routing of the cables beneath a computer/raised floor should be coordinated with the NEC.

Frames

Use wall-mounted or self-supporting frames for MDFs that you install with raised floors. Terminal blocks mounted directly to the wall require cables to be fed from both the top and bottom exposing the cables to view and defeating the purpose of the raised-floor installation. However, if the customer does not object to the exposed cabling, wall mount the wiring blocks directly — that is without frames.

Self-supporting frames usually are bolted directly to the base floor, figure 2-17, *Floor-Secured Frame Installation,* and this method of installation requires the removal of the raised floor stringers. Obtain the cooperation of the floor installer to install frames. Use a frame whose height has been increased to fit the raised floor, and make sure you include the increased height in ordering them.

You also can install self-supporting frames by bolting them to the top of the stringer system. Before planning this approach, confer with the customer and the manufacturer of the raised-floor system. Brace all self-supporting frames at their tops whether you have anchored them to the base floor or to the top of the stringer system.

Floor Plan

Consult with the National Engineering Center (NEC) to obtain a detailed floor plan for the system 85 or DEFINITY Generic 2 installation. This includes cable distances, tile cutouts, the relationship of the System 85 or DEFINITY Generic 2 with traditional module equipment to the stringer system, and the relationship of the MDF to the stringer system.

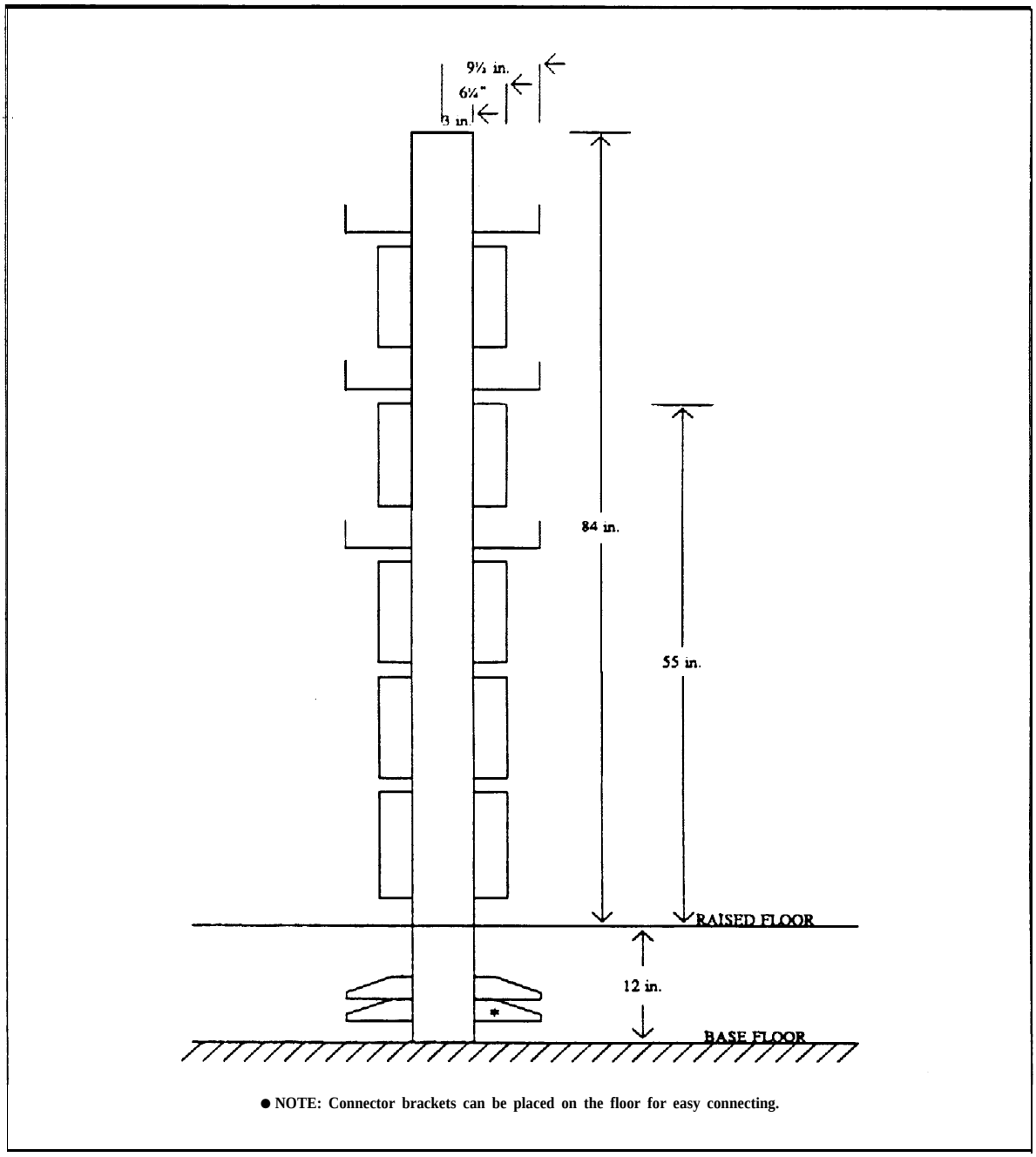


Figure 2-17. Floor-Secured Frame Installation

RECOMMENDATIONS FOR IDF DESIGNS

For System 85 and DEFINITY Generic 2 with traditional modules, IDFs serve as secondary cross-connect points between distribution cables and installation cables, which connect to the IOs. The IDFs usually are housed in closets. Along with the IDF, these closets frequently house the auxiliary power units that some System 85 and DEFINITY Generic 2 with traditional modules telephones require.

Although the design of an IDF depends on the site, it should conform as closely as possible to the Premises Distribution System (PDS) guidelines. The recommendations in this section supplement the PDS guidelines, and are essential to the design of IDFs. Beyond these recommendations, use your experience and judgment in designing IDFs.

Recommended Terminal Blocks

Use 110AB1-100 or 110AB1-300 terminal blocks for both the blue and white fields of the IDF. Use the 110P only if thc customer requests patchcords. Information on the 110P cross-connect hardware appears in the *Premises Distribution System Design Guide* (555-400-602) and in the *AT&T System 75 Wiring* (555-200-111) document.

Mounting the Terminal Blocks

If you are terminating fewer than 1200 cable pairs, riser and installation cables combined, on an IDF, wall mount the terminal blocks directly, without a frame. If you are terminating more than 1200 pairs on an IDF, use a wall-mounted, type-1 frame (discussed under *Recommended Frames for Terminal Blocks* earlier in this chapter.) If you must use 110P cross-connect hardware for the IDF, wall mount it regardless of the number of cable pairs that you are terminating.

Accommodating RGIs

If an IDF is serving a remote group interface (RGI), add a purple field in the closet to terminate the RGI ports. For most installations, the RGI terminations are cross-connected from the purple field to the blue field. But at some installations, the RGI terminations are cross connected from the purple field to the gray field for distribution to other IDFs. If an RGI is located in the equipment room, its cables can terminate on the purple field of the MDF and be cross-connected to a blue field on the MDF. The installation cables would then travel "homerun" from the blue field to the IO at the workstation.

Remote groups are supported in Generic *2* systems via the traditional module only.

INSERT LABELS

Insert labels identify the origins of cables that terminate on the MDF and on the IDFs. The labels are color-coded and come in sheets with 18 labels per sheet. The labels slip into the 1/2 in. by 8 in. clear plastic holders that snap between the horizontal index strips of the terminal blocks. Many different types of labels are available.

The color coding of the labels indicates the source of terminating leads as follows:

- Green: network services (CO trunks)
- Purple: equipment ports
- Yellow: auxiliary cabinet and miscellaneous switch cables
- Blue: IOs
- Gray: connections between IDFs
- White: connections between the MDF and the IDFs

The color coding of the labels is also used to set off specific fields on the MDF and IDFs as follows:

- On the MDF:
  - Green for the network services (CO trunks) field
  - Yellow for the auxiliary field
  - Purple for the equipment ports field
  - White for the building distribution field (cables coming from the IDFs)
  - Blue for the installation field
- On the IDFs:
  - White for the building distribution field (cables coming from the MDF)
  - Blue for the IO field
  - Gray for the tie cable field (cables coming from another IDF)
  - Purple for remote equipment ports terminated at tie IDF

In addition to being color coded, the labels are printed in various pair combinations to match the pairings that can occur on the fields. They also contain preprinted circuit numbers and space to fill in the module, carrier, and carrier slot numbers at the time of installation. Figure 2-18, *Example of Label Filled In*, shows an example of a label with the above information filled in.

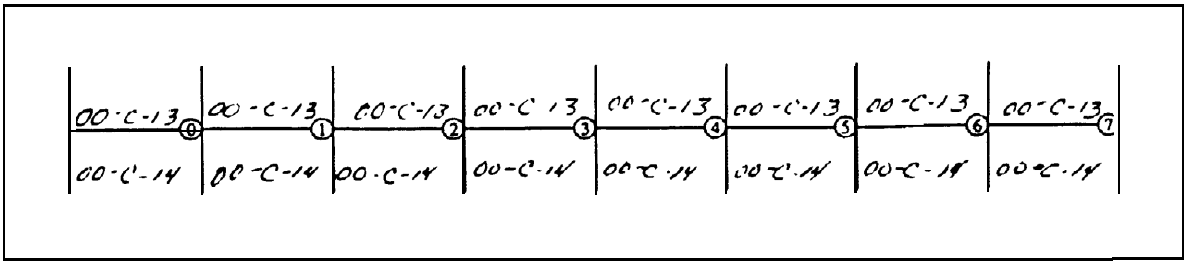


Figure 2-18. Example of Label Filled In

The label sheets are stocked at the AT&T Customer Information Center and can be obtained by calling (800) 432-6600 or by writing to:

AT&T Customer Information Center
P.0. Box 19901
Indianapolis, Indiana 46219

Include the following information when ordering:

- Name and address
- Geographic location number (such as CO8100)
- Organization number (such as 20052119)
- Account code (such as 123-4567)
- Select code of sheets needed (upper righthand corner of each sheet)
- Number of sheets needed

A partial reproduction of each label sheet is shown in chapter 14, *Insert Labels.*

CUSTOMER PARTICIPATION

Customer partcipation in wiring administration allows the customer to set up, tear down, and alter cross-connections on the building distribution field of the MDF and on the IDFs. Because 110A cross-connect hardware is used with jumper wires and require the use of a punchdown tool to make cross-connections, customers who wish to handle their own wiring administration can have their technician instructed on the use of a punchdown tool and connecting and disconnecting jumper wires.

3. ELECTRICAL PROTECTION: SYSTEM 85 AND DEFINITY GENERIC 2 WITH TRADITIONAL MODULES

This chapter identifies the electrical hazards that can harm personnel, the switch, terminals, and building wiring; instructs you in how to evaluate the basic wiring design for real or potential electrical hazards; and describes the protective devices and methods used to minimize those hazards.

If this chapter does not provide all the information that you need or if your wiring design presents some atypical requirements, see *Related Resources* in *About This Document* for a list of documents on electrical hazards and protection.

TYPES OF ELECTRICAL HAZARDS

Surges from four major electrical hazards can cause electrical or fire damage to personnel, the switch, terminals, building wiring, equipment, or the building itself. These hazards are lightning, power cross, power induction, and ground-potential rise, and they are conducted through the distribution cables.

Lightning causes a high-voltage surge by striking on or near the distribution cables. Power lines that fall across the distribution cables are a power cross, which also causes a high-voltage surge. Power lines that run long distances parallel and close to telephone lines create power induction. And an increase in the voltage at the grounding point because of a power fault or because of lightning current flowing into the ground in the nearby area causes ground-potential rise.

PROTECTING AGAINST HAZARD EXPOSURE

The areas that you must protect from electrical hazards are as follows:

- AT&T distribution cables
- Cabling that enters the facility from the telephone company
- Customer building entrance facilities (BEF)

Cabling is considered exposed to lightning if any of these conditions exist:

- It is aerial
- It is above ground in an area where thunder is heard more than five times a year
- The surrounding terrain has a history of lightning damage
- It is buried without a grounded metallic shield or the grounding is poor
- It is buried in a span larger than 140 ft in soil with resistivity greater than 100 ohms per meter
- It is outside the "cone of protection" of buildings or other conducting structures

For more details on electrical protection, see *Telecommunication Electrical Protection* (350-060).

Riser Cable

Although riser cable (the distribution cable that stays within a building) rarely receives direct lightning strikes, instances of risers subjected to residual voltages as high as 5000V from lightning strikes on the buildings housing them have been observed. To protect against this type of hazard, design your riser with a coupled bonding conductor (CBC) to protect it. Ground the shield at each closet or floor where pairs leave the main cable. Use 6AWG wire and connect all grounds to a common ground.

Campus Cable

Campus cable (the distribution cable that is laid between buildings) is considered exposed to power contact or induction if it shares a trench with power lines that carry more than 300 Vrms and if 12-in. spacing between the two cannot be guaranteed. It is also considered exposed to induction if the cable travels a long distance parallel to a power line even though it does not share the same trench. Campus cable that is exposed to power contact is also considered to be susceptible to sneak currents. Campus cabling may also be exposed to lightning under certain conditions.

PROTECTING THE SWITCH

System 85 and DEFINITY™ Generic 2 Communications System (hereafter abbreviated to *DEFINITY Generic 2* or *Generic* 2) are equipped with single-point ground lightning protection to prevent lightning-induced surges from traveling through the power system. Single-point grounding provides for all grounds in the communications system to originate from a single point or node on the AC protector cabinet. If lightning strikes, the communications system avoids damage because it rises and falls in potential with the single-point ground in response to the lightning potential. In addition, surge arresters on the main AC power lines reduce the amplitude of the lightning-caused surges and prevent damage to the system's AC-powered equipment.

The communications system's cabinets are grounded when they are installed. Each cabinet has a ground for lightning and a ground for the equipment that it houses, and the grounds for each cabinet are connected to the single-point ground for the system. A CBC connects the single-point ground of the switch to the protector-ground terminal, which establishes a path to route lightning to ground.

PROTECTING OTHER EQUIPMENT

Three kinds of protectors are used for distribution cables, the main distribution frames (MDFs), intermediate distribution frames (IDFs), circuit packs, and terminals: primary protectors, enhanced primary protectors, and secondary protectors. Primary and enhanced primary protectors protect against high voltage, and in some cases excessive current flows, by grounding the circuit. Such situations can be caused by surges from lightning, power crosses, power induction and ground-potential rise. The difference between the primary protector and the enhanced primary protector is that the enhanced

primary protector operates at a lower threshold. A secondary protector protects against currents and, in some cases, residual voltages that get past the primary protector.

When analog circuit packs, analog voice terminals, and the distribution cables and cross-connect fields serving them are exposed to lightning, power crosses, and/or ground-potential rise, they require only overvoltage protection because they already have built-in, sneak-current protection in the circuit packs and terminals. These sneak-current devices protect against moderate levels of sustained current caused by voltages too low to activate the high voltage protection device.

Sneak-current protection is not built into hybrid and digital voice terminals and ports, therefore when these devices are exposed to lightning, ground-potential rise, power crosses, or power induction, they require both overvoltage and sneak-current protection.

The telephone company installs primary overvoltage protection in its BEFs for its cables from the central office (CO) when it has determined that those cables are exposed; it does not install sneak-current protection. Determine whether or not their primary protection adequately safeguards AT&T's cables and equipment and if it does not, add the proper protectors. For customer BEFs, assess the possible electrical hazards and the protective requirements since the telephone company, in most instances, does not provide this information. See the *Premises Distribution System Design Guide* (555-600-402) guidelines for determining if an installation is susceptible to one or more of the principal electrical hazards.

Discussions of primary, enhanced primary, and secondary protectors follow, and figure 3-1, *Placement of Electrical Protectors on CO Side of Switch*, shows where the protectors are placed in a wiring path between the CO and the switch.

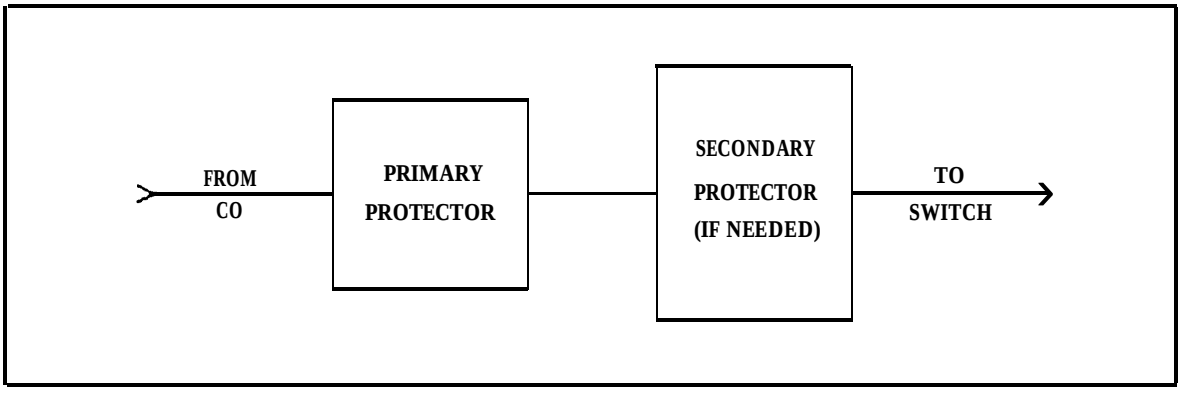


Figure 3-1. Placement of Electrical Protectors on CO Side of Switch

PRIMARY PROTECTION

Primary protection is provided by a fusible link and an overvoltage device. The following are descriptions of these elements of primary protectors.

Overvoltage Devices

There are three types of overvoltage devices: carbon blocks, gas tubes, and solid-state devices.

Carbon Blocks

A carbon block is a device holding two or more small carbon electrodes gapped at a distance that allows a voltage power surge to arc across the gap to ground. On average, carbon blocks operate when a voltage of 500V to 700V occurs. Use carbon blocks to protect against hazardous voltages caused by lightning, power crosses, power induction, and ground-potential rise.

Gas Tubes

A gas tube is a device containing a special gas that allows an electrical-voltage surge to arc through the gas to ground. On average, gas tubes operate when a voltage of about 300V occurs. Use gas tubes to protect against surges caused by lightning, power crosses, power induction, and ground-potential rise.

Solid-State Devices

A solid-state device uses a semiconductor in one of two ways to protect against high-voltage surges. It either shunts the high voltage to ground or prevents it from exceeding a certain level. A solid-state device usually operates at lower voltages and is much faster than carbon blocks and gas tubes. Use solid-state devices to protect against surges caused by lightning, power crosses, power induction, and ground-potential rise.

Sneak-Current Device: Heat Coll

A heat coil is a device that grounds a conductor when a hazardous current of more than 0.35A overheats it. Heat coils protect against continuous faults and may only be used at the BEF. They are used in combination with overvoltage devices and are installed in series behind any overvoltage device that is used.

Sneak-Current Device: Fuse

A sneak-current fuse is a fuse that melts when currents of .35A (for 4 hours) to 5.25A (for more than 10 seconds) reach it. Sneak-current fuses may be installed before or after the network interface (NI) in series with the primary protector. Sneak-current fuses operate independently of the primary protector and must be installed after it.

NOTE: AT&T protector units that start with the number 4 are equipped with a heat coil to provide both sneak-current and overvoltage protection.

ENHANCED PRIMARY PROTECTION

Enhanced primary protectors are protectors that operate at lower voltage or current levels than primary protectors.

SECONDARY PROTECTION

Secondary protection, such as a data-link protector (DLP), provides additional protection for equipment with a specific vulnerability. A DLP is an isolation transformer that provides protection for digital terminals by isolating the low-impedance, phantom-powered circuit from an exposed loop. Local power must be provided if the digital terminals are to be port-powered.

RECOMMENDED PROTECTORS

Following are recommended electrical protectors that can be used for primary, enhanced primary, and secondary applications. With the exception of the 79A sneak-current fuses, all of the following primary and enhanced primary protector units plug into 188 panels.

PRIMARY PROTECTORS

The following AT&T primary protector units are recommended for the protection of analog circuits.

- 3B1A — carbon block protector unit
- 3B1E-W — gas tube protector unit
- 3C1S — solid-state, overvoltage protector unit for analog circuits
- 4B1C — carbon-block and heat-coil protector unit
- 4B1E-W — gas-tube and heat-coil protector unit
- 4C1S — solid-state, overvoltage protector unit for analog circuits and heat-coil protector unit

Enhanced Primary Protectors

The following are enhanced primary protector units supplied by AT&T, Illinois Tool Works (ITW), and Porta Systems:

- AT&T 4C3S-75 (comcode 105581086; PEC 65543 and 65543A) — a semiconductor device and heat-coil protector unit that offers precise clamping, superior balanced performance, fail safe operation and no deterioration with age or number of operations. This module is used to protect:

  — Multibutton electronic telephones (METs)

  — SN224B (hybrid) circuit packs

  — 7200 series (hybrid) terminals

  — SN270B (digital) circuit packs

  — 7400 series (digital) terminals

  Digital terminals protected by the 4C3S-75 do not require local power if the terminals have no adjuncts attached. The terminals require local power if adjuncts are attached.

  The 4C3S-75 is the best and preferred device for protecting hybrid and digital terminals and ports in System 85 and DEFINITY Generic 2 with traditional modules. The 4C3S-75 is less expensive than the module protectors offered by outside vendors.

  NOTE: Do not use the 4C3S-75 with analog ports and terminals.

- ITW Linx LP2-100-068 (comcode 405077355; PEC 65541 and 65541A) — an avalanche-diode, gas-tube, sneak-current fuse, protector unit. This protector unit has the same loop range for terminals as a PDP protector (see table 3-1, *Loop Ranges for Protected Hybrid Terminals,* and table 3-2, *Loop Ranges for Protected Digital Terminals)* and is recommended for the protection of small numbers of cabling pairs (up to 50 pairs). Although this protector may be used, it does not mount on the standard 5-pin protector block. The separate ground connection requirement of this protector requires more time to install and replace, increasing the chance of improper or faulty connections. It mounts on the 66 cross-connect system and can be used to protect:

  — MET sets

  — SN224B (hybrid) circuit packs

  — 7200 series (hybrid) terminals

  — SN270B (digital) circuit packs

  — 7400 series (digital) terminals

  Linx cannot be used for analog circuit packs and terminals.

- Porta Systems Corp., Delta Protector (comcode 405077371; PEC 65540) — a gas-tube, avalanche-diode, heat-coil module. See table 3-1, *Loop Ranges for Protected Hybrid Terminals,* and table 3-2, *Loop Ranges for Protected Digital Terminals.* The PDP recommended for the protection of more than 50 cabling pairs. It plugs into the 188-90 protector panel and to protect:

  — MET sets

  — SN224B (hybrid) circuit packs

  — 7200 series (hybrid) terminals

— SN270B (digital) circuit packs

— 7400 series (digital) terminals

Digital terminals protected by PDPs do not require local power if the terminals have no adjuncts attached. The terminals do require local power if adjuncts are attached.

NOTE: Do not use the PDP with analog ports and terminals.

Secondary Protectors

The following protectors supplied by AT&T or ITW are used for secondary protection:

- AT&T Data Link Protector (DLP) — date-link transformers that provide secondary electrical protection for:

  — 1201A (comcode 103972733; PEC 24901) — 8-circuit protector that is mounted on 110A-type cross-connect hardware

  — 1203A (comcode 103972758: PEC 24900) — single-circuit protector contained in a wall-mounted, 104A connector-block housing

  DLPs are used to protect 7400-series digital terminals and SN270B circuit packs and must be installed with a primary protector. DLPs are especially recommended for protection against lightning and must be installed at both ends of the exposed cable serving an SN270B or a digital terminal.

  Terminals protected by DLPs must be powered locally from either the satellite closet or at the workstation. The use of local power extends the loop range of the terminal from 3400 ft to 5000 ft.

  DLPs cannot be used for METs, hybrid 7200 terminals, or hybrid SN224B circuit packs.

PROTECTION MATRIX

Table 3-3, *System 85 and DEFINITY Generic 2 with Traditional Modules Protection Matrix*, contains the overall protection matrix for port packs, terminals, and trunks in the System 85 and DEFINITY Generic 2 with traditional modules.

TABLE 3-1. Loop Ranges for Protected Hybrid Terminals

Terminal	Protector	Adjuncts	Range Ft (M)	
			24AWG	26AWG
7203	4C3S-75*	0	3000 (914)	2300 (701)
	ITW	0	3000 (914)	2300 (701)
	PDP	0	3000 (914)	2300 (701)
7205	4C3S-75*	0	3000 (914)	2000 (610)
	ITW	0	3000 (914)	2000 (610)
	PDP	0	3000 (914)	2000 (610)
	4C3S-75*	1	1750 (533)	1100 (335)
	ITW	1	1750 (533)	1100 (335)
	PDP	1	1750 (533)	1100 (335)
	4C3S-75*	2	1000 (305)	750 (229)
	ITW	2	1000 (305)	750 (229)
	PDP	2	1000 (305)	750 (229)
MET	4C3S-75*	0	1000 (305)	1000 (305)
	ITW	0	1000 (305)	1000 (305)
	PDP	0	1000 (305)	1000 (305)

***This is the recommended module protector.**

TABLE 3-2. Loop Ranges for Protected Digital Terminals

Terminal	Protector	Range Ft (M)	
		24AWG	26AWG
Digital Set	4C3S-75*	3400 (1036)	2200 (671)
	ITW	3400 (1036)	2200 (671)
	PDP	3400 (1036)	2200 (671)
	DLP	5000 (1524)	4000 (1219)

***This is the recommended module protector.**

TABLE 3-3. System 85 and DEFINITY Generic *2* with Traditional Modules Protection Matrix

Line	AT&T System 85/ G2 Traditional	Circuit Packs/ Circuit	Exposed Circuits/ On-Off Premises	Terminal Trunk	Sneak Current Protection Required	Protector								Notes
						Primary				Enhanced Primary			Secondary	
						3b1A	3b1E-W	4B1C	4B1E-W	AT&T 4C3S-75	ITW	PDP	DLP	
	All	ANN11/1	Yes/Both	DS1	Yes	--	Yes	--	Yes	NA	NA	NA	NA	1
2	R2V3-V4 & G2 Trad.	ANN15/1	Yes/Both	DS1/RGrp	Yes	--	Yes	--	Yes	NA	NA	NA	NA	1
3	R2V2-V4 & G2 Trad.	ANN17/8	No/On	730X/MFAT	NA	NA	NA	NA	NA	NA	NA	NA	NA	2
4	R2V4 & G2 Trad.	ANN35	Yes/Both	DS1/ISDN	Yes	--	Yes	--	Yes	NA	NA	NA	NA	1
5	All	SN224/4	Yes/Both	720X/MFAT	Yes	No	No	No	No	Yes	Yes	Yes	NA	7
6	All	SN228/8	Yes/Both	Anl Line	No	Yes	--	Yes	--	NA	NA	NA	NA	3
7	All	SN229/8	Yes/Both	Anl Line	No	Yes	--	Yes	--	NA	NA	NA	NA	3
8	All	SN230B/4	Yes/Both	GS CO Trk	Yes	--	Yes	--	Yes	NA	NA	NA	NA	3
9	All	SN231/4	No/On	Aux Trk	NA	NA	NA	NA	NA	NA	NA	NA	NA	2
10	All	SN232B/4	Yes/Both	DID Trk	Yes	--	Yes	--	Yes	NA	NA	NA	NA	3
11	All	SN233C/4	Yes/Both	Console	No	NA	NA	NA	NA	NA	NA	NA	NA	4
12	All	SN233C/4	Yes/Both	Tie Trk	NA	Yes	--	Yes	--	NA	NA	NA	NA	5
13	R2V2-V4 & G2 Trad.	SN238/4	No/On	EIA Port	NA	NA	NA	NA	NA	NA	NA	NA	NA	2
14	All	SN243/4	Yes/Both	Data Port	No	Yes	--	Yes	--	NA	NA	NA	NA	3
15	All	SN270/4	Yes/Both	740X/MFDT	Yes	No	No	No	No	Yes	Yes	Yes	Yes	6,7
16	All	SN244/2	Yes/Both	ANI XMTR	Yes	--	Yes	--	Yes	NA	NA	NA	NA	3
17	All	TN492C/2	Yes/Both	LP ST RMATS	No	Yes	--	Yes	--	NA	NA	NA	NA	3
18	R2V4-V4 & G2 Trad.	TN474B/2	No/On	PCC/3B2	NA	NA	NA	NA	NA	NA	NA	NA	NA	2

NOTES:

1. The ANN11, 15, 16, and 35 all require channel service units (CSU) as the network interface (NI). If the NI is provided, then primary protection is provided between the NI and network facilities. Gas tube protectors are recommended.
2. Circuit pack not approved for exposed applications.
3. Analog line circuit packs require primary protection.
4. The SN233C must be protected by console repeaters and primary protection when used for exposed console service.
5. The SN233C requires primary protection when used for off-premises tie-trunk service.
6. When the SN270 requires DLP protection, then primary protection must also be provided.
7. Thc 4C3S-75, Comcode 105-581-086, is the preferred protection device for enhanced applications.
8. The protection matrix applies to these and later vintages.

4. PORT PACKS/DCP REPEATERS: SYSTEM 85 AND DEFINITY GENERIC 2 WITH TRADITIONAL MODULES

This chapter presents supplementary information on port circuit packs, loop distances for terminals, and digital communications protocol (DCP) repeaters that you may find useful in designing a wiring installation for System 85 and DEFINITY Generic 2 Communications Systems (hereafter abbreviated to *DEFINITY Generic 2* or *Generic 2)* with traditional modules.

PORT CIRCUIT PACKS

Table 4-1, *Port Circuit Pack Cabling,* identifies the Circuit packs that are housed in the port carrier and the fields on the main distribution frame (MDF) where cables from those circuit packs terminate. There are 16 circuit packs per carrier with one 25-pair cable serving every two packs, except for the digital signaling level- 1 (DS1) carrier which has one 25-pair cable for each slot. The table also gives the number of ports for each circuit pack. There are four ports for each digital pack and eight ports for each analog pack.

If you receive just circuit pack information (types and quantities) from the Marketing Branch Organization (MBO) but no information on the cabling accompanying those packs, use table 4-1, *Port Circuit Pack Cabling,* to calculate the number of cables that can be expected to accompany the switch for these packs and determine the fields for their terminations.

Table 4-2, *Terminals and Peripherals Served by Port Circuit Packs,* lists the voice terminals that each circuit pack can serve, and table 4-3, *Voice Terminal Loop Ranges,* lists the loop ranges for voice terminals.

The design of the MDF must allow for the termination of all eight carrier cables whether or not the carrier is slated for a full complement of circuit packs. The design should not allow for vacant carrier positions unless such an allowance is specifically requested.

TABLE 4-1. Port Circuit Pack Cabling

Ckt Pack	Port Fcn	#Ports	Field for Term	Ckt Packs/ 25 Pair Cable
ANN17	MFAT line port	8	bldg dist	1
SN228	Off-premises station line	8	trunk/aux	2
SN229	On-premises station line	8	bldg dist	2
SN224	MFET line port	4	bldg dist	2
SN230	CO trunk	4	trunk/aux	2
SN231	Auxiliary trunk	4	trunk/aux	2
SN232	DID trunk	4	trunk/aux	2
SN233	Tie trunk	4	trunk/aux	2
SN238	EIA	4	trunk/aux	2
SN241	Contact interface	4	bldg dist	2
SN242	Automatic number ID	1	bldg dist	2
SN243	Data port	4	bldg dist	2
SN270	Digital voice/data port	4	bldg dist	2

TABLE 4-2. Terminals and Peripherals Served by Port Circuit Packs

Ckt Pack	Port Fcn	Term/Periph Served
ANN17B	MFAT	7303S, 7305S
SN228	Off-premises station line	2500, 7101A,* 7103A*
SN229	On-premises station line	2500, 7101A,* 7103A*
SN224	MFET line port	7203H,* 7205H*
SN233	Tie trunk/attendant console	Attendant console
SN238	EIA	RS232 terminals
SN243	Data port	Analog modems (modem pooling)
SN270	Digital voice/data port	7401D, 7404D, 7405D, 7406D, 7407D, 510D, 515

*Discontinued

TABLE 4-3. Voice Terminal Loop Ranges

Voice Terminal	Distance (Ft)		Comments
	24AWG	26AWG	
Analog			
All sets	5380	3500	Using SN229 circuit pack
2500 series	18,460	12,000	Using SN228 or SN228B circuit pack
7100 series	13850	9000	Using SN228 or SN228B circuit pack
Hybrid			
7203H	3540	2300	
7205H	3540	2300	
	1690	1100	With 1 module
	1150	750	With 2 modules
7303S	1540	1000	
	1000	650	With 1 adjunct
	3075	2000	With adjunct power supplied from the closet or at the workstation
7305S	1000	650	
	690	450	With 1 adjunct
	3075	2000	With adjunct power supplied from the closet or at the workstation
Digital			
740X	5230	3400	With adjunct power supplied from the closet or at the workstation. Loop range can be extended 5000 ft with each DCP repeater. A maximum of 6 DCP repeaters can be linked together.
	7695	5000	Loop range can be extended 5000 ft with each DCP repeater. A maximum of 6 DCP repeaters can be linked together.

DCP REPEATERS

When a digital voice terminal must be installed at a loop-length distance in excess of 5000 ft, a DCP repeater must be installed in its wiring path. The DCP repeater is a circuit board that has been designed for mounting on a 100-pair, 110A wiring block. It boosts and cleans up the signals to and from the terminal, and extends a terminal's loop length 5000 ft. A maximum of six repeaters can be linked together. Repeaters are intended to serve small numbers of terminals.

Repeaters are not hermetically sealed, which prevents their use in manholes and on utility poles. Install the repeaters in a closet that has 110 VAC power. If a repeater is exposed to electrical hazards, install primary protection before it.

Ensure that the circuit breaker to the 110 VAC power for the repeaters is labeled with a notice cautioning personnel not to disrupt power to the repeaters. However, the repeaters do contain a reserve battery that permits them to operate for about two hours after AC power has been shut off or disrupted. When multiple repeaters are linked together, each one requires a 110 VAC power source and each source must be labeled to prevent accidental disruption of power to any repeater. If the AC power to any repeater in a chain is disrupted, the voice terrninal stops operating (once that repeater's reserve battery expends itself).

Exposed DCP repeaters require a data link protector (DLP). See chapter 3, *Secondary Protectors,* for DLP information.

The price element code (PEC) for the DCP repeater is 9601-017.

5. INSTALLATION EXAMPLE: SYSTEM 85 AND DEFINITY GENERIC 2 WITH TRADITIONAL MODULES

This chapter illustrates the design process for a hypothetical main distribution frame (MDF) using a seven-module system. The process consists of two steps: sizing the MDF and constructing the MDF.

SIZING THE MDF

Sizing is the determination of the number of 300-pair terminal blocks needed to construct the MDF. First, the requirements of the four principle fields are assessed. Second, the number of blocks needed for each field to meet those requirements is determined.

Assessing Field Requirements

The four principal fields on the MDF are the central office (CO) trunks of network services, auxiliary and miscellaneous, equipment ports, and distribution fields. The following are the requirements for each field.

- The network services field, which uses green labels, is where the CO cables terminate. For this installation all trunks are digital. There is a direct connection between the customer's channel service unit (CSU) and the digital service level-1 (DS1) interface of the telephone company. No cables have to be terminated on this field, which eliminates the need for terminal blocks.
- The auxiliary and miscellaneous field, which uses yellow labels, is where the cables from the auxiliary equipment terminate. Two auxiliary cabinets, whose contents are unknown, serve this system. Allow for the termination of twelve 25-pair cables from each cabinet.

  In addition, a maximum of twelve 25-pair cables from the common control (CC) cabinet terminate on this field. This includes the cabling for one attendant console.
- The equipment port field, which uses purple labels, is where the cable from the equipment ports terminate. There are 57 port carriers in the system and ten DS1/MFAT carriers used to hold ANN15 remote group interface (RGI) circuit packs. Modules 00 and 02 contain only six port carriers each. The remaining five modules contain nine port carriers and two DS1/MFAT carriers each.
- The distribution field, which uses white labels, is where the distribution cables that run to the intermediate distribution frames (IDFs) terminate. Numerous factors affect the sizing of the distribution cable, including the stations served by closets, the number and type of stations, the spares needed, and the possibility of cable breakage. Allow for the termination of 14,000 distribution cable pairs.

Determining Block Quantities

The following computations show how the field requirements are converted into terminal blocks.

	Subtotal Cable Pairs	Total Cable Pairs	Subtotal Field Blocks	Total Field Blocks	Total MDF Blocks
1. Green Field A. Number of Cable pairs terminated =	0				
B. Number of cross-connect blocks required =		0		0	
2. Yellow Field A. Auxiliary cabinet terminations: 2 cabinets x $\frac{12 \text{ cables}}{\text{cabinet}}$ x $\frac{25 \text{ pairs}}{\text{cable}}$ =	600				
B. CC cabinet termination: 1 cabinet x $\frac{12 \text{ cables}}{\text{cabinet}}$ x $\frac{25 \text{ pairs}}{\text{cable}}$ =	300				
C. Total pairs		900			
D. Blocks needed: 900 pairs + $\frac{300 \text{ pairs}}{\text{block}}$ =			3		
E. Spare blocks			1		
F. Number of required blocks			2	4	
3. Purple Field A. Sizing largest module: i $\frac{9 \text{ step carriers}}{\text{module}}$ x $\frac{8 \text{ cables}}{\text{carrier}}$ x $\frac{25 \text{ pairs}}{\text{cable}}$ = $\frac{1800 \text{ pairs}}{\text{module}}$					
ii $\frac{2 \text{ MFAT/DS1 carriers}}{\text{module}}$ x $\frac{4 \text{ cables}}{\text{carricr}}$ x $\frac{25 \text{ pairs}}{\text{cable}}$ = $\frac{200 \text{ pairs}}{\text{module}}$					
iii $\left(\frac{200 \text{ pairs}}{\text{module}} + \frac{1800 \text{ pairs}}{\text{module}} \right)$ x module =	2000				
iiii $\left(\frac{2000 \text{ pairs}}{\text{module}} + \frac{300 \text{ pairs}}{\text{block}} \right)$ = $\frac{7 \text{ blocks}}{\text{module}}$					

	Subtotal Cable Pairs	Total Cable Pairs	Subtotal Field Blocks	Total Field Blocks	Total MDF Blocks
B. Computation of blocks: $\frac{7 \text{ blocks}}{\text{module}} \times 7 \text{ modules} =$				49	
C. Computation of blocks: $14{,}000 \text{ pairs} + \frac{300 \text{ pairs}}{\text{block}} =$					
4. White Field A. Computation of blocks: $14{,}000 \text{ pairs} + \frac{300 \text{ pairs}}{\text{block}} =$				47	
5. All Fields					100

The total number of blocks required to construct the MDF is 100.

CONSTRUCTING THE MDF

The construction of the MDF is based on the block counts made above and on the factors listed below. Note that in some installations, such as this one, the arrangement of the frames may increase or decrease the number of frames needed despite the block count.

- *Location of the MDF.* The size of the equipment room governs the location of the MDF. For this installation, the 25-ft-wide wall space is available close enough to the equipment to permit the use of either wall-mounted or self-supporting frames.
- *Terminal-block mounting.* For an installation of this size, the terminal blocks can only be mounted on frames. Choose which of the two types of frames is to be used and whether the frames should be wall mounted or self supporting.
  - *Wall-mounted frames. The* type-1 frame requires 10 frames and the type-2 frame requires 13 frames. This eliminates the type-2 frame since its 26-ft lineup would exceed the available wall space of 25 ft. The type-1 frame requires one additional frame to accommodate the required spare blocks. Figure 5-1, *7-Module System Wall-Mounted* on *Type-1 Frame,* shows one possible arrangement.

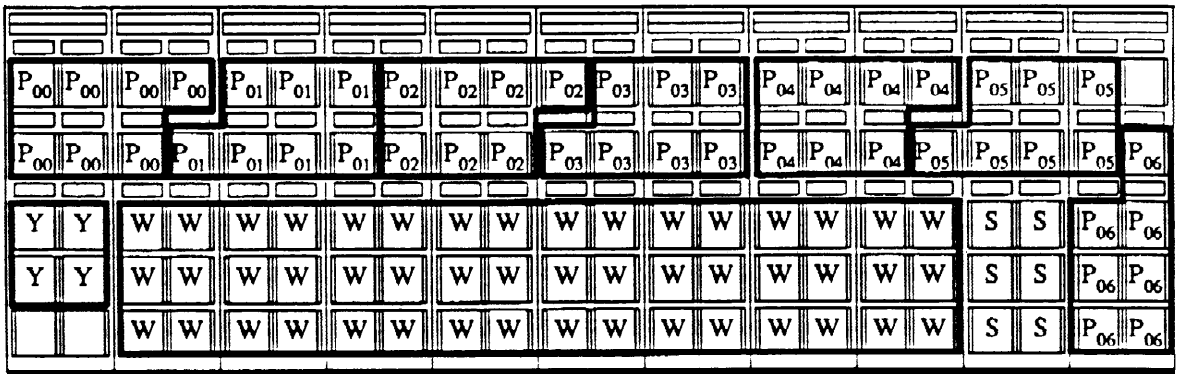


Figure 5-1. 7-Module System Wall-Mounted on Type-1 Frame

Several problems arise from the arrangement shown in figure 5-1, *7-Module System Wall-Mounted on Type-1 Frame,* that make it undesirable. First, because the module layouts are asymmetrical, cable terminations begin in a different location for each module. Second, the layouts for modules 1 through 6 require special frames since each spans three of the type-1 frames. Also, the yellow field shares the same frame as module 1. Third, these layouts require jumpers longer than the recommended 16 ft.

— *Self-supporting frames.* Mounting the terminal blocks on self-supporting frames, which is preferable to wall mounting for this installation, requires five type-1 frames or seven type-2 frames. The type-1 frame arrangement is shown in figure 5-2, *7-Module System Mounted on Self-Supporting Type-1 Frame, Front,* and figure 5-3, *7-Module System Mounted on Self-Supporting Type-1 Frame, Rear.*

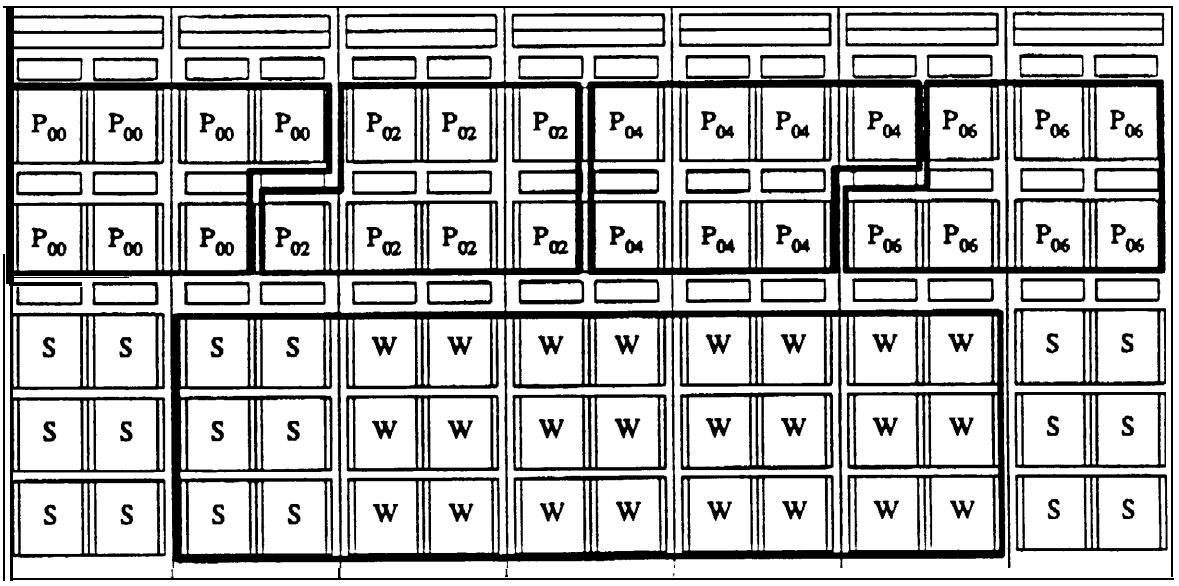


Figure 5-2. 7-Module System Mounted on Self-Supporting Type-1 Frame, Front

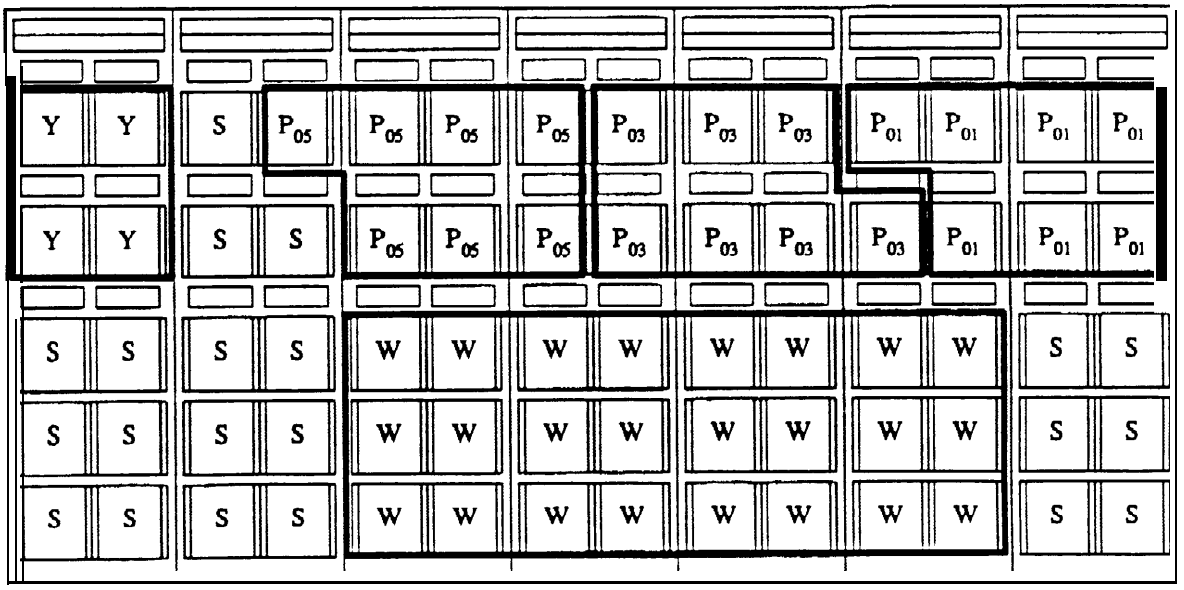


Figure 5-3. 7-Module System Mounted on Self-Supporting Type-1 Frame, Rear

- *Frame arrangements.* In this installation, although the block count shows that five frames are needed, the arrangement of the frames increases the need to seven. And, since this installation uses zones, the distribution cable is separated on the MDF. One side of the frame lineup supports four modules and the other side supports only three, thus most of the spare distribution cable pairs are placed on the side with three modules.

  Figure 5-4, *7-Module System Mounted on Self-Supporting Type-2 Frame, Front,* and figure 5-5, *7-Module System Mounted on Self-Supporting Type-2 Frame, Rear,* show the same arrangement on a type-2 frame. The type-2 frame is preferable because, although it contains 1200 fewer pairs than the type-1 frame, the resulting lineups are the same.

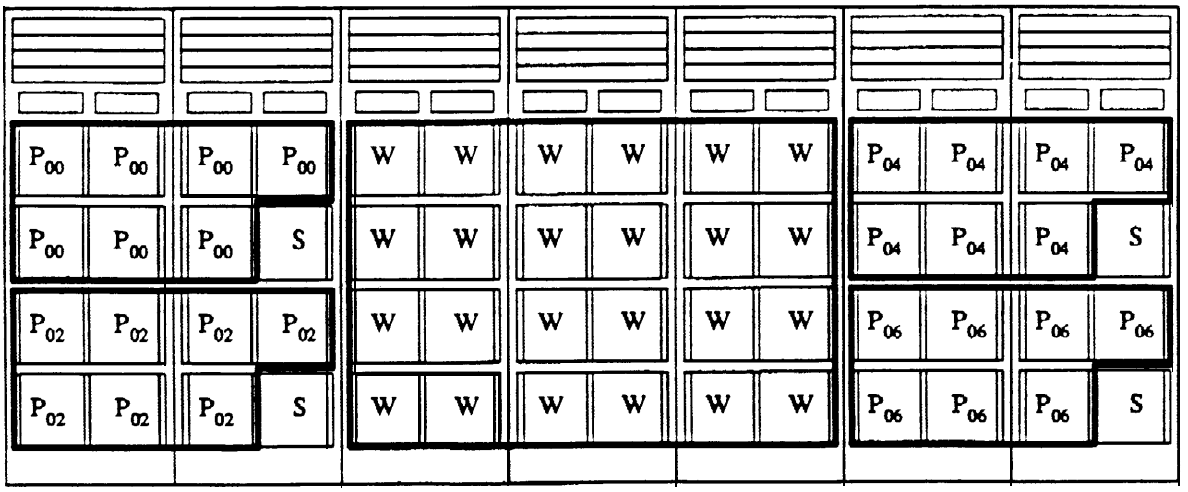


Figure 5-4. 7-Module System Mounted on Self-Supporting Type-2 Frame, Front

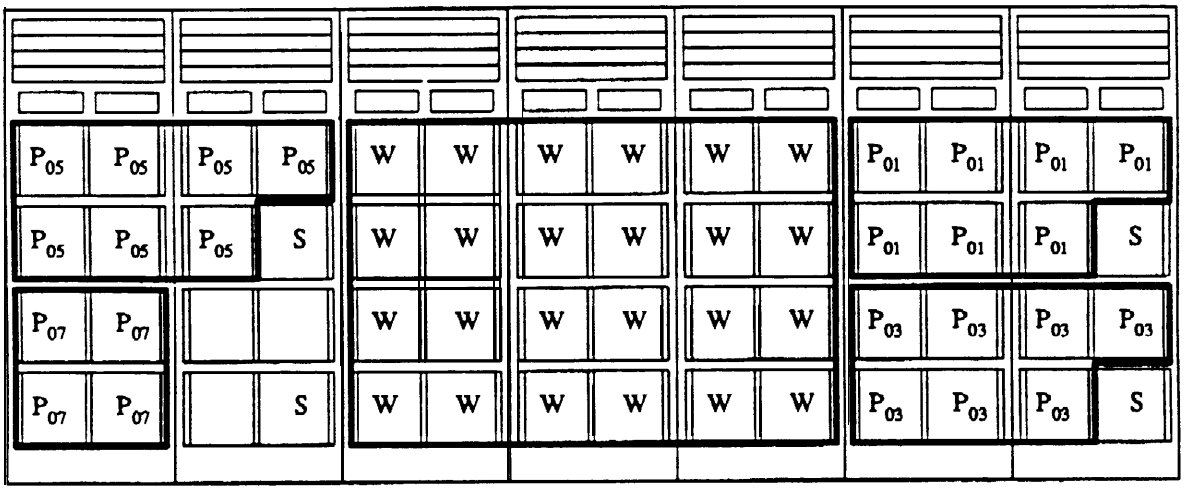


Figure 5-5. 7-Module System Mounted on Self-Supporting Type-2 Frame, Rear

- ***Cable connections to the MDF.*** **In this example, all connections to the frames from the equipment are by connector cables. All distribution cables are field terminated directly to the terminal blocks.**

6. OVERVIEW: DEFINITY GENERIC 2 WITH UNIVERSAL MODULES

This chapter identifies the important differences between a DEFINITY® Generic 2 Communications System (hereafter abbreviated to *DEFINITY Generic 2* or *Generic 2)* with universal modules and the systems described in chapter 1, *Overview: System 85 and DEFINITY Generic 2 with Traditional Modules. A* brief description of the major components of the single carrier module (SCM), a type of remote universal module that introduces new cabinetry, is included toward the end of this chapter. Generally, the configurations and system design rules that apply to universal modules also apply to SCMs. Significant information on the SCM will be included throughout the universal module chapters of this document, as needed.

MAJOR COMPONENTS—MULTICARRIER MODULE

Generic 2's main operating units are the common control (CC) carrier, time-multiplexed switch (TMS), common port carrier (CPC), and universal module control (UMC) carrier. These operating units are contained in either the CC/TMS cabinet, UMC cabinet, or TMS cabinet.

A DEFINITY Generic 2 with universal modules offers multimodule capability. A single system can contain up to 31 communications switching modules with each module providing as many as 1440 ports for a universal module. The multimodule architecture uses a time-multiplexed switch (TMS) as the link between communications switching modules.

Cabinet Types

The Generic 2 system has three types of cabinets: the CC/TMS, TMS, and UMC. The CC carrier (J58888AB) and TMS carrier (J58888C) are housed in the new CC/TMS cabinet together; both the port carriers and UMC carriers are housed in the new UMC cabinets. The TMS carrier is housed in a TMS cabinet in duplicated systems with more than seven modules or unduplicated systems with more than 15 modules. The CC/TMS cabinet can support up to 15 modules in an unduplicated system or seven modules in a duplicated system.

The UMC cabinet is the most significant hardware introduction in the Generic 2 release, providing new port board technology that saves on power, cabinetry, and space. The UMC cabinet houses the UMC carriers (J58890-AK1) and CPCs (J58890BB) in a single cabinet. The port boards used with the UMC carriers are System 75 boards; they are denser than System 85 boards, requiring less space in the equipment room.

DEFINITY Generic 2 offers some features that require the use of R2V4 technology. These features require a traditional switching module and are listed in chapter 1, *Overview: System* 85 *and DEFINITY Generic 2 with Traditional Modules.*

CC Carrier (J58888AB)

The CC carrier fulfills the same function for DEFINITY Generic 2 with universal modules that it does in System 85 and DEFINITY Generic 2 with traditional modules.

TMS Carrier (J58888C)

The TMS performs the same function in DEFINITY Generic 2 with universal modules that it does in System 85 and DEFINITY Generic 2 with traditional modules. In DEFINITY Generic 2 with universal modules, the ODL®-50 fiber-optic paddleboards replace the ODL®-40 series, allowing remote modules to be connected up to 25,000 ft away.

CPC (J58890BB)

The CPC (J58890BB) for the DEFINITY Generic 2 universal module is not compatible with System 85 or DEFINITY Generic 2 with traditional modules. The CPC is capable of supporting 20 ports per carrier. It fulfills the same functions in DEFINITY Generic 2 with universal modules that the DS1 and port carriers do in System 85 and DEFINITY Generic 2 with traditional modules.

The CPC introduces a major improvement in cabling between the switch and wall fields with the new I/O connector plate on the rear of the UMC cabinet. The I/O connector plate provides 20 25-pair connectors to interface circuit pack slots to the cross-connect field. The cables for these connections are B25A male-to-female (M-F) connectors, replacing the male-to-male (M-M) versions used in other System 85 connectorized systems. M-M A25D cables are available to connect switches to wall fields already installed with female connectors.

UMC Carrier (J58890AK-1)

The UMC carrier fulfills the same function in DEFINITY Generic 2 with universal modules that the MC carrier (J58888M) does in System 85 and DEFINITY Generic 2 with traditional modules.

The UMC has an I/O connector accessible from the rear of the cabinet to provide an interface with cross-connect fields, remote modules, and internal connections to other carriers and hardware devices. The UMC has 23 slots: 2 for power, and 21 for circuit packs.

Remote Groups

Remote groups are not supported by DEFINITY Generic 2 with universal modules.

Remote Modules

The UMC carrier can hold up to seven remote module interface (RMI) circuit packs (TN456). Remote modules are supported by System 85 and universal and traditional modules in the DEFINITY Generic 2 system. Call control uses fiber-optic links with a central-to-remote range of up to 25,000 ft. Remote modules with optically-remoted peripheral interfaces (ORPI) for attendant consoles have a maximum range of 13,000 ft.

Detailed information on the installation of remote modules is available in the *DEFINITY™ Communications System Generic 2 and System 85 Installation* (555-104-120).

SYSTEM ADJUNCTS

DEFINITY Generic 2 with universal modules supports a number of applications processors that enhance the switch with administrative and application functions that do not reside on the switch. lncluded among these are Audio Information Exchange (AUDIX), 3B2, 3B5, and Adjunct Processor 16 (APl6).

AUDIX

The AUDIX system is compatible with all versions of System 85 and DEFINITY Generic 2.

More detailed descriptions of AUDIX appear in the *AUDIX Reference Manual* (585-300-201).

APs

APs are compatible with R2V4 and DEFINITY Generic 2 with either traditional or universal modules.

Auxiliary Cabinet

The function of the auxiliary cabinet for DEFINITY Generic 2 with universal modules is the same as it is for R2V1-4 and DEFINITY Generic 2 with traditional modules. Refer to *About This Document* for specific information on installation.

New Common Cabinet (J58886N-2) is used with new shipments of System 85 and G2 with traditional or universal modules. Cables can be run into cabinet using 2-sided, vertical cable troughs, eliminating the need for connector panels in many cases. Consult with the NEC to determine specific termination field requirements.

CROSS-CONNECT FIELDS

The DEFINITY Generic 2 with universal modules uses System 75 port board technology and has 500 pairs per carrier and 3 carriers per module. This creates significant differences in wall-field design from that used in System 85 and DEFINITY Generic 2 with traditional modules. See chapter 7, *MDF/IDF Design: DEFINITY Generic 2 with Universal Modules,* for more information on wall-field design for DEFINITY Generic 2 with universal modules.

TERMINALS AND TERMINAL ADJUNCTS

Physical and functional descriptions for prospective customers, account teams, and others who need specific information on universal terminals and terminal adjuncts for Generic 2 with universal modules are listed in *About This Document* under *Related Resources.*

CONNECTIVITY

Connectivity for DEFINITY Generic 2 with universal modules is similar to that of System 85 and DEFINITY Generic 2 with traditional modules. A major difference is the use of unshielded M-F B25A cables to connect the switch to the male-connectorized cross-connect field wherever possible. Previously installed systems may require M-M A25D connectorized cables. (See figure 1-1, *System* 85 *and DEFINITY Generic 2 with Traditional Module Connectivity,* for a typical connectivity configuration.)

MAJOR COMPONENTS—SINGLE CARRIER MODULE

The single carrier module (SCM) introduces new cabinetry and equipment into the G2 environment:

- The SCM is designed as a remote module only and cannot support other remote modules.
- Each SCM can accommodate one to three single carrier port cabinets to support the port complex.
- The module control is duplicated in a single carrier.

Cabinet Types

The main components of the SCM are the single carrier module control cabinet (SCMCC) and the single carrier port cabinet (SCPC). A full, four-cabinet SCM stack contains one SCMCC and three SCPCs.

SCMCC (J58890P)

The SCMCC provides module processing functions similar to those of the UMCC (universal module control cabinet) but can only be used as a remote module. Each SCMCC houses the universal module control and contains the equipment required to support one unduplicated or one duplicated module control complex. This cabinet contains the hardware that allows the CC to interrogate and scan the ports, send instructions to them, and create transmission path connections. The SCMCC uses existing module control circuit packs and acts as an intelligent interface between the CC and the ports. At least one SCMCC is required for each SCM.

SCPC (J58890H)

The SCPC supports the port network complex of the SCMCC stack. The cabinet uses existing port and tone circuit packs and provides space for 18 universal port packs and a dedicated power supply. An SCM can support up to three SCPCs, but must always have at least one.

7. MDF/IDF DESIGN: DEFINITY GENERIC 2 WITH UNIVERSAL MODULES

This chapter recommends the terminal blocks and frames best suited for constructing a main distribution frame (MDF) for the DEFINITY™ Generic 2 Communications System (hereafter abbreviated to *DEFINITY Generic 2* or *Generic 2)* with universal modules, presents the guidelines for their design, presents some guidelines for the intermediate distribution frame (IDF) design, and briefly discusses labeling for the MDFs and IDFs.

This chapter also presents some general guidelines, cross-connect hardware recommendations, and frame recommendations for designing IDFs. They are simplified because IDFs, unlike the MDF, vary greatly, and only the most general design guidelines can be applied.

RECOMMENDED TERMINAL BLOCKS

The 110A system is the one recommended type of AT&T cross-connect hardware for constructing Generic 2 MDF cross-connect fields.

The 110A comes in several models that are called terminal blocks. Each terminal block is composed of a wiring block and a unique combination of connecting blocks. A wiring block is where the equipment, distribution, or central office (CO) cables terminate. The connecting block, which snaps onto the front of the wiring block, is where the jumper wires are attached to establish a path from the pairs in one cable to the pairs in another cable.

In order to simplify the design of wiring installations, only two terminal blocks — the 110AB1-300 and the 110AB1-100 — are recommended for Generic 2 with universal modules. Generally, the 300-pair terminal block is preferred for the MDF. The IDF can be designed with the 100-pair or 300-pair blocks, or both.

The 110AB1-300 terminal block has a 300-pair wiring block, 60 4-pair connecting blocks, 12 5-pair connecting blocks, and six designation strips. You can order this terminal block in connectorized and field-terminated versions.

The 110AB1-100 terminal block has a 100-pair wiring block, 20 4-pair connecting blocks, four 5-pair connecting blocks, and two designations strips. You can order this terminal block in connectorized or field-terminated versions.

Table 7-1, *300-Pair Terminal Blocks,* gives the ordering information for 300-pair terminal blocks:

TABLE 7-1. 300-Pair Terminal Blocks

Product Code	Comcode	Height (in.)
ll0AB1-300FT*	104049051	10.79
110AB1-300CTM**	104409024	20.37
110AB1-300CBM†	104408091	20.37

NOTE: The meanings for the alphabetic suffixes to the model codes are as follows:
* Field terminated
** Connectorized w/male connector
† Connectorized bottom w/male

Table 7-2, *100-Pair Terminal Blocks,* gives the ordering information for the 100-pair terminal blocks:

TABLE 7-2. 100-Pair Terminal Blocks

Product Code	Comcode	Height (in.)
ll0AB1-100FT*	103823845	3.59
ll0AB1-100CT**	104408992	13.29
ll0AB1-100CTM†	104409008	13.29
ll0ABl-100CB‡	104408026	13.29
ll0AB1-100CBM§	104408075	13.29

NOTE: The meanings for the alphabetic suffixes to the model codes are as follows:
*** Field terminated**
**** Connectorized w/female connector**
† Connectorized w/male
‡ Connectorized bottom w/female connector
§ Connectorized bottom w/male

When you are enlarging an existing IDF or MDF constructed of terminal blocks other than those in table 7-1, *300-Pair Terminal Blocks,* and table 7-2, *1OO-Pair Terminal Blocks,* maintain uniformity in the field by using the same blocks for the expansion that were used for the initial installation. For new installations, use the previously described terminal blocks.

NOTE: 110A cross-connect blocks cannot accommodate patchcords.

Height Requirement for Terminal-Block Columns

When you lay out the columns of terminal blocks for the MDF, place no more than 1500 pairs (five 300-pair blocks in a column) for either frame- or wall-mounted installations. (See figure 7-1, *Maximum Column 1500 Pairs (Five 300-Pair Teminal Blocks).)* Taller columns are hard to reach and make connecting and disconnecting jumper wires difficult. Also, if horizontal space is limited, you may use 1800-pair columns for small installations as long as height does not present problems.

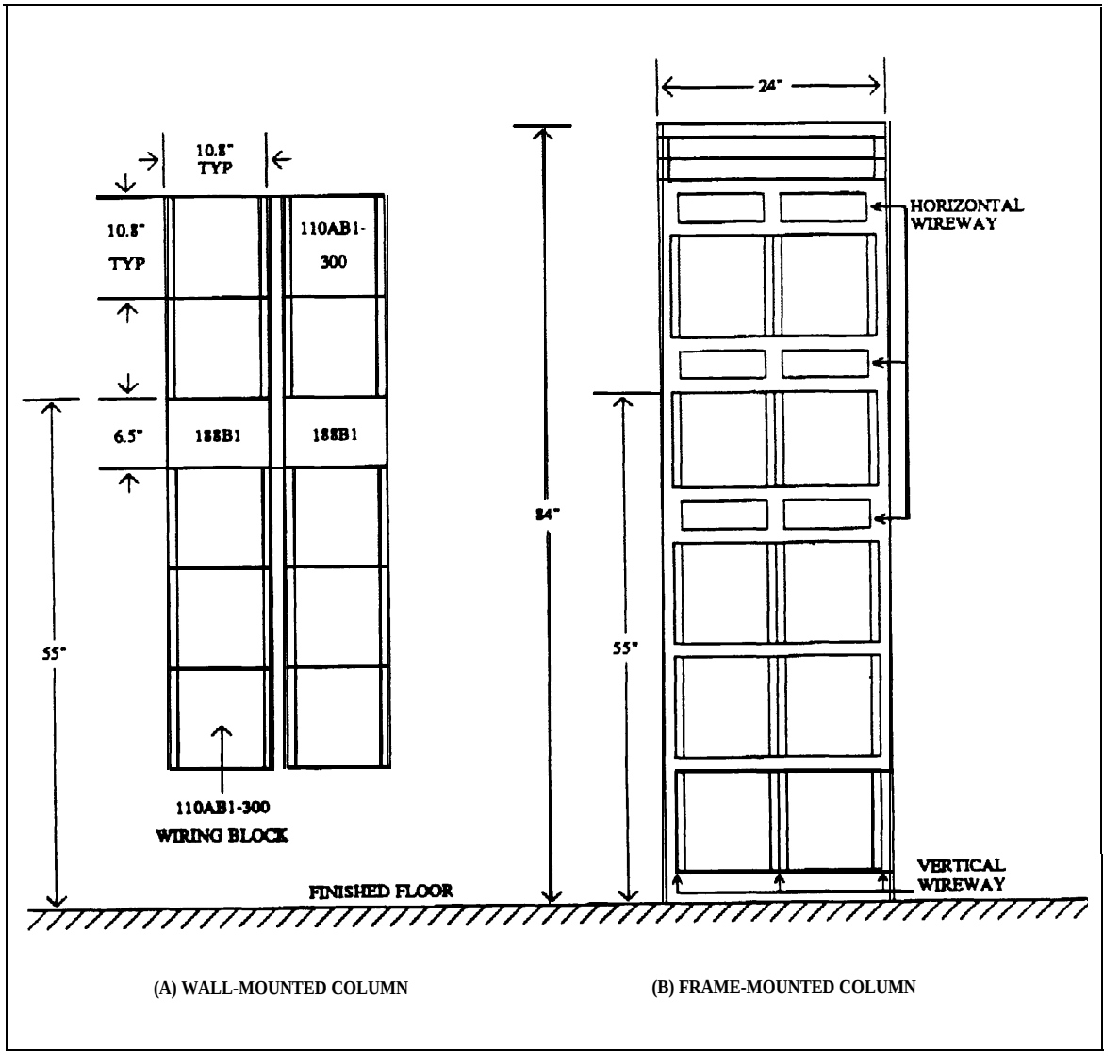
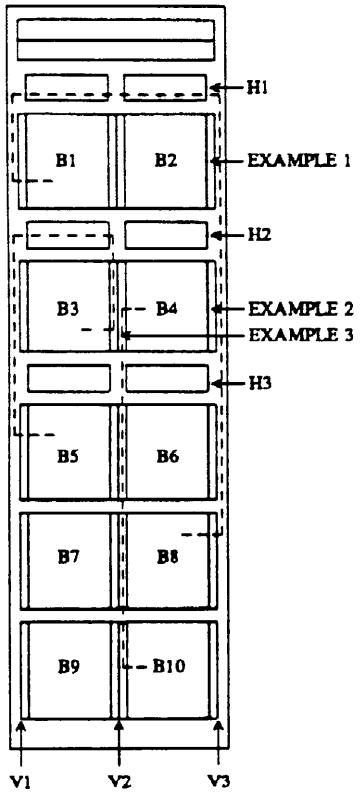


Figure 7-1. Maximum Column 1500 Pairs (Five 300-Pair Terminal Blocks)

Connecting Jumper Wires

To facilitate cross-connections, connect jumper wires as follows:

- Use the layout and instructions shown in figure 7-2, *Jumper Placement,* for the 110A terminal blocks. (Figure 7-2 illustrates a layout for frame mounting, but the layout applies to wall mounting as well.)
- Use only the number of jumpers required for a connection. There is no advantage in using a 3-pair for a 2-pair circuit.
- Make sure that 80% of the jumpers are less than 20 ft long. This can be done in the largest of installations, as described under *Designing the MDF* earlier in this chapter.
- Maintain clean contacts on the terminal blocks by using a spudger tool (110 tool; comcode 405423260). Clean contacts by:
  - — Removing jumpers with a perpendicular motion from the connecting block
  - — Always using the spudger to clean the contacts immediately after you remove the jumper wires



Jumper Placement Rules:

- Index strips consist of a right and a left half. Dress pairs l to 12 to the left and dress pairs 13 to 25 to the right.
- Eliminate "spider webs" and use all horizontal wireways equally.
- Use small amounts of diagonal dress in the horizontal wireway system, if needed, but avoid diagonal dress during system installation.

Examples:

- Block B1, row 7, pair 10 to block B8, row 2, pair 24.

  B1 left, V1 up, H1 right, V3 down, B8 left.
- Block B4, row 6, pair 8 to block B10, row 2, pair 12.

  B4 left, V2 down, B10 right.
- Block B3, row 11, pair 16 to block B5, row 1, pair 1.

  B3 right, V2 up, H2 left, V1 down, B5 right.

Figure 7-2. Jumper Placement

RECOMMENDED FRAMES FOR TERMINAL BLOCKS

The extra-large building entrance terminal (XLBET) frame, which is manufactured at the AT&T Los Angeles Service Center, can be used for the MDF. The frame comes in single- and double-sided versions that are 84 in. high, 10 in, deep (single-sided) to front edge of wireway with rear foot removed, 20 in. deep (wireway-to-wireway), and 24 in. wide. (All frame illustrations shown in this document are the standard 84-in. high frame. You may use taller frames in special circumstances as explained below in *Customization,)*

Several characteristics make the AT&T frames preferable when installing a Generic 2 with universal modules. They are:

- *Frontal connectorization.* AT&T frames have specially designed connector panels located at the front and top.

  NOTE: Connector mating on any type of trough or ladder rack is prohibited.

- *Color selection.* AT&T frames are manufactured in the same colors as AT&T equipment cabinets. The color match of the frames and cabinets considerably enhances the appearance of an installation.
- *Ordering simplicity.* AT&T frames are easy to order: you submit one comcode to obtain the frame and the terminal blocks, which come assembled as a complete unit. You only order ladder racks and insert labels separately.
- *Customization.* You can order AT&T frames in special heights to accommodate connector panels, equipment rooms with high ceilings, or equipment rooms with raised floors. Also, you can order frames fitted with mountings for protector units.

Whenever possible, use the XLBET frames, either self-supported or wall-mounted, for the MDF. The benefits and advantages, for both the customer and AT&T, of easier ordering, better aesthetics, and easier connecting and disconnecting of jumper wires more than offset the slightly higher cost over wall modules. For systems larger than five modules, try to design the MDF with self-supported frames. Self-supported frames allow the most flexibility for handling jumper wires and permit the most efficient cable terminations. But whether the frame is wall mounted or self supported, attempt to use one of the two types of XLBET frames discussed below.

Type-1 Frame

The type-1 frame shown in figure 7-3, Six *Type-1 Frames with 18,000-Pair Capacity,* is the most widely used. You can terminate 3000 cable pairs on each side. Cross-connections on the type-1 are made between the top and the bottom of the frame. This means that all equipment cables are connected to the top half of the frame and all distribution cables to the bottom half. Exceptions occur only at the green (CO) and yellow (miscellaneous) fields.

The type-1 frame is most suited for lineups not exceeding nine frames, although it can be used for larger lineups if necessary. (A discussion of its use in large lineups appears under *Designing the MDF* later in this chapter.)

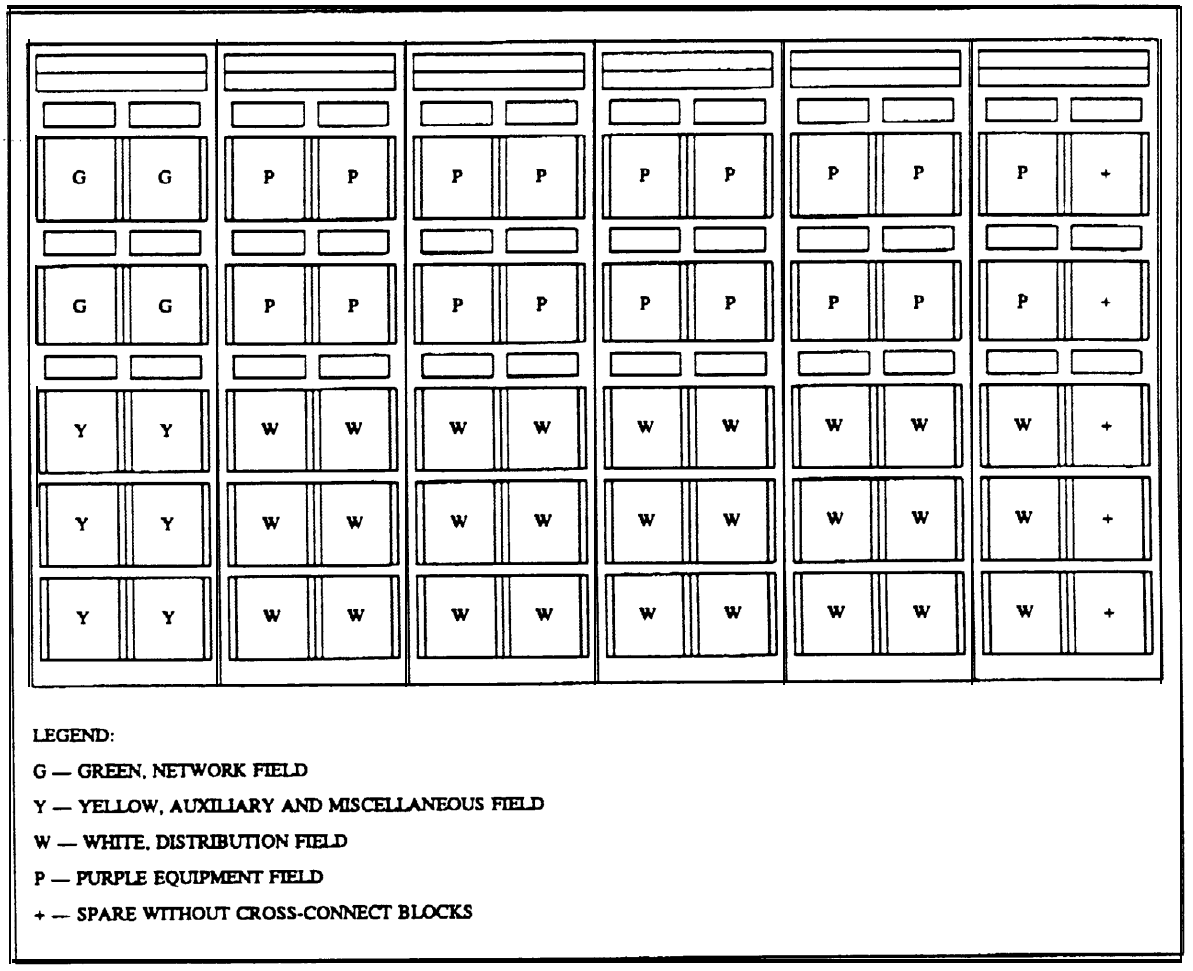


Figure 7-3. Six Type-1 Frames with 18,000-Pair Capacity

Type-2 Frame

The type-2 frame shown in figure 7-4, *Seven Type-2 Frames with 16,800-Pair Capacity,* has added jumper capacity. You may terminate 2400 pairs on each of its sides. Cross-connections on the type-2 frame can be made either from top to bottom or from side to side, depending on the size and shape of the installation.

Use the type-2 frame for large installations that require more than nine frames in a lineup.

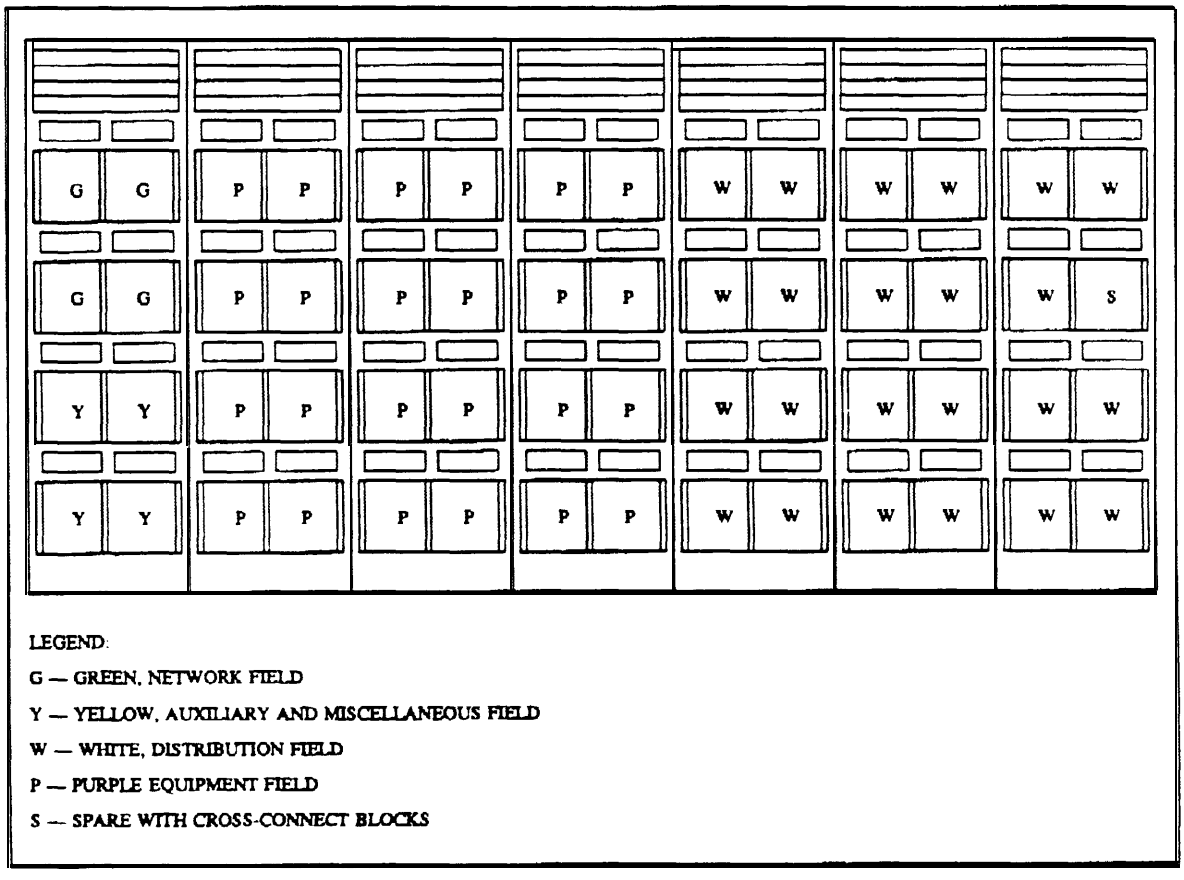


Figure 7-4. Seven Type-2 Frames with 16,800-Pair Capacity

Ordering

The service center ships all frames with terminal blocks as one comcode. Frames ordered for 110A hardware come with 110AB1-300 terminal blocks, clear designation strips, and wireways installed. You must order insert labels and ladder racks separately.

Order type-1 and type-2 frames and connectors according to table 7-3, *Type-1 Frame Ordering Information,* and table 7-4, *Type-2 Frame Odering Information.*

TABLE 7-3. Type- 1 Frame Ordering Information

Comcode	Top	Bottom	Remarks
105 639 561	1200-pair connectorized with male tops	1800-pair field field terminated.	Single sided.
105 639 538	2400-pair connectorized with male tops	3600-pair field field terminated.	Double sided.
105 174 148	600-pair connectorization	—	Kit for the above frames. Order one for single-sided and two for double-sided.
105 689 475	3000-pair field terminated	—	110C connector must be ordered separately.
105 728 414	6000-pair field terminated	—	110C connector must be ordered separately.

TABLE 7-4. Type-2 Frame Ordering Information

Comcode	Style	Remarks
105 689 491	2400-pair male connectorized	Single sided.
105 689 483	2400-pair field terminated	Single sided.
105 730 212	4800-pair male connectorized	Double sided.
105 730 113	4800-pair field terminated	Double sided.

DESIGNING THE MDF

Designing the MDF is a two-step process. First, determine the size of the MDF. Second, construct the MDF. As you proceed with the design, keep in mind that function is more important than cost in reaching a final decision since it is possible for the final installation to be inexpensive but nonfunctional. A design that imposes operational limits to save costs may prove less desirable in the long run. Use your site analysis to compare alternatives and arrive at the best solution in terms of both function and cost.

Since the design of the MDF affects the design of the equipment room, be sure that your completed design for the MDF is compatible with your equipment room plans or with the room that you have selected for the MDF location. (When designing the MDF for a raised-floor installation, follow the instructions under *Designing the MDF for a Raised Floor* in this chapter.) Figure 7-5, *Overall Equipment Wiring Plan: DEFINITY Generic 2 with Universal Modules,* shows the overall equipment wiring plan for Generic 2 with universal modules based upon the standard star configuration.

Sizing the MDF

The MDF is the largest cross-connect field of the wiring installation. It is where the incoming trunk cables terminate and cross-connect to the trunk ports of the switch and where the building distribution cables cross-connect to the line ports of the switch. The MDF consists of four fields: network services/CO trunks (green), auxiliary and miscellaneous (yellow), distribution (white), and equipment (purple).

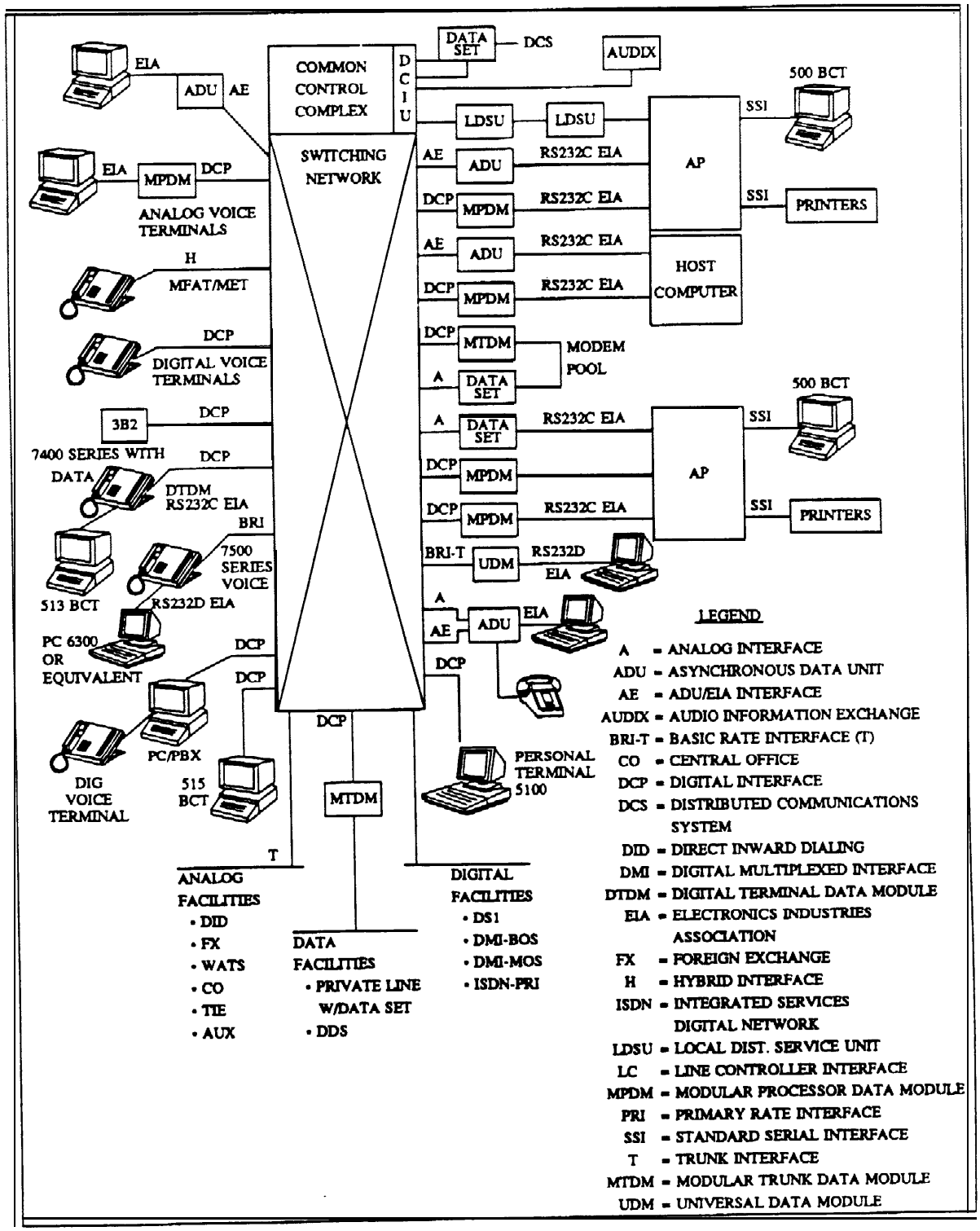


Figure 7-5. Overall Equipment Wiring Plan: DEFINITY Generic 2 with Universal Modules

Two factors govern the size of the MDF: the number of cable pairs to be terminated and the type of cross-connect hardware used. Since the recommended cross-connect hardware for Generic 2 with universal modules is the 110A, you need only to calculate the number of cable pairs that must terminate on the MDF and the number of 110A cross-connect blocks needed to terminate those pairs to arrive at the size of the MDF.

This section helps you calculate the number of cable pairs terminating at the MDF by determining what effect the four major fields of the MDF have on its size. These four fields are as follows:

- Network services (CO trunks) field with green labels
- Auxiliary equipment and miscellaneous field with yellow labels
- Equipment (switch) port field with purple labels
- Distribution field with white labels

A fifth field, with blue labels, may be required for some installations. This field terminates 4-pair installation cables that connect the MDF directly to the information outlets (IOs)at workstations.

The guidelines for sizing each field follow.

Network Services (CO Trunks) Field

The network services field uses green labels; it terminates CO cables. Cabling for analog network services is cross-connected to the green field from an RJ21X or an RJ2GX interface. This cabling requires sneak-current protection in addition to the standard electrical protection that the telephone company provides.

The total number of pairs in the network services cable is governed by the number of pairs that the customer needs to connect to the network. It is also governed by the number of pairs that the telephone company supplies. For example, if the customer needs to connect 750 pairs to the network, and the telephone company supplies a 900-pair cable, the green field must be sized to terminate 900 pairs.

For some installations, digital signal level-1 (DS1) transmission capabilities also may be needed. When the DS1 connection is part of the installation, then a digital signal cross-connect (DSX) may be required. If a DSX is required, use the 800 series DSX as described in *800 Series DSX — General Description, DSX System* (365-301-102).

Auxiliary Equipment and Miscellaneous Field

The auxiliary field uses yellow labels; it terminates auxiliary equipment cables. This includes emergency transfer units, recorded announcement units, recorded dictation units, loudspeaker paging units, and radio paging units. The auxiliary field also accommodates miscellaneous cabling that is not associated with ports, such as cables from CC cabinets, console cables, and alarm cables. Therefore, the size of the yellow field varies depending on the amount of auxiliary equipment installed and the number of miscellaneous cables terminated.

Allocate space on the yellow field for the termination of a minimum of 300 pairs. Allocate additional space in 300-pair groups for each auxiliary cabinet installed with the system. Increase the field size beyond these minimums as actual needs dictate.

Equipment (Switch) Port Field

The equipment port field uses purple labels; it terminates equipment port cables. Two factors govern its size. The first is the type, usage, and number of port carriers. The second is module needs, since all ports from an equipment module must be colocated.

Modules usually contain the same number of port carriers. To calculate the number of wiring blocks required for the entire port field, multiply the number of modules by the number of wiring blocks required to serve one module.

Each common port carrier (CPC) requires twenty 25-pair cables (500 pairs total) at the cross-connect field. Since the 110A blocks recommended for the MDF contain 300 pairs, two blocks are needed to accommodate the 500 pairs of each CPC. Figure 7-6, *CPC Wall Field Configuration*, displays the recommended configuration of 110A blocks for each CPC. This configuration leaves 100 unused pairs that can be used as needed.

A Generic 2 with universal modules uses the universal module control (UMC) cabinet containing space for three CPCs (J58890BB), therefore space must be provided to serve all three carriers, whether they are used or not. Allow for the termination of 1800 pairs for the port field. Increase or decrease the number in 300-pair increments according to actual needs.

NOTE: Use the same rules for designing single carrier port cabinet (SCPC) installations, but note that there will be eighteen 25-pair cables from each cabinet. These eighteen cables will translate into 450 pairs on two 110A-300 blocks at the cross-connect field, plus 150 spare pairs. Be sure to install enough 110A blocks to serve all three SCPC of the single carrier module whether they are used or not, that is, allow for termination of 1800 pairs on the port field.

If the system contains both universal and traditional port boards, the MDF will have to be designed to accommodate both types of boards. If you are upgrading a system from System 85 to DEFINITY Generic 2, use existing MDF hardware except for patch cords. New systems are connectorized or field-terminated only.

NOTE: If traditional modules are part of the Generic 2 installation, their use is limited to services other than ports. Traditional modules require no termination at the cross-connect field.

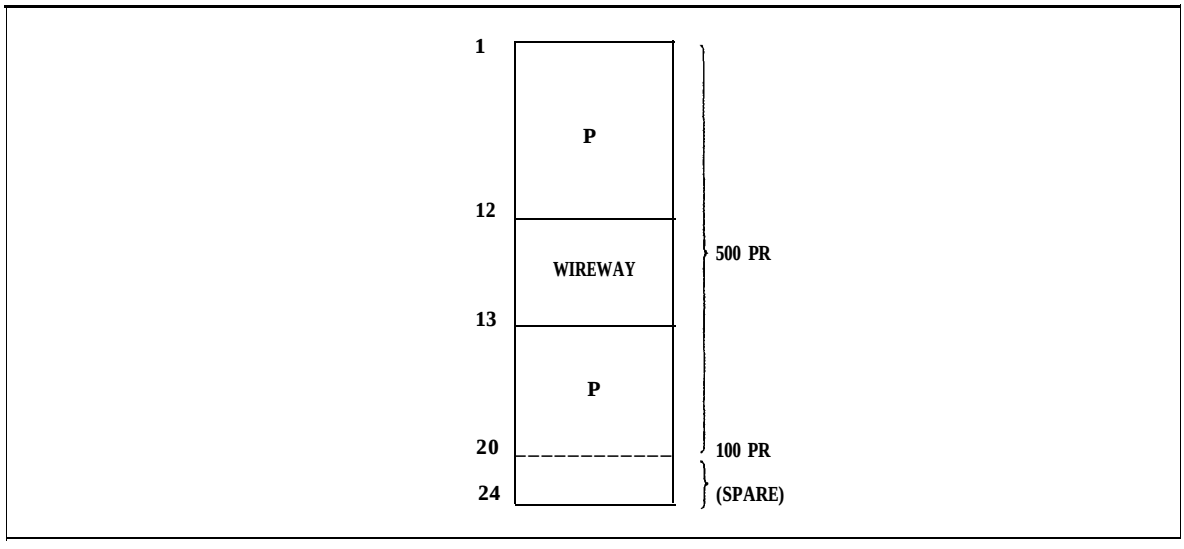


Figure 7-6. CPC Wall Field Configuration

Distribution Field

The distribution field uses white labels; it is where all distribution cables terminate. Distribution cables are the cables that run from the MDF in the equipment room to the IDF in the closets. (They are sometimes called "house," "backbone," "riser," "campus," or "black" cables. This document calls them distribution cables.)

The *Premises Distribution System Design Guide* (555-400-602) presents several approaches to sizing the distribution cables based upon the needs of the customer. These approaches apply to the sizing of distribution cables for a Generic 2 universal system, with the following exceptions:

- Size the distribution cable so that each workstation is allotted a minimum of two cable pairs.
- Allow the 25th pair in each 25-pair bundle to serve as a spare.
- Allot three cable pairs for each workstation if the customer requests single-point administration.
- It is recommended that you terminate large numbers of spare pairs requested by the customer on a specially designated area of the MDF. This guideline is recommended for efficiency since the spare pairs artificially increase the size of the distribution field.

Installation Cable Field

The installation cable field uses blue labels; it is where IO cables terminate directly on the MDF. (Remote-module MDFs require fields labeled purple and blue when installation cables are connected directly to them.) When the installation cable terminates in the equipment room, size it and plan for its termination as you would for closet terminations. Allotting one 4-pair D-inside-wiring (DIW) cable for each workstation. Allot two 4-pair DIW cables for those workstations that use a separate IO for a data connection.

NOTE: When a blue field is used, the blue field cross-connects directly to the purple field and not to the white field.

Terminate only six 4-pair DIW cables to each index strip of a 110AB1-300 wiring block (the 25th pair is unused), which means that you can terminate a maximum of 72 4-pair DIW cables on each 300-pair wiring block.

Although the termination of 72 4-pair DIW cables leaves 12 unused pairs, you must add an additional block to terminate more pairs. For example, to terminate 75 4-pair DIW cables, you would use two blocks instead of one.

Constructing the MDF

Once you have calculated the number of cable pairs needed for each of the MDF areas and converted them to the number of 300-pair blocks needed, decide the following:

- Where to locate the MDF
- How to mount the terminal blocks
- How to arrange the terminal blocks
- How to connect to the terminal blocks

Locating the MDF

Locate MDF as close to the switch cabinets as possible. The preferred location is in the equipment room, but if space is not available, locate it in a separate area within 20 to 30 ft of the equipment room.

Orient the MDF so that the distribution cables can be routed to it as directly as possible.

Mounting the Terminal Blocks

You can mount the MDF hardware in one of the following three ways:

- Directly to a wall
- On a wall-mounted frame
- On a self-supported frame

Table 7-5, *Mounting Methods.* is a mounting guide for the number of modules appropriate for each mounting method. Remember to factor in available space with the number of modules when you select your mounting method.

TABLE 7-5. Mounting Methods

Number of Modules	Method of Mounting		
	Wall	Wall Frame	Self-Supporting
1 - 5	x	x	
5 - 8		x	x
9 & up			x

Frame mounting of the terminal blocks for installations of all module sizes is desirable but those of 9 modules or more must be frame mounted.

Arranging the Terminal Blocks

Arrange the terminal blocks with the following factors in mind:

- Cable terminations to the fields and how the fields cross-connect
- The type of port fields and the necessity for short jumper lengths
- Possible zone configurations

These factors are discussed in the sections that follow.

Cable Terminations and Cross-Connections. Terminate the equipment port cables close to the distribution cables, as suggested in figure 7-7, *Four-Area MDF,* to make connecting and disconnecting the jumper wires as easy as possible. Figure 7-7 is only a possible configuration; vary the field design if it is more useful for a particular application.

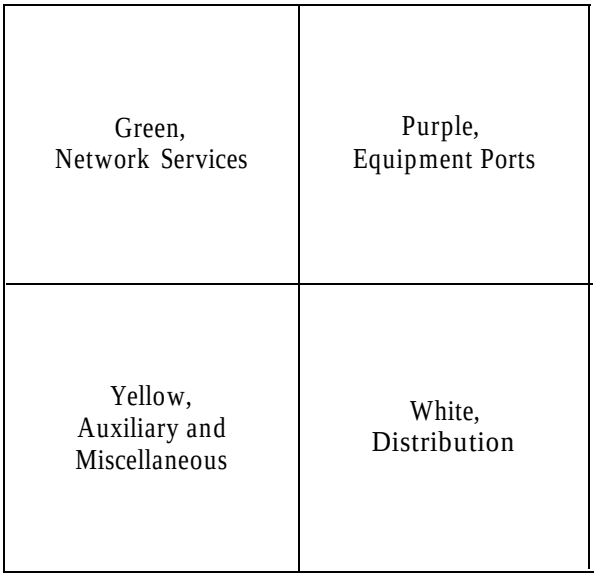
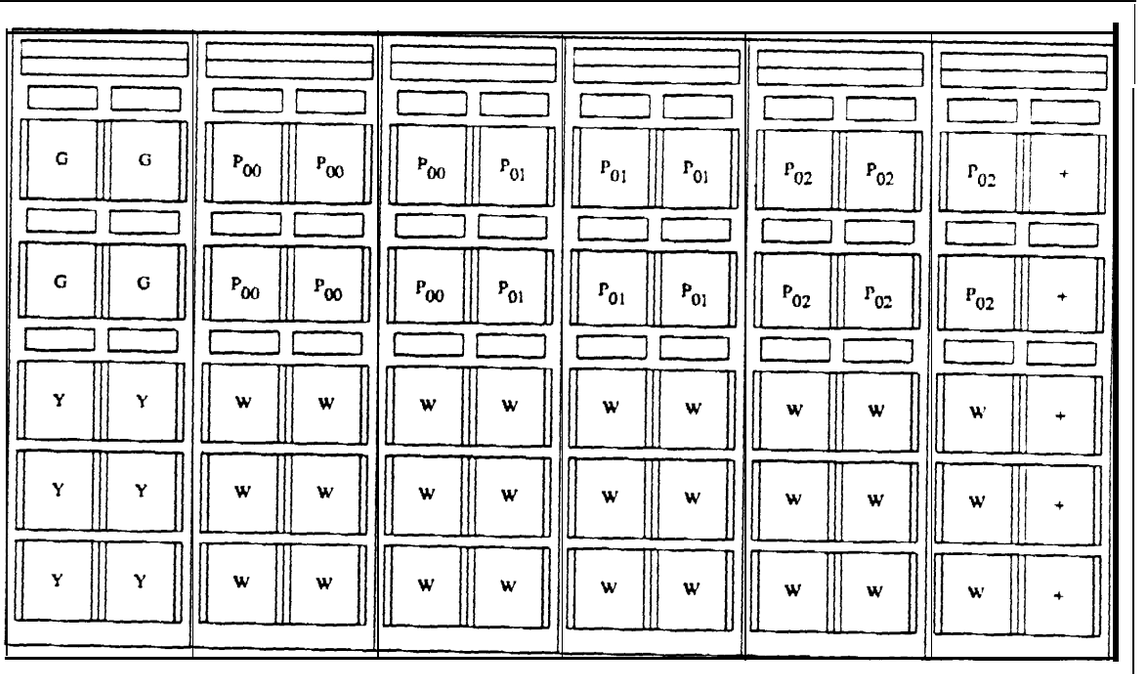


Figure 7-7. Four-Area MDF

When 4-pair installation cables and spare cables or cables dedicated to systems terminated on the MDF other than Generic 2 with universal modules are terminated on the MDF, add two more fields to the arrangement.

Port Fields and Short Jumper Lengths. For most installations, combine the line and trunk fields to accommodate the CPC, as shown in figure 7-8, *Combined Trunk and Line Ports.*

Some fields may be better arranged with separated port and trunk blocks, as shown in figure 7-9, *Separated Trunk and Line Ports.* Use space for port trunks sparingly in large installations.



LEGEND:

G — GREEN, NETWORK FIELD

Y — YELLOW, AUXILIARY AND MISCELLANEOUS FIELD

W — WHITE, DISTRIBUTION FIELD

P — PURPLE, EQUIPMENT FIELD

+ — SPARE WITHOUT TERMINAL BLOCKS

Figure 7-8. Combined Trunk and Line Ports

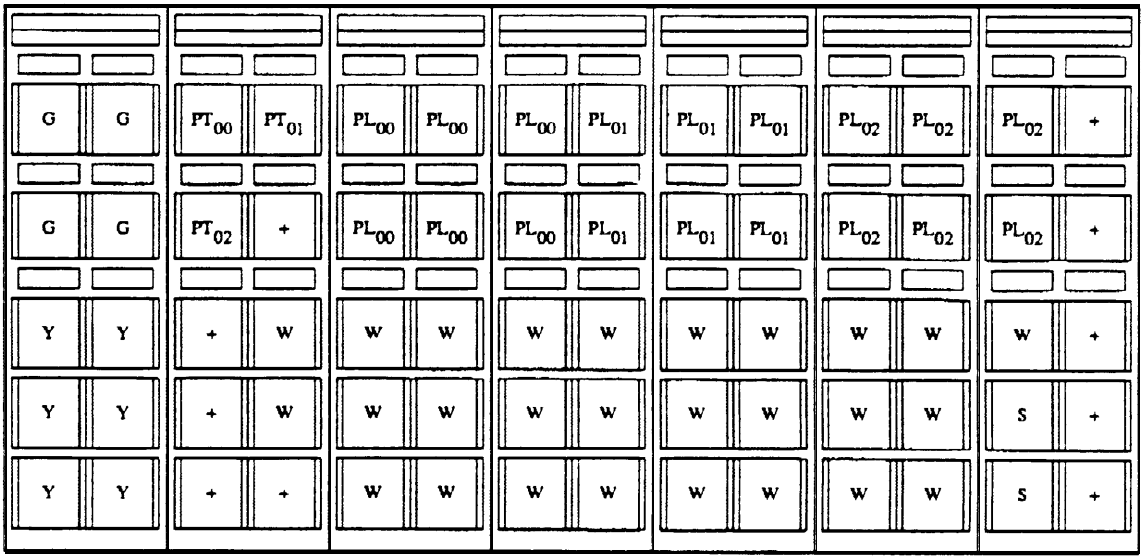


Figure 7-9. Separated Trunk and Line Ports

Zone Configurations. When a large number of frames are required to construct an MDF, the task of connecting and disconnecting jumper wires can become difficult for two reasons. First, jumper wires of awkwardly long lengths are needed to make cross-connections between the extreme ends of the frame lineup. Second, the necessity to make cross-connections between the ends of the frame lineup can cause an overflow of jumper wires in the wireways of the middle frames.

To avoid these problems, frame lineups that exceed 16 ft and terminate more than eight modules are divided into zones. A zone is a section of the MDF that has a maximum horizontal distance of 16 ft. Cross-connections can be made only between the cables that terminate within the same zone. This keeps the jumper wires short and easily manageable.

When the MDF is more than 16 ft wide and terminates cabling from six or more modules, you must:

- Divide the cable terminations from the modules among the zones according to table 7-6, *Module Allocation per Zone with Type-1 Frame,* or table 7-7, *Module Allocation per* Zone *with Type-2 Frame,* depending upon the type of frame you are using.

- Divide the terminations of the distribution cables among the zones in 100-pair increments.

(described earlier in this chapter under *Recommended Frames for Terminal Blocks)* may be used for a zoned MDF that is terminating up to 10 modules. Table *7-6, Module Allocation per Zone with Type-1 Frame,* shows the number of modules allocated per zone when you design an MDF with a type-1 frame. Each type-1 frame can accommodate 3000 jumper pairs per side. Figure 7-10, *Zone Arrangement of Type-1 Frame — Plan View,* and figure 7-11, *Zone Arrangement of Type-1 Frame — Front View, Zone 2.* show a type-1 frame used in a zone arrangement.

NOTE: Type-1 frames are not recommended for greater than 10 modules.

TABLE 7-6. Module Allocation per Zone with Type-1 Frame

Number of Modules	Number of Zones	Number of Modules for Zone
1-5	1	1-5
6	2	3,3
7	2	4,3
8	2	4,4
9	2	5,4
10	2	5,5

NOTE: Custom-engineer all installations over 10 modules.

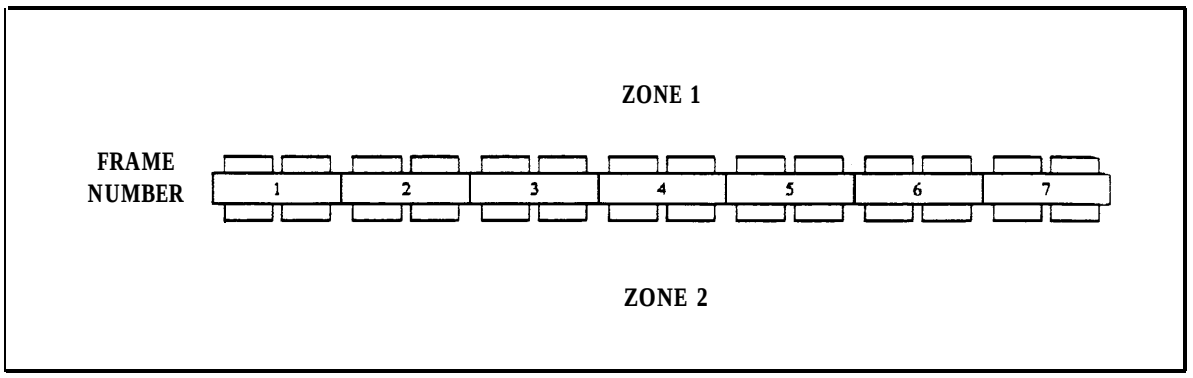


Figure 7-10. Zone Arrangement of Type-1 Frame — Plan View

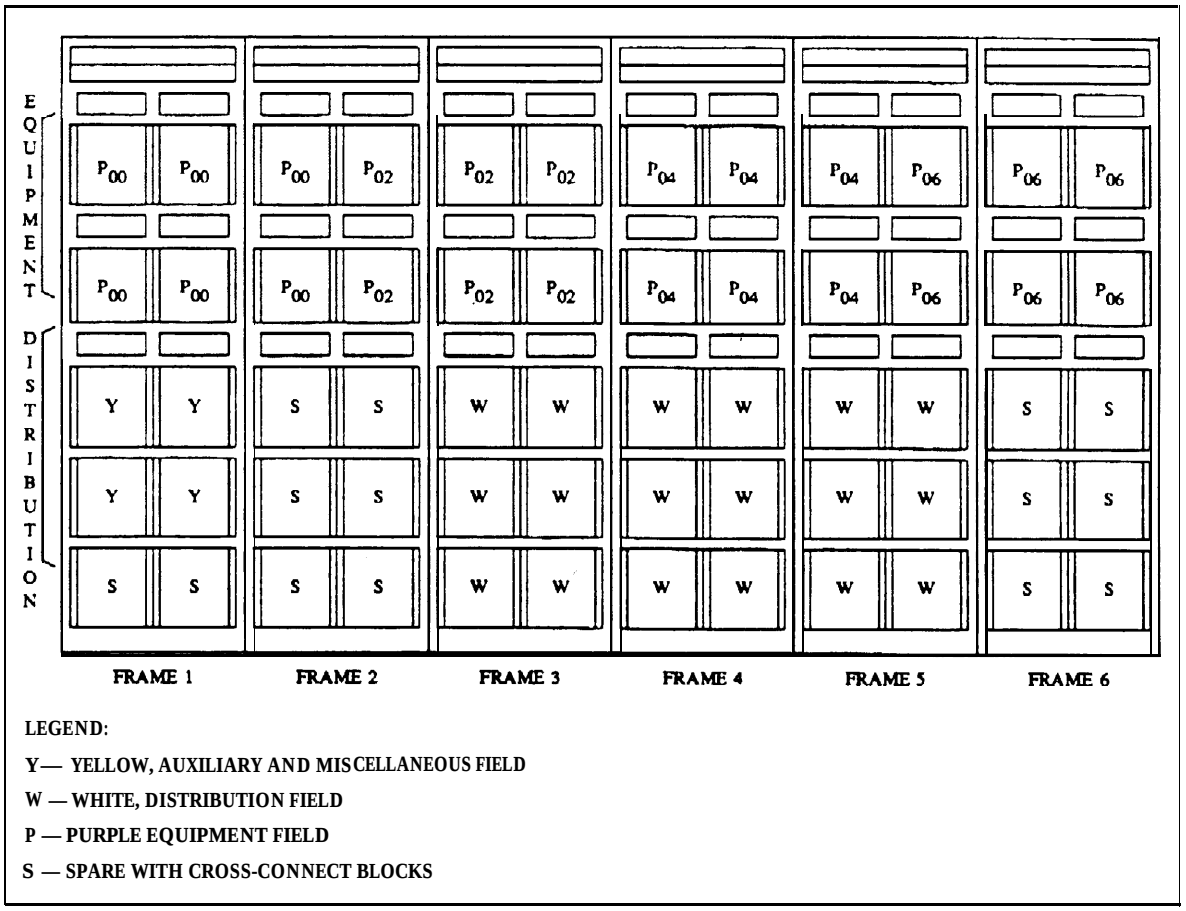


Figure 7-11. Zone Arrangement of Type-1 Frame — Front View, Zone 2

Use the type-2 frame (described earlier in this chapter under *Recommended Frames for Terminal Blocks)* to design a zoned MDF that is terminating up to 16 modules. Table 7-7, *Module Allocation per Zone with Type-2 Frame,* shows the number of modules allocation per zone when you design an MDF with a type-2 frame. Each type-2 frame can accommodate 4000 jumper pairs per side. Figure 7-12, *Zone Arrangement of Type-2 Frame — Plan View,* and figure 7-13, *Zone Arrangement of Type-2 Frame — Front View, Zone 2,* show a type-2 frame used in a zone arrangement.

TABLE 7-7. Module Allocation per Zone with Type-2 Frame

Number of Modules	Number of Zones	Number of Modules for Zone
1-8	1	1-8
9	2	4,5
10	2	5,5
11	2	5,6
12	2	6,6
13	2	6,7
14	2	7,7
15	2	7,8
16	2	8,8

NOTE: Custom-engineer all installations over 16 modules.

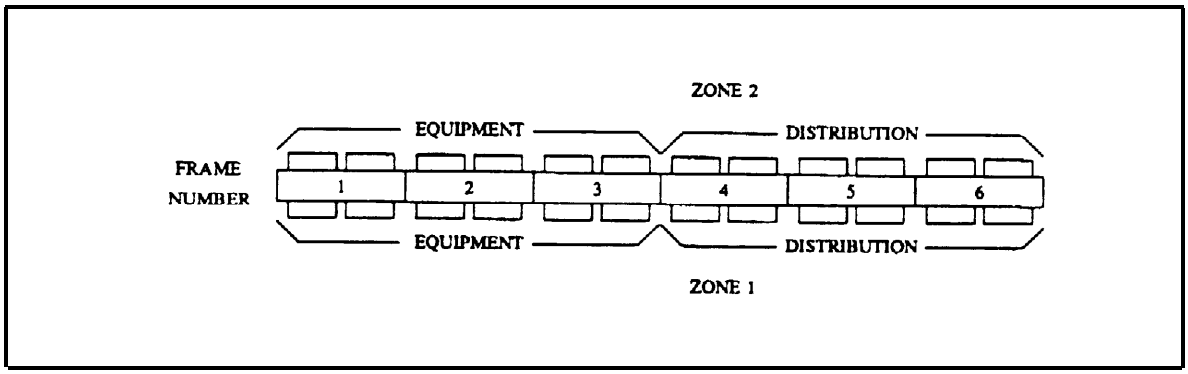


Figure 7-12. Zone Arrangement of Type-2 Frame — Plan View

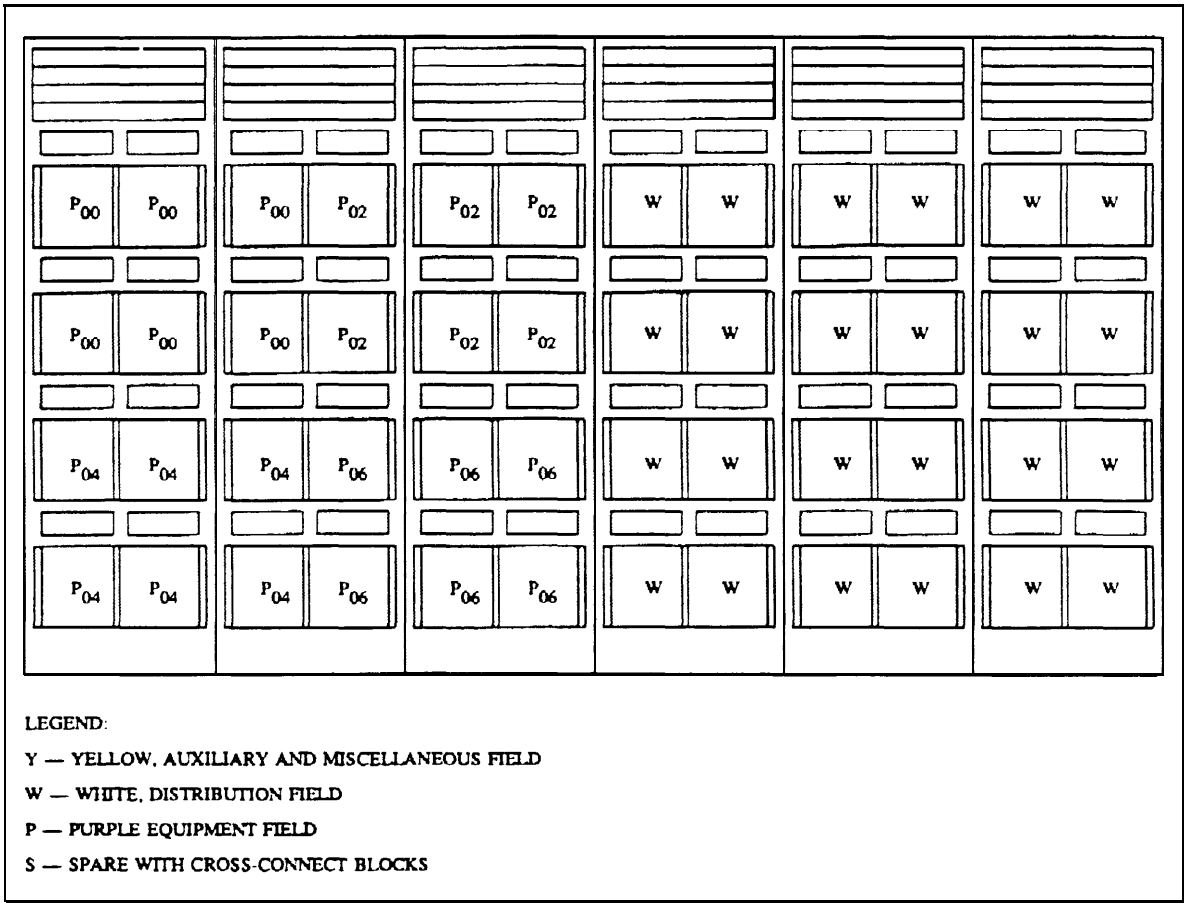


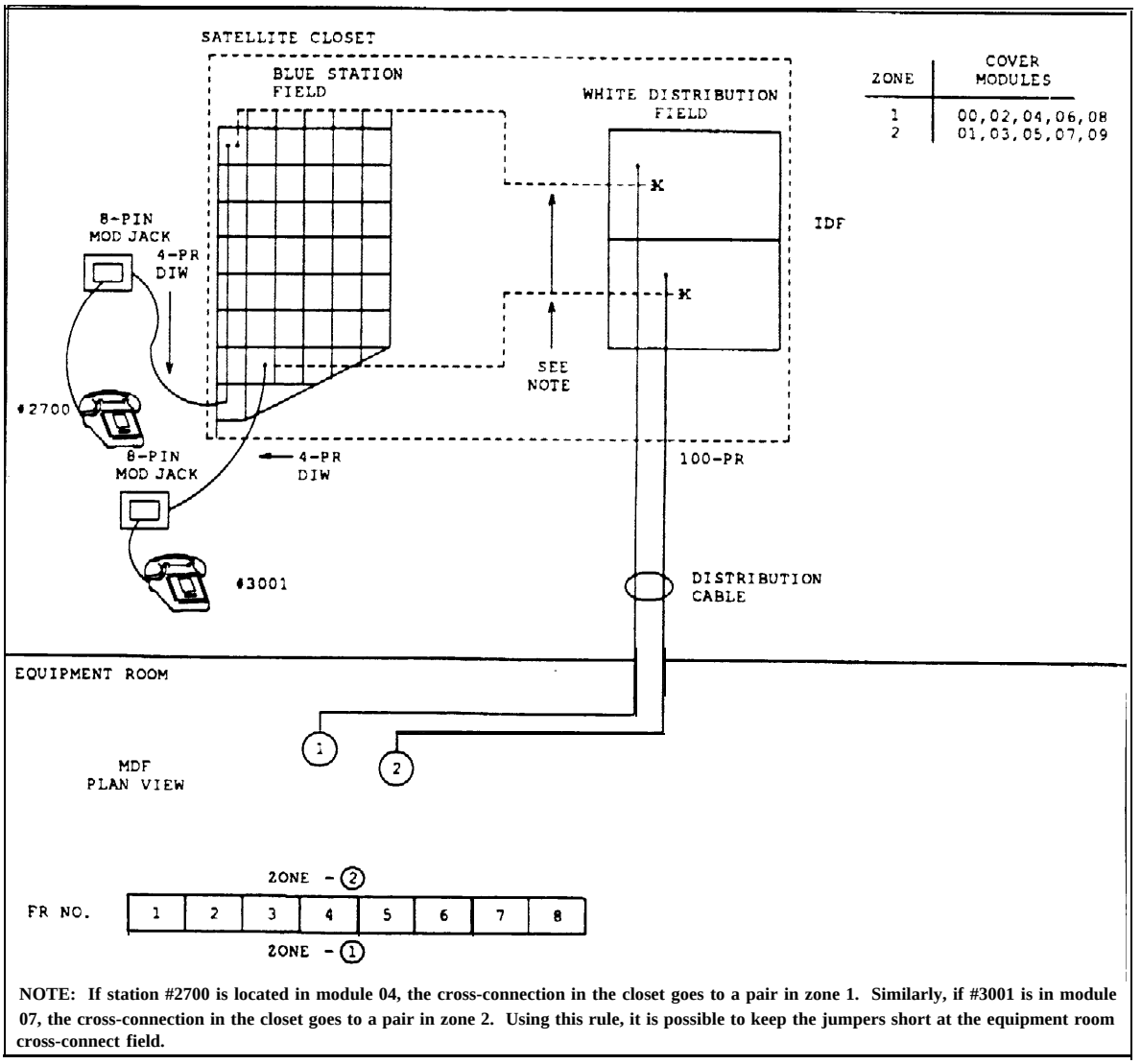
Figure 7-13. Zone Arrangement of Type-2 Frame — Front View, Zone 2

In addition to the preceding guidelines, observe these rules when designing zones:

- Mount the hardware on frames. For 1-zone installations, wall-mounted frames may be used. For 2-zone installations, double-sided, self-supporting frames must be used.
- Divide the distribution cables (in 100 pair increments) as equally between zones as possible. For example, assume that an installation has two zones and a 300-pair distribution cable. You would terminate 100 pairs at one zone and 200 pairs at the other.
- Do not add extra cable pairs to a distribution cable to achieve an equal number of terminations at all zones. That is, in the preceding rule you would not add 100 pairs to the 300-pair cable in order to terminate 200 pairs at both zones.
- Do not spread the equipment ports at the MDF, keep them in the same area.

When you use zones in the equipment room, the proper cross-connections at the IDF are crucial. Figure 7-14, *Closet Cross-Connects Using Type-1 Frames,* illustrates IDF cross-connections of distribution cables originating from two different zones in the equipment room. Make sure that you label the IDF cross-connections as follows:

- IO number for an extension
- Equipment line location (ELL) number for that extension
- Module number for that ELL



NOTE: If station #2700 is located in module 04, the cross-connection in the closet goes to a pair in zone 1. Similarly, if #3001 is in module 07, the cross-connection in the closet goes to a pair in zone 2. Using this rule, it is possible to keep the jumpers short at the equipment room cross-connect field.

Figure 7-14. Closet Cross-Connects Using Type-1 Frames

Connecting to Terminal Blocks

The 110A cross-connect hardware is available with connectors or without connectors. The determination of whether to use connectorized or field terminated cross-connect hardware is best made at the site, but in general, the following guidelines apply:

- Use cross-connect hardware without connectors (for field terminations) for distribution cables.
- Use cross-connect hardware without connectors (for field terminations) for equipment cables for systems over five modules.
- Use cross-connect hardware with connectors for equipment cables for systems of one to five modules.

NOTE: The connector gender of the unshielded B25A cables supplied with Generic 2 universal modules is male-to-female (M-F) with the male end connecting to the switch. To connect Generic 2 universal modules to a wall-field with female plugs already installed, use the A25D male-to-male (M-M) connector.

If connector-type cross-connect hardware is used for connecting equipment cables, make sure that you order the correct hardware.

Synchronization Clock

The synchronization clock provides enhanced network synchronization and improved transmission performance in digital networks.

The clock can be connected to either duplicated or unduplicated systems. An unduplicated module or TMS requires wall field space for 125 pair (5 cables) in consecutive blocks; a duplicated module or TMS requires space for 150 pair (6 cables) in consecutive blocks.

The clock should be connected to the auxiliary equipment and miscellaneous field, that is, the yellow portion of the wall field. There are three ways to establish the yellow wall-field cross connection. In order of preference they are as follows:

- Yellow field—Use a portion of this field that has not been dedicated to other equipment.
- Spare field—Convert spare field space to a yellow field dedicated to the clock.
- Custom installation—As a last resort, install a 110A-300 block dedicated to the clock on or near the MDF.

DESIGNING THE MDF FOR A RAISED FLOOR

A modem communications system is perceived by the customer to look like a computer installation. For this reason, some customers request that the communications systems installed in the equipment rooms be installed on raised flooring to conceal unsightly cabling and over-the-cabinet racks or ducts. Also, where communications systems are installed beside computer installations, the communications systems wiring must conform to the computer's installation wiring, which must be out of sight.

Using the raised-floor design may make installation time longer for systems of two modules or more and the same amount of time for single-module systems. Changes and additions also may take more time than the normal installations if cabling is involved. Several factors contribute to the increased time: some are logistical (such as removing tiles), some are engineering (such as detail design or structural considerations for frame mounting), and some relate to the installation of cables (such as storage of cable slack or dressing of cables via holes in the floor).

If you are required to design a raised-flooring MDF, use the following guidelines.

Before designing the layout of an MDF over a raised floor, take into account the following three issues that can affect the design:

- The use of raised floor space as an air plenum. The National Electric Code (NEC) prohibits the placement of cables that use ordinary covering materials, such as polyvinyl chloride (PVC) or polyethylene, in the building air plenums. However, when the raised floor is used as an air plenum the plenum typically serves only the raised-floor room, which permits the use of cables with ordinary cover materials in that space. On the other hand, if the local codes forbid the use of ordinary covering materials for the installation that you are planning, use ducts for such cables as the input/output (I/O) cables (which connect the switch to the MDF).
- Space availability under the floor. Is there adequate space for ducts and cables to be installed and what is under the raised floor—for example, electrical conduits, air conditioning ducts, water pipes?
- Modification of the floor tiles. Cutouts in floor tiles will have to be made to accommodate the MDF. Discuss this with the customer. Contact the NEC regarding final requirememts for cutouts in floor tiles. See figure 7-15, *Floor Template -18 Inch Tile (L-472366),* figure *7-16, Floor Template -* 24 *Inch Tile (L472367),* and figure 7-17, *Floor Template - Cabinet Lineup (L472368).*

Once you have resolved the preceding issues, use the following guidelines for designing frame installations, and the floor plan.

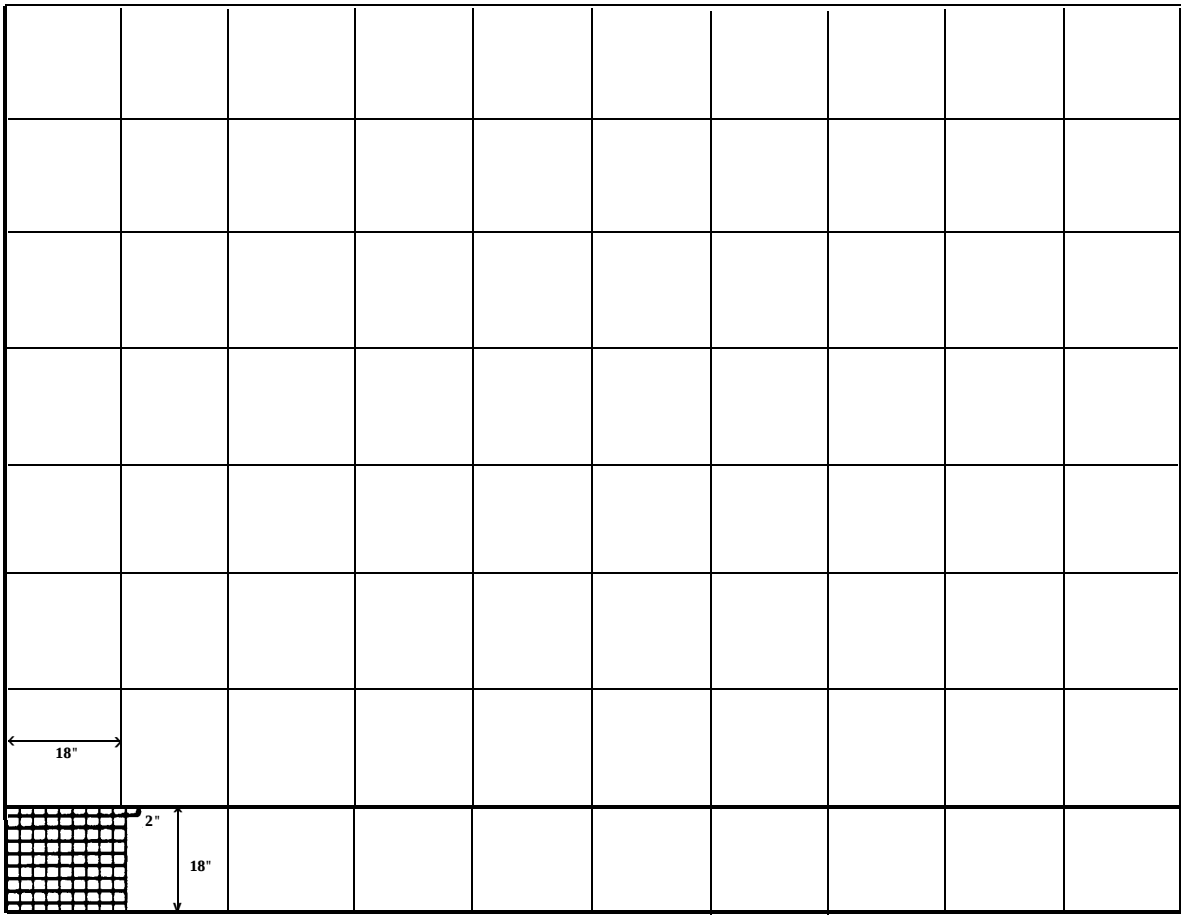


Figure 7-15. Floor Template -18 Inch Tile (L472366)

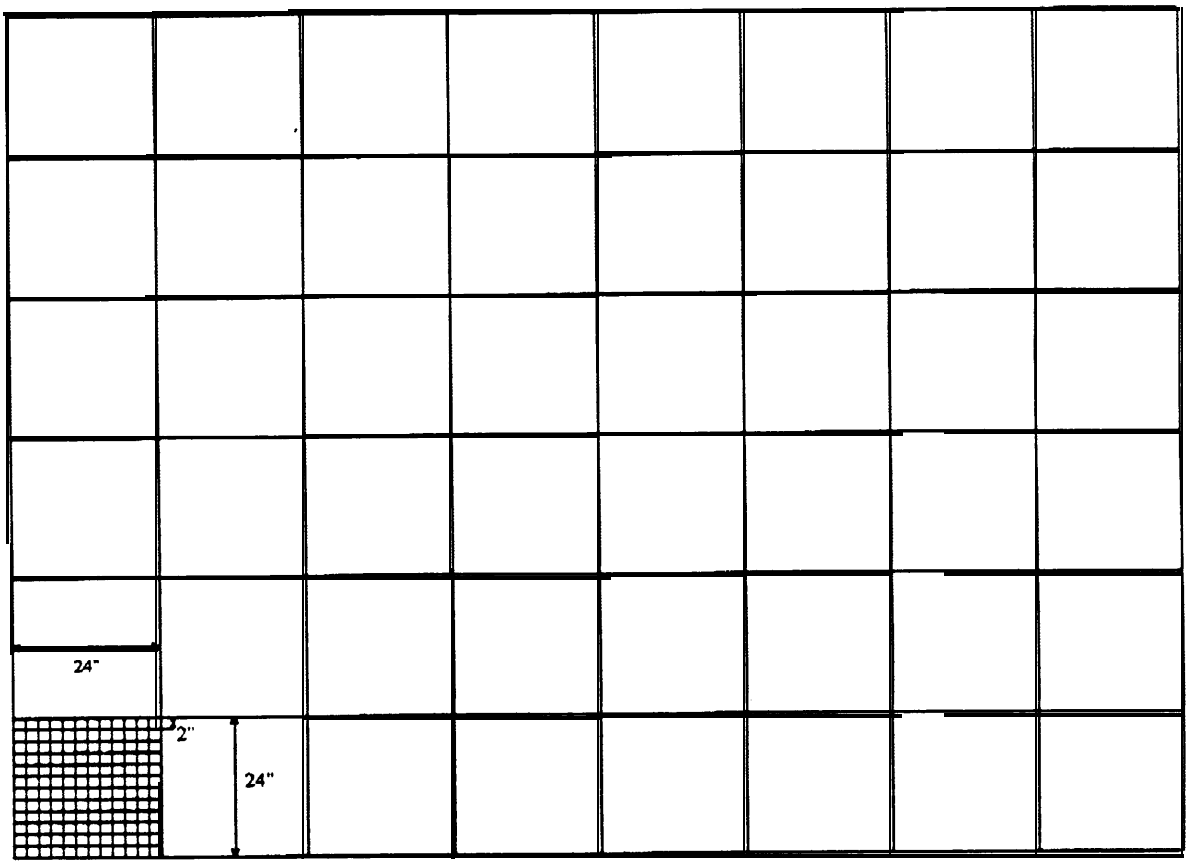


Figure 7-16. Floor Template - 24 Inch Tile (L472367)

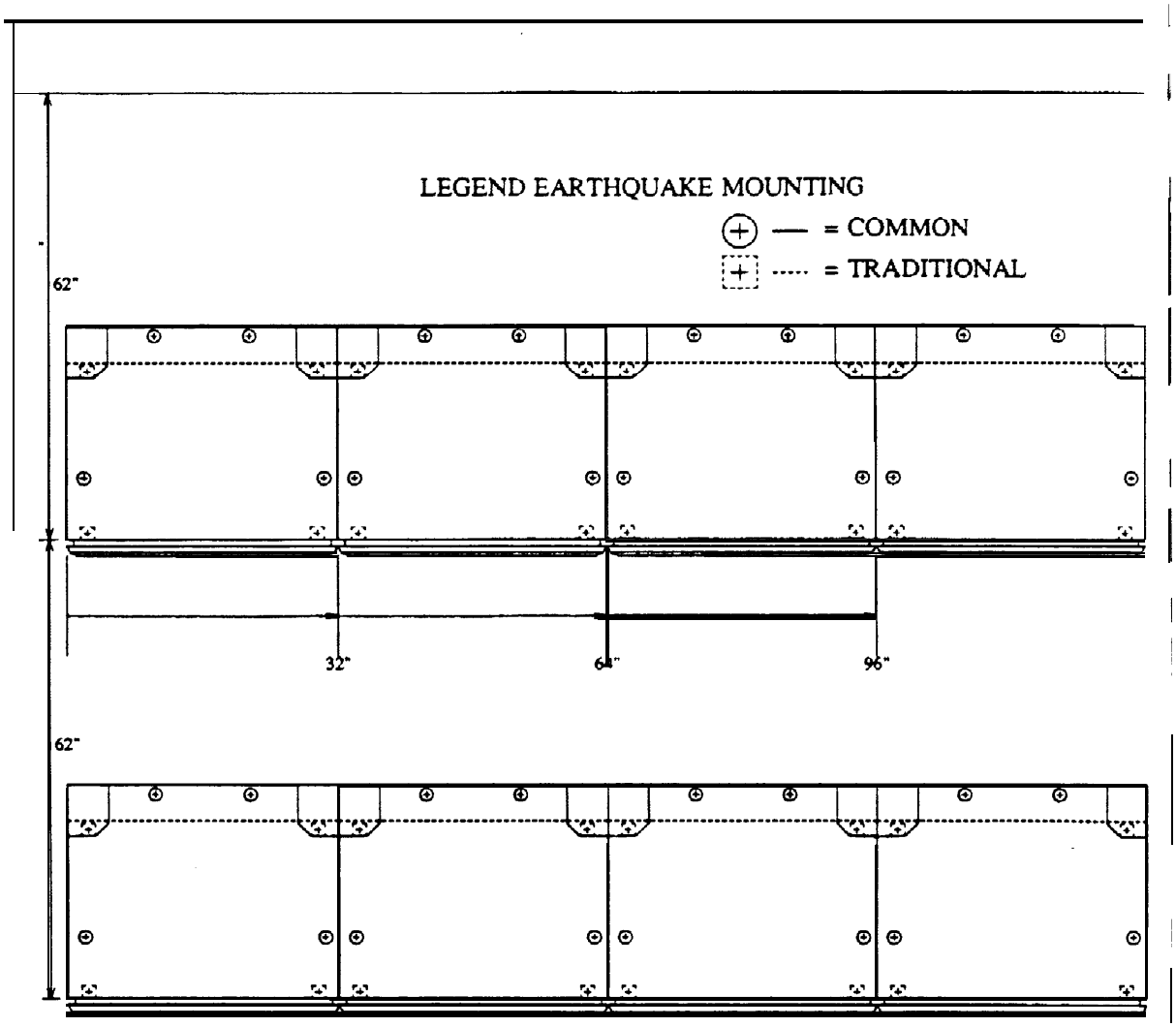


Figure 7-17. Floor Template - Cabinet Lineup (L472368)

Cable Routing

Take special care to ensure that cables from different modules do not cross at the MDF and that distribution cables are not crossed over module cables. Make sure that the cables routed under the raised floor are dressed and that they are done so with a minimum of slack to prevent tangled cables that can obstruct access to other under-floor equipment. The routing of cables beneath a computer/raised floor should be coordinated with the NEC.

Frames

Use wall-mounted or self-supporting frames for MDFs that you install with raised floors. Terminal blocks mounted directly to the wall require cables to be fed from both the top and bottom exposing the cables to view and defeating the purpose of the raised-floor installation. (However, if the customer does not object to the exposed cabling, wall mount the wiring blocks directly — that is without frames.)

Self-supporting frames usually are bolted directly to the base floor (see figure 7-18, *Floor-Secured Frame Installation);* this method of installation requires the removal of the raised floor stringers, Obtain the cooperation of the floor installer to install frames. Use a frame whose height has been increased to fit the raised floor, and make sure you include the increased height when ordering them.

You also may install self-supporting frames by bolting them to the top of the stringer system. Before planning this approach, confer with the customer and the manufacturer of the raised-floor system. Brace all self-supporting frames at their tops whether you have anchored them to the base floor or to the top of the stinger system.

Floor Plan

Consult with the National Engineering Center (NEC) to obtain a detailed floor plan for the system 85 of DEFINITY Generic 2 installation. This includes cable distances, tile cutouts, the relationship of the Generic 2 with universal modules equipment to the stringer system, and the relationship of the MDF to the stinger system.

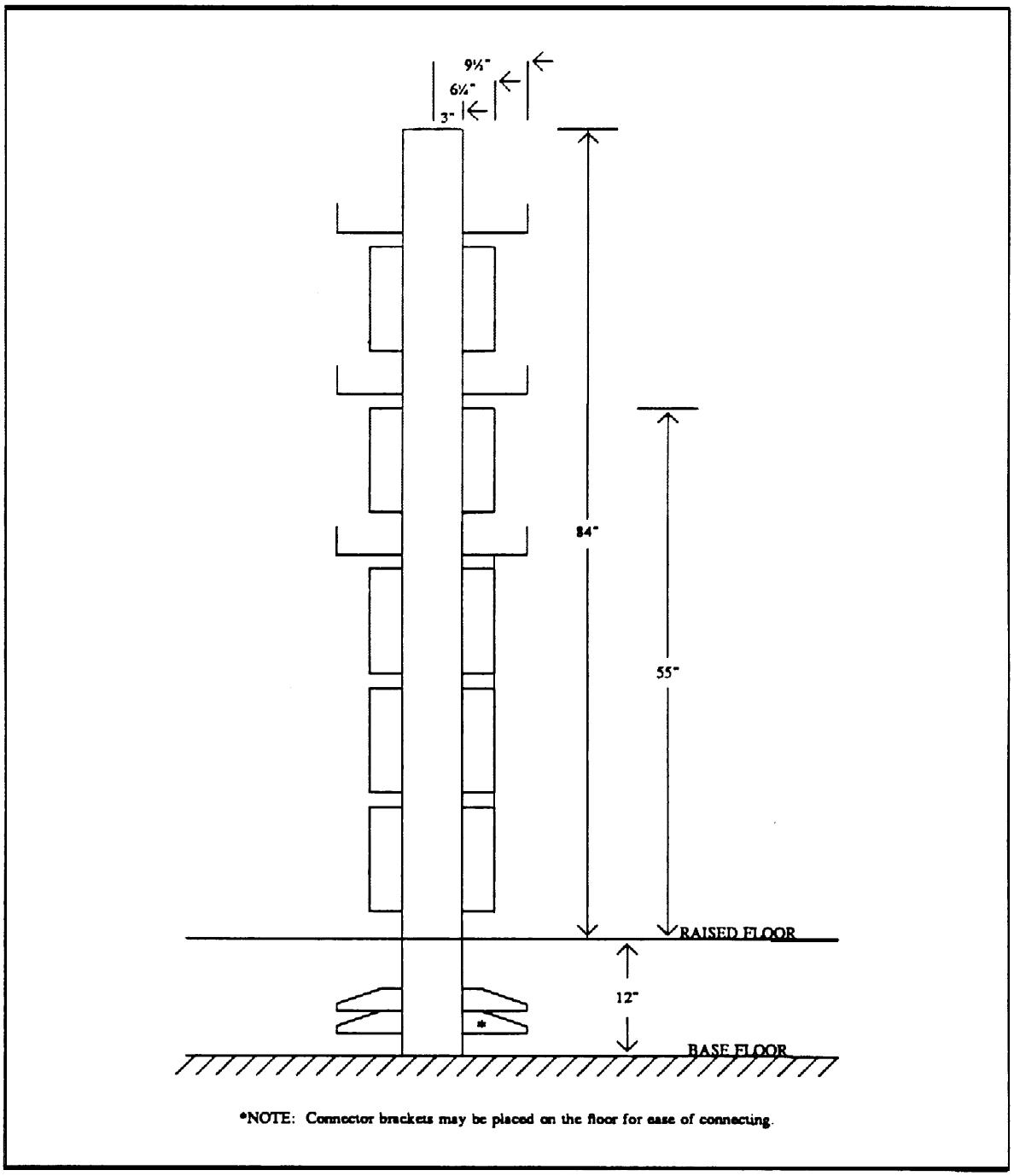


Figure 7-18. Floor-Secured Frame Installation

RECOMMENDATIONS FOR IDF DESIGNS

For Generic 2 with universal modules, IDFs serve as secondary cross-connect points between distribution cables and installation cables, which connect to the IOs. The IDFs usually are housed in closets. Along with the IDF, these closets frequently house the auxiliary power units that some telephones require.

Although the design of an IDF depends upon the site, it should conform as closely as possible to the Premises Distribution System (PDS) guidelines. The recommendations in this section supplement the PDS guidelines, and are essential to the design of IDFs. Beyond these recommendations, use your experience and best judgement in designing IDFs.

Recommended Terminal Blocks

Use 110AB1-100 or 110AB1-300 terminal blocks for both the blue and white fields of the IDF.

Mounting the Terminal Blocks

If you are terminating fewer than 1200 cable pairs (riser and installation cables combined) on an IDF, wall mount the terminal blocks directly (without a frame). If you are terminating more than 1200 pairs on an IDF, use a wall-mounted type-1 frame (discussed earlier in this chapter under *Recommended Frames for Terminal Blocks.)*

Accommodating RGIs

Remote groups are not supported by Generic 2 with universal modules.

INSERT LABELS

Insert labels identify the origins of cables that terminate on the MDF and on the IDFs. The labels are color-coded and come in sheets with 18 labels per sheet. The labels slip into the ½-in. by 8-in. clear plastic holders that snap between the horizontal index strips of the terminal blocks. Many different types of labels are available.

The color coding of the labels indicates the source of terminating leads as follows:

- Green: network services (CO trunks)
- Purple: equipment ports
- Yellow: auxiliary cabinet and miscellaneous switch cables
- Blue: IOs
- Gray: connections between IDFs
- White: connections between the MDF and the IDFs

The color coding of the labels is also used to set off specific fields on the MDF and IDFs as follows:

- On the MDF:
  - — Green for the network services (CO trunks) field
  - — Yellow for the auxiliary field
  - — Purple for the equipment ports field
  - — White for the building distribution field (cables coming from the IDFs)
  - — Blue for the installation field
- On the IDFs:
  - — White for the building distribution field (cables coming from the MDF)
  - — Blue for the IO field
  - — Gray for the tie cable field (cables coming from another IDF)
  - — Purple for remote equipment ports terminated at the IDF

In addition to being color coded, the labels are printed in various pair combinations to match the pairings that can occur on the fields. They also contain preprinted circuit numbers and space to fill in the module (0-31), cabinet (0), carrier (0-2), and port slot numbers (1-20) at the time of installation. Figure 7-19, *Example of Label Filled In*, shows an example of a label with the above information filled in.

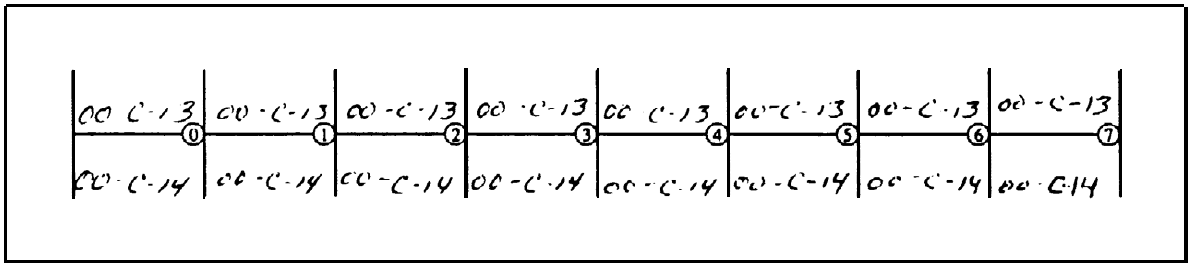


Figure 7-19. Example of Label Filled In

The label sheets are stocked at the AT&T Customer Information Center and can be obtained by calling (800) 432-6600 or by writing to:

AT&T Customer Information Center
P.0. Box 19901
Indianapolis, Indiana 46219

Include the following information when ordering:

- Name and address
- Geographic location number (such as CO81OO)
- Organization number (such as 20052119)
- Account code (such as 123-4567)
- Select code of sheets needed (upper righthand corner of each sheet)
- Number of sheets needed

A partial reproduction of each label sheet is shown in chapter 14, *Insert Labels.*

CUSTOMER PARTICIPATION

Customer participation in wiring administration allows the customer to set up, tear down, and alter cross-connections on the building distribution field of the MDF and on the IDFs. Because 110A cross-connect hardware is used with jumper wires and require the use of a punchdown tool to make cross-connections, customers who wish to handle their own wiring administration may have their technician instructed on the use of a punchdown tool and connecting and disconnecting jumper wires.

8. ELECTRICAL PROTECTION: DEFINITY GENERIC 2 WITH UNIVERSAL MODULES

This chapter describes the protection scheme for DEFINITY® Communications System Generic 2 (hereafter abbreviated to *DEFINITY Generic 2* or *Generic* 2) with universal modules. Basic protection concepts apply to both the DEFINITY Generic 2 with universal modules, System 85, and DEFINITY Generic 2 with traditional modules.

There are some differences in the devices used to protect the Generic 2 with universal modules, as well as differences in the types of circuit packs and terminals these devices protect. See chapter *3, Electrical Protection: System 85 and DEFINITY Generic 2 with Traditional Modules,* for basic information on protectors and protection schemes for System 85 and DEFINITY Generic 2 with traditional modules. For Generic 2 with universal modules, there are six primary, three enhanced primary, and one secondary protector that can serve the needs of in-range, out-of-building (IROB) terminal installations. The primary protectors all provide protection in the standard analog voltage range of 220V to 300V and may include a heat coil for sneak-current protection. The 4C3S-75 enhanced primary protector is installed in place of the primary protector and operates at 75V. The secondary protector is used in conjunction with primary protection and is installed on the equipment (terminal or port) side of the primary protector.

RECOMMENDED PROTECTORS

Following are recommended electrical protectors that can be used for primary, enhanced primary, and secondary applications. With the exception of the 79A sneak-current fuses, all of the following primary and enhanced primary protector units plug into 188 panels.

Primary Protectors

There are several primary protection devices available for circuit packs, terminals, and trunk lines of Generic 2 with universal modules.

- 3BlA — carbon block device
- 3BlE-W — wide-gap gas tube
- 3C1S — solid-state device
- 4B1C — carbonblock device that includes a heat coil, providing primary and sneak-current protection
- 4B1E-W — wide-gap gas tube that includes a heat coil, providing primary and sneak-current protection
- 4C1S — solid-state device that includes a heat coil, providing primary and sneak current protection

Enhanced Primary Protector

The 4C3S-75 (PEC 65543 and 65543A), ITW LP2-100-068 (PEC 65541 and 65541A), and Porta Systems Corp., Delta Protector (PDP) (PEC 65540) are the three devices available for providing vulnerable port packs with enhanced primary protection. (See table 8-1.)

Select the ITW LP2-100-068 for installations with a type 66 mounting. Select PDP for installations with an AT&T 188-90 mounting.

Secondary Protector

Secondary protection for DEFINITY Generic 2 with universal modules is provided by the same data-link protector (DLP) used in the System 85 and DEFINITY Generic 2 with traditional modules; the DLP must be used in conjunction with primary protection. DLPs used with 7400 sets are isolation transformers and require the terminal to be locally powered.

DLP is available in either the 8-circuit version (1201A) or the single circuit version (1203A).

PROTECTION MATRIX

Table 8-1, *Generic 2 with Universal Modules Projection Matrix,* shows the overall protection matrix for port packs, terminals, and trunks of Generic 2 with universal modules.

TABLE 8-1. Generic 2 with Universal Modules Protection Matrix

Line	Circuit Packs/ Circuit	Exposed Circuits/ On-Off Prem	Term/ Trunk	Sneak[5] Current Protection Required	Protector			Notes
					Primary[6]	Enhanced Primary PDP, ITW, or 4C3S-75	Secondary DLP	
1	TN72/8	Yes/Both	Anl Line	Yes	Yes	No	NA	1
2a	TN46/16	No/On	Anl Line	NA	NA	NA	NA	
2b	TN746B/16	No/On	Anl Line	NA	NA	NA	NA	
3	TN762B/8	No/On	730X- MFAT	NA	NA	NA	NA	
4a	TN754/8	Yes/Both	740x-Dig	Yes	Yes	PDP or ITW	Yes	2,8
4b	TN754B/8	Yes/Both	740X-Dig	Yes	Yes	Yes	Y E	2
5	TN47/8	Yes/Both	CO Trk	Yes	Yes	No	NA	1
6	TN753/8	Yes/Both	DID Trk	Yes	Yes	No	NA	1
7	TN760C/4	Yes/Both	Tie Trk	Yes	Yes	No	NA	3
8	TN763C/4	No/On	Aux	NA	NA	NA	NA	
9	TN735/4	No/On	MET	NA	NA	NA	NA	
10	TN555/1	Yes/Both	ISDN PR1	Yes	Yes	NA	NA	4
11	TN556/12	Yes/Both	750X-lSDN BRI	Yes	Yes	4C3S-75	NA	7
12	TN767/1	Ycs/Both	DS1	Yes	Yes	NA	NA	3

NOTES:

1. Gas tube may be substituted for carbon block to increase protection and lower maintenance cost.
2. If the DLP protector is provided, then primary protection is required on the network side of the facilities.
3. If the TL31M or channel service unit (CSU) is provided, then primary protection must be provided on the network side of the facilities. The TN760C cannot be directly connected to exposed facilities.
4. The TN555 does not have tip and ring connections. It connects directly to the TN767 via a special "Y" cable.
5. AT&T 5-pin plug-in protector units and primary protetectors that begin with the number 4 are equipped with heat coils that provide sneak-current protection.
6. Primary and sneak-current protection can be provided simultaneously by using carbon blocks (4BlC), wide-gap gas tubes (4BIE-W). or solid-state protectors (4C1S). Primary protector with a "4" prefix are preferred but not required. 3B/3C protector series can be used after a thorough site investigation that determines there is no need for sneak-current protection no chance of a power cross.
7. The 7500 ISDN-BRI (integrated services digital network-basic rate interface) requires a 4C3S-75 be placed on the switch and a carbon block on the terminal end.
8. For TN754 circuit packs, the 4C3S-75 protector is only appropriate for vintage 15.

Table 8-2, *Loop Ranges for Protected Terminals,* lists the loop ranges and required protection devices for the protected terminals for Generic 2 with universal modules.

TABLE 8-2. Loop Ranges for Protected Terminals

Terminal Type	Protectors	Range (ft)	
		24 AWG	26 AWG
7400	Primary & DLP	5000	4000
7500	4C3S-75 & 4B1C	1900	1600

9. PORT PACKS: DEFINITY GENERIC 2 WITH UNIVERSAL MODULES

This chapter presents supplementary information on port circuit packs, and loop distances for terminals that you may find useful in designing a wiring installation.

Digital communications protocol (DCP) guidelines for DEFINITY® Generic 2 Communications System (hereafter abbreviated to *DEFINITY Generic 2* or *Generic 2)* with universal modules are the same as those for System 85 and DEFINITY Generic 2 with traditional modules. See chapter 4, *Port Packs/DCP Repeaters: System* 85 *and DEFINITY Generic 2 with Traditional Modules,* for more detailed information.

PORT CIRCUIT PACKS

Table 9-1, *Port Circuit Pack Cabling,* identifies the circuit packs that are housed in the universal module control (UMC) common port carrier (CPC) and the fields on the main distribution frames (MDF) where cables from those packs terminate. There are 20 circuit packs per carrier, and one 25-pair cable serves each pack. The table also gives the number of ports for each circuit pack. There are 8 ports for each digital pack and 8 or 16 ports for each analog pack. Table 9-1 also lists the fields for cable termination.

Table 9-2, *Terminals and Peripherals Served by Port Packs,* list the voice terminals that each circuit pack can serve, and table 9-3, *Voice Terminals Loop Ranges,* list the loop ranges for voice terminals.

The design of the MDF must allow for the termination of all 20 carrier cables even if the carrier is not slated for a full complement of circuit packs. The design should not allow for vacant carrier positions unless such an allowance is specifically requested.

TABLE 9-1. Port Circuit Pack Cabling

Ckt Pack	Port Fcn	#Ports	Field for Term	Ckt Packs/ 25 Pair Cable
TN555 TN767	DS1 Packet Adjunct PRI	23(24)	Trunk/AUX	1
TN556	ISDN-BRI	12	BLDG DIST.	1
TN726	Data Line	8	BLDG DIST.	1
TN735	MET Line	4	BLDG DIST.	1
TN742	ONS Analog Line or OFS Analog Line	8 8	BLDG DIST Trunk/AUX	1 1
TN746	Analog Line ONS	16	BLDG DIST.	1
TN747B	CO Trunk	8	Trunk/AUX	1
TN753	DID Trunk	8	Trunk/AUX	1
TN754	Digital Line	8	BLDG DIST.	1
TN754B	Digital Line	8	BLDG DIST.	1
TN760C	Tie Trunk/Attendant Interface	4	Trunk/AUX	1
TN762	Hybrid Line	8	BLDG DIST.	1
TN763C	AUX Trunk ONS	4	Trunk/AUX	1

TABLE 9-2. Terminals and Peripherals Served by Port Packs

Ckt Pack	Port Fcn	Term/Periph Served
TN556	ISDN-BRI	750X-BRI — 7505, 7506, 7507
TN726	EIA	ASD terminal with RS232 interface
TN753	MET Line	MET
TN742	Analog Line ONS/OFS	Analog Phones — 7102A, 2500
TN746	Analog Line ONS	Analog Phone — 7102A, 2500
TN754	Digital Line	740X-Digital — 7410D, 7434D
TN754B	Digital Line	740X-Digilal — 7410D, 7434D
TN760C	Tie Trunk/Attendant Console	Attendant Console
TN762B	Hybrid Line	730X-MFAT — 7303S, 7505S

TABLE 9-3 Voice Terminal Loop Ranges

Terminal Type	Distance (Ft)		Comments
	24 AWG	26 AWG	
Analog			
500/2500	20000	13000	On-premises or out-of-building — same premises (TN742, TN769).
500/2500	3100	2000	On-premises only — no bridging terminals without adjuncts (TN742).
710X	15200	10000	
Hybrid			
730X	1000	750	Without adjunct power
	2000	2000	With adjunct power
Digital			
740X	3000	2200	On premises
	2400	1300	Out-of-building same premises
BRI			
750X	1900	1600	Adjunct Power required on all terminals All 750X terminals require a terminating resistor. These figures assume the resistor is installed within 33' (IOM) of the terminals.

DCP REPEATERS

Basic guidelines for DCP repeaters are the same for DEFINITY Generic 2 with universal modules as they are for System 85 and DEFINITY Generic 2 with traditional modules. See chapter 4, *Portpacks/DCP Repeaters: System 85 and DEFINITY Generic 2 with Traditional Modules* for more detailed information.

10. INSTALLATION EXAMPLE: DEFINITY GENERIC 2 WITH UNIVERSAL MODULES

This chapter illustrates the design process for a hypothetical main distribution frame (MDF) using a seven-module system. The process consists of two steps: sizing the MDF and constructing the MDF.

SIZING THE MDF

Sizing is the determination of the number of 300-pair terminal blocks needed to construct the MDF. First, assess the requirements of the four principle fields. Second, determine the number of blocks needed for each field to meet those requirements.

For large installations, be especially aware of potential problems of expansion. Keep module ports in the same area and use the closest available space for additions; leave space on the wall fields for carrier additions even if the initial design does not require the use of all three available carriers.

Assessing Field Requirements

The four principal fields on the MDF are the network services central office (CO) trunks, auxiliary and miscellaneous, equipment ports, and distribution fields. Following are the requirements for each field.

- The network services field is where the CO cables terminate; it has green labels. For this installation all trunks are digital. There is a direct connection between the customer's channel service unit (CSU) and the digital service 1 (DS1) interface of the telephone company. No cables have to be terminated on this field, which eliminates the need for terminal blocks.
- The auxiliary and miscellaneous field, which uses yellow labels, is where the cables from the auxiliary equipment terminate. Two auxiliary cabinets, whose contents are unknown, serve this system. Allow for the termination of twelve 25-pair cables from each cabinet.

  In addition, a maximum of twelve 25-pair cables from the common control cabinet terminate on this field. This includes the cabling for one attendant console.
- The equipment port field, which uses purple labels, is where the cable from the equipment ports terminate. There are 57 port carriers in the system and 10 DS1/MFAT carriers used to hold ANN15 (RGI) circuit packs. Modules 00 and 02 contain only 6 port carriers each. The remaining 5 modules contain 9 port carriers and 2 DS1/MFAT carriers each.
- The distribution field, which uses white labels, is where the distribution cables that run to the IDFs terminate. Numerous factors affect the sizing of the distribution cable, including the stations served by closets, the number and type of stations, the spares needed, and the possibility of cable breakage. Allow for the termination of 14,000 distribution cable pairs.

Determining Block Quantities

The following computations show how the field requirements are converted into terminal blocks.

	Subtotal Cable Pairs	Total Cable Pairs	Subtotal Field Blocks	Total Field Blocks	Total MDF Blocks
1. Green Field					
A. Number of Cable pairs terminated =	0				
B. Number of cross-connect blocks required =		0		0	
2. Yellow Field					
A. Auxiliary cabinet terminations:					
2 cabinets x $\frac{12 \text{ cables}}{\text{cabinet}}$ x $\frac{25 \text{ pairs}}{\text{cable}}$ =	600				
B. CC cabinet termination:					
1 cabinet x $\frac{12 \text{ cables}}{\text{cabinet}}$ x $\frac{25 \text{ pairs}}{\text{cable}}$ =	300				
C. Total pairs		900			
D. Blocks needed:					
900 pairs + $\frac{300 \text{ pairs}}{\text{block}}$ =			3		
E. Spare blocks			1		
F. Total number of required blocks				4	
3. Purple Field					
A. Carrier sizing:					
$\frac{20 \text{ cables*}}{\text{carrier}}$ x $\frac{25 \text{ pairs}}{\text{cable}}$ =	500				
B. Required blocks per carrier			2		
C. Blocks required per cabinet:					
$\frac{3 \text{ carriers}}{\text{cabinet}}$ x $\frac{2 \text{ blocks}}{\text{carrier}}$ =			6		
D. Blocks required for 7 module installation:					
$\frac{6 \text{ blocks}}{\text{cabinet}}$ x 7 cabinets =				42	

***A single carrier port cabinet (SCPC) will have only 18 cables per carrier, but will require 2 field blocks just like the CPC.**

	Subtotal Cable Pairs	Total Cable Pairs	Subtotal Field Blocks	Total Field Blocks	Total MDF Blocks
4. White Field A. Computation of blocks: 12,000 pairs x $\frac{1 \text{ block}}{300 \text{ pairs}}$ =				40	
5. All Fields 4+42+40					86

The total number of blocks required to construct the MDF is 86.

CONSTRUCTING THE MDF

The construction of the MDF is based on the block counts made above and on the factors listed below. Note that in some installations, such as this one, the arrangement of the frames may increase or decrease the number of frames needed, despite the block count.

- *Location of the MDF.* The size of the equipment room governs the location of the MDF. This installation needs 25 ft of wall space close enough to the equipment to use either wall-mounted or self-supporting frames.
- *Terminal-block mounting.* For an installation of this size, the terminal blocks can only be mounted on frames. Choose one of the two types of frames to be used and whether the frames should be wall-mounted or self-supporting.
  - *Wall-mounted frames.* Figure 10-1, *7-Module System Wall-Mounted on Type-1 Frames,* shows a possible arrangement for a type-1 wall-mounted configuration requiring 12 frames. Although it has significant room for the white field, it has little room for expansion of the purple field. Expansion would require the use of very long jumpers and would exceed the jumper capacity of frames. This configuration is not recommended.

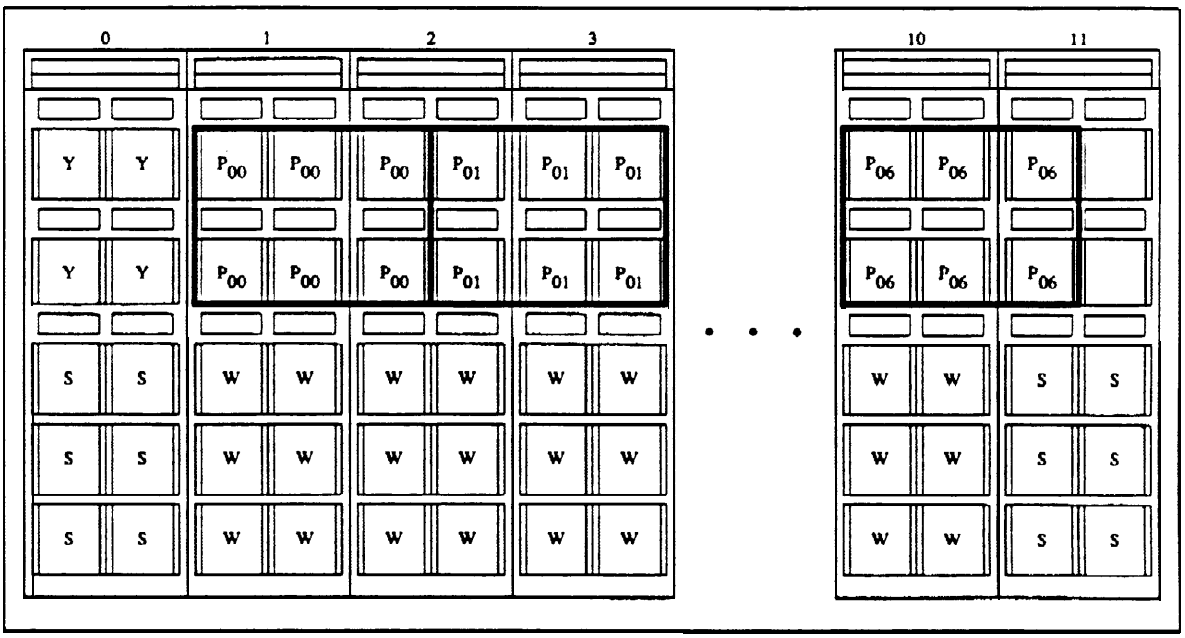


Figure 10-1. 7-Module System Wall-Mounted on Type-1 Frames

Figure 10-2, *7-Module System Wall-Mounted on Type-2 Frames,* shows a possible arrangement for a type-2 wall-mounted configuration requiring 12 frames. This arrangement has greater jumper capacity and room to add another cabinet. It can be used as long as there is no need to expand the white field. (In figure 10-2, a single cabinet represents white-field cabinets 4 through 8.)

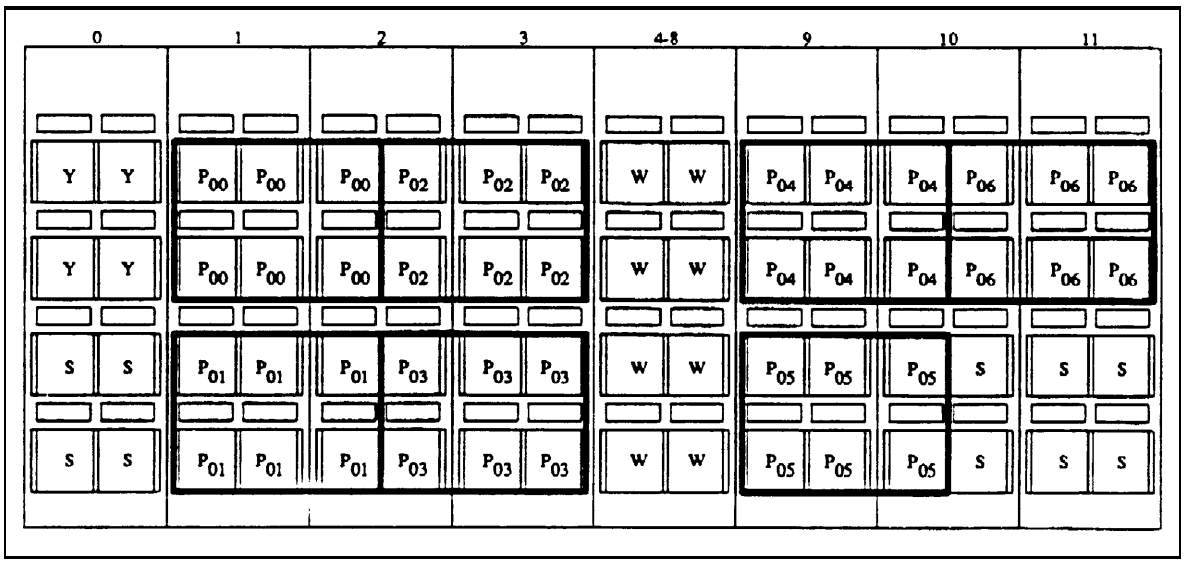


Figure 10-2. 7-Module System Wall-Mounted on Type-2 Frames

— *Self-supporting frames.* Mounting the terminal blocks on self-supporting frames requires seven type-1 frames or seven type-2 frames.

Figure 10-3, *7-Module System Mounted on Self-Supporting Type-1 Frame, Front,* and figure 10-4, *7-Module System Mounted on Self-Supporting Type-1 Frame, Rear,* display the front and rear of a type-1 frame. Since this is a zone installation, distribution cable is separated on the MDF. This is a good arrangement with room for expansion and effective cable management.

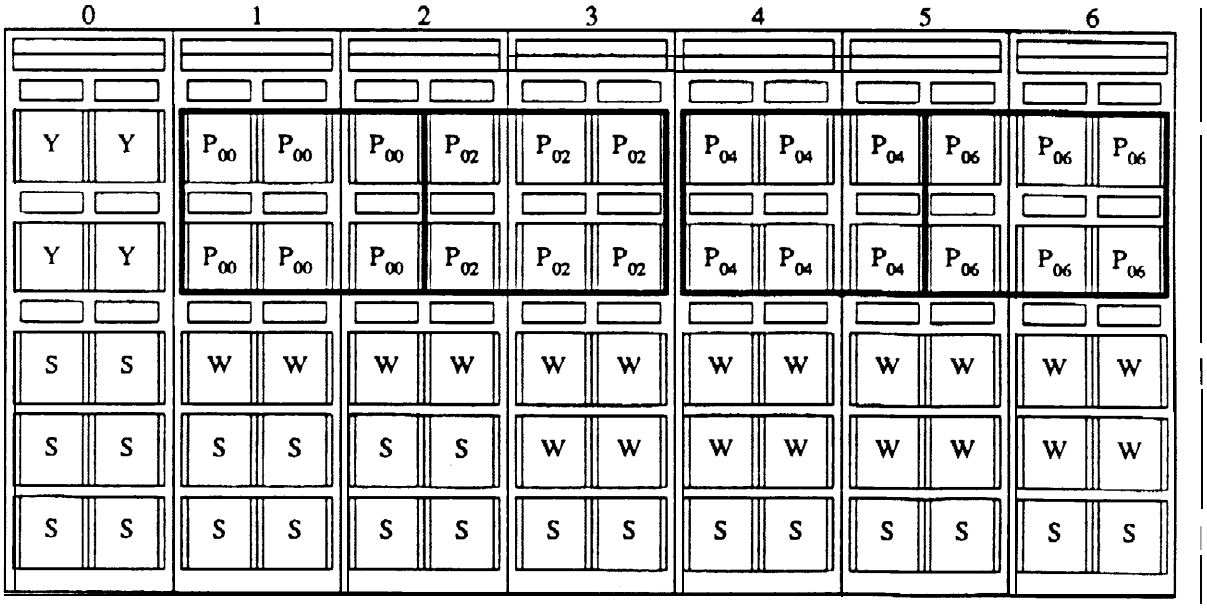


Figure 10-3. 7-Module System Mounted on Self-Supporting Type-1 Frame, Front

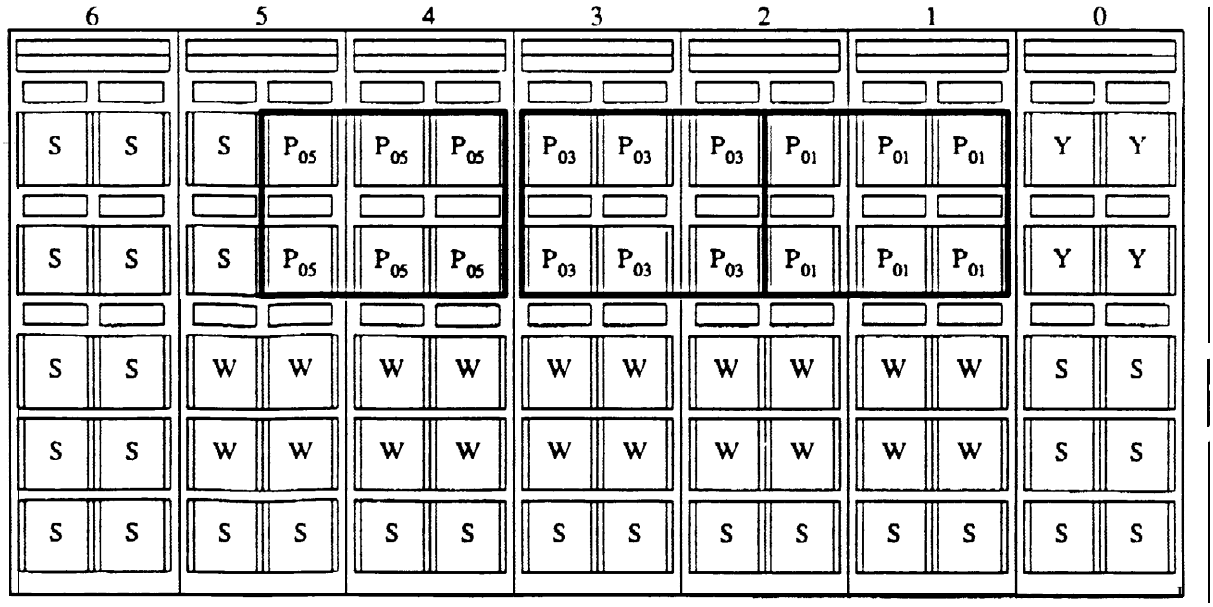


Figure 10-4. 7-Module System Mounted on Self-Supporting Type-1 Frame, Rear

— *Frame arrangements.* Figure 10-5, *7-Module System Mounted* on *Self-Supporting Type-2 Frame, Front,* and figure 10-6, *7-Module System Mounted on Se/f-Supporting Type-2 Frame, Rear,* show an arrangement requiring seven type-2 frames. Since this arrangement uses zones, the distribution cable is separated on the MDF. One side of the frame lineup supports three modules and the other side supports four, thus most of the spare distribution cable pairs are placed on the side with four modules. This arrangement is a desirable one, with good jumper capacity, a modest amount of spare area, and good expansion potential. Since jumper management is the most important consideration in the design of the MDF, designers should consider type-2 frames for installations of six cabinets or greater.

— *Cable connections to the MDF.* Cable connections can be either field-terminated or connectorized. It is up to the MDF designer, with input from installers, to make this selection. Generally, use connectorized cables for small installations of five or fewer cabinets; connectorized cables are easier to install. Use field-terminated cables for installations greater than five cabinets; the slack management characteristics of field-terminated cables is superior.

Note that in this example we have avoided the problems of managing cable slack by using connector cables. In a real installation all cables for this size installation should be field-terminated. In this example, all connections to the frames from the equipment are by connector cables; a real installation should be field terminated directly to terminal blocks. Field-terminated cables are made by determining the length needed from the switch to the MDF field, then cutting off the unneeded portion of a B25A cable.

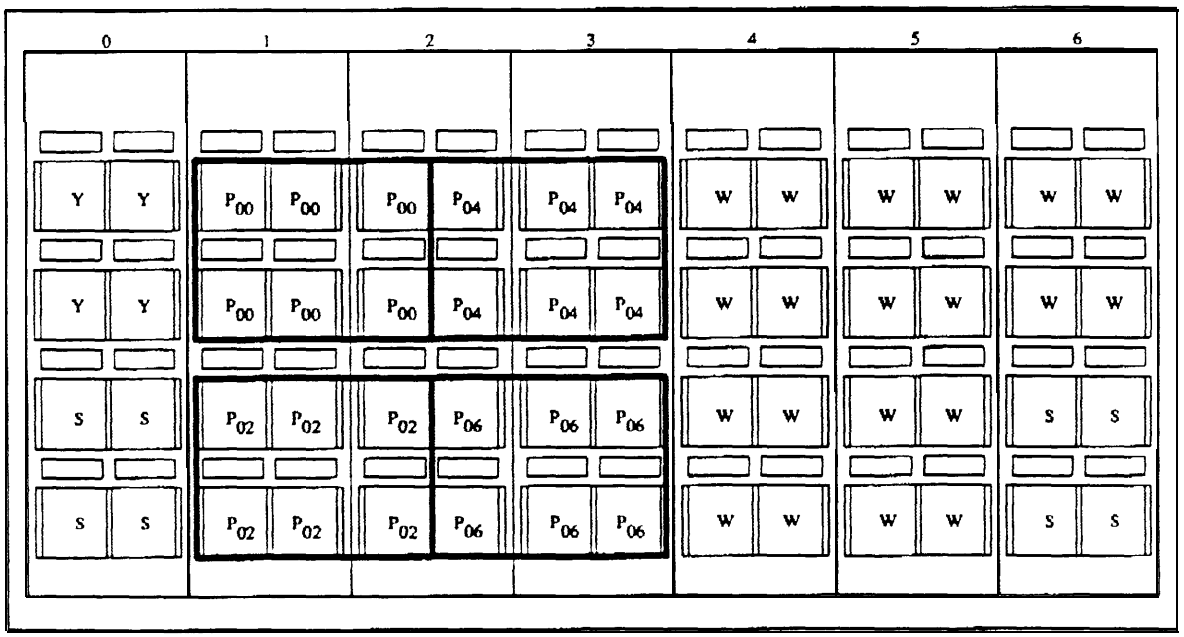


Figure 10-5. 7-Module System Mounted on Self-Supporting Type-2 Frame, Front

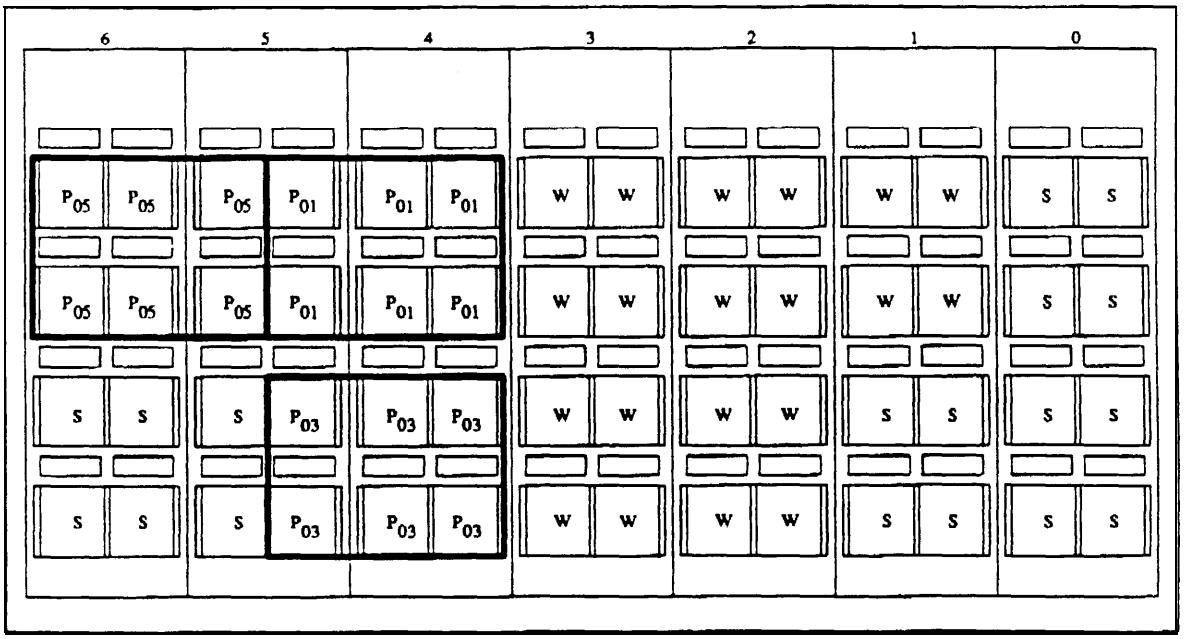


Figure 10-6. 7-Module System Mounted on Self-Supporting Type-2 Frame, Rear

11. BRI: DEFINITY GENERIC 2 WITH UNIVERSAL MODULES

The integrated services digital network (ISDN) basic rate interface (BRI) provides ISDN service between voice and data terminals and the switch.

The TN556 is the new BRI port pack; it provides 12 ISDN ports and is housed in the common port carrier (CPC) of DEFINITY® Generic 2 Communications System (hereafter abbreviated to *DEFINITY Generic 2* or *Generic 2)* with universal modules. The TN556 is not compatible with System 85 or DEFINITY Generic 2 with traditional modules.

BRI TERMINALS

Generic 2 with universal modules introduces the new 7500 series of voice terminals for BRI applications and the 7500 Universal Data Module (UDM) for data only applications:

- The 7505 is an ISDN-BRI digital voice terminal (VOM-T) with an optional asynchronous data module (ADM-T) for simultaneous voice and data operations. When used, the optional ADM-T is part of the 7505 basic modular telephone (BMT) voice terminal base. The 7505 also contains a loudspeaker and speakerphone.
- Model 7506 is functionally identical to the 7505 except it includes a built-in two-line digital display with 24 charactcrs per line. The 7506 also has an optional ADM-T for simultaneous voice and data operations.
- The 7507 is a VOM-T equipped with a two-line 40-character display. The display gives access to the Display — Voice Terminal feature. The 7507 also has an optional ADM-T for simultaneous voice and data operations.
- The 7500 UDM is designed to connect unattended data terminal or communications equipment to the ISDN network. The 7500 has no voice functions and cannot be linked to the voice terminal.

BRI Terminal Configurations

The 7500 voice terminals must be powered by either local or satellite closet power (see chapter 12, *Adjunct Power Supplies).* BRI signal lines use a terminating resistor (TR) as part of their configuration. Placing the TR at the 7500 workstation provides the maximum range between the terminal and the switch. Placing the TR in the satellite closet provides the maximum manageability and aesthetic appeal.

For all 7500 BRI terminals, placing the terminating resistor in the satellite closet produces a total loop range of 1500 ft. For direct inside wiring (DIW, a maximum of 250 ft of the total 1500 ft range is available between the closet and the terminal. If the TR is at the work location, the maximum range between the terminal and the switch is a maximum of 1900 ft.

BRI uses pairs 1 and 3 of the DIW cable as shown in figure 11-1, *Special ISDN Wiring for Satellite Closet.*

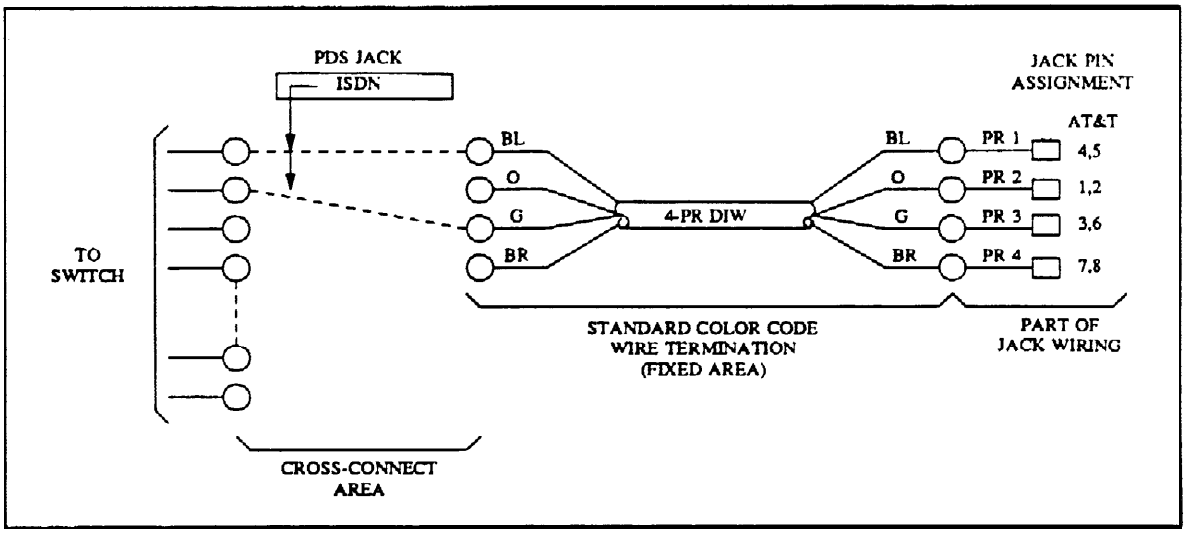


Figure 11-1. Special ISDN Wiring for Satellite Closet

BRI POWER SUPPLIES

BRI terminal power can be installed in either the satellite closet or the workstation. The power supplies available for ISDN BRI terminals are:

- 353A — A 12-watt power supply with a single -40 VDC output; a standalone supply that can be used only with ISDN BRI sets.
- 945-1 bulk power supply — Provides 13 ports with 18 watts at -40 VDC; a closet unit with an overall capacity of 144 watts available for terminal power. Terminal load should be distributed as evenly as possible across the thirteen ports.

  When bridging (adding more than one terminal to a port) or when moving terminals from port to port, ensure that you do not exceed the 18-watt power rating. For specific information on bridging, refer to the ISDN *Terminal Installation and Tests* (555-021-101) manual.

  This power supply can be used with ISDN BRI sets only. Do not use with other voice terminals compatible with Generic 2 with universal modules.

  NOTE: If you are powering a large number of terminals with the 945-1, ensure that they are all close enough to the power supply to be accommodated by a single unit; that is, ensure that all terminals fall within the range limits of the power supply. (See table 11-1, *Power Supply Distance Limits,* for range and power data.)

- KS22911 — A 10-watt, -48 VDC workstation power supply; if the terminal has a speakerphone or headset, the power supply range is 150 ft.

- 346A bulk power supply — Four 10-watt outputs of -48 VDC each; located in the satellite closet and not limited to powering BRI terminals. The 346A is switch-selectable and can also supply two outputs of 20 watts each.
- 329A — One 25-watt output at -48 VDC. It can be located in the satellite closet or at the workstation.

Table 11-1, *Power Supply Distance Limits,* shows power consumption and distance limits for the 7500 ISDN BRI voice terminals and one adjunct, either the S101A, S201A, or 500A. These distances are conservative and are valid for both 40V and 48V power supplies.

TABLE 11-1. Power Supply Distance Limits

Terminal	Operating Condition							
	Power Consumption (Watts)						Distance (ft)*	
	Phantom	Idle	Max. Term. Pwr.	S101A Speakerphone	S201A Speakerphone	500A Headset	24 AWG†	26 AWG
7505/06 VOM-T	0.9	1.2	2.4	3.7	4.3	3.3	659	408
7505/06 ADM-T	2.0	2.4	3.9	4.9	5.5	4.5	536	332
7507 VOM-T	1.0	1.3	4.8	6.2	6.8	5.8	446	276
7507 ADM-T	2.3	2.5	6.2	7.5	8.1	7.1	381	235

*** Distances were calculated by using the maximum power consumption allowable and will provide minimum distance allowable under all conditions for the set.**

† 24 AWG should generally be used.

12. ADJUNCT POWER SUPPLIES

This chapter describes the power supplies for adjuncts such as speakerphones, display modules, or voice terminals. It further describes the adjuncts served by each supply and the AC power requirements of each power supply. These power supplies serve adjuncts for both System 85 and DEFINITY® Generic 2 Communications Systems (hereafter abbreviated *DEFINITY Generic* **2** or *Generic 2).*

The customer designates a certain number of voice terminals to be fitted with one or more of the following adjuncts:

- Speakerphone
- Display module
- Call coverage module
- Headset
- Data stand
- Digital terminal display module

All these adjuncts require power either from an individual power supply located at the workstation, an individual power supply located in the satellite closet, or a bulk power supply located in the satellite closet. Diagrams showing how power supplies are connected at the workstation or satellite closet to a voice terminal appear in *AT&T System 75 Wiring* (555-200-111).

INDIVIDUAL POWER SUPPLIES

Three power units can be used individually to power adjuncts: the 2012D transformer, the 329A power supply, and the KS22911 power supply.

- 2012D — A transformer that operates with the 248B adapter off 110 VAC from a wall outlet. It supplies 18 VAC over 24 AWG wire to a speakerphone or headset up to 150 ft away. The 2012D transformer is used only at the workstation.
- 329A — A power supply that can be used locally or in a satellite closet, it is capable of powering any adjunct that can be added to a digital voice terminal, and has a power output of 25 watts. (The 329A has been replaced by the 346A as the -48 VDC power supply of choice, but 329A units in the field are still supported.)

  The 329A can supply -48 VDC over 24 AWG wire to:

  — One digital module plus speakerphone or headset up to 490 ft

  — Two digital modules plus speakerphone or headset up to 330 ft

  — Three digital modules plus speakerphone or headset up to 240 ft

- KS22911 — A power supply that plugs into three-prong 120 VAC outlets at the workstation. The KS22911 supplies -48 VDC up to 150 ft for any one adjunct and a speakerphone or headset. When the KS22911 is used at the workstation, it provides power through the connecting cord to a terminal.

  When small numbers of terminals require adjunct power, the KS22911 power supply can be installed in the satellite closet. From the satellite closet it provides power over the fourth pair of the 4-pair installation cable, to the information out.let (IO) at the workstation. If the distance from the satellite closet to the workstation exceeds 150 ft. you must install the power supply at the workstation.

BULK POWER SUPPLY

The 346A modular bulk power unit is installed only in the satellite closet and accepts up to three 346A power supplies. Each 346A has four outputs. The power unit plugs into a standard 120 VAC outlet with 20A service. As many as four power units can be connected to the same 20A circuit, which must be dedicated and unswitched.

Each pair of outputs on the 346A has a slide switch between them. The switch allows the outputs to operate individually and supply 10W of power, or to operate in combination and put out 20W of power. The 346A transmit power over the fourth pair of the cable that connect the intermediate distribution field (IDF) to the IO at the workstation.

When the outputs on the 346As are operating individually (10W), they can power one speakerphone or headset and one other adjunct. When two outlets are operated in combination (20W power comes only from the upper output; the lower one is without power), they can power a data module, two other adjuncts and a speakerphone or headset attached to one voice terminal. Table 12-1, *Maximum Loop Lengths for the 346A Power Unit,* shows the loop distance for the 346A power unit.

TABLE 12-1. Maximum Loop Lengths for the 346A Power Unit

Adjunct Configuration	Cable Distances (in ft)	
	24 AWG	26 AWG
Speakerphone S101A or headset 500A only	2750	1730
with 1 adjunct	531	334
with 2 adjuncts	350	238
with 3 adjuncts	250	167
Speakerphone S201A only	2060	1295
with 1 adjunct	493	309
with 2 adjuncts	331	208
with 3 adjuncts	243	152

13. FIBER-OPTICS

Fiber-optic cables connect the TMS to module control (MC) carriers. Fiber-optic cables also connect remote module interface (RMI) circuits in remote modules to RMI circuits at the central location. In a multimodule system, each MC carrier has a fiber-optic transmitter and a fiber-optic receiver that interfaces with a two-fiber cable. At the other end of the link, a fiber-optic transmitter and a fiber-optic receiver interface the two-fiber cable to the time-multiplex switch (TMS).

LCIT

The lightguide cable interconnection terminal (LCIT) is used to connect individual fiber links to multifiber riser cables or outside plant cables. Each LCIT can house up to six fanouts and each fanout terminates one 12-fiber ribbon; each of the 12 fibers is connected to an individual connector. Dual-fiber cable from the TMS or RMI pack plugs into these connectors.

Remote-module links require an additional fiber pair to carry 4-MHz common control (CC) channel information. A special circuit pack, the remote-module interface (RMI), is mounted in the carrier at each end of the remote-module link. For DEFINITY™ Generic 2 Communications System (hereafter abbreviated to *DEFINITY Generic 2* or *Generic 2)* with traditional modules, the RMI connects to paddleboards on the carrier backplane; for Generic 2 with universal modules, the RMI connects to the lightwave transceiver which, in turn, connects to dual-fiber cables that terminate on the LCIT.

CONNECTORS

DEFINITY Generic *2* uses the 3B ST® connectors to terminate fiber-optic cables at the LCIT; System 85 uses biconic connectors.

In Generic *2*, the 107A optically-remoted peripheral interface (ORPI) uses biconic connectors. Therefore, the 107A requires a special cable assembly (ED-1E434-11, group 509) whenever it is used. The group 509 cable has a biconic connector and attenuator on the 107A end and an ST® connector on the LCIT end. The ORPI has a distance limit of 13,000 ft for 62.5- and 50- micron fiber.

PADDLEBOARD RANGE LIMITATIONS

Table 13-1, *System* 85 *and DEFINITY Generic 2 Fiber-Optic Paddleboard Ranges,* contains information on System 85 and DEFINITY Generic 2 transmitter, receiver, and transceiver paddleboard ranges. The table includes the range limitations for 62.5 micron (ODL®50) and 50 micron (ODL®40) fibers. Note the significant drop in range between the two fiber types.

TABLE 13-1. System 85 and DEFINITY Generic 2 Fiber-Optic Paddleboard Ranges

Application		Model	Distance Limits	
			62.5 Micron	50 Micron
Generic 2 (traditional module) — as a central-location module, a nearby remote module, or containing an RMI seining a nearby module	Transmitter	982NL	4900 ft (1.5 km)	2000 ft (0.6 km)
	Receiver	982NK	4900 ft (1.5 km)	2000 ft (0.6 km)
Generic 2 (traditional module) — as a distant remote module or containing an RMI serving a distant remote module	Transmitter	982NN	25,000 ft (7.6 km)	12,140 ft (3.7 km)
	Receiver	982NM	25,000 ft (7.6 km)	12,140 ft (3.7 km)
Generic 2 TMS — connection to a central location or a nearby remote module	Transmitter	982NL	4900 ft (1.5 km)	2000 ft (0.6 km)
	Receiver	982NK	4900 ft (1.5 km)	2000 ft (0.6 km)
Generic 2 TMS — connection to a distant remote module	Transmitter	982NN	25,000 ft (7.6 km)	12,140 ft (3.7 km)
	Receiver	982NM	25,000 ft (7.6 km)	12,140 ft (3.7 km)
Generic 2 (universal module) — as a central-location module, a nearby remote module, or containing an RMI serving a nearby module	Transceiver	9823A	4900 ft (1.5 km)	2000 ft (0.6 km)
Generic 2 (universal module) — as a distant remote module or containing an RMI serving a distant remote module	Transceiver	9823B	25,000 ft (7.6 km)	12,140 ft (3.7 km)
System 85 Module — at a central location connecting to the TMS	Transmitter	Z982A	13,000 ft (4.0 km)	13,000 ft (4.0 km)
	Receiver	Z982B	13,000 ft (4.0 km)	13,000 ft (4.0 km)
System 85 Module — at a remote location connecting to the TMS	Transmitter	Z982C	13,000 ft (4.0 km)	13,000 ft (4.0 km)
	Receiver	Z982D	13,000 ft (4.0 km)	13,000 ft (4.0 km)
System 85 Module — at a remote location connecting to an RMI at the central locale	Transmitter	Z982J	13,000 ft (4.0 km)	13,000 ft (4.0 km)
	Receiver	Z982D	13,000 ft (4.0 km)	13,000 ft (4.0 km)

TABLE 13-1. System 85 and DEFINITY Generic 2 Fiber-Optic Paddleboard Ranges (Continued)

Application		Model	Distance Limits	
			62.5 Micron	50 Micron
System 85 RMI — in a central location module, or an RMI carrier, connecting to an RMI in the remote module	Transmitter	Z982J	13,000 ft (4.0 km)	13,000 ft (4.0 km)
	Receiver	Z982D	13,000 ft (4.0 km)	13,000 ft (4.0 km)
System 85 TMS — connecting to a central location module	Transmitter	Z982A	13,000 ft (4.0 km)	13,000 ft (4.0 km)
	Receiver	Z982B	13,000 ft (4.0 km)	13,000 ft (4.0 km)
System 85 TMS — connecting to a remote module	Transmitter	Z982C	13,000 ft (4.0 km)	13,000 ft (4.0 km)
	Receiver	Z982D	13,000 ft (4.0 km)	13,000 ft (4.0 km)

14. INSERT LABELS

This chapter shows partial reproductions of the upper third of each insert label sheet. Table 14-1, *Numerical List of Insert Labels,* lists the labels in numerical order. The representations are grouped by the following color coding that indicates the source of the terminating leads as follows:

- Green: network services central office (CO) trunks
- Purple: equipment ports
- Yellow: auxiliary cabinet and miscellaneous field
- Blue: information outlets (IOs)
- Gray: connections between intermediate distribution fields (IDFs)
- White: connections between main distribution field (MDF) and the IDFs

TABLE 14-1. Numerical List of Insert Labels

Select Code	Label Title
801-l00	1 Pair, Ports (Purple)
801-101	1 Pair, Ports (Purple)
801-102	1 or 3 Pair, Ports (Purple)
801-103	1 or 3 Pair, Ports Mix (Purple)
801-104	3 Pair, Ports (Purple)
801-105	3 Pair, Ports (Purple)
801-106	2 Pair, Ports (Purple)
801-107	2 Pair, Ports (Purple)
801-108	3 Pair, Misc (Purple)
801-109	4 Pair, Misc (Purple)
801-110	3 Pair, Misc (Yellow)
801-111	3 Pair, Misc (White)
801-112	3 Pair, Link (Gray)
801-113	2 Pair, Link (White)

TABLE 14-1. Numerical List of Insert Labels (continued)

Select Code	Label Title
801-114	2 Pair, Link (White)
801-115	3 Pair, Link (White)
801-116	3 Pair, Link (White)
801-117	3 Pair, Link (White)
801-118	3 Pair, Link (White)
801-119	3 Pair, Link (Blue)
801-120	4 Pair, Jack (Blue)
801-121	4 Pair, Jack 1-216 (Blue)
801-122	4 Pair, Jack 217-432 (Blue)
801-123	Pair Count, Generic (Green)
801-124	Pair Count, Generic (Yellow)
801-125	Pair Count, Generic (Purple)
801-126	Pair Count, Generic (Blue)
801-127	Pair Count, 1-900 (Green)

TABLE 14-1. Numerical List of Insert Labels (continued)

Select Code	Label Title
801-128	Pair Count, 1-900 (Yellow)
801-129	Pair Count, Generic (White)
801-130	Pair Count, 1-900 (White)
801-131	Pair Count, 901-1800 (White)
801-132	Pair Count, 1801-2700 (White)
801-133	1 Pair, Ports (Purple)
801-134	2 or 1 Pair, Ports (Purple)
801-135	1 or 2 Pair, Ports (Purple)
801-136	3 or 1 Pair, Ports (Purple)
801-137	1 or 3 Pair, Ports (Purple)
801-138	2 or 1 Pair, Ports (Purple)
801-139	1 or 2 Pair, Ports (Purple)
801-140	3 or 1 Pair, Ports (Purple)
801-141	1 or 3 Pair, Ports (Purple)

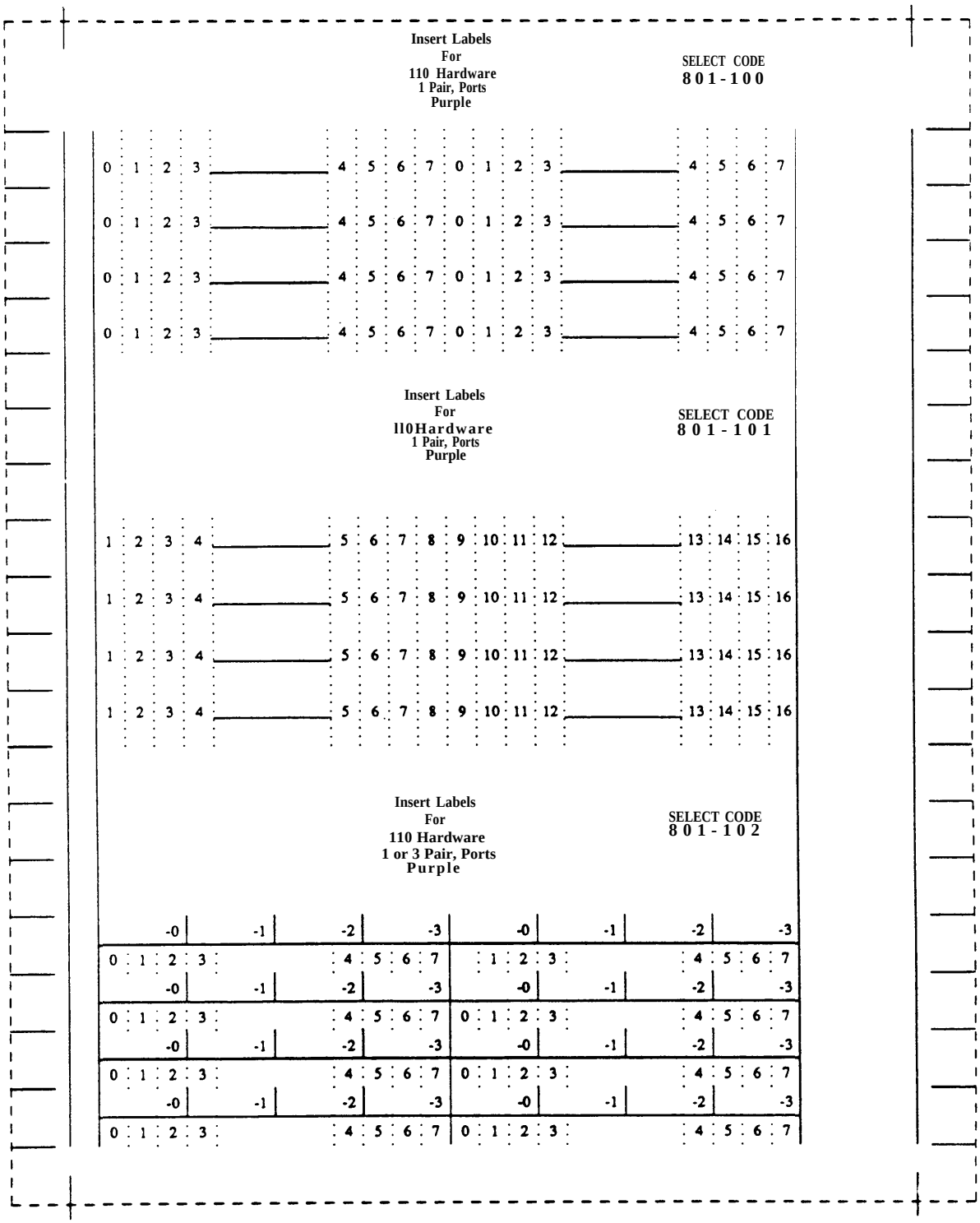


Figure 14-1. Insert Labels - Partial Reproductions

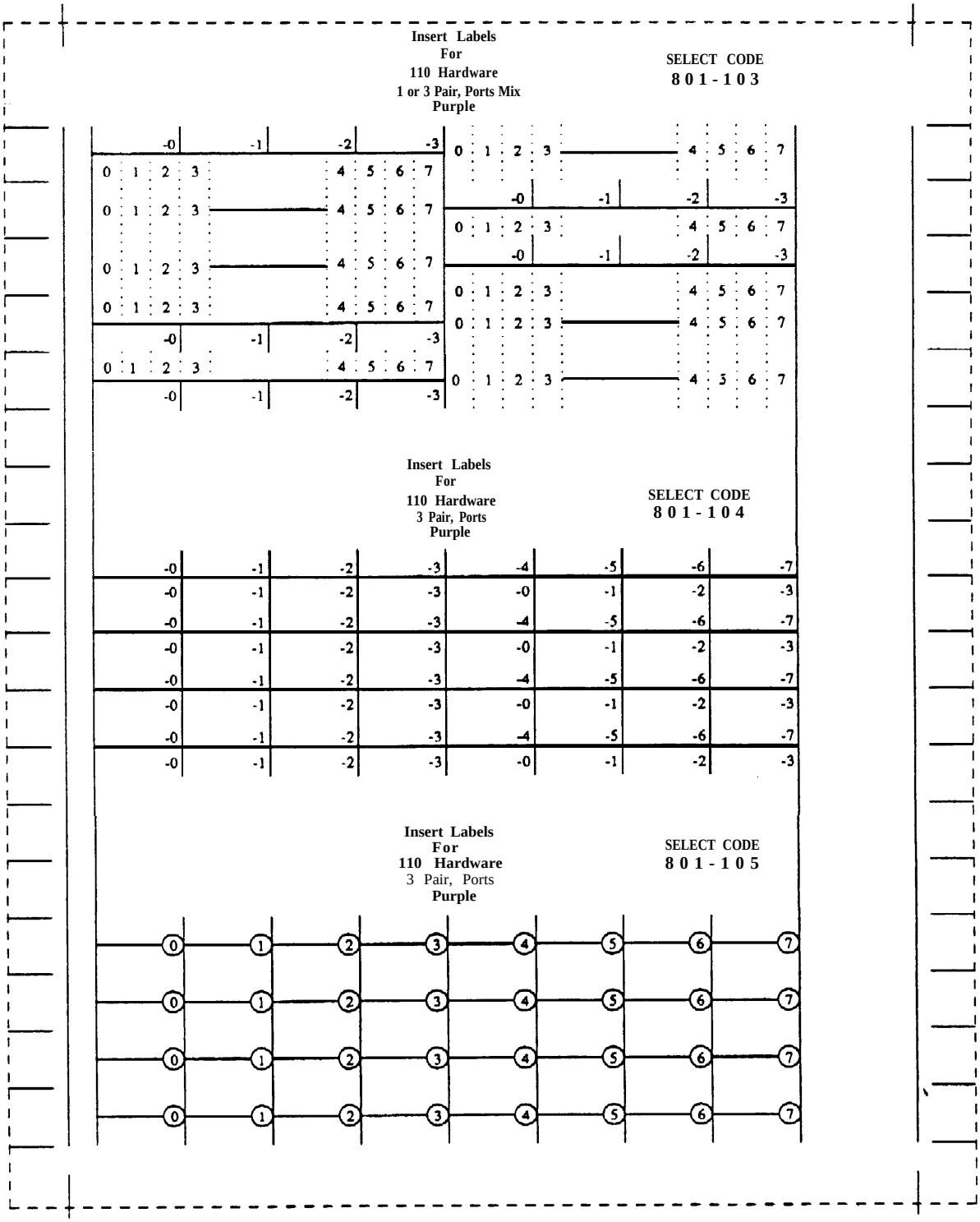


Figure 14-2. Insert Labels - Partial Reproductions

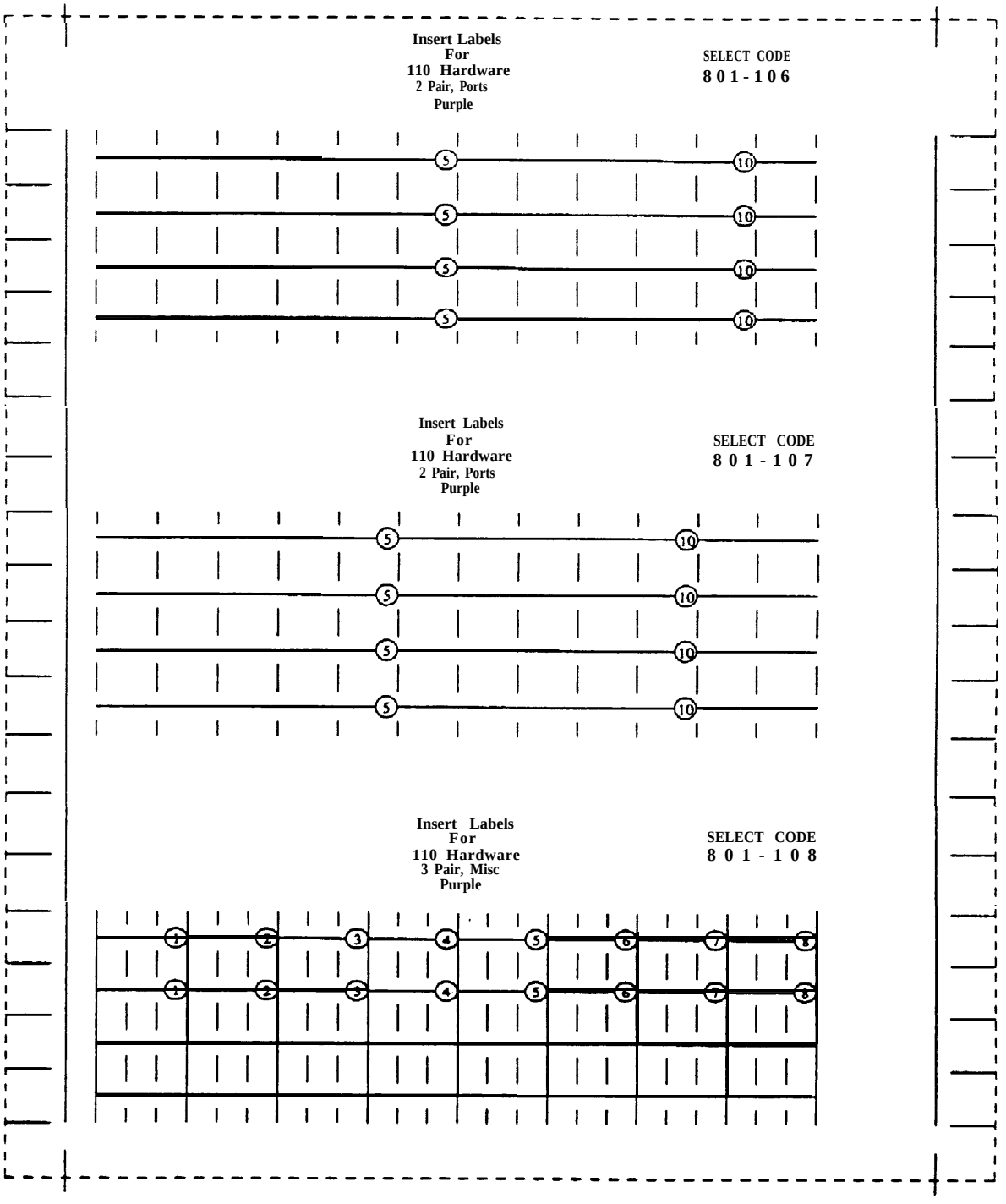


Figure 14-3. Insert Labels - Partial Reproductions

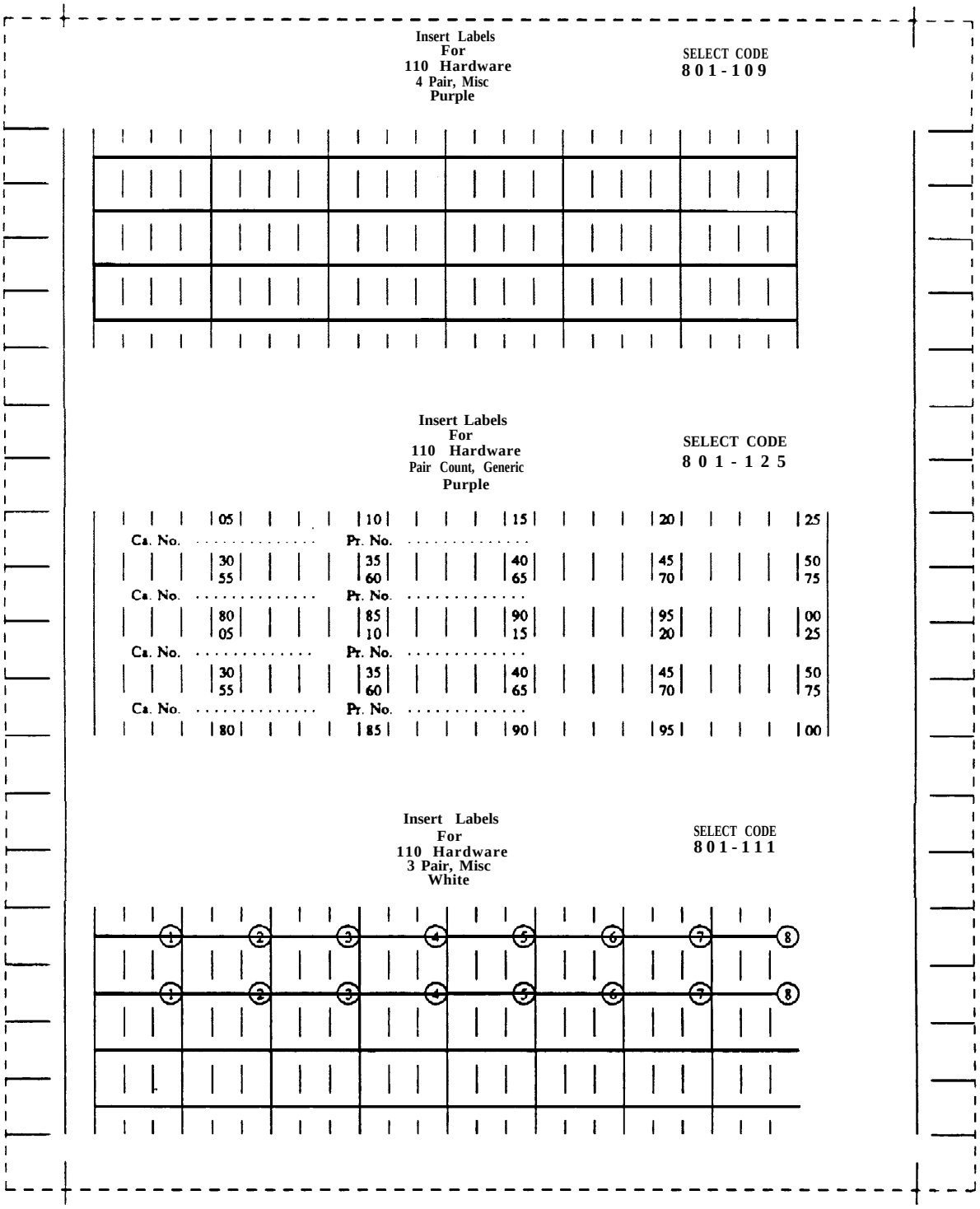


Figure 14-4. Insert Labels - Partial Reproductions

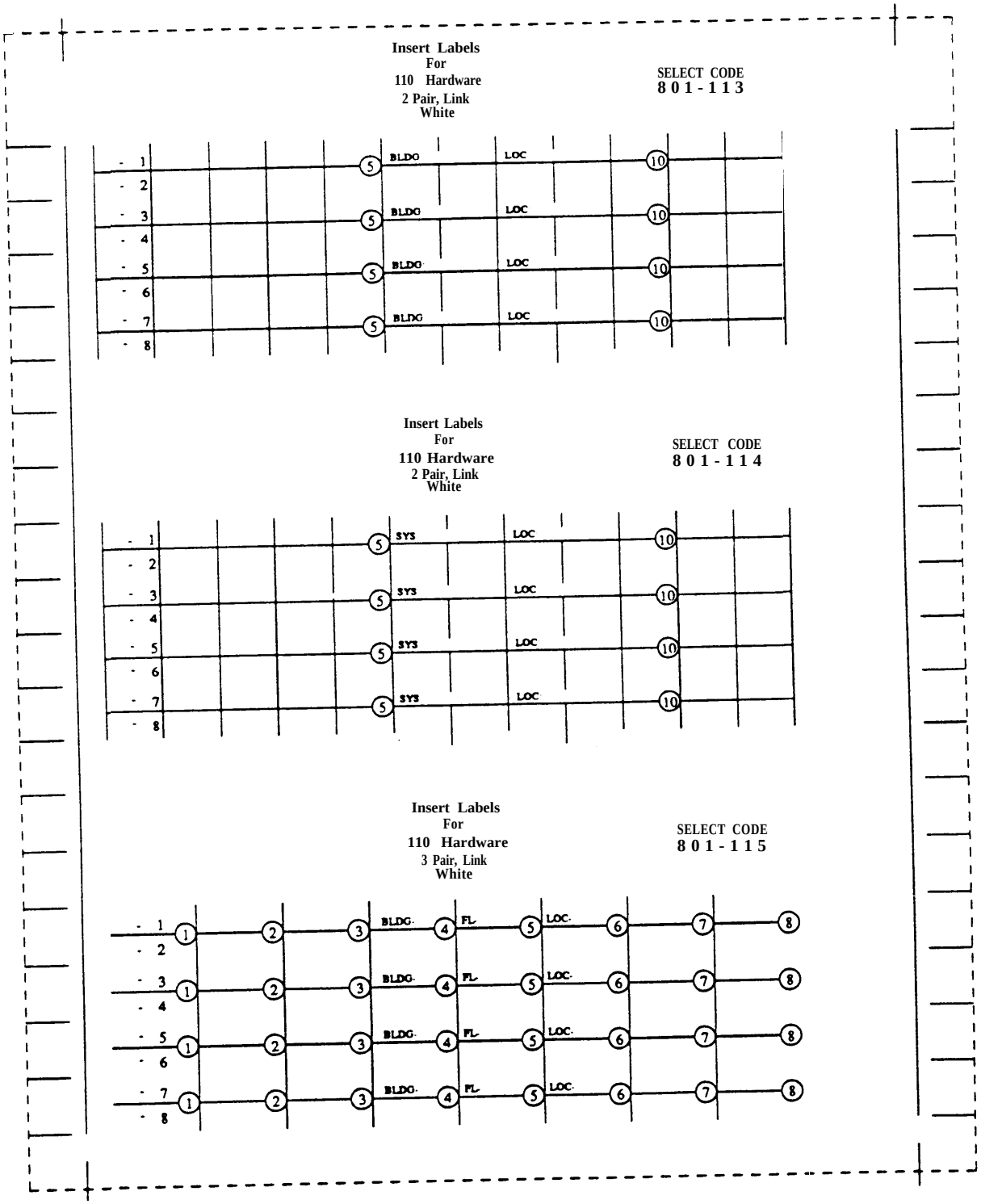


Figure 14-5. Insert Labels - Partial Reproductions

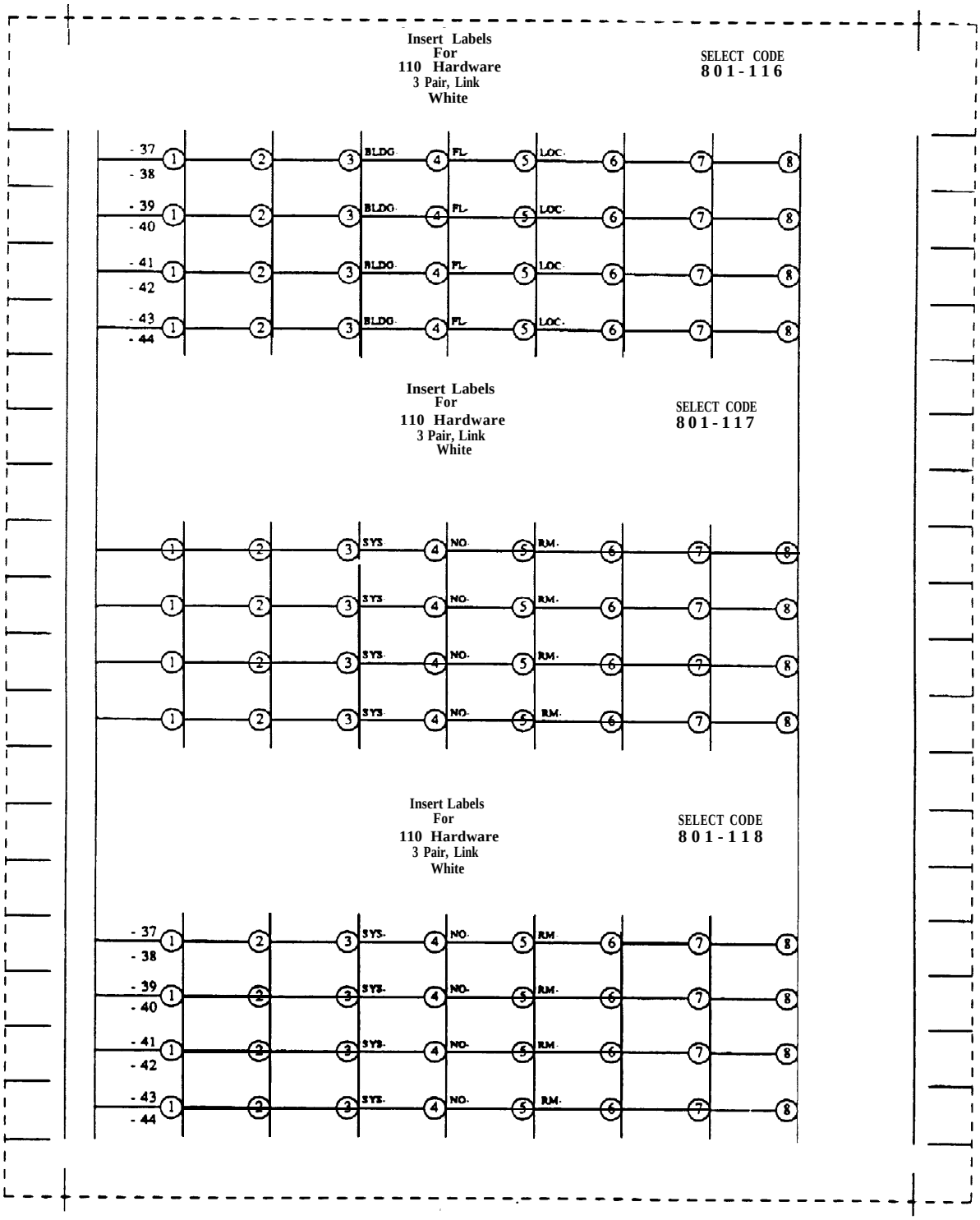


Figure 14-6. Insert Labels - Partial Reproductions

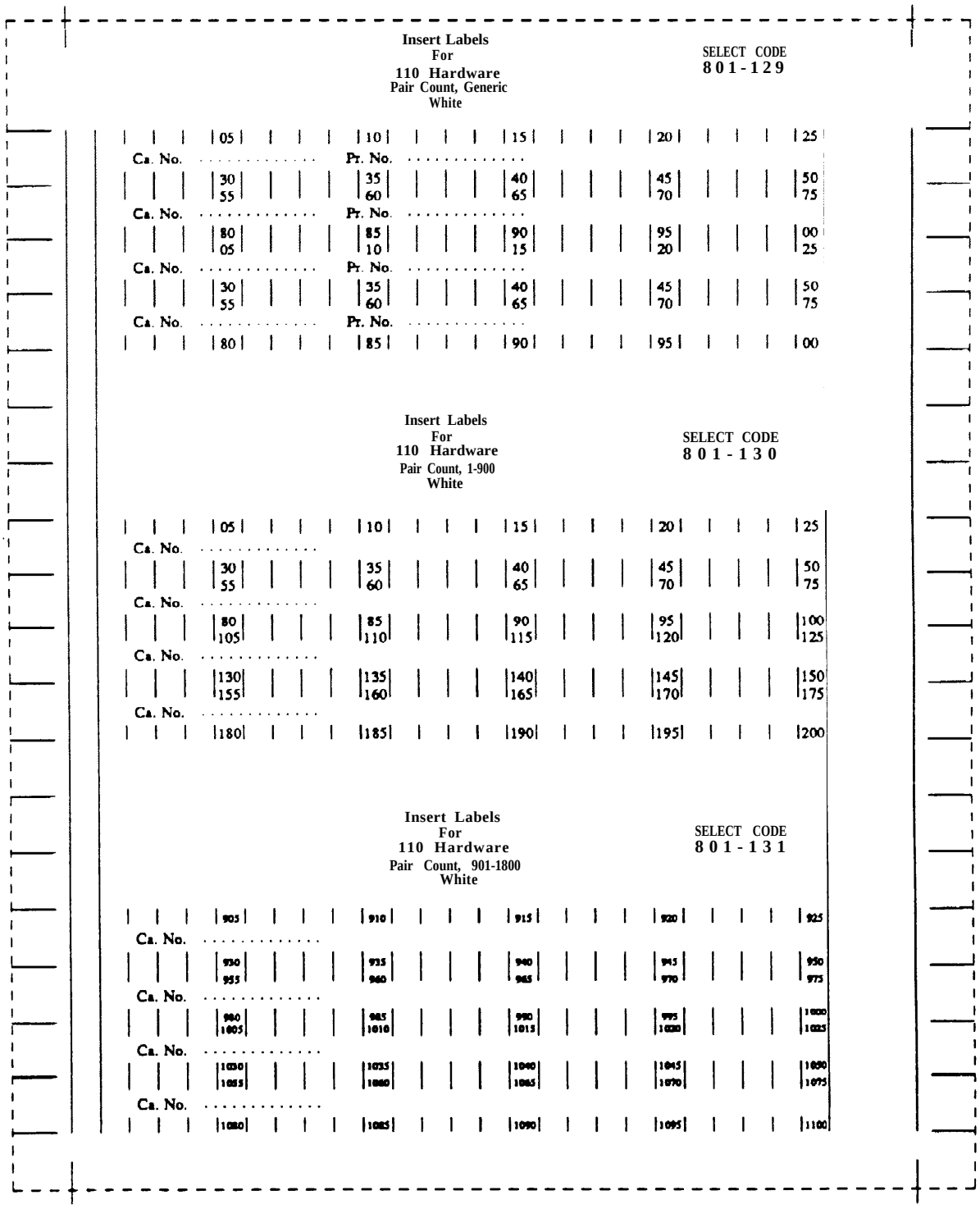


Figure 14-7. Insert Labels - Partial Reproductions

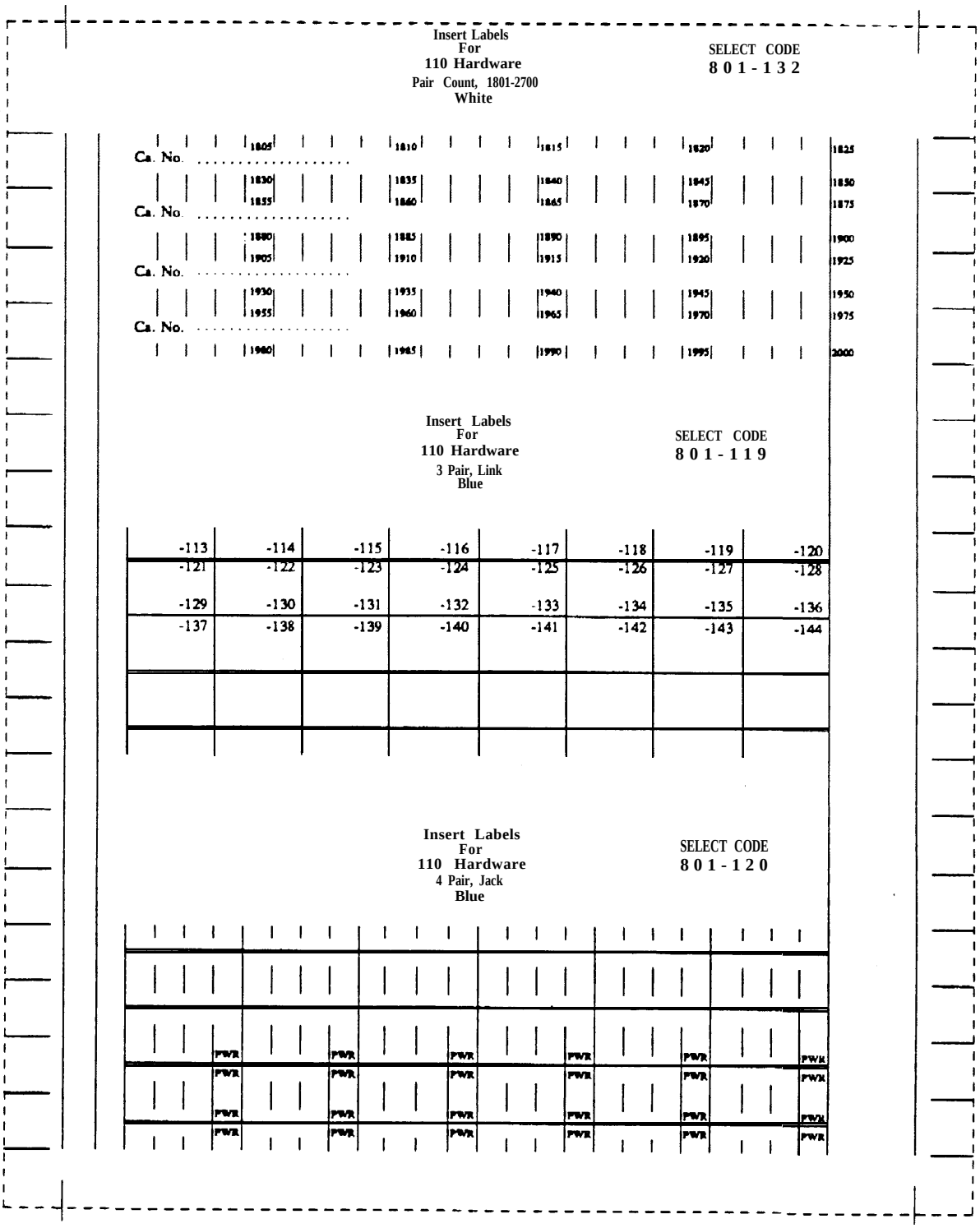
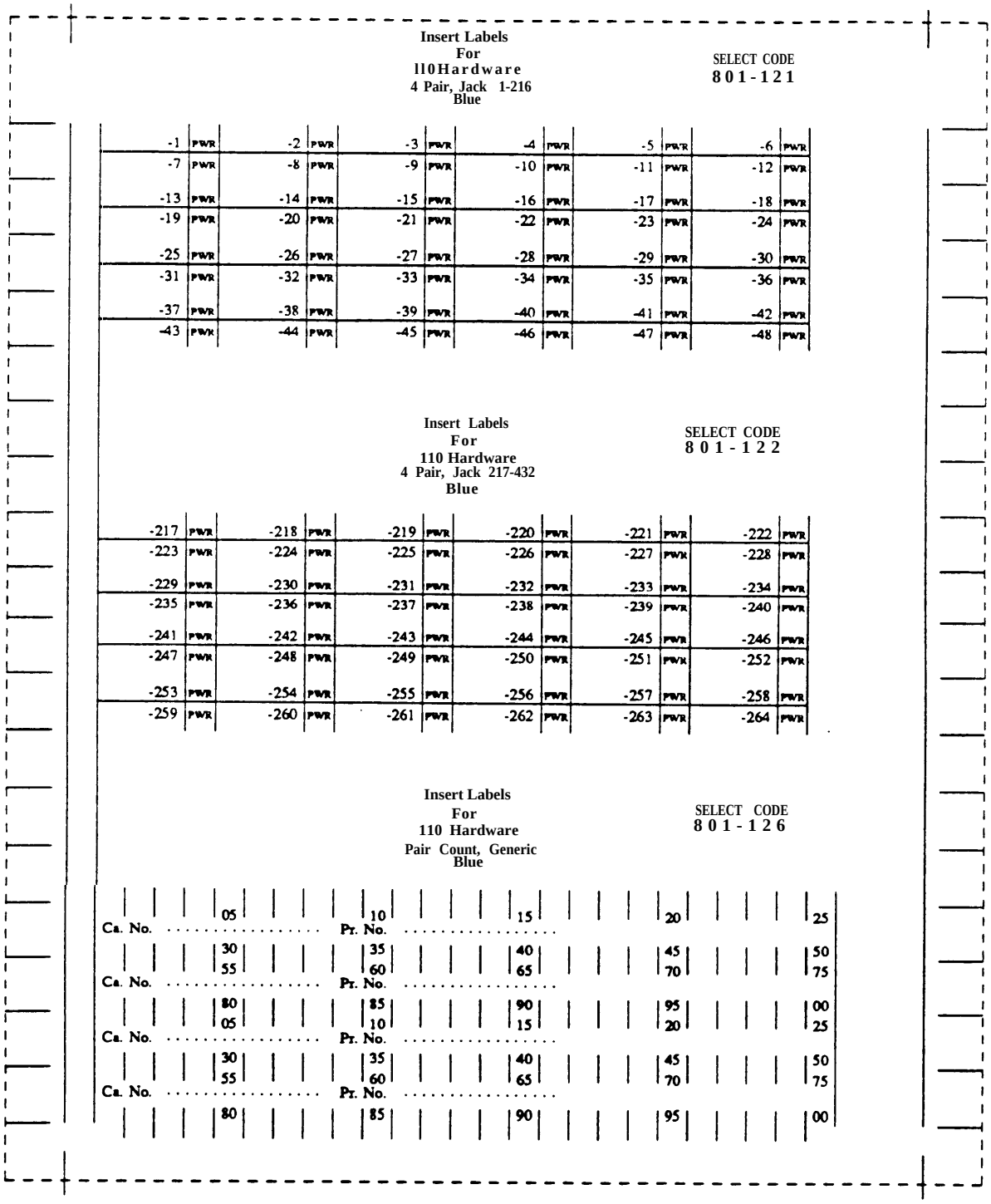


Figure 14-8. Insert Labels - Partial Reproductions



Insert Labels
For
110 Hardware
4 Pair, Jack 1-216
Blue

SELECT CODE
801-121

-1	PWR	-2	PWR	-3	PWR	-4	PWR	-5	PWR	-6	PWR
-7	PWR	-8	PWR	-9	PWR	-10	PWR	-11	PWR	-12	PWR
-13	PWR	-14	PWR	-15	PWR	-16	PWR	-17	PWR	-18	PWR
-19	PWR	-20	PWR	-21	PWR	-22	PWR	-23	PWR	-24	PWR
-25	PWR	-26	PWR	-27	PWR	-28	PWR	-29	PWR	-30	PWR
-31	PWR	-32	PWR	-33	PWR	-34	PWR	-35	PWR	-36	PWR
-37	PWR	-38	PWR	-39	PWR	-40	PWR	-41	PWR	-42	PWR
-43	PWR	-44	PWR	-45	PWR	-46	PWR	-47	PWR	-48	PWR

Insert Labels
For
110 Hardware
4 Pair, Jack 217-432
Blue

SELECT CODE
801-122

-217	PWR	-218	PWR	-219	PWR	-220	PWR	-221	PWR	-222	PWR
-223	PWR	-224	PWR	-225	PWR	-226	PWR	-227	PWR	-228	PWR
-229	PWR	-230	PWR	-231	PWR	-232	PWR	-233	PWR	-234	PWR
-235	PWR	-236	PWR	-237	PWR	-238	PWR	-239	PWR	-240	PWR
-241	PWR	-242	PWR	-243	PWR	-244	PWR	-245	PWR	-246	PWR
-247	PWR	-248	PWR	-249	PWR	-250	PWR	-251	PWR	-252	PWR
-253	PWR	-254	PWR	-255	PWR	-256	PWR	-257	PWR	-258	PWR
-259	PWR	-260	PWR	-261	PWR	-262	PWR	-263	PWR	-264	PWR

Insert Labels
For
110 Hardware
Pair Count, Generic
Blue

SELECT CODE
801-126

			05				10				15				20				25					
Ca. No.						Pr. No.																	
			30 55				35 60				40 65				45 70				50 75				
Ca. No.						Pr. No.																	
			80 05				85 10				90 15				95 20				00 25				
Ca. No.						Pr. No.																	
			30 55				35 60				40 65				45 70				50 75				
Ca. No.						Pr. No.																	
			80				85				90				95				00				

Figure 14-9. Insert Labels - Partial Reproductions

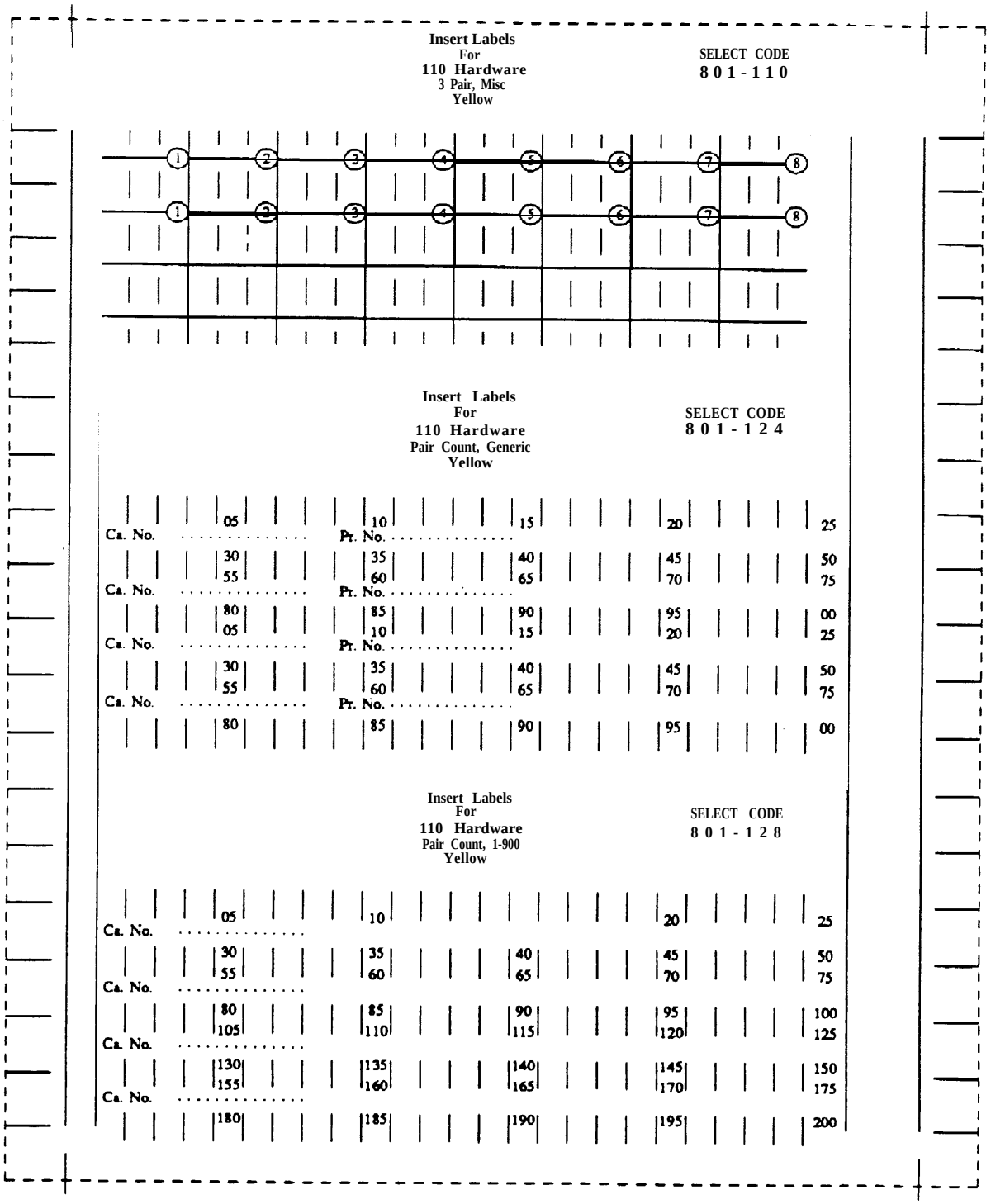
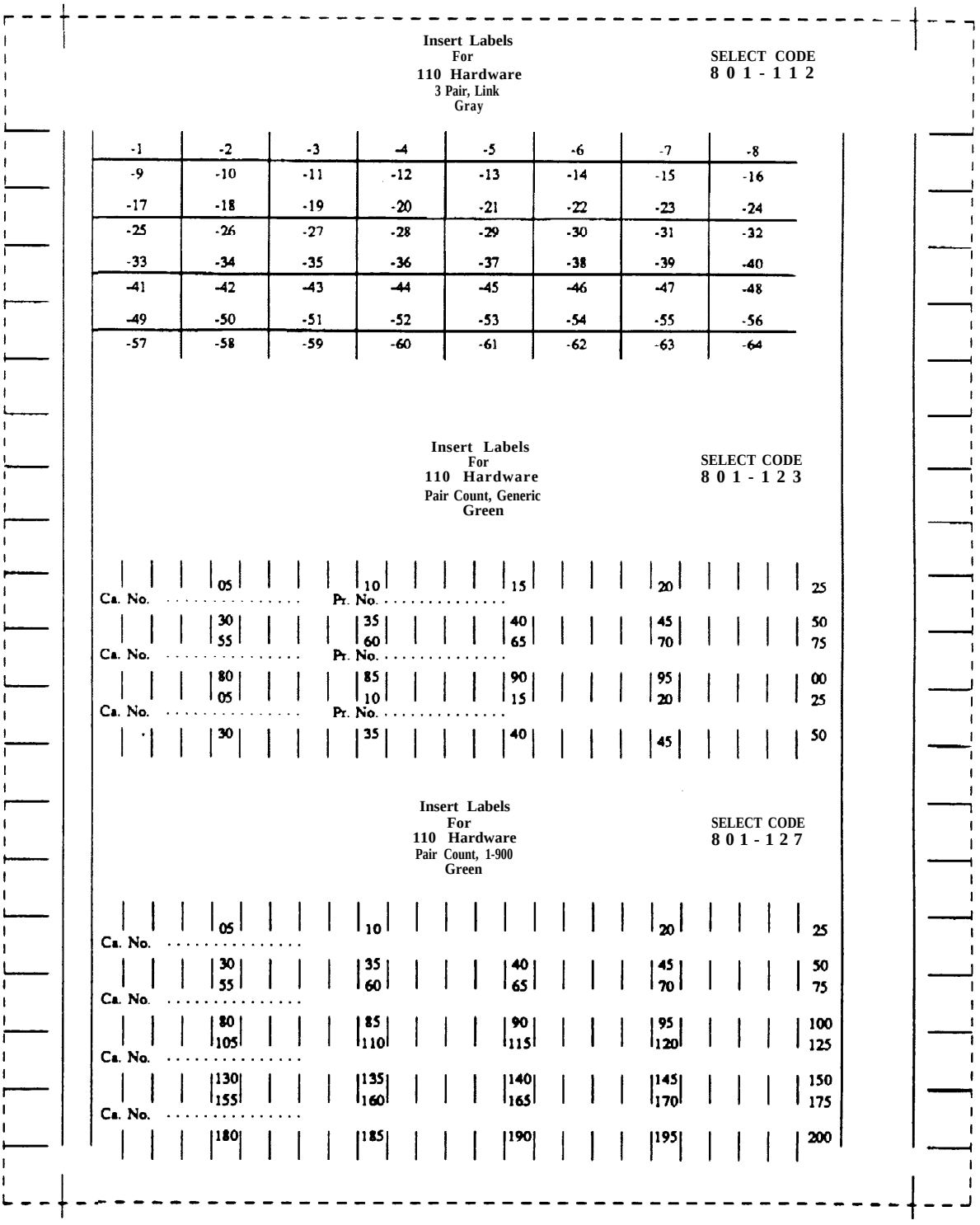


Figure 14-10. Insert Labels - Partial Reproductions



Insert Labels
For
110 Hardware
3 Pair, Link
Gray

SELECT CODE
8 0 1 - 1 1 2

-1	-2	-3	-4	-5	-6	-7	-8
-9	-10	-11	-12	-13	-14	-15	-16
-17	-18	-19	-20	-21	-22	-23	-24
-25	-26	-27	-28	-29	-30	-31	-32
-33	-34	-35	-36	-37	-38	-39	-40
-41	-42	-43	-44	-45	-46	-47	-48
-49	-50	-51	-52	-53	-54	-55	-56
-57	-58	-59	-60	-61	-62	-63	-64

Insert Labels
For
110 Hardware
Pair Count, Generic
Green

SELECT CODE
8 0 1 - 1 2 3

Ca. No. . . . . Pr. No. 05 10 15 20 25

Ca. No. . . . . Pr. No. 30 35 40 45 50
55 60 65 70 75

Ca. No. . . . . Pr. No. 80 85 90 95 00
05 10 15 20 25

30 35 40 45 50

Insert Labels
For
110 Hardware
Pair Count, 1-900
Green

SELECT CODE
8 0 1 - 1 2 7

Ca. No. 05 10 20 25

Ca. No. 30 35 40 45 50
55 60 65 70 75

Ca. No. 80 85 90 95 100
105 110 115 120 125

Ca. No. 130 135 140 145 150
155 160 165 170 175

180 185 190 195 200

Figure 14-11. Insert Labels - Partial Reproductions

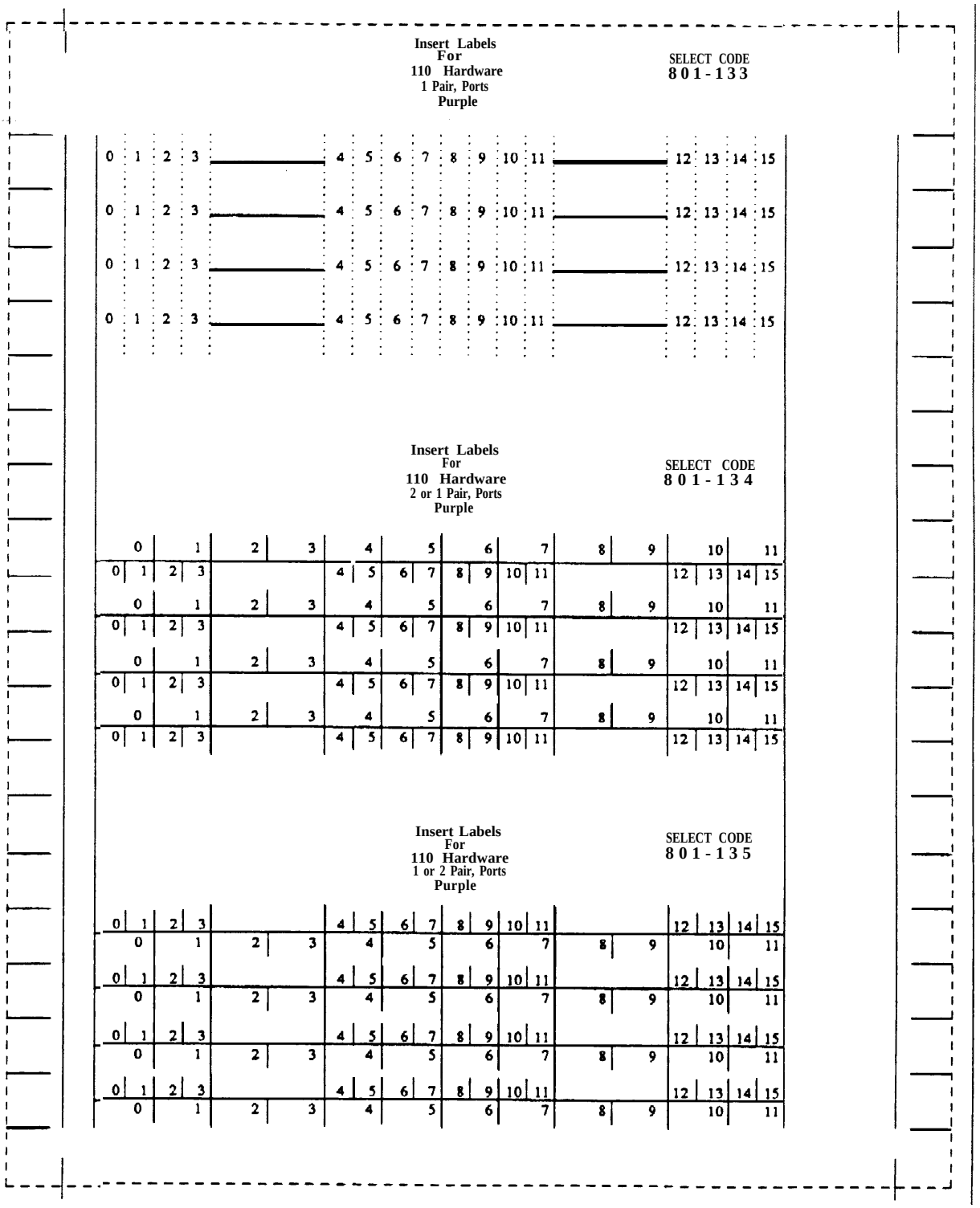


Figure 14-12. Insert Labels - Partial Reproductions

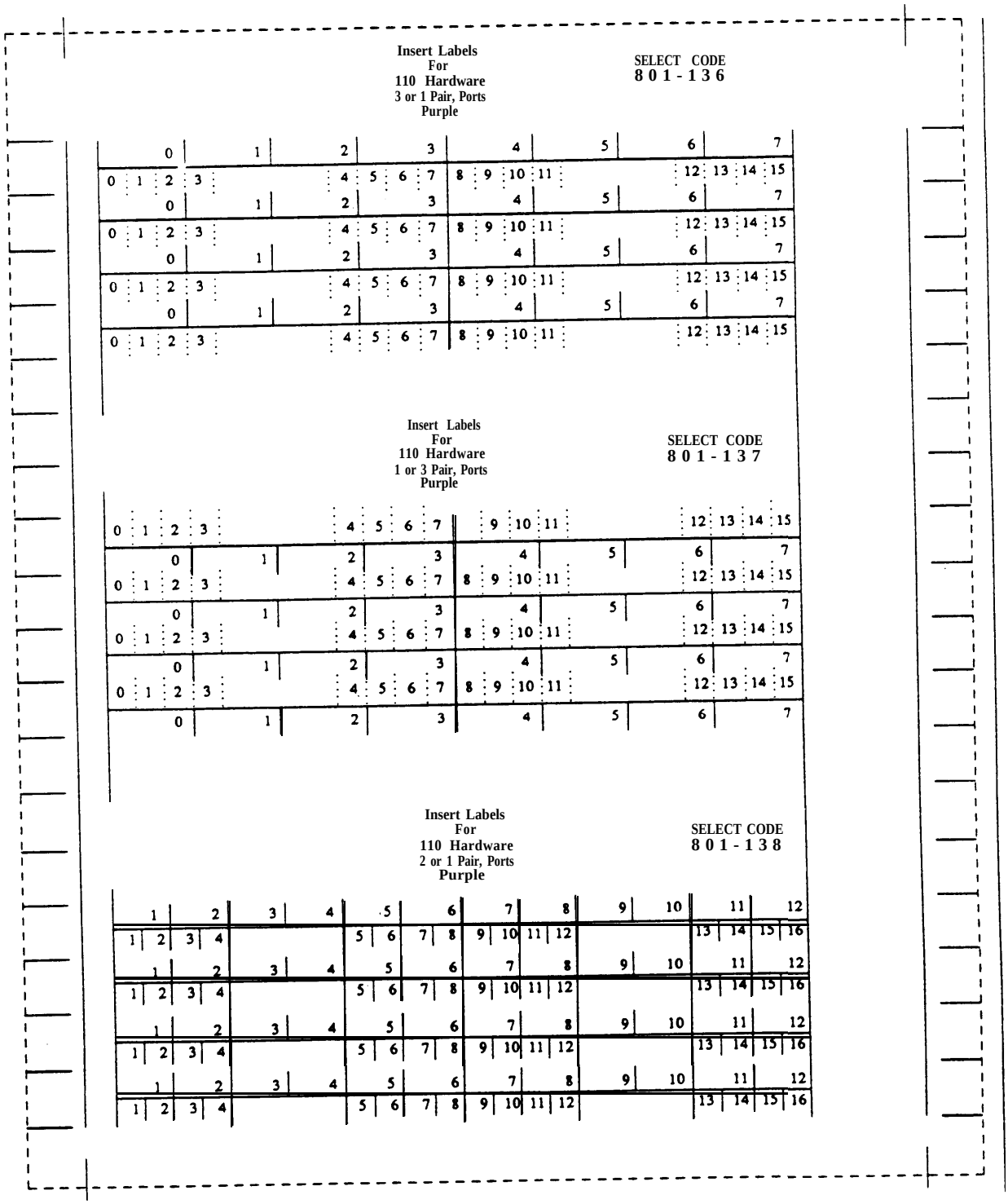


Figure 14-13. Insert Labels - Partial Reproductions

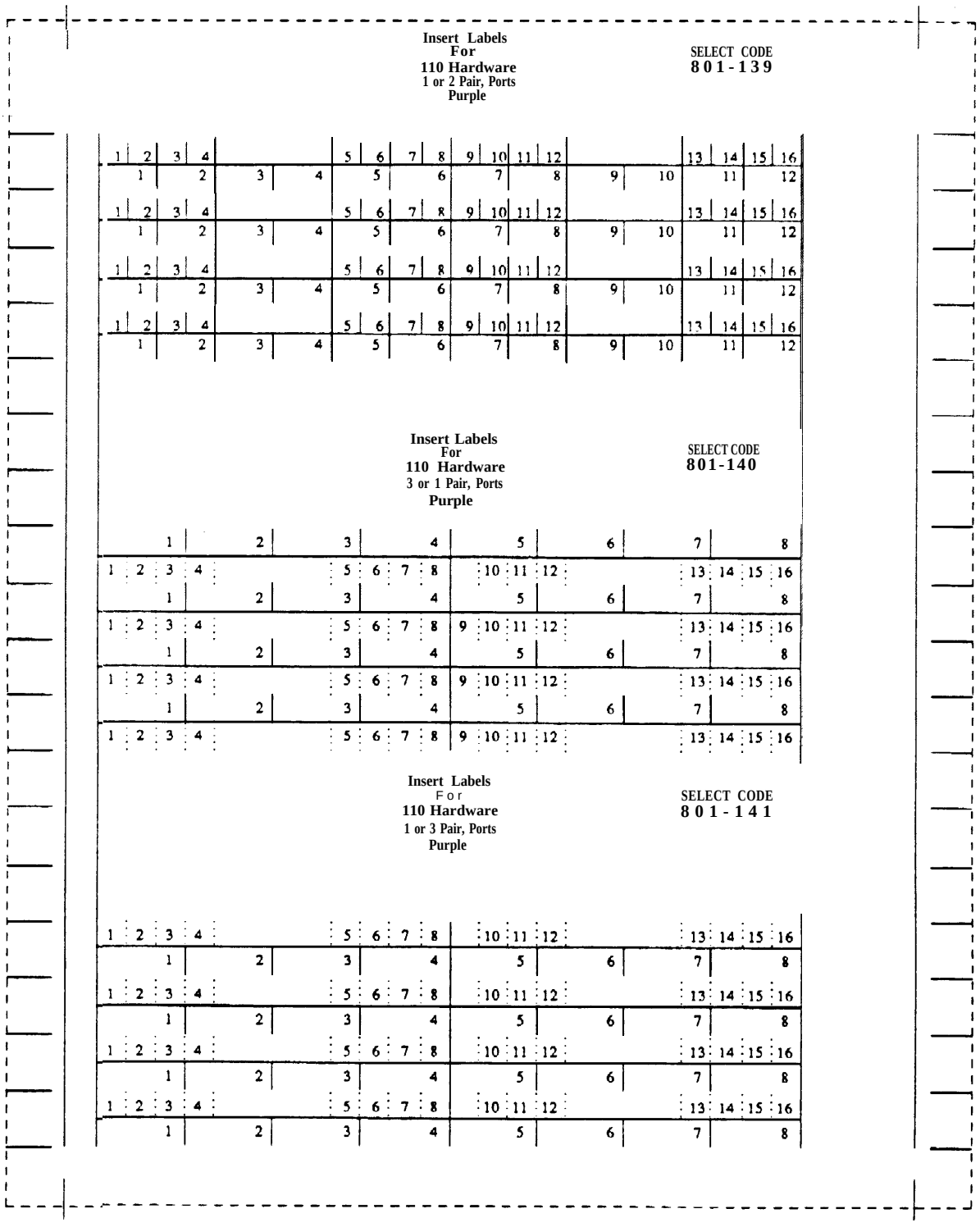


Figure 14-14. Insert Labels - Partial Reproductions

GLOSSARY

ADFTC	analog / digital facility test circuit
ADM	asynchronous data module
ADU	asynchronous data unit
AIOD	Automatic Identification of Outward Dialing
applications processor (AP)	A computer designed for running applications that both manage and enhance the capabilities of a communications system.
asynchronous data unit (ADU)	A limited-distance modern that allows direct connection between RS-232C equipment and the communications system.
AT&T Audio Information Exchange (AUDIX)	An AT&T voice-mail system that allows users to leave, receive, replay, transfer, and broadcast recorded messages.
avalanche diode	A solid-state device used as a primary electrical protector against surges caused by lightning, power crosses, and ground-potential rise.
backbone cable	*See distribution cable.*
backplane	The rear surface of a circuit-pack carrier that is equipped with clusters of pins for the connection of equipment cables.
Basic Rate Interface (BRI)	A standard ISDN format that supports two B channels and one D channel.
BEF	building entrance facility
BRI	basic rate interface

black cable — See *distribution cable.*

BMT — basic modular telephone

building entrance facility (BEF) — The cross-connect field (which may or may not be enclosed) where cables from the central office (CO) terminate for cross-connection to the network interface (NI).

bulk power supply — A power supply capable of supplying power to multiple voice terminal adjuncts.

bulk power unit — The combination of a panel that plugs into 120 VAC and up to three power supplies that are mounted on the panel to supply power to voice terminal adjuncts.

call coverage module — A voice terminal adjunct with 20 line-appearance lamps. The module is usually used by a secretary (or clerk) covering calls for a group. The group's phones are bridged to the secretary's, and a line appearance lamp lights on the module when a member of the group receives a call.

campus cable — *See distribution cable.*

carbon block — A surge-limiting device that is placed in series with distribution cabling or cabling from the central office (CO). The block arcs to ground across an air gap when voltage surges through it in excess of a predetermined level. Carbon blocks are used as primary electrical protection.

central office (CO) — A location housing telephone switching equipment that provides local telephone service and access to toll facilities for long-distance service.

circuit pack — A circuit board of one or more layers that is inserted into the carriers of a switch cabinet and that controls a particular operation of the switch.

combination protection — The use of primary and secondary electrical protectors, usually in a single device, to protect against two or more types of electrical surges.

comcode — The nine-digit identification number for AT&T's equipment and parts.

common control (CC) — The master controller of the communications system.

communication module — See *module.*

communications processor — See *common control.*

coupled bonding conductor (CBC) — A conductor that is connected between a PBX single-point ground and the protector ground terminal. It is run adjacent to protected pairs in an associated cable. The mutual coupling between the bonding conductor and the pairs reduces electrical potential differences in terminating equipment.

This conductor can be constructed in one of the following manners:

- When pairs are run in a shielded cable, the cable shield can be used as the CBC.
- With inside wiring cable, 10 AWG wire that is tie-wrapped to the cable can be used as the coupled bonding conductor.
- If the use of 10 AWG wire is impractical, six dedicated, good spare pairs within the cable may be used as the coupled bonding conductor. The six spare pairs must be twisted and soldered to prevent their use for other purposes.

cross-connect block — A flame-retardant plastic block containing metal wiring terminals (quick clips) used to establish cross-connections between cables.

cross-connect field — An arrangement of cross-connect blocks used for the termination and cross-connection of groups of cables.

customer participation — The set up and removal of cross-connections at the main and intermediated distribution fields (MDFs and IDFs) by the customer.

data-link transformer — An isolation transformer, used for secondary electrical protection, that protects against residual voltages and sneak currents.

Delta — A module protector manufactured by Porta Systems, Corp.

designation strip — A clear plastic strip installed between the terminal strips of the 110A-type cross-connect blocks to hold and protect insert labels.

digital circuit packs — The circuit packs installed in port carriers to serve digital terminals.

digital communications protocol (DCP) — A digital protocol used by AT&T System 85 and DEFINITY Generic 2 .

digital service level-1 (DS1) — The multiplexing of 24 voice and/or data communication onto a single channel for transmission.

digital signals cross-connect (DSX) — A special cross-connect assembly used to terminate and cross-connect cables carrying DS1 signals.

digital terminal — A terminal that uses the digital communications protocol (DCP) to transmit voice, data and station control information to and from the switch simultaneously through a two-wire-pair connection.

digital terminal data module (DTDM) — An add-on data module for the model 7403D and 7405D voice terminals. It converts RS232C signals to digital communication protocol (DCP) to permit an RS232C data terminal to share the voice terminal's wiring connection to the switch.

direct inward dialing (DID) — A feature of the communications system that allows an incoming call from the public network, not FX (foreign exchange) or WATS (Wide Area Telecommunications Service) to reach a specific voice terminal of the private network without attendant assistance.

display module — A 40-character screen that attaches to the 7405D voice terminal to display messages and calling information.

distributed communications system (DCS) — A private network of multiple switches with transparent operation of certain attendant and terminal features between the switches. To users, the DCS appears to be one switch.

distribution cable — The cable that connects the main distribution frame (MDF) to an intermediate distribution frame (IDF., When the cable is run between floors in the same building, it is called *riser, house,* or *backbone cable.* When the cable runs from the MDF in one building to an IDF in another building, it is called campus *cable.* Distribution cable is also known as *black* cable because of the heavy polyvinyl chloride (PVC) protective covering that it is normally encased in.

DS1/MFAT carrier — The carrier in the port cabinet that holds digital service 1 (DS1) circuit packs and multifunction analog terminal (MFAT) circuit packs. It also can hold the same circuit packs that the universal port carrier can hold.

enhanced primary protector — A protector that operates at a lower voltage or current threshold than a primary protector.

extra-large building entrance terminal (XLBET) — A frame manufactured by the AT&T Service Center in Los Angeles to hold terminal blocks for main distribution frames (MDFs) and intermediate distribution frames (IDFs). The Service Center manufactures the XLBET in several models.

foreign exchange (FX) — A central office (CO) other than the one located in the calling customer area.

frame — A metal structure used to hold arrangements of cross-connect blocks.

fusible link — A short length of fine gauge wire that melts when subjected to an electrical current exceeding 5A. It is used as a primary protector against ground-potential rise and power crosses.

gas tube — A device containing a sealed special gas used to protect against high-voltage surges. Gas tubes are used as primary electrical protectors against lightning, ground potential rise, and power crosses. They reset themselves for a limited number of times depending upon the duration of surges.

ground-potential rise — A voltage, conducted through the earth to the grounding point for a switch and its cabling, that exceeds the voltage being discharged into the earth by the switch and cable grounds. Ground-potential rise is usually caused by a lightning strike or a severe power fault nearby.

hard-wired Wired directly from the main distribution frame (MDF) to an information outlet (IO) that bypasses an intermediate distribution frame (IDF).

headset A device, substituting for a handset, that combines an earphone and mouthpiece in an arrangement to be worn on the user's head. A headset is used mostly by employees who must have their hands free for duties other than answering calls.

heat coil A device that overheats from low currents (0.3A to 5.0A) and grounds a conductor. Heat coils are supplementary electrical protectors used to protect against sneak current caused by power crosses, power inductions, and ground potential rise.

homerun Installation cable that runs from the main distribution frame (MDF) in the equipment room to the information outlet (IO) at the workstation without a cross-connection in a satellite closet.

horizontal subsystem See *installation cable.*

hybrid circuit packs The circuit packs installed in the port carriers to serve hybrid terminals.

hybrid terminal A telephone with multiple features that requires one wire pair for analog voice transmissions and two wire pairs for digital-control transmissions.

information outlet (IO) The wall jack at an employee's desk that his or her terminal plugs into. The IO is connected to the intermediate distribution field (IDF) by installation cabling.

IROB in-range, out-of-building

insert labels Labels inserted into the designations strips of the 110A terminal blocks to identify a cable and its leads when the cable is terminated on a main distribution frame (MDF) or an intermediate distribution frame (IDF).

installation cable — Usually a four-pair cable that connects an information outlet (IO) to an intermediate distribution frame (IDF). It is also known as *gray cable* or *horizontal wiring.*

integrated services digital network (ISDN) — An end-to-end digital network that supports a wide array of voice and data services.

intermediate distribution field (IDF) — A cross-connect field where the distribution cables from the main distribution field (MDF) arc cross-connected to the installation cables from the information outlets (IOs). The IDF is usually located in a satellite closet. It can be wall mounted or frame mounted depending on the size and special needs of the installation. Also a generic term for other than MDF cross-connect fields.

ISDN — integrated services digital network

jumper wire — A twisted-pair wire in 24 or 26 gauge used with a special tool to cross-connect cables terminated on the main distribution frame (MDF) and intermediate distribution (IDFs).

main distribution frame (MDF) — The cross-connect field where cables from the central office (CO) are cross-connected to the switch and where port cables from the switch are cross-connected to the distribution cables. This is the largest cross-connect field of the installation and is located in the equipment room.

modular processor data module (MPDM) — A multipurpose data module that can be set up to convert any one of several protocols to digital communications protocol (DCP) for automatic or off-premises data calls.

modular trunk data module (MTDM) — A multipurpose data module used to convert RS232C protocol to digital communications protocol (DCP). It is used for modem pooling, private line trunks, switched networks, and off-premises data-only extensions.

module — A group of AT&T system 85 or DEFINITY™ Gencric 2 switch ports and the processor used to control them. The ports are located in the port cabinets and the processor, called the *module control* (MC), is located in the MC cabinet. Each module can have up to 1536 ports.

multibutton electronic telephone (MET) — A telephone manufactured for the AT&T DIMENSION® PBX. Some of its features operate with the AT&T System 85 or DEFINITY™ Generic 2.

multimodule — Pertaining to an AT&T System 85 or DEFINITY™ Generic 2 with two or more modules. A module consists of a module processor (two for a duplicated system) and up to 12 port carriers.

ORPI — optically-remoted peripheral interface

patchcords — Wires in two-, three-, or four-pair groupings with connectors on either end. Patchcords are used with 110P-type cross-connect hardware for cross-connections that do not require a special tool.

port — A circuit on a port circuit pack that provides connection to a System 85 or DEFINITY™ Generic 2 voice or data terminal.

Porta Data System — The manufacturer of the Delta protector module and other electrical protectors.

power cross — The actual contact or possibility for contact ofhigh-voltage power lines with the distribution cables of a switch.

power induction — The creation of electrical currents in distribution cables by power lines running parallel and very close to the cables.

premises distribution system (PDS) — The transmission network inside a building or group of buildings that connects various types of voice and data communication devices, switching equipment and information management systems.

premises services consultant (PSC) — The AT&T field representative who is responsible for designing, estimating, and overseeing the installation of a premises distribution system (PDS).

price element code (PEC) — The number used to give the cost of and to order AT&T equipment and parts.

primary protector — The protector installed on one or both ends of exposed cabling to protect against high-voltage surges caused by lightning, power crosses, and ground-potential rise. Also know as *standard protector*.

purple field — The section of the main distribution frame (MDF) where the cables from line or trunk ports from the communications system terminate.

remote group — A group of extensions at a remote site that are served by a special port circuit pack installed in a remote group housing (RGH). The special port circuit pack is conneted to another special port circuit pack in one of the modules of the central switch by a digital service 1 (DS1) link.

remote group interface (RGI) — The circuit packs used to send and receive the signals transmitted by the fiber-optic link to the remote module.

remote module — A module that is located outside the equipment room that the central switch is located in and is connected to the central switch by an fiber-optic link.

residual voltages — Low voltages that remain in distribution cables after higher voltages have triggered primary protectors.

riser — See *distribution cable.*

riser subsystem — See *distribution cable.*

satellite closet — A small walk-in room used to house an intermediate distribution frame (IDF) and any adjunct power supplies that are needed.

self-supporting frame — A frame that is bolted to the floor.

single carrier module — A remote module comprised of single carrier module control and single carrier port cabinets.

single carrier module control cabinet (SCMCC) — A single cabinet containing all hardware necessary to support one unduplicated or one duplicated module control complex for a single carrier module.

single carrier port cabinet (SCPC) — A single cabinet containing port and tone circuit packs for the single carrier module.

sneak current — Current caused by power induction.

sneak-current fuse — A fuse that operates when a sneak current reaches a level that may be harmful to the system.

speakerphone — A combination speaker and microphone that plugs into a telephone. It enables the user to talk and listen without using the handset.

standard serial interface (SSI) — A protocol used to link application processors (APs) to 400-series printers and to the 500 Business Communications Terminal (BCT).

star configuration — A configuration of telecommunications and/or computer hardware in which a central node connects to each terminal by a single, point-to-point link. Communications between terminals must pass through the central node.

stringer system — The lattice of metal grids under a raised floor. The stringer system holds the floor tiles and supports the equipment loads.

supplementary protection — Protection against residual voltages and sneak currents.

surge — A sudden, abnormal, and potentially harmful flow of voltage and/or current in installation cabling.

synchronization clock — A synchronizing system clock that provides additional quality and performance in large digital networks.

system adjuncts — Processor-controlled machines that are linked to the communications system and perform special functions to augment the capabilities of the system. Audio Information Exchange (AUDIX) and an application processor (AP) are examples of system adjuncts.

terminating leads	The individual wires in a cable.
time-multiplex switch (TMS)	The AT&T System 85 or DEFINITY® Generic 2 processor that controls timing and communications among the system modules.
trunk/aux field	The section of the main distribution frame (MDF) where cables from the central office (CO) and from auxiliary equipment termiate for cross-connection to the switch.
UDM	universal data module
universal port carrier	A carrier in the port cabinet that accepts all port circuit packs except for very specialized ones such as the ANN 17B, which is used for digital service 1 (DS1) links.
VOM	voice-only module
white field	The area of the main distribution frame (MDF) where distribution cables from the intermediate distribution frame (IDF) terminate; the area of the IDF where distribution cables from the MDF terminate.
wiring block	The portion of the terminal block on which distribution and central office (CO) cables terminate.
workstation	The location of an employee's desk and the information outlet (IO) for the terminals used at that desk.
XLBET	extra-large building entrance terminal
zone concept	The approach to designing and constructing large main distribution frames (MDFs) so that distribution cables and equipment cables, which must be cross-connected, fall within the same 16-ft section of the MDF.

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