

COVER Book Cover

IBM 4680 Store System:

Preparing Your Site

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EDITION Edition Notice
Sixth Edition (March 1992)

This is the sixth edition of the *IBM 4680 Store System: Preparing Your Site*. It replaces GA27-3692-04 and applies to the IBM (*) 4680 Operating System. A vertical bar appears in the left margin to indicate new or revised information. See the Summary of Changes for a list of changes in this edition.

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FRONT_1.2 Electronic Emission Notices

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Subtopics

FRONT_1.2.1 Telecommunications Safety Requirements -- United Kingdom

FRONT_1.2.2 Canadian Department of Communications Compliance Statement

FRONT_1.2.3 Avis de conformité aux normes du ministère des Communications du Canada

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PREFACE Preface

This manual is a guide for personnel who are responsible for preparing a store for the installation of the IBM 4680 Store System.

- Topic 1 describes the hardware components of this store system.
- Topic 2 describes the physical and electrical requirements of the IBM equipment.
- Topic 3 describes the planning necessary for installing different kinds of wiring.
- Topic 4 describes the communication facilities necessary if your store is to communicate with a computer at a remote location.
- Appendix A describes considerations that apply to World Trade countries.
- Appendix B describes expendable supplies and replaceable parts.
- Appendix C contains cable connector and device dimensions.
- Appendix D illustrates the power plugs and receptacles.
- Appendix E describes the store loop and 4683-xx2 to 4683-xx1 information.
- Appendix F describes cables to connect the Realtime Interface Co-Processor Multiport Adapter in the store controller to devices using RS-232 and RS-422 interfaces.
- Appendix G contains miscellaneous technical information about ambient light and noise emission values.

Subtopics

- PREFACE.1 Store System Library
- PREFACE.2 Related Publications -- Software
- PREFACE.3 Related Publications -- Hardware

PREFACE.1 Store System Library

The following chart relates each publication in the library to the task or tasks for which it provides data. Choose the task you want to complete and find the appropriate publication in the corresponding column.

Table 0-1. Store System Library - Publication Grouping by Task				
Planning	Installing	Operating	Programming	Maintaining
IBM 4680 Store System: Selecting Hardware and Software Components GA27-3691	IBM 4683 Point of Sale Terminal: Installation Guide SA27-3783	IBM 4683/4684 Point of Sale Terminal: Operations Guide SA27-3704	IBM 4680 BASIC: Language Reference SC30-3356	IBM 4680 Store System and IBM 4683/4684 Point of Sale Terminal: Problem Determination Guide SY27-0330
IBM 4680 Store System: Planning and Configuration Guide GC30-3532		IBM 4680 Store System: User's Guide SC30-3518	IBM 4680 Store System: Programming Guide SC30-3517	IBM 4680 Store System: Terminal Test Procedures Reference Summary GX27-3779
IBM 4680 Store System: Preparing Your Site GA27-3692	IBM 4684 Point of Sale Terminal: Installation Guide SA27-3837	IBM 4680 Store System: Display Manager User's Guide SC30-3404		IBM 4684 Point of Sale Terminal: Maintenance Summary Card SX27-3885
IBM 4684 Point of Sale Terminal: Introduction and Planning Guide SA27-3835	IBM Personal System/2 Store Loop Adapter/A Installation and Setup Instructions SK2T-0318			IBM 4683/4684 Point of Sale Terminal: Maintenance Manual SY27-0295
	IBM 4684 Store Loop Adapter/A: Installation, Testing, Problem Determination, and Technical Reference SD21-0045			IBM 4683/4684 Point of Sale Terminal: Parts Catalog S131-0097
		IBM 4680 Store System: Messages Guide SC30-3521		
See the "Related Publications" topic for the application manuals that support these tasks.				

IBM Retail Industry Programming Support Services

IBM Retail Industry Programming Support Services: Planning and Installation Guide - SC33-0575

IBM Retail Industry Programming Support Services: Base Package Programmer's Guide - SC33-0576

IBM Retail Industry Programming Support Services: Device Drivers Programmer's Guide - SC33-0680

IBM Retail Industry Programming Support Services: Host Communication Package Programmer's Guide - SC33-0650

IBM 4680 General Sales Application

IBM 4680 General Sales Application: Planning and Installation Guide - GC30-3368

IBM 4680 General Sales Application: Guide to Operations - SC30-3369

IBM 4680 General Sales Application: Programming Guide - SC30-3370

IBM 4680 General Sales Application - Price Management Feature: User's Guide - SC30-3461

IBM 4680 General Sales Application - Terminal Offline Feature: User's Guide - SC30-3499

IBM 4680 Supermarket Application

IBM 4680 Supermarket Application: Planning and Installation Guide - GC30-3371

IBM 4680 Supermarket Application: Guide to Operations - SC30-3372

IBM 4680 Supermarket Application: Programming Guide - SC30-3373

IBM 4680 Supermarket Application - Terminal Offline Feature: User's Guide - SC30-3512

IBM 4680 Supermarket Application - Electronic Funds Transfer Feature: User's Guide - SC30-3513

IBM 4680 Chain Drug Sales Application

IBM 4680 Chain Drug Sales Application: Planning and Installation Guide - GC30-3412

IBM 4680 Chain Drug Sales Application: Guide to Operations - SC30-3413

IBM 4680 Chain Drug Sales Application: Programming Guide - SC30-3414

IBM 4680 Store Management Application

IBM 4680 Store Management Application: Planning and Installation Guide - GC30-3483

IBM 4680 Store Management Application: Guide to Operations - SC30-3484

IBM 4680 Store Management Application: Programming Guide - SC30-3487

IBM 4680 Store Management Application - Inventory Control Feature: User's Guide - SC30-3485

IBM 4680 Store Management Application - Price Management Feature: User's Guide - SC30-3486

IBM 4684 Store Sales Application

IBM 4684 Store Sales Application: Planning and Installation Guide - SB11-8470

IBM 4684 Store Sales Application: Programmer's Reference Manual - SB11-8472

IBM 4684 Store Sales Application: Operator's Guide - SB11-8471

IBM 4684 Store Run-time Support System: Installation and User's Guide - SB11-8552

IBM 4684 Store Application Tool Kit: Programmer's Guide - SB11-8478

In-Store Processing

In-Store Processing: Application Development Guide - SC30-3534

In-Store Processing: IBM AIX - Application Development Guide - SC30-3537

In-Store Processing: IBM OS/2 Extended Edition - Application Development Guide - SC30-3538

In-Store Processing: IBM OS/400 - Application Development Guide - SC30-3535

In-Store Processing: IBM 4680 OS - Application Development Guide - SC30-3536

Networks

IBM Local Area Network Support Program - IBM P/N 83X7873

IBM PC Network Baseband Planning Guide - S68X-2269

IBM PC Network Broadband Guide - S68X-2269

IBM Token-Ring Network Introduction and Planning Guide - GA27-3677-2

Scanners

IBM 1520 Hand-Held Scanner User's Guide - GA27-3685

IBM 4686 Retail Point of Sale Scanner: Physical Planning,
Installation, and Operation Guide - SA27-3854

IBM 4686 Retail Point of Sale Scanner: Maintenance Manual - SY27-0319

IBM 4687 Point of Sale Scanner Model 1: Physical Planning,
Installation, and Operation Guide - SA27-3855

IBM 4687 Point of Sale Scanner Model 1: Maintenance Manual -
SY27-0317

IBM 4687 Point of Sale Scanner Model 2: Physical Planning Guide -
SA27-3882

IBM 4687 Point of Sale Scanner Model 2: Operator's Guide - SA27-3884

IBM 4687 Point of Sale Scanner Model 2: Maintenance Manual -
SY27-0324

IBM Personal Computer and IBM Personal System/2 (*)

IBM Guide to Operations - Personal Computer/AT - IBM P/N 6280066

IBM Guide to Operations - Personal Computer/AT - Store Loop Adapter -
SA27-3694

IBM Hardware Maintenance and Service - Personal Computer/AT - Store
Loop Adapter - SX27-0296

IBM Personal System/2 - Model 50 Quick Reference and Reference
Diskette - S68X-2247

IBM Personal System/2 - Model 60 Quick Reference and Reference
Diskette - S68X-2213

IBM Personal System/2 - Model 70 Quick Reference and Reference
Diskette - S68X-2308

IBM Personal System/2 - Model 80 Quick Reference and Reference
Diskette - S68X-2284

IBM Personal System/2 - Store Loop Adapter/A - Supplements for the
Hardware Maintenance Library - SK2T-0319

Cabling

A Building Planning Guide for Communication Wiring - G320-8059

IBM Cabling System Planning and Installation Guide - GA27-3361

IBM Cabling System Catalog - G570-2040

IBM PC Network Broadband Guide - S68X-2269

IBM Token-Ring Network Introduction and Planning Guide - GA27-3677

Using the IBM Cabling System with Communication Products - GA27-3620

Setup and Verification

IBM 4680 Store System: Setup and Verification - SA27-3703

Subtopics

PREFACE.3.1 General Publications

PREFACE.3.1 General Publications

Advanced Data Communications for Stores - General Information -
GH20-2188

Distributed Systems Executive - General Information - GH19-6394

IBM Disk Operating System 4.0 - IBM P/N 6280256

IBM Proprinters - SC31-3793

IBM 3270 Emulation Feature for the IBM 4680 Store System - (Online
with the product)

IBM 4680 Support for COBOL Version 2 - (Online with the product)

IBM 4680 Store System Regression Tester - (Online with the product)

NetView Distribution Manager: General Information - GH19-6587

Systems Network Architecture: General Overview - GC30-3073

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CHANGES.2 GA27-3692-4 (March 1990)
CHANGES.3 GA27-3692-3 (December 1987)
CHANGES.4 GA27-3692-2 (December 1986)
CHANGES.5 GA27-3692-1 (April 1986)

|CHANGES.1 GA27-3692-5 (March 1992)

|This edition includes information on:

- | The ANPOS Keyboard
- | The Point of Sale Printer Model 3.

|Reference is also made to the 4683-Px1 point-of-sale terminals.

CHANGES.2 GA27-3692-4 (March 1990)

This edition includes information on:

- The 50-Key Modifiable Keyboard/Operator Display (referred to in this book as the Combined Keyboard/Display)
- The Low Profile Dual-Track Magnetic Stripe Reader for the Combined Keyboard/Display
- Selected models of the IBM Personal System/2 (*) (PS/2) as the store controller
- The National Electrical Code for store loop cable
- Backup electrical power for the PS/2 store controller
- Attaching Store Controllers to the IBM Token Ring Network.

All references to the 5-inch Monochrome Display described in previous editions have been removed. The display is no longer available.

CHANGES.3 GA27-3692-3 (December 1987)

This edition includes information about devices and enhancements associated with the IBM 4680 Operating System Version 1 Release 3. This edition includes information on:

- IBM 4683-A01 Point of Sale Terminal
- IBM 4683-A02 Point of Sale Terminal
- Matrix Keyboard (available in some countries)
- 9-Inch Monochrome Display
- IBM 8503 12-Inch Monochrome Display
- IBM 8513 12-Inch Color Display
- Hand-Held Bar Code Reader
- Flip Top Cash Drawer (available in some countries)
- IBM 6157 Streaming Tape Drive
- Cables for attaching EIA RS-232 or RS-422 devices to the optional Realtime Interface Co-processor Multiport Adapter in the store controller.

This edition removes all references to the 12-Inch Monochrome Display and the 14-Inch Color Display described in previous editions. These displays are no longer available.

CHANGES.4 GA27-3692-2 (December 1986)

This edition includes information about devices and functions associated with the IBM 4680 Operating System Version 1 Release 3. This edition includes information on:

- Alphanumeric Keyboard
- 14-Inch Color Display
- Operator Display
- Shopper Display
- Multiple displays on the point-of-sale terminals
- Availability of optional locking or non-locking power plugs for the point-of-sale terminals.

CHANGES.5 GA27-3692-1 (April 1986)

This edition includes information about devices and functions associated with the IBM 4680 Operating System Version 1 Release 2. It includes information on:

- Wiring for optional store controller backup
- Optional local area network wiring using the IBM PC Network
- Feature Expansion D
- Magnetic Wand Reader
- 12-inch monochrome display
- IBM 1520 Hand-Held Scanner Model A02
- Support for non-IBM coin dispenser
- Support for non-IBM scale
- Non-IBM Special Attachment Cable.

1.0 Topic 1. Overview of the IBM 4680 Store System

The IBM 4680 Store System consists of hardware and software that allow a store to register and process point-of-sale transactions. It may be a complete store system for a single store or it may be used with a group, or network, of stores.

The major hardware units of the IBM 4680 Store System are:

- The store controller, which directs the flow of data for point-of-sale terminals that can be located throughout the store
- Several models of point-of-sale terminals that process transactions.

A user-provided store loop supplies the link for a store controller to communicate with point-of-sale terminals. To help ensure continuous operation, it is possible to configure the store loop(s) so that one store controller can back up another store controller if necessary. If a store controller cannot function, another store controller can automatically take over operations, permitting point-of-sale activity to continue.

Subtopics

- 1.1 Communication Networks
- 1.2 The Store Controller
- 1.3 The IBM 4683 Point of Sale Terminals
- 1.4 Point of Sale Terminal I/O Configurations
- 1.5 Types of Store Wiring

1.1 Communication Networks

To facilitate store controller backup, the store controllers must have some method of communicating with one another. This applies when there are two store controllers or more. The IBM PC Network provides the physical link for communications between store controllers, if your store controllers are IBM Personal Computer ATs (*) The IBM Token-Ring Network provides the physical link for communications between store controllers, if your store controllers are IBM Personal System/2s or Personal Computer ATs.

Communication between networks is also possible, utilizing different types of network adapters and bridge programs. See the *IBM 4680 Store System: Planning Guide* and your IBM Marketing Representative for information on the network connectivity alternatives that will best meet your communication needs.

1.2 The Store Controller

The store controller can be a selected model of the IBM Personal Computer AT or the IBM Personal System/2 (PS/2), that has one or two store loop adapters installed. The store controller processes data for the point-of-sale terminals and controls the flow of data in the store loop. In addition, it can perform administrative and support functions. While it functions as a store controller, it retains the capabilities of an IBM Personal Computer AT or an IBM PS/2.

If the store controller is to communicate with a remote host processor, it must have some type of communication adapter(s). Depending on the communication requirements, the adapters can be one or two of the following types currently available for the IBM Personal Computer AT or the IBM PS/2:

- Asynchronous communication adapter
- Binary Synchronous Communication (BSC) adapter
- Synchronous Data Link Control (SDLC) adapter
- Multiprotocol Communication Adapter.

An optional Realtime Interface Co-processor Multiport Adapter is available for the store controller. It consists of an adapter card and cable for the store controller. The cable provides attachment for serial devices that meet EIA RS-232 or RS-422 interface requirements. Appendix F contains information regarding the cables necessary for attaching devices to the multiport adapter.

PICTURE 1

Figure 1-1. Store Controllers

1.3 The IBM 4683 Point of Sale Terminals

Several models of point-of-sale terminals are available. Each can perform point-of-sale functions to check out customer purchases. The models look alike, except at the rear where their input/output (I/O) cables attach. All models can have the same types of I/O devices attached.

Subtopics

- 1.3.1 The IBM 4683-xx1 Point of Sale Terminal
- 1.3.2 The IBM 4683-xx2 Point of Sale Terminal
- 1.3.3 Input/Output (I/O) Devices
- 1.3.4 Minimum Terminal Configuration

1.3.1 The IBM 4683-xx1 Point of Sale Terminal

The 4683-xx1 attaches to a store loop. They perform the processing for all attached I/O devices. A 4683-xx1 can have one 4683-xx2 terminal attached and it performs the processing for the attached terminal.

1.3.2 The IBM 4683-xx2 Point of Sale Terminal

As part of the IBM 4680 Store System, a 4683-xx2 terminal must be attached to a 4683-xx1. They do not attach directly to the store loop. The 4683-xx2 depends on the 4683-xx1 for its processing and control functions.

PICTURE 2

Figure 1-2. IBM 4683 Point of Sale Terminal

1.3.3 Input/Output (I/O) Devices

All models of terminals support a variety of I/O devices. You can attach the same type or different types of devices at each terminal, according to your needs. The following devices provide input to the terminal:

- 50-Key Modifiable Keyboard
- Alphanumeric Keyboard
- ANPOS Keyboard
- Combined Keyboard/Display (keyboard and optional MSR portion provide input)
- Matrix Keyboard (available in some countries)
- Hand-Held Bar Code Reader
- Single-Track Magnetic Stripe Reader
- Dual-Track Magnetic Stripe Reader
- IBM 1520 Hand-Held Scanner Model A01
- IBM 1520 Hand-Held Scanner Model A02
- IBM Point of Sale Scanners
- Magnetic Wand Reader
- Non-IBM Hand-Held Optical Character (OCR) Reader
- Non-IBM Scale
- Non-IBM devices that attach to RS-232C interfaces in the Feature Expansion options (for example, a non-IBM MSR/PIN Pad).

Other devices can provide different forms of output, including:

- Non-video displays:
 - 40-Character Alphanumeric Display
 - Combined Keyboard/Display (operator display portion provides output)
 - Operator Display
 - Shopper Display
- Video displays:
 - 9-Inch Monochrome Display
 - IBM 8503 12-Inch Monochrome Display
 - IBM 8513 12-Inch Color Display
- Printer
- Non-IBM alarm
- Non-IBM devices that attach to RS-232C interfaces in the Feature Expansion options.

In addition, each point-of-sale terminal can have up to two cash drawers that provide storage space for currency, coins, and checks. In some countries, a Flip-top Cash Drawer is available for use where space is limited. You can also attach a non-IBM coin dispenser to the terminals. Topic 2 describes and illustrates the IBM I/O devices and describes how the non-IBM devices attach to the terminals.

1.3.4 Minimum Terminal Configuration

Each point-of-sale terminal must have a keyboard and a display. The keyboard can be one of the following:

- A 50-Key Modifiable Keyboard
- An Alphanumeric Keyboard
- An ANPOS Keyboard
- A Combined Keyboard/Display
- A Matrix Keyboard.

The display can be one of the following:

- 40-Character Alphanumeric Display
- Operator Display
- 9-Inch Monochrome Display
- IBM 8503 12-Inch Monochrome Display
- IBM 8513 12-Inch Color Display
- Combined Keyboard/Display.

All other input/output devices are optional.

1.4 Point of Sale Terminal I/O Configurations

You can arrange the point-of-sale terminals in either of two configurations:

- *Integrated*, with the I/O devices placed together and connected to the base unit by cables that are 0.5 m (20 in.) long. The terminal has the appearance of being a one-piece terminal.
- *Distributed*, with some or all of the I/O devices physically separate from the base unit. Any devices that are placed with the base unit can be connected using the short 0.5 m (20 in.) cables. Any distributed devices connect to the base unit using distributed cables, 3.8 m (12 ft) or 4 m (13 ft) long.

Subtopics

1.4.1 Integrated I/O Configuration

1.4.2 Distributed I/O Configuration

1.4.1 Integrated I/O Configuration

In an integrated configuration, IBM recommends that you place the I/O devices as shown in Figure 1-3. This arrangement provides the optimum clearances for operating the terminal.

PICTURE 3

Figure 1-3. Terminal with I/O Devices in Integrated Configuration

1.4.2 *Distributed I/O Configuration*

The 4683 terminals can have I/O devices arranged in a distributed configuration. Within the limitations of the distributed cable lengths, the I/O devices can be placed in flexible physical arrangements that best suit your needs.

Many different configurations are possible. For example, you can keep some devices with the base unit as in an integrated configuration and distribute other devices.

PICTURE 4

Figure 1-4. Terminal with I/O Devices in Distributed Configuration

1.5 Types of Store Wiring

Different types of wiring are required for the store system. They include the following:

- Electrical wiring that provides power to the IBM 4683 terminals and to the store controller
- Store loop wiring that connects the store controller and each 4683-xx1 terminal
- Store loop wiring for optional store controller backup
- Wiring for the optional IBM PC Network for communication between store controllers
- Wiring for the optional IBM Token-Ring Network for communication between store controllers
- Point-to-point wiring that connects a 4683-xx2 terminal to a 4683-xx1.

The different types of wiring are described in Topic 4. Instructions and guidelines for installing the different types of wiring are located in appendixes in this manual. Figure 1-5 illustrates the IBM 4680 Store System. It shows store loop wiring and the point-to-point wiring to connect a 4683-xx2 terminal to a 4683-xx1.

The store loop is a user-supplied cable that provides a continuous data path from the store controller to each 4683-xx1 terminal and back to the store controller. The cable usually contains four wires; two wires bring the data to the terminal and the other two wires send it from the terminal. Figure 1-5 illustrates a radial store loop. A radial store loop can be compared with the spokes on a wheel, in which the store loop cable goes from a central point out to each terminal. The signal starts at the store controller and goes to a unit called a Loop Wiring Concentrator (LWC), which acts as a hub. From there, the signal goes to the first 4683-xx1 terminal and comes back to the LWC. It then goes to the next 4683-xx1 and back, and continues in this manner to each 4683-xx1 terminal. Finally, the signal goes back to the store controller to complete the loop.

You can also wire the store loop in a serial configuration. In this configuration, the store loop goes from the store controller to the first terminal, on to each successive terminal, and back to the store controller.

IBM recommends the radial store loop configuration. It offers the most flexibility for future expansion and for relocating the point-of-sale terminals. In addition, it is easier to determine the location of problems and to take corrective action when problems appear to be in the store loop.

Figure 1-5 also illustrates 4683-xx2 terminals attached to 4683-xx1 terminals. A 4683-xx2 can attach to a 4683-xx1 terminal through a choice of cables. For cable distances of up to 20 meters (65 feet), you can use preassembled cables, available from IBM. They have a modular connector at each end and plug directly into the terminals. The cables are available in 6 m (20 ft) and 20 m (65 ft) lengths.

For longer distances, up to a maximum of 150 m (490 ft), you must provide and install a cable for point-to-point connection of the terminals. The cable is the same type of cable that is used for the store loop, but it is not a part of the store loop. You must install a data connector at each end of the cable. The data connectors can be installed as wall outlets, and the terminals then attach to the data connectors through 4 m (13 ft) attachment cables.

PICTURE 5

Figure 1-5. IBM Store Controller and IBM 4683 Point of Sale Terminals

2.0 Topic 2. Planning the Installation

The user is responsible for ensuring that the store is prepared to support the IBM 4680 Store System. This includes the planning necessary to provide physical space for the equipment and the proper electrical support. Because many of the tasks require a significant period of time, planning must begin early. For example, designing and building checkstands and planning and installing store wiring can require long periods of time.

This topic provides information to assist in planning the proper physical space and in meeting the electrical requirements for the equipment. It includes information about the physical and electrical requirements for the machines and devices.

Subtopics

- 2.1 Checklist of Plans and Schedules
- 2.2 Planning Physical Space Requirements
- 2.3 Planning the Checkstand
- 2.4 Planning the Store Wiring
- 2.5 Planning for Future Changes
- 2.6 Planning the Communication Facilities
- 2.7 Store Controller Characteristics
- 2.8 IBM 6157 Streaming Tape Drive
- 2.9 Terminal Characteristics
- 2.10 Descriptions of Terminal Units and Devices
- 2.11 Summary of Cable Lengths to Attach Distributed Devices
- 2.12 Cable Connections at Rear of Base Unit
- 2.13 Non-IBM Cash Drawer
- 2.14 Non-IBM External Alarm
- 2.15 Security Considerations
- 2.16 Environmental Considerations
- 2.17 Considerations for Customer Setup
- 2.18 Safety Considerations

2.1 Checklist of Plans and Schedules

This checklist can help in planning your installation. It lists some of the tasks that must be done, with guidelines to help ensure they are completed on time. Modify the list of items and recommended schedules, or add other items to the list to fit your needs.

Table 2-1. Planning Checklist			
Task	Weeks Before Delivery	Date Scheduled	Date Completed
Determine equipment schedules	24		
Determine machine configurations	24		
Order planning and installation manuals	24		
Review communications plans for store	24		
Determine checkstand requirements	24		
Determine electrical requirements	24		
Determine requirements for store loop	24		
Determine requirements for optional local area network	24		
Develop plans for preparing the store	24		
Review plans for preparing the store	20		
Develop installation plans with contractor	20		
Order store loop cables and accessories	20		
Order cables and accessories for optional local area network	20		
Order modems and telephone connections	20		
Order expendable supplies	12		
Install store loop wiring	10		
Complete store loop wiring	4		
Begin testing the store loop wiring	4		
Complete installing checkstands	4		
Complete store loop testing	2		
Complete testing of optional local area network	2		
Complete all site preparations	2		

2.2 Planning Physical Space Requirements

Be sure to plan enough workspace at each terminal location. The physical dimensions and weight of each unit are provided in this topic, in addition to environmental requirements.

Subtopics

- 2.2.1 Clearance for Air Circulation at the Terminals
- 2.2.2 Air Circulation Into Checkstands Containing Scanners
- 2.2.3 Service Clearance for Maintenance

2.2.1 Clearance for Air Circulation at the Terminals

The terminal's base unit contains a fan for cooling. In planning your installation, you must provide unrestricted access to room air for cooling.

The air intake and exhaust are located at the left side of the base unit. Provide at least 152 mm (6 in.) clearance at the left side of the base unit. In distributed configurations, avoid placing the base unit in locations that restrict the circulation of room air. If you place a distributed base unit under a counter, leave the left side open or vented so the fan can circulate room air, not heated air that has already been exhausted from the unit.

Other devices, such as displays and printers, use normal convection cooling. Avoid blocking the air vents in these devices.

2.2.2 Air Circulation Into Checkstands Containing Scanners

IBM scanners contain a fan for cooling. Air is drawn into the scanner through a vent in the bottom and heated air is exhausted through a vent in the scanner's housing. Figure C-25 in topic C.0 illustrates the location of the vents.

If the checkstand is to contain a point-of-sale scanner, you must ensure that room air can circulate into the checkstand through a vent or some other opening. Make sure the heated exhaust air can escape from the checkstand to avoid recirculating heated air through the scanner.

2.2.3 Service Clearance for Maintenance

Maintenance of terminals at the store will often consist of removing a device and replacing it with a new or exchanged device. Although no specific amount of clearance is stated for the devices, you should provide enough space at each terminal for easy access to the devices and their cables.

All cables from the attached I/O devices connect to the rear of the base unit. To facilitate swapping or replacing I/O devices, locate the base unit so that you have easy access to these cables.

2.3 Planning the Checkstand

A variety of checkstands is used throughout the industry and the design of the checkstands is your option. Guidelines are included in this topic regarding the recommended height of the keyboard above the floor, the location of electrical power receptacles, and other environmental considerations. Appendix C contains information on the physical dimensions of the devices.

2.4 Planning the Store Wiring

Topic 4 of this manual provides information about planning the following types of store wiring:

- Electrical power wiring for the IBM machines
- Store loop wiring
- Wiring for optional store controller backup
- Wiring for an optional local area network
- Wiring to connect a 4683-xx2 terminal to a 4683-xx1.

2.5 Planning for Future Changes

As you plan the installation of the store system, consider potential changes in the store that may affect the wiring for the point-of-sale terminals. It may be more practical to install additional wiring now to provide for expansion or changes in the future. For example, you may want to route the store loop cable to locations where you may need additional 4683-xx1 terminals later. There also may be locations where you can anticipate the need to attach a 4683-xx2 to an existing 4683-xx1 terminal.

In addition, there may be locations in the store where you will need to relocate point-of-sale terminals for special sales or seasonal promotions. You may also want to consider having additional terminals available during periods that are especially busy.

2.6 Planning the Communication Facilities

Stores that transmit data to and from a host processor need communication facilities for this purpose. This usually consists of a telephone line with a connection in the store to connect a modem, which is a device for transmitting data over communication lines.

Topic 3 provides information about modems and telephone facilities, and supplies the details on ordering the telephone connection.

2.7 Store Controller Characteristics

Two types of store controllers are available:

- Selected models of the IBM Personal System/2
- Selected models of the IBM Personal Computer AT.

Each must contain at least one Store Loop Adapter.

The store controller must include the system unit, a keyboard, and a display. Other devices, such as an Enhanced A/N Keyboard for the PS/2 Store Controller, or a printer for either model store controller, are available, depending on the needs of the store. Refer to the appropriate documentation on the IBM Personal Computer AT and the IBM Personal System/2 for information on additional devices that are available.

The following sections contain specific information on both types of store controller.

Subtopics

2.7.1 The IBM Personal System/2 as the Store Controller

2.7.2 The IBM Personal Computer AT as the Store Controller

2.7.1 The IBM Personal System/2 as the Store Controller

Note: The IBM Personal System/2 (PS/2) is supported as the store controller only on Version 2 of the IBM 4680 Operating System.

Physical Characteristics

Front: 165 mm (6-1/2 in.)
Side: 483 mm (19 in.)
Height: 597 mm (23-1/2 in.)
Weight: 20 kg (44 lb)

Store Loop Attachment Cable

A 4 m (13 ft) cable is available to attach a PS/2 store controller to a store loop. If the PS/2 store controller has a Second Store Loop Adapter, two attachment cables are required.

Local Area Network Attachment Cables (Optional)

A PS/2 store controller can attach to an IBM Token-Ring Network. A PS/2 store controller attached to an IBM PC Network is not supported by the IBM 4680 Operating System.

Communication Cable (Optional)

A 3 m (9.9 ft) cable is available to attach the PS/2 store controller to a modem.

Attachment Cables

Cables are available with the PS/2 store controller to attach the keyboard, display, and printer, as applicable.

Power Cord and Plug

The power cord is 1.8 m (6 ft) long and has a non-locking plug attached.

Power Requirements

Low Voltage 100 to 125 V ac 50/60 Hz
High Voltage 200 to 240 V ac 50/60 Hz

Warning: The IBM PS/2 Store Controller system unit requires at least a 4-inch clearance from walls or partitions adjacent to the exhaust fan. Failure to provide this clearance could cause the exhaust fan motor to stall, resulting in overheating of the unit, and possible damage to the fixed disk.

PICTURE 6

Figure 2-1. PS/2 Store Controller Dimensions

2.7.2 The IBM Personal Computer AT as the Store Controller

Physical Characteristics

Front: 540 mm (21-1/4 in.)
Side: 422 mm (16-1/2 in.)
Height: 432 mm (17 in.)
Weight: 21 kg (47 lb)

Store Loop Attachment Cable

A 4 m (13 ft) cable is required to attach the Personal Computer AT store controller to a store loop. If the store controller has a Second Store Loop Adapter, two store loop attachment cables are required.

Local Area Network Attachment Cables (optional)

Coaxial cable is available in several lengths to connect the Personal Computer AT store controller to the optional local area network.

Communication Cable (optional)

A 3 m (9.9 ft) cable is available to attach the Personal Computer AT store controller to a modem.

Attachment Cables

Cables are available with the Personal Computer AT store controller to attach the keyboard, display, and printer, as applicable.

Power Cord and Plug

The power cord is 1.8 m (6 ft) long and has a non-locking plug attached.

Power Requirements

Low Voltage 100 to 125 V ac 50/60 Hz
High Voltage 200 to 240 V ac 50/60 Hz

Warning: The IBM Personal Computer AT Store Controller system unit requires at least a 4-inch clearance from walls or partitions adjacent to the exhaust fan. Failure to provide this clearance could cause the exhaust fan motor to stall, resulting in overheating of the unit, and possible damage to the fixed disk.

PICTURE 7

Figure 2-2. Personal Computer AT Store Controller Dimensions

2.8 IBM 6157 Streaming Tape Drive

An IBM 6157 Streaming Tape Drive can be attached to the store controller to permit tape backup of program and data files onto removable tape cartridges. The tape drive has a 2.7 m (9 ft) power cord and requires a properly grounded 120 V ac electrical outlet. It has a permanently attached 1.8 m (6 ft) cable that connects to the store controller.

For information about tape cartridges used with the tape drive, refer to *IBM 6157 Streaming Tape Drive Setup and Operating Instructions*, SA23-1045.

Physical Characteristics

Front: 203 mm (8 in.)
Side: 372 mm (14-5/8 in.)
Height: 140 mm (15-1/2 in.)
Weight: 5.7 kg (13 lb)

Electrical and Environmental Characteristics

Power requirements: 120 V ac
Power consumption: 0.075 kVA
Heat output: 140 Btu/hour (40 watts)

2.9 Terminal Characteristics

The point-of-sale terminal must always include at least a base unit, keyboard, and display. All other devices are optional. Appendix C contains the dimensions for all units and devices.

Physical Characteristics (integrated terminal)

Front: 498 mm (19-3/4 in.)
Side: 476 mm (18-3/4 in.)
Height: 508 mm (20 in.)
Weight: 25.4 kg (56 lb)

Store Loop Attachment Cable

A 4 m (13 ft) cable is required to attach a 4683-xx1 terminal to a store loop.

Attachment Cables

Cables are described with the appropriate input/output devices.

Power Cord and Plug

The standard power cord is a 4.3 m (14 ft) cord, with a non-locking plug. In the US and Canada, a 1.8 m (6 ft) cord with a locking or non-locking plug is also available.

Power Requirements

Low Voltage	100 to 125 V ac 50/60 Hz
High Voltage	200 to 240 V ac 50/60 Hz

PICTURE 8

Figure 2-3. IBM 4683 Point of Sale Terminal Dimensions

2.10 Descriptions of Terminal Units and Devices

This topic contains descriptions of the individual devices and information about the cables for connecting them. Appendix C contains dimensions and weights of the units and devices.

Subtopics

- 2.10.1 Base Unit
- 2.10.2 40-Character Alphanumeric Display
- 2.10.3 Operator Display
- 2.10.4 Shopper Display
- 2.10.5 9-Inch Monochrome Display
- 2.10.6 IBM 8503 12-Inch Monochrome Display
- 2.10.7 IBM 8513 12-Inch Color Display
- 2.10.8 50-Key Modifiable Keyboard
- 2.10.9 Alphanumeric Keyboard
- 2.10.10 ANPOS Keyboard
- 2.10.11 Matrix Keyboard
- 2.10.12 Combined Keyboard/Display
- 2.10.13 Cash Drawer
- 2.10.14 Flip-Top Cash Drawer
- 2.10.15 Single-Track Magnetic Stripe Reader (MSR)
- 2.10.16 Dual-Track Magnetic Stripe Reader (MSR)
- 2.10.17 Magnetic Wand Reader
- 2.10.18 Point of Sale Printer Model 1 and Model 2
- 2.10.19 Point of Sale Printer Model 3
- 2.10.20 IBM Scanners

2.10.1 Base Unit

The base unit of a terminal supplies the required voltages to most devices attached to that terminal. The base units of all models are similar in appearance and in operating requirements. The difference in the external appearance is at the rear panels, where cable connections for the devices are located.

All cables going to devices originate at the rear of the base unit. In planning the physical space for terminals, be sure to provide enough space for the units and enough slack in the cables so that your personnel can connect and disconnect the cables at the rear of the base unit.

The standard power cord is a 4.3 m (14 ft) cord with a non-locking plug. In the US and Canada, a 1.8 m (6 ft) cord with a locking or non-locking plug is also available. For the physical security of the base unit, there are threaded inserts in the bottom of the unit for securing it to a countertop.

The base unit contains a fan for cooling, located in the left side. It is important that you provide sufficient space and allow unrestricted circulation of room air to the base unit. Provide at least 150 mm (6 in.) clearance at the left side of the base unit. In distributed configurations, avoid placing the base unit in locations that restrict the circulation of room air. If you place a distributed base unit under a counter, leave the left side open or vented so the fan can circulate room air and not recirculate heated air that has already been exhausted from the unit.

PICTURE 9

Figure 2-4. Base Unit for an IBM 4683 Point of Sale Terminal

2.10.2 40-Character Alphanumeric Display

A 40-character alphanumeric display can display up to 40 characters of alphabetic or numeric characters, or special symbols, in two rows of 20 characters each. The display mounts on a pedestal and can be tilted and rotated for best viewing.

A long pedestal is shipped with the display. In an integrated configuration, the display attaches to the base unit with two thumbscrews provided with the display. When mounted on the long pedestal, the display stands 315 mm (12-1/2 in.) high.

When a distributed display cable is shipped, a short pedestal is included with the cable. In a distributed configuration, you can mount the display on either the long or short pedestal, depending on your requirements. When mounted on the short pedestal, the display stands 172 mm (6-3/4 in.) high.

In a distributed configuration, you can attach the display pedestal to the base unit or cash drawer, using the two thumbscrews. If you prefer, you can locate the display wherever you choose, within the limits of the 3.8 m (12 ft) distributed cable. In either configuration, do not block the air vents in the display.

PICTURE 10

Figure 2-5. 40-Character Alphanumeric Display

2.10.3 Operator Display

The Operator Display is a small 40-character display used to provide information to the salesperson. It displays alphabetic and numeric information in two rows of 20 characters each. The character height is approximately 4.85 mm (0.190 in.). The salesperson can tilt the display for best viewing. The Operator Display is intended to be viewed only by the salesperson. It has a narrow viewing angle and should be placed so that it is in the salesperson's normal field of vision. The display comes with a cable, 0.7 m (28 in.) long, for use in an integrated arrangement.

The Operator Display comes with two mounting options:

- You can mount the display on a 50-Key Modifiable Keyboard or an Alphanumeric Keyboard, using a mounting bracket shipped with the display. If the keyboard is distributed, you must connect the display to the terminal, using a 2.8 m (9 ft) extension cable. You can mount either an Operator Display or a Magnetic Stripe Reader on the keyboard, but not both.
- You can mount the display on a small tray base, which is shipped with the display. The tray base is 159 mm (6-1/4 in.) long x 127 mm (5 in.) wide. With the display mounted on the tray base, the total height is 59 mm (2-3/8 in.).

Depending on the terminal configuration, the tray base and display can be:

- Integrated beside a 50-Key Modifiable Keyboard
- Integrated beside the printer
- Distributed, using the 2.8 m (9 ft) extension cable.

Note: If your Operator Display is an integral part of the Combined Keyboard/Display, you cannot remove it from the keyboard unit. You can adjust the display for best viewing by the salesperson.

PICTURE 11

Figure 2-6. Operator Display Mounted on a 50-Key Modifiable Keyboard

PICTURE 12

Figure 2-7. Operator Display Installed Beside a 50-Key Modifiable Keyboard

2.10.4 Shopper Display

The Shopper Display provides one row of eight numerals with commas and decimal points. It is intended for displaying information about the transaction to the shopper. It provides six indicator lights, which can be used to assist in defining the numeric information provided to the customer. The display tilts and rotates for best viewing by the shopper. It displays numerals with a 7-segment format and can also display a limited alphabetic character set. The numerals are approximately 14 mm (0.55 in.) high. The commas and decimal points are located at the positions indicated:

Decimal points: 1 2 3.4 5.6.7 8

Commas: 1 2,3,4 5,6,7 8

Two mounting options are provided with the display:

- You can attach a Shopper Display to either a short post, 36 mm (1-3/8 in.), or a long post, 175 mm (7 in.). The post is attached in the same manner that a 40-Character Alphanumeric Display is attached. You can then mount the Shopper Display and short post on the terminal, facing the shopper. If you prefer, you can distribute the display, using a 2.8 m (9 ft) cable.
- As an alternative, you can attach the display to an arm and mount the display and arm at the rear of the terminal, facing the shopper. The arm can mount on either the left or right side of the base unit or cash drawer, depending on your arrangement. In either case, the display extends out from the side of the terminal a maximum of 102 mm (4 in.). For dimensions of the display, mounting post, and arm, refer to Appendix C.

The display comes with a 0.7 m (28 in.) attachment cable for use in an integrated configuration. If you distribute the display, a 2.8 m (9 ft) extension cable is required.

PICTURE 13

Figure 2-8. Shopper Display on Post

PICTURE 14

Figure 2-9. Shopper Display on Arm

2.10.5 9-Inch Monochrome Display

You can install a 228 mm (9 in.) monochrome display on a terminal. The display contains front-mounted brightness and contrast controls. It has a tilt/swivel stand for flexible positioning. The display can be installed in one of three arrangements:

- Integrated on the terminal, using a security base
- Integrated on the terminal, in the place usually occupied by the printer, using the tilt/swivel stand
- Distributed in a location of your choice, using the tilt/swivel stand.

When used in an integrated arrangement, along with a printer, the display must be mounted on a security base. This security base allows the display to extend past the right side of the terminal and permits the display to tilt and swivel. If you place the display on the terminal in the position usually occupied by the printer, it can sit on its rubber feet or on its stand, where it can tilt and swivel. The tilt/swivel stand has a threaded insert in the bottom for securing it to the surface it is placed on. In an integrated arrangement, you can attach the display to the security base using an M6 screw supplied with the security base. In a distributed configuration, you can use an M6 screw of appropriate length to secure the display to your counter.

A short cable, 470 mm (18-1/2 in.) long, with a 15-pin connector is permanently attached to the display. An additional cable is required to attach the display:

- A 180 mm (7 in.) cable is required for an integrated arrangement.
- A 3.5 m (11.5 ft) cable is required for a distributed arrangement.

These same cables can be used to attach a 9-Inch Display, 8503 12-Inch Monochrome Display, or 8513 12-Inch Color Display. The display is available for use with 100 to 125 volts or 200 to 240 volts. It has a detachable 2.8 m (9 ft) power cord with a non-locking plug. Also available in the US is a 1.8 m (6 ft) power cord with a non-locking plug. It has its own ON/OFF switch and controls, and requires a properly grounded electrical outlet.

PICTURE 15

Figure 2-10. 9-Inch Monochrome Display

2.10.6 IBM 8503 12-Inch Monochrome Display

You can attach the IBM 8503 12-Inch Monochrome Display to a 4683 terminal. This 305 mm (12 in) display can be placed on its four rubber feet on a flat surface or on its pedestal. When on the pedestal, the display can tilt to the front and rear and can swivel to the left or right.

The display is available for use with 100 to 125 volts or 200 to 240 volts. It has its own power cord, ON/OFF switch and controls, and requires a properly grounded electrical outlet. In the U.S., it comes with its own 1.8 m (6 ft) power cord and non-locking power plug.

Because of its size, the display must be distributed. A 1.8 m (6 ft) cable with a 15-pin connector is permanently attached to the display. An additional cable is required to attach the display to the terminal. A choice of two cables is available:

- A 180 mm (7 in.) cable
- A 3.5 m (11.5 ft) cable.

These same cables can be used to attach a 9-Inch Display, 8503 12-Inch Monochrome Display, or 8513 12-Inch Color Display.

PICTURE 16

Figure 2-11. IBM 8503 12-Inch Monochrome Display

2.10.7 IBM 8513 12-Inch Color Display

You can attach the IBM 8513 12-Inch Color Display to a 4683 terminal. This 305 mm (12 in) display can be placed on its four rubber feet on a flat surface or on its pedestal. When on the pedestal the display can tilt to the front and rear and can swivel to the left or right.

The display is available for use with 100 to 125 volts or 200 to 240 volts. It has its own power cord, ON/OFF switch and controls, and requires a properly grounded electrical outlet. In the U.S, it comes with its own 1.8 m (6 ft) power cord and non-locking power plug.

Because of its size, the display must be distributed. A 1.8 m (6 ft) cable with a 15-pin connector is permanently attached to the display. An additional cable is required to attach the display to the terminal. A choice of two cables is available:

- A 180 mm (7 in.) cable
- A 3.5 m (11.5 ft) cable.

These same cables can be used to attach a 9-Inch Display, 8503 12-Inch Monochrome Display, or 8513 12-Inch Color Display.

PICTURE 17

Figure 2-12. IBM 8513 12-Inch Color Display

2.10.8 50-Key Modifiable Keyboard

You can install a 50-Key Modifiable Keyboard on a terminal. In an integrated arrangement, a 0.7 m (28 in.) cable is required. In a distributed arrangement, a 3.8 m (12 ft) cable is required.

An optional lock is available and is located near the upper left corner of the keyboard. The lock can limit certain functions or operations to authorized personnel only. A speaker in the keyboard can generate an audible tone under program control.

You can mount either a Magnetic Stripe Reader or an Operator Display at the right rear of the keyboard, but not both.

The keyboard has a threaded insert in the bottom for securing it to the surface it is placed on. In an integrated configuration, you can secure it to a security base, using an M6 screw provided with the terminal. In a distributed configuration, you can use an M6 screw of appropriate length to secure the keyboard to your counter.

The suggested nominal height above the floor to the center of the keyboard is:

- When the operator always works in a seated position: 711 mm to 762 mm (28 in. to 30 in.)
- When the operator works in either a seated or standing position: 914 mm to 990 mm (36 in. to 39 in.).

PICTURE 18

Figure 2-13. 50-Key Modifiable Keyboard

2.10.9 Alphanumeric Keyboard

You can attach an alphanumeric keyboard to a terminal. The alphanumeric keyboard contains 84 keys, including alphabetic, numeric, and special function keys. A speaker in the keyboard can generate an audible tone under program control.

You can mount a Magnetic Stripe Reader or an Operator Display at the right rear of an Alphanumeric Keyboard, but not both. In an integrated arrangement, a 0.7 m (28 in.) cable is required. In a distributed arrangement, a 3.8 m (12 ft) cable is required.

The keyboard has a threaded insert in the bottom for securing it to the surface it is placed on. In an integrated configuration, you can secure it to the security base, using an M6 screw shipped with the terminal. In a distributed configuration, you can use an M6 screw of appropriate length to secure the keyboard to your counter.

PICTURE 19

Figure 2-14. Alphanumeric Keyboard

2.10.10 ANPOS Keyboard

You can attach an ANPOS keyboard to a terminal. The ANPOS keyboard contains alphabetic, numeric, and special function keys. A speaker in the keyboard can generate an audible tone under program control.

You can mount a Dual-Track Magnetic Stripe Reader at the right rear of the keyboard. In an integrated arrangement, a 0.7 m (28 in.) cable is required. In a distributed arrangement, a 3.8 m (12 ft) cable is required.

The keyboard has a threaded insert in the bottom for securing it to the surface it is placed on. In an integrated configuration, you can secure it to the security base, using an M6 screw shipped with the terminal. In a distributed configuration, you can use an M6 screw of appropriate length to secure the keyboard to your counter.

PICTURE 20

Figure 2-15. ANPOS Keyboard

2.10.11 Matrix Keyboard

A Matrix Keyboard is available in some countries. An overlay permits a user to personalize key descriptors and to quickly change overlays. A protective shield can be placed on top of the overlay. In an integrated arrangement, a 0.7 m (28 in.) cable is required. In a distributed arrangement, a 3.8 m (12 ft) cable is required.

The keyboard has two threaded inserts in the bottom for securing it to the surface it is placed on. In an integrated arrangement, you can secure it to a security base, using an M6 screw provided with the security base. In a distributed arrangement, you can use an M6 screw of an appropriate length to secure the keyboard to your counter.

PICTURE 21

Figure 2-16. Matrix Keyboard

2.10.12 Combined Keyboard/Display

The combination of a 50-Key Modifiable Keyboard, an Operator Display, and an optional Low-Profile Dual-Track Magnetic Stripe Reader is available to attach to the terminal. The three devices are all contained on the keyboard unit of the Combined Keyboard/Display. The Operator Display is permanently mounted in the keyboard. Its angle can be adjusted by the salesperson.

The keyboard has an audible alarm with a fixed tone frequency and a fixed volume level. The audible alarm duration is under program control. An optional lock is available on the keyboard, which can limit certain functions or operations to authorized personnel only.

The keyboard unit can be mounted on the terminal in either an integrated configuration or a distributed configuration. If placed in an integrated arrangement, a 0.7 m (28 in.) cable is required. In a distributed arrangement, a 3.8 m (12 ft.) cable is required.

The keyboard has a threaded insert in the bottom for securing it to the surface it is placed on. In an integrated configuration, you can secure it to a security base, using an M6 metric screw provided with the terminal. In a distributed configuration, you can use an M6 metric screw of appropriate length to secure the keyboard to your counter.

For information on the optional Low-Profile Dual-Track Magnetic Stripe Reader, refer to "Low-Profile Dual-Track MSR" in topic 2.10.16.1.

PICTURE 22

Figure 2-17. Combined Keyboard/Display

2.10.13 Cash Drawer

Each terminal can have one or two cash drawers, each with a removable cash till. In an integrated arrangement, the cash drawer is placed under the base unit and connects with a 0.5 m (20 in.) cable. In a distributed arrangement, the cash drawer connects to the base unit with a 3.8 m (12 ft) distributed cable.

An optional lock is available on the cash drawer and is recessed into the front of the cash drawer. There are two threaded inserts in the bottom of the cash drawer for installing user-supplied screws to secure it to a countertop.

Note: In the fully open position, the cash drawer extends 326 mm (13 in.) toward the front.

PICTURE 23

Figure 2-18. Cash Drawer

2.10.14 *Flip-Top Cash Drawer*

A Flip-Top Cash Drawer is available in some countries. It provides a cash drawer and removable cash till for applications where space is limited. The top cover flips open for access to the till, which has adjustable note compartments. Cash drawer opening is under program control and a cash drawer lock is available. The cash drawer has two threaded inserts in the bottom for securing it to your counter. It can be used in a distributed arrangement only and requires a 3.8 m (12 ft) distributed cable.

PICTURE 24

Figure 2-19. Flip-Top Cash Drawer

2.10.15 *Single-Track Magnetic Stripe Reader (MSR)*

A Single-Track Magnetic Stripe Reader can be attached to an Alphanumeric Keyboard or a 50-Key Modifiable Keyboard. The MSR and Operator Display cannot both be mounted on these keyboards at the same time.

The MSR can read a number encoded in a single track on a credit card or badge as the card or badge is passed through a slot in the reader. It can read American Banking Association (ABA) track 2 data. Cards or badges must conform to American National Standards Institute (ANSI) Specifications, or International Organization for Standardization (ISO) 3554.

The reader is similar in appearance to the Dual-Track Magnetic Stripe Reader. It is slightly less in height and has one raised mark on top to identify it as a single-track reader.

The reader attaches to the keyboard with a cable, 75 mm (3 in.) long. A test card, IBM P/N 4055210, is included with the MSR. A cleaning card is available, IBM P/N 6019483, which the salesperson can pass through the reader occasionally to clean the read head.

PICTURE 25

Figure 2-20. Single-Track Magnetic Stripe Reader Mounted on a 50-Key Keyboard

2.10.16 Dual-Track Magnetic Stripe Reader (MSR)

You can attach a Dual-Track Magnetic Stripe Reader (MSR) that can read information encoded in two tracks on a credit card or badge as the card or badge is passed through a slot in the reader. Cards or badges must conform to American National Standards Institute (ANSI) Specifications X4.13 and X4.16 or International Organization for Standardization (ISO) 3554.

A test card, IBM P/N 90X9640, is included with the MSR. A cleaning card is available, IBM P/N 6019483, which the salesperson can pass through the reader occasionally to clean the read head. Depending on your keyboard, two different models are available. The Dual-Track MSR cannot be mounted on a Matrix Keyboard.

The Dual-Track MSR can mount on the 50-Key Modifiable Keyboard or the Alphanumeric Keyboard. It is similar in appearance to the Single-Track MSR. It is slightly taller and has two raised marks on top to identify it as a dual-track reader. It also has identifying information on its underside.

The MSR attaches directly to the base unit, using a cable identical to the one used with the keyboard. The cable is 0.7 m (28 in.) long when the keyboard is integrated and is 3.8 m (12 ft.) long when the keyboard is distributed.

A Dual-Track Magnetic Stripe Reader and an Operator Display cannot both be mounted on top of a 50-Key Modifiable Keyboard or an Alphanumeric Keyboard at the same time.

Two models are available, depending on the data to be read:

- IBM P/N 76X0192 can read ISO track 1 and track 2 data.
- IBM P/N 76X0193 can read ISO track 2 and track 3 data.

PICTURE 26

Figure 2-21. Dual Track Magnetic Stripe Reader Mounted on a 50-Key Keyboard

Subtopics

2.10.16.1 Low-Profile Dual-Track MSR

2.10.16.1 Low-Profile Dual-Track MSR

You can add an optional Low Profile Dual-Track MSR to the ANPOS keyboard or to the Combined Keyboard/Display. The keyboard comes with a filler cover that covers the area if the Low-Profile Dual-Track MSR is not present.

No additional cabling is required for the Low-Profile Dual-Track MSR. It operates in the same manner as a Dual-Track MSR. It mounts flush with the top of the keyboard.

A cleaning card and a test card are shipped with the device. These cards are used for the same purposes and in the same manner as those for the Dual-Track MSR.

Two models of the Low-Profile Dual Track MSR are available, depending on which tracks of data will be read:

- IBM P/N 25F6310 can read ISO track 1 and track 2 data.
- IBM P/N 25F6320 can read ISO track 2 and track 3 data.

PICTURE 27

Figure 2-22. Dual-Track MSR on a Combined Keyboard/Display

PICTURE 28

Figure 2-23. Dual-Track MSR on an ANPOS Keyboard

2.10.17 *Magnetic Wand Reader*

You can attach a Magnetic Wand Reader to Feature Expansion D on a terminal. It can read magnetic encoded data on merchandise tickets, credit cards, and employee badges. It attaches to the base unit with a 1 m (3 ft) flexible cable that is permanently attached to the magnetic wand. A coiled portion of the cable permits it to extend to 1.8 m (6 ft).

PICTURE 29

Figure 2-24. Magnetic Wand Reader

2.10.18 Point of Sale Printer Model 1 and Model 2

You can install a Model 1 or Model 2 printer on each terminal. In an integrated arrangement, a 0.5 m (20 in.) cable is required. In a distributed arrangement, a 3.8 m (12 ft) cable is required.

The printer prints on two rolls of standard adding machine paper: one at the document insert/customer receipt station and the other at the journal station. In addition, the salesperson can insert forms for printing at the document insert station, located at the left front of the printer. The salesperson also can insert checks at this station for printing the store's endorsement. If you distribute the printer, be sure the document insert station is easily accessible to the salesperson.

An optional lock on the printer journal station cover limits access to the journal print station paper. It is located inside the printer and is easily accessible, when the printer top cover is raised.

The printer uses one print head and one ribbon cartridge. The print head is shipped with the printer. A ribbon cartridge and two rolls of paper are shipped with the printer cable.

Do not block the air vents at the right side of the printer.

The printer has a threaded insert in the bottom for securing it to the surface it is placed on. In an integrated arrangement, you can secure it to a security base, using an M6 metric screw provided with the terminal. In a distributed arrangement, you can use an M6 metric screw of appropriate length to secure the printer to your counter.

PICTURE 30

Figure 2-25. Point of Sale Printer Model 1 and Model 2

2.10.19 Point of Sale Printer Model 3

You can install a Model 3 printer on each terminal. In an integrated arrangement, a 0.5 m (20 in.) cable is required. In a distributed arrangement, a 3.8 m (12 ft) cable is required.

The printer prints on two rolls of standard adding machine paper: one at the customer receipt station and the other at the journal station. The customer receipt station has a paper cutter to make removal of the receipt easier.

In addition, the salesperson can insert forms to be printed into the top of the printer or into the front of the printer. The printer will print the store's endorsement on preprinted checks or it will print the entire check including the endorsement.

An optional lock on the printer journal station cover limits access to the journal print station paper. It is located inside the printer and is easily accessible, when the printer top cover is raised.

The printer uses one print head and one ribbon cartridge. A ribbon cartridge and two rolls of paper are shipped with the printer cable.

Do not block the air vents on the sides of the printer.

The printer has a threaded insert in the bottom for securing it to a surface. In an integrated arrangement, you can secure it to a security base, using an M6 metric screw provided with the terminal. In a distributed arrangement, you can use an M6 metric screw of appropriate length to secure the printer to your counter.

PICTURE 31

Figure 2-26. Point of Sale Printer Model 3

2.10.20 IBM Scanners

There are several models of IBM scanners available. Detailed information on one particular model, the IBM 3687 Checkout Scanner Model 2, is contained in this manual. For information on other models of IBM scanners, refer to the appropriate physical planning manual for the scanner that you plan to install. See the *Related Publications* section of this manual for a list of manuals that are used with other IBM scanners.

Subtopics

- 2.10.20.1 IBM 3687 Checkout Scanner Model 2
- 2.10.20.2 IBM 3687 Checkout Scanner Model 2 Attachment Adapter
- 2.10.20.3 IBM 1520 Hand-Held Scanner Models A01 and A02
- 2.10.20.4 IBM Hand-Held Bar Code Reader

2.10.20.1 IBM 3687 Checkout Scanner Model 2

You can attach an IBM 3687 Checkout Scanner Model 2 to the terminals and install it in a checkstand of your choice. It scans the Universal Product Code (UPC) and European Article Number (EAN) bar code symbols on articles as they are passed over a window in the top of the scanner. The scanner attaches to the terminal through an attachment adapter and a 4.6 m (15 ft) cable. A plastic installation/removal strap comes with the scanner to use in moving the scanner into or out of the checkstand.

Two options are available when installing the scanner in a checkstand:

- You can place it on an adjustable surface inside the checkstand.
- You can suspend the scanner in the checkstand, using optional mounting brackets, which extend across the front and rear of the scanner at the top edge. The brackets attach to the scanner with screws. The mounting brackets are illustrated in Figure C-29 and Figure C-30 in topic C.0. If you plan to use the mounting brackets, they must be specified at the time of order and will be factory installed on the scanner.

A 1.8 m (6 ft) power cord with a locking-type plug is attached to the scanner. You must provide power to the point-of-sale scanner by means of:

- An ac electrical power outlet in the checkstand
- An easily accessible ON/OFF switch to control power to the outlet. (The point-of-sale scanner does not have an ON/OFF power switch.)

Note: You should not connect any other units or devices to the electrical outlet for the scanner.

The point-of-sale scanner contains a fan for cooling, which draws room air into the scanner through a vent in the bottom and exhausts it through a vent in the front. To avoid recirculating air heated by the scanner, the checkstand must have provisions for admitting room air and for exhausting heated air. A baffle is provided to deflect air from the exhaust fan for point-of-sale scanners in World Trade countries.

PICTURE 32

Figure 2-27. IBM 3687 Checkout Scanner Model 2

2.10.20.2 IBM 3687 Checkout Scanner Model 2 Attachment Adapter

An adapter is required when attaching an IBM 3687 Checkout Scanner Model 2 to an IBM 4683 Point of Sale Terminal. The adapter is a small unit that fits in the recessed area at the front of the point-of-sale scanner. This recessed area is where the scanner attachment cable connects to the scanner. The scanner adapter contains two cable connectors:

- A 25-pin cable connector that plugs into a short cable extending from the scanner, next to the scanner's power cord
- A 16-pin cable connector for the attachment cable coming from the terminal.

A 4.6 m (15 ft) cable comes with the scanner adapter. It connects the adapter to socket 17 in the terminal's base unit.

PICTURE 33

Figure 2-28. Attachment Adapter for IBM 3687 Checkout Scanner Model 2

2.10.20.3 IBM 1520 Hand-Held Scanner Models A01 and A02

You can attach an IBM 1520 Hand-Held Scanner Model A01 or Model A02 to the terminals. The hand-held scanner allows item information to be entered into the terminal without keying the information. It can read the product code symbols affixed to boxes, bags, packages, or other items. Both models can read UPC-A, UPC-E, EAN-8, and EAN-13 product code symbols. In addition, the Model A02 can read Code 39 and Interleaved 2 of 5 codes.

The Model A01 attaches to socket 21 of Feature Expansion B, C, or D. The Model A02 attaches to socket 5B on the standard base unit and does not require a Feature Expansion.

Both models are similar in appearance and both consist of three parts: a hand-held scanner, a small control unit or console, and a power supply. The hand-held scanner itself is identical in both models, while the console/control unit is slightly larger in the Model A02. A holder is provided for the hand-held unit, which affords convenient storage of the unit when it is not in use. You can attach the holder in a location convenient to the salesperson.

The control unit has connections for three cables:

- A coiled cable that attaches to the hand-held unit. The cable can extend to a total length of 1.8 m (6 ft) to permit easy movement of the hand-held scanner by the salesperson.
- A 3.8 m (12 ft) output cable that attaches to the terminal.
- A 1.8 m (6 ft) cord attached to a small power supply.

You can place the control unit on any flat surface or attach it to a convenient location with Velcro (**) strips that come with the unit. The power supply unit has a 1.8 m (6 ft) power cord and requires a 120 volts ac electrical power outlet. Figure 2-29 illustrates the hand-held scanner. The dimensions of both models are shown in Appendix C.

PICTURE 34

Figure 2-29. IBM 1520 Hand-Held Scanner

2.10.20.4 IBM Hand-Held Bar Code Reader

You can attach a Hand-Held Bar Code Reader to a terminal. The reader allows item information to be entered into the terminal without keying the information. It can read the product code symbols affixed to boxes, bags, packages, or other items.

A holder is provided, which affords convenient storage of the unit when it is not in use. You can attach the holder at the checkstand, convenient to the salesperson.

The readers attach to socket 9 of the terminal base unit through a permanently-attached 2.5 m (8 ft) cable.

PICTURE 35

Figure 2-30. Hand-Held Bar Code Reader

PICTURE 36

Figure 2-31. Hand-Held Bar Code Reader Model 2

2.11 Summary of Cable Lengths to Attach Distributed Devices

This table shows the length of cables for devices that are used in distributed arrangements. Each device cable is labeled with a number corresponding to the base unit socket it plugs into, such as 4 or 7. Some sockets can connect to more than one type of device.

The cables are not interchangeable between devices. The cable connectors are keyed to fit only certain sockets. This is to ensure that only the proper device cable can connect to each terminal socket.

Table 2-2. Summary of Cables to Connect Distributed Devices		
To (Distributed Device)	From (4683 Base Unit)	Cable Length
Cash Drawer	Base Unit Socket 3A or 3B	3.8 m (12 ft)
Flip-Top Cash Drawer	Base Unit Socket 3A or 3B	3.8 m (12 ft)
40-Character Alphanumeric Display	Base Unit Socket 4A or 4B	3.8 m (12 ft)
Operator Display	Base Unit Socket 4A or 4B	2.8 m (9 ft)
Shopper Display	Base Unit 4A or 4B	2.8 m (9 ft)
9-Inch Monochrome Display	Feature Expansion A Socket 81. (Note: Feature Expansion A must be part number 83X7601, shipped after January 29, 1988.)	3.5 m (11-1/2 ft). (Attaches to a 470 mm (18-1/2 in.) cable that is permanently attached to the 9-Inch Display.)
IBM 8503 12-Inch Monochrome Display	Feature Expansion A Socket 81. (Note: Feature Expansion A must be part number 83X7601, shipped after January 29, 1988.)	180 mm (7 in.) or 3.5 m (11-1/2 ft). (Attaches to a 1.8 m (6 ft) cable that is permanently attached to the 12-Inch Display.)
Combined Keyboard/Display	Base Unit Socket 5A	3.8m (12 ft)
IBM 8513 12-Inch Color Display	Feature Expansion A Socket 81. (Note: Feature Expansion A must be part number 83X7601, shipped after January 29, 1988.)	180 mm (7 in.) or 3.5 m (11-1/2 ft). (Attaches to a 1.8 m (6 ft) cable that is permanently attached to the 12-Inch Display.)
50-Key Modifiable Keyboard	Base Unit Socket 5A	3.8 m (12 ft)
Alphanumeric Keyboard	Base Unit Socket 5A	3.8 m (12 ft)
ANPOS Keyboard	Base Unit Socket 5A	3.8 m (12 ft)
Matrix Keyboard	Base Unit Socket 5A	3.8 m (12 ft)
Printer	Base Unit Socket 7	3.8 m (12 ft)
Magnetic Wand Reader	Feature Expansion D Socket 26	Comes with an attached coiled cable that can extend to 1.8 m (6 ft).
IBM 3687 Checkout Scanner Model 2	Base Unit Socket 17	4.6 m (15 ft)
IBM Point of Sale Scanners	See appropriate scanner physical planning guide	
IBM 1520 Hand-Held Scanner Model A01	Feature Expansion B, C, or D Socket 21	4 m (13 ft)

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 Summary of Cable Lengths to Attach Distributed Devices

IBM 1520 Hand-Held Scanner Model A02	Base Unit Socket 5B	3.8 m (12 ft)
Hand-Held Bar Code Readers	Base Unit Socket 9B	Comes with an attached 2.5 m (8 ft) cable.
Non-IBM alarm (using the non-IBM Attachment Cable)	Base Unit Socket 3B	4 m (13 ft)
Non-IBM cash drawer (using the non-IBM Attachment Cable)	Base Unit Socket 3A or 3B	4 m (13 ft)
Non-IBM coin dispenser	Feature Expansion B, C, or D Socket 29	4 m (13 ft)
Non-IBM Hand-Held Optical Character Reader (OCR)	Feature Expansion B, C, or D Socket 21	4 m (13 ft)
Non-IBM scale	Feature Expansion B or C Socket 21	4 m (13 ft)
Non-IBM asynchronous device using RS-232C interface	Feature Expansion C, D, E; Socket 23 (8-pins) or Socket 25 (16-pins)	4 m (13 ft)
Non-IBM current loop device using RS-232C interface	Feature Expansion C, D, E; Socket 23	4 m (13 ft)

2.12 Cable Connections at Rear of Base Unit

Base units of the terminals contain ports, or sockets, for attaching cables to point-of-sale devices. Base units can also contain one or two optional Feature Expansions to attach additional selected point-of-sale devices. These Feature Expansions also contain sockets for attaching appropriate device cables.

The following may aid you in routing the cables to the terminals. Table 2-3 identifies the port, or socket used with each cable.

Socket Number	Device Name	Cable Number
1	Store Loop	1
3A	Cash Drawer A	3
3B	Cash Drawer B or Remote Alarm	3
4A	Alphanumeric, Operator, or Shopper Display	4
4B	Alphanumeric, Operator, or Shopper Display	4
5A	50-Key Keyboard, Alphanumeric Keyboard, ANPOS Keyboard, Combined Keyboard/Display, or Matrix Keyboard	5
5B	50-Key Keyboard, Alphanumeric Keyboard, ANPOS Keyboard, Combined Keyboard/Display, Matrix Keyboard, 1520 Hand-Held Scanner Model A02, or Dual-Track MSR	5
6	Single-Track Magnetic Stripe Reader (MSR) Note: Socket 6 is located on the 50-key keyboard.	None
7	Printer	7
9A	Reserved	-
9B	Hand-Held Bar Code Reader	-
11	4683-xx2 TO 4683-xx1 or 4684	11
17	Checkout Scanner or Scanner/Scale	17
21	1520 Hand-Held Scanner Model A01, Optical Character Reader (OCR), or Scale	21
22	Reserved	-
23	RS-232 Device	23
25	RS-232 or Current Loop Device	25
26	Magnetic Wand	26
29	Coin Dispenser	29
81	Video Display	81
82	Video Display	82

A terminal can have up to two Feature Expansions Cards. You can install different combinations of Feature Expansion Cards A, B, C, and D; however, a terminal can have *only one* Feature Expansion Card D. Whenever present, the Feature Expansions are always in the upper row and can be installed in either the left-hand or the right-hand position. The left-hand position is referred to as Location 2A and the right-hand position is referred to as Location 2B. Any position that does not contain a Feature Expansion should have a blank filler plate installed to cover the empty space.

Figure 2-32 illustrates the back panels of two base units with different combinations of Feature Expansions installed. One illustrates a 4683-001 terminal with Feature Expansions A and B installed. The other shows a 4683-002 terminal with Feature Expansions C and D installed.

Figure 2-32. Locations of Cable Connections on Base Units

Notes:

1. The rear panels of a 4683-xx1 are identical.
2. The rear panel of a 4683-A02 contains Socket 9A, which is not present on a 4683-002.

2.13 Non-IBM Cash Drawer

You can attach a non-IBM cash drawer to a terminal. A Non-IBM Special Attachment cable is available, P/N 63X4997, which is 4 m (13 ft) long. The non-IBM cash drawer can attach to *either* connector 3A or 3B on the base unit. Contact your IBM Marketing Representative for additional information regarding the interface requirements.

2.14 *Non-IBM External Alarm*

You can attach a non-IBM alarm to a terminal. A Non-IBM Special Attachment Cable is available, P/N 63X4997, which is 4 m (13 ft) long. The non-IBM alarm can attach *only* to connector 3B on the base unit. Contact your IBM Marketing Representative for additional information regarding the interface requirements.

2.15 Security Considerations

Several options are available to enhance physical security for the terminals and devices. They include:

- Two styles of optional security bases to help prevent unauthorized removal of devices when they are placed on top of the base unit or cash drawer. The devices that can be attached to the security bases include:
 - Keyboards
 - Printer
 - 9-Inch Monochrome Displays
 - Operator display, when it is mounted on the tray base.
- Optional locks for the keyboard, cash drawers, and printer
- Threaded inserts in the bottom of the base unit and cash drawer for securing them to a checkstand or countertop.

Subtopics

- 2.15.1 Security Base
- 2.15.2 Security Base for Attaching a 9-Inch Monochrome Display
- 2.15.3 Locks on Terminal Devices
- 2.15.4 Store Controller Keyboard Lock
- 2.15.5 Securing the Cash Drawer or Base Unit to the Checkstand

2.15.1 Security Base

The optional security base is a plastic plate that fits on top of a base unit or cash drawer. Its purpose is to secure the keyboard, printer, and Operator Display to help prevent unauthorized removal of the devices from the terminal. In addition, you can attach the 9-Inch Monochrome Display to the security base when the display is placed in the location usually occupied by the printer.

The security base does not attach to the base unit or cash drawer. In an integrated configuration, it rests on top of the base unit. In a distributed configuration, it can rest on top of the base unit or the cash drawer. It is approximately the same length and width as the base unit and cash drawer and is about 19 mm (3/4 in.) high.

It comes with M6 x 16 security screws for attaching the devices. You can install security screws in the bottom of the devices to be attached. With security screws installed, you press the head of the screw down through a hole in the security base. Once in place, the security screw will hold the device to the security base.

In order to separate the devices from the security base, you must raise the security base and remove the security screw from each device. Figure 2-33 shows a security base in place on top of a base unit.

PICTURE 38

Figure 2-33. Security Base Placed on Base Unit

2.15.2 Security Base for Attaching a 9-Inch Monochrome Display

A security base is available, which must be used when you integrate a 9-Inch Monochrome Display on a terminal that has an integrated printer. It permits the display to extend past the right side of the terminal and contains a tilt/swivel mechanism that allows the salesperson to adjust the position of the display. Like the security base described in "Security Base" in topic 2.15.1, it can secure a keyboard, printer, and Operator Display to help prevent unauthorized removal of the devices from the terminal.

The security base does not attach to the base unit or cash drawer. In an integrated configuration, it rests on top of the base unit. In a distributed configuration, it can rest on top of the base unit or the cash drawer. It is approximately the same depth as the base unit and cash drawer. An extension at the right side supports the 9-Inch Monochrome Display.

It comes with M6 x 16 security screws for attaching the devices. You can install security screws in the bottom of the keyboard, display, and printer. With security screws installed, you press the head of the screw down through a hole in the security base. Once in place, the security screw will hold the device to the security base.

In order to separate the devices from the security base, you must raise the security base and remove the security screw from each device.

PICTURE 39

Figure 2-34. Security Base for Integrating a 9-Inch Monochrome Display

2.15.3 Locks on Terminal Devices

Locks are available on certain devices to prevent unauthorized operation or access, depending on the device. They include:

- A lock in the keyboard to limit access to certain functions or operations to authorized personnel only
- A lock inside the printer cover to limit access to the journal print station
- A lock in the cash drawer to limit access to the cash drawer.

Locks may be ordered to accept either specific keys or random keys selected from a large group of lock combinations. The locks are installed by your personnel when they install the terminals.

Subtopics

2.15.3.1 Blank Lock Inserts

2.15.3.2 Replacement Keys and Lock Inserts

2.15.3.1 *Blank Lock Inserts*

A blank lock insert is available to cover the hole for the lock insert when no lock is installed.

2.15.3.2 Replacement Keys and Lock Inserts

Replacement keys, locks and blank lock inserts can be ordered as supply items. Part numbers and lock serial numbers can be found in *IBM 4680 Store System: Selecting Hardware and Software Components* and in the *IBM 4680 Store System: Messages Guide*.

2.15.4 Store Controller Keyboard Lock

The store controller contains a lock that can deactivate the keys on the keyboard and lock the system unit cover closed.

2.15.5 Securing the Cash Drawer or Base Unit to the Checkstand

The bottom of the base unit and the cash drawer have threaded inserts for installing screws to secure either of them to a checkstand or countertop. These inserts are located at two points in the bottom of the cash drawer and at one point in the base unit. Appendix C contains illustrations of the bottom view of the units.

You must provide M6 screws for securing the devices. The screws can extend approximately 9 mm (11/32 in.) into the bottom of the base unit or cash drawer.

2.16 *Environmental Considerations*

This section provides guidelines regarding temperature and humidity.

Subtopics

2.16.1 Operating Environment

2.16.2 Heat Output

2.16.3 Maximum Operating Altitude

2.16.4 Static Electricity

2.16.1 Operating Environment

The operating temperature and humidity limits for the point of sale terminals are:

Temperature	10° C to 32° C (50° F to 90° F)
Relative Humidity	8% to 80%
Maximum Wet Bulb	23° C (73° F)

Note: The IBM 4680 Store System is designed to operate in a store environment where heating and/or cooling facilities are provided as required for normal store operations.

The operating temperature and humidity limits for the store controller are:

Temperature	15.6° C to 32° C (60° F to 90° F)
Relative Humidity	8% to 80%
Maximum Wet Bulb	23° C (73° F)

Note: The store controller contains both diskette and disk units. Do not locate it where dust might be drawn into the unit by its cooling fans.

2.16.2 Heat Output

The heat output of the machines is shown in the following table. You should refer to the documentation with any non-IBM devices for information regarding their heat output.

Table 2-4. Heat Output	
Machine Type	Heat Output
Store Controller (PS/2)	363 watts (1240 Btu/hr)
Store Controller (Personal Computer AT)	360 watts (1230 Btu/hr)
IBM 4683 Point of Sale Terminals	275 watts (940 Btu/hr)
IBM 3687 Checkout Scanner Model 2	140 watts (480 Btu/hr)
9-Inch Monochrome Display	25 watts (90 Btu/hr)
IBM 8503 12-Inch Monochrome Display	55 watts (190 Btu/hr)
IBM 8513 12-Inch Color Display	80 watts (270 Btu/hr)

2.16.3 Maximum Operating Altitude

The maximum operating altitude for the 4680 Store System is 2135 m (7000 ft) above sea level.

2.16.4 Static Electricity

When the humidity is low, the movement of people, paper or objects can build up a static electricity charge. These charges create an annoying static shock when discharged to or near another person or object. If discharged to or near data processing equipment, errors can result.

A proven method of controlling static buildup is to maintain a relative humidity level of 40% to 50%.

Some other ways to minimize static buildup are:

- Use anti-static carpet
- Use anti-static treatment on your floor covering
- At the machines, install pads or mats designed to reduce static buildup.

2.17 Considerations for Customer Setup

The user is responsible for setup of the machines, including unpacking, installing the devices and features, and testing. This includes the installation of all cables. Cables to connect the devices are shipped with the terminals and are usually installed at the same time as the terminals.

In distributed configurations, some cables may have to pass through conduit or special cable ducts. Be sure the cables can be easily routed at installation time. A summary of the cable lengths is provided in "Summary of Cable Lengths to Attach Distributed Devices" in topic 2.11.

2.18 Safety Considerations

Safety is a major consideration in the design of all IBM products. All machines meet or exceed the standards required by your local government.

Environmental safety is your responsibility. You should:

- Adhere to local and national electrical codes.
- Provide enough service clearances so that your personnel can easily connect and disconnect cables and devices.
- Ensure that the power ON/OFF switches for all units are accessible.

3.0 Topic 3. *Planning the Store Wiring*

The user is responsible for obtaining, installing, testing, and maintaining the store wiring. This topic provides information on planning both the wiring for electrical power and the wiring to connect the units to one another.

Subtopics

- 3.1 Types of Store Wiring
- 3.2 Checklist for Planning Store Wiring
- 3.3 Electrical Requirements
- 3.4 Backup Electrical Power
- 3.5 Location of ac Power Receptacles
- 3.6 The Store Loop
- 3.7 Testing the Store Wiring
- 3.8 Terminal Numbers and Locations
- 3.9 Data Flow Through a Store Loop
- 3.10 Store Controller Backup
- 3.11 IBM PC Network
- 3.12 IBM Token-Ring Network
- 3.13 Cables to Connect a 4683-xx2 to a 4683-xx1
- 3.14 Lightning Protection for Outdoor Store Loop Cable

3.1 Types of Store Wiring

Several types of store wiring are described in this topic, including:

- Electrical power wiring required for the store controller and point-of-sale terminals
- Store loop wiring that connects a store controller to one or more IBM 4683-xx1 terminals
- Wiring to provide optional store controller backup
- Wiring to provide an optional local area network for communication between store controllers
- Point-to-point wiring to connect a 4683-xx2 terminal to a 4683-xx1.

3.2 Checklist for Planning Store Wiring

This checklist shows some of the tasks necessary in planning and installing the store loop wiring and the electrical power wiring for the IBM equipment. There is space for you to include additional tasks that may apply.

Table 3-1. Checklist for Planning Store Wiring			
Task	Date Scheduled	Date Completed	Notes
Order IBM Cabling System manuals			
Determine types of machines to install			
Determine requirements for store loop			
Determine requirements for connecting 4683-xx2 terminals to 4683-xx1 terminals			
Determine electrical requirements			
Review plans for electrical wiring			
Review plans for store loop wiring			
Order store loop cables and accessories			
Order IBM PC Network or Token-Ring Network components, if applicable			
Determine need for auxiliary power source			
Order IBM Tester			
Develop installation plans with contractor			
Develop plan to test store loop			
Prepare documentation for contractor			
Review installation documentation with contractor			
Install store loop wiring			
Install IBM PC Network or Token-Ring Network wiring, if applicable			
Install all electrical power wiring			
Test the store loop wiring			
Complete all site preparations			

3.3 *Electrical Requirements*

The IBM machines require standard electrical wiring. The following topics provide guidelines for planning the installation of electrical power wiring for the IBM machines. They include information regarding the option of providing backup electrical power to the store system.

Subtopics

- 3.3.1 Electrical Power Requirements
- 3.3.2 Electrical Branch Circuits
- 3.3.3 Grounding of Branch Circuits

3.3.1 Electrical Power Requirements

Each of the units listed below requires an ac power receptacle.

Table 3-2. Electrical Requirements					
Machine or Device	Nominal Volts ac	Minimum Volts ac	Maximum Volts ac	Maximum kVA/Watts	Frequency (in Hz)
IBM 4683 Terminals	100 to 125 200 to 240	90 180	137 259	0.40/280	50/60 ±3 50/60 ±3
Store Controller (PS/2)	100 to 125 200 to 240	90 180	137 265	0.37 to 0.72/ 100 to 225 (Depending on Model)	50/60 ±3 50/60 ±3
Store Controller (Personal Computer AT)	100 to 125 200 to 240	90 180	137 259	0.625/440 (1)	50/60 ±3 50/60 ±3
IBM 3687 Checkout Scanner Model 2	100 to 120 200 to 240	90 180	127 259	0.20/140	60 ±0.5 (2) 50 ±0.5 (2)
IBM 1520 Hand-Held Scanner	120	104	127	0.12/85	60 ±0.5
9-Inch Monochrome Display	100 to 125 200 to 240	90 180	137 259	0.03/25	50/60 50/60
IBM 8503 12-Inch Monochrome Display	100 to 125 200 to 240	90 180	137 259	0.09/95	50/60 50/60
IBM 8513 12-Inch Color Display	100 to 125 200 to 240	90 180	137 259	0.10/115	50/60 50/60

Note: For the electrical power requirements of other IBM scanners, refer to the appropriate scanner physical planning manual for information. See the *Related Publications* section of this manual for ordering information.

1. An IBM printer adds 0.1 kVA and a color display adds 0.11 kVA to the store controller kVA.
2. Frequency tolerance of ±3 Hz is allowed for limited periods (up to a few days) when operating from an emergency backup power source.

You should review the wiring and electrical requirements for non-IBM machines or equipment with the electrical contractor. Those requirements may differ from the requirements shown in this manual for IBM machines.

3.3.2 Electrical Branch Circuits

The IBM machines require standard electrical branch circuits. You should plan to have separate branch circuits for the IBM equipment.

The 4683-xx1 terminals contain a storage retention battery and can retain the data stored in the terminal if electrical power to the terminal is interrupted for a short time. The battery can retain data in the terminal for up to 15 minutes, depending on its state of charge when power is interrupted. *The battery does not permit the terminal to continue to operate; its only function is to retain the data and the program in storage during this period.*

In normal operation, a trickle charge keeps the battery charged as long as the terminal's power cord is connected to electrical power. The terminal can retain the data in storage, even when its power switch is moved to the OFF position. When the power switch is returned to the ON position, the terminal is ready for use immediately.

If the power cord is disconnected from electrical power, or if the store should lose electrical power, the storage retention battery can retain the data for up to 15 minutes. If power to the terminal is not restored before the battery discharges, the data in storage will be lost.

Some stores may wish to disconnect power to the point-of-sale terminals at times, without causing their batteries to discharge. For example, you may wish to completely shut off power to the terminals at night. Through the application program or operator command, the battery protection can be disabled. You can then remove power to the terminals without causing the battery to discharge. Of course, with the battery protection disabled, the data in storage will be lost when the power is disconnected. When you restore power, it will be necessary for the store controller to reload the control program and the application into the 4683-xx1 terminals.

Note: If the battery completely discharges, the terminal must be plugged into a power source for approximately 14 hours before the battery will fully recharge.

3.3.3 Grounding of Branch Circuits

The power cords for all IBM machines include an equipment ground conductor. Each user-supplied branch circuit *must* have a wire conductor for the purpose of grounding the equipment. *This equipment grounding wire is a dedicated ground, not a neutral.* All branch circuit grounding wires must be connected to a common ground point at the distribution panel and, by a single ground wire, to the nearest building ground station. Conduit *must not* be used as the only means of grounding. Grounding must comply with local and national electrical codes.

For safety, all receptacles located near those receptacles used for IBM machines must be grounded. This will ensure that all nearby equipment is connected to grounded receptacles.

3.4 Backup Electrical Power

You may want to provide a backup source of power in case the store loses power from the electric utility company. This is sometimes done with an auxiliary power source, such as a standby motor generator. If the electric power is interrupted for any reason, it will be necessary to initiate a restart of the store system. An interruption can occur when switching to emergency generator power and when switching back to utility power.

In stores where the store system must remain fully functional in the event of any disruption to power, you may wish to consider an uninterruptible power source, often referred to as a UPS. It can provide electrical power for protection from power line disturbances, as well as from a complete loss of power from the utility company. The units are available from vendors in several sizes and capacities.

You may want to consider a UPS for only the store controller or for the store controller and selected 4683-xx1 terminals. Depending on your requirements, you can choose from two general types. An *online UPS* provides power continuously. A less costly *standby power supply* provides power only when the utility power falls below a certain voltage level. The following table lists the requirements for a standby type of power supply to maintain power to the IBM 4680 Store System. This information may be helpful in determining the type of UPS that is best suited to your needs. You should contact your IBM Marketing Representative for additional information.

The following charts identify the requirements for store controllers using 120 Volts 60 Hz and 240 Volts 50 Hz. The store controller can be either:

- Selected models of the IBM Personal Computer AT
- Selected models of the IBM Personal System/2.

Some power requirements differ, depending on which store controller you have. Where differences exist, the requirements for both are shown.

Table 3-3. Electrical Power Requirements for 120 Volts ac 60 Hz Standby Power Supply	
Features of a Standby Power Supply	Requirements of the IBM 4680 Store System
RMS Voltage Output	120 V ac \pm 5 V
Waveform	<p>When the store controller is an IBM Personal Computer AT:</p> <p>Sinewave approximation. A squarewave is acceptable for short periods of time if the peak voltage requirements are met. (Peak voltage is to be = 128 V ac.)</p> <p>When the store controller is an IBM Personal System/2:</p> <p>Sinusoidal only. A squarewave is not acceptable.</p>
Harmonic content	<p>When the store controller is an IBM Personal Computer AT:</p> <p><10%</p> <p>When the store controller is an IBM Personal System/2:</p> <p><5%</p>
Output frequency	60 Hz \pm 3
Transfer time (length of interruption to the critical load)	<p>When the store controller is an IBM Personal Computer AT:</p> <p>=10 milliseconds</p> <p>When the store controller is an IBM Personal System/2:</p> <p>=8 milliseconds</p>
Transfer threshold when	96 to 104 V ac

switching from utility power to standby power supply	
Transfer threshold when switching from standby power supply to utility power	=104 V ac
Overcurrent protection	Current limiting circuitry (output should remain stable)
Battery	Sealed lead acid, maintenance-free

Table 3-4. Electrical Power Requirements for 240 Volts ac 50 Hz Standby Power Supply

Features of a Standby Power Supply	Requirements of the IBM 4680 Store System
RMS Voltage Output	240 Volts ac \pm 10 Volts
Waveform	<p>When the store controller is an IBM Personal Computer AT:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Sinewave approximation. A squarewave is acceptable for short periods of time if the peak voltage requirements are met. (Peak voltage is to be = 259 Volts ac.) <p>When the store controller is an IBM Personal System/2:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Sinusoidal only. A squarewave is not acceptable.
Harmonic content	<p>When the store controller is an IBM Personal Computer AT:</p> <ul style="list-style-type: none"> <input type="checkbox"/> <10% <p>When the store controller is an IBM Personal System/2:</p> <ul style="list-style-type: none"> <input type="checkbox"/> <5%
Output frequency	50 Hz \pm 3
Transfer time (length of interruption to the critical load)	<p>When the store controller is an IBM Personal Computer AT:</p> <ul style="list-style-type: none"> <input type="checkbox"/> =10 milliseconds <p>When the store controller is an IBM Personal System/2:</p> <ul style="list-style-type: none"> <input type="checkbox"/> =8 milliseconds
Transfer threshold when switching from utility power to standby power supply	182 to 208 Volts ac
Transfer threshold when switching from standby power supply to utility power	=190 Volts ac
Overcurrent protection	Current limiting circuitry (output should remain stable)
Battery	Sealed lead acid, maintenance-free

Subtopics

3.4.1 Lightning Protection for the Backup Power Source

3.4.2 Auxiliary Power Systems

3.4.1 Lightning Protection for the Backup Power Source

IBM recommends that lightning protection be installed on the backup (secondary) power source when:

- Lightning protection is installed on the primary power source
- The area is subject to electrical storms or other power surges.

You should get the advice of a competent electrical specialist to determine the need for lightning protection.

3.4.2 Auxiliary Power Systems

An auxiliary power system, such as a motor generator supplying power for the IBM 4680 Store System, should have the following characteristics:

- The auxiliary power system must have the capability to provide the steady-state kVA power requirements of the store system. To find this steady-state requirement, add the kVA rating for each machine in the store system and any additional circuits or equipment that receive power from the auxiliary power system.
- The voltages provided by the auxiliary power system should be within the ranges shown in "Electrical Power Requirements" in topic 3.3.1.
- The input power frequency requirements are either 50 Hz or 60 Hz as shown in "Electrical Power Requirements" in topic 3.3.1.

Note: The auxiliary power system should provide output characteristics, such as the nominal voltage magnitude level and frequency, equivalent to the power provided by the utility company.

The transfer from utility power to auxiliary power and from auxiliary power back to utility power should not cause a power or phase change during the transfer.

You should verify with the manufacturer that the auxiliary power system conforms to these characteristics.

3.5 Location of ac Power Receptacles

The power receptacles should be installed in locations where the power cords are safe from being accidentally disconnected.

The power cords for the IBM 4683 terminals are 4.3 m (14 ft) long, except in areas where local codes require a 1.8 m (6 ft) power cord. The power cords for the store controller and the IBM 3687 Checkout Scanners are 1.8 m (6 ft) long.

3.6 The Store Loop

This section describes wiring required for:

- Stores that can use existing store loop wiring
- Stores that require new store loop wiring.

In addition, this topic provides specifications for store loop cable and lists some sources of cable. It provides a description of the basic components of the IBM Token-Ring Network.

The store loop is a user-provided cable that connects the store controller to the 4683-xx1 terminals. It begins at the store controller and goes to each location where installation of a 4683-xx1 is planned. You must provide a connection at each planned location to attach the terminal. The maximum number of 4683-xx1 terminals you can connect to one store loop is 64.

You can choose from two kinds of cabling methods when installing the store loop cable:

- Install the store loop using the IBM Cabling System cable and components.
- Install other cable of your choice. Any cable you use must be a type that has been tested and is suitable for use with the IBM 4680 Store System as store loop cable.

The IBM Cabling System is described in this topic and in other referenced manuals. This topic lists specifications for store loop cable other than cable that is part of the IBM Cabling System.

Subtopics

- 3.6.1 Data Connectors for Store Loop Wiring
- 3.6.2 Comparison of Data Connectors and 4-Pin Connectors
- 3.6.3 IBM Cabling System
- 3.6.4 Other Types of Store Loop Cable
- 3.6.5 Using Existing Store Loop Cable
- 3.6.6 Operating an Existing Store Loop During Conversion
- 3.6.7 Specifications for Store Loop Cable
- 3.6.8 Cabling for United States Installations
- 3.6.9 Central Switch Panels
- 3.6.10 Maximum Allowable Distance Between Terminals on a Store Loop
- 3.6.11 Maximum Recommended Distance Between Terminals
- 3.6.12 Maximum Number of Terminals on a Store Loop
- 3.6.13 Radial Store Loop Configuration
- 3.6.14 Serial Store Loop Configuration

3.6.1 Data Connectors for Store Loop Wiring

The IBM 4680 Store System uses a connector, referred to as a data connector, to terminate the ends of cable. You must install this kind of connector as the store loop connector. Cable 1 (the store loop cable) now comes equipped with a shorting plug that automatically self-shorts if the store loop cable is disconnected at the terminal. This shorting capability prevents the store loop from being opened unintentionally.

The data connectors attach to the store loop cable with solderless connections. They terminate the four signal wires and the braided shield ground in the cable. The data connectors are self-shorting when the store controller or terminals are disconnected. This maintains the continuity of the store loop without the need for shorting plugs and prevents an interruption to the store loop when terminals are removed from the store loop. The data connectors also maintain the continuity of the braided shield ground throughout the store loop.

The terminal's attachment cable has a matching data connector. Figure 3-1 illustrates a data connector installed in a wall outlet and the matching data connector on the terminal's attachment cable. It shows how the "T-tab" interlocks with the "T-cutout" to lock the data connectors together. To connect or disconnect a data connector, simply squeeze the lock tabs. A locking clip that slides over each connector is included and should be installed on both connectors. When the locking clip is in place, the connector cannot be accidentally disconnected.

Be sure to carefully label the data connectors you install, to avoid connecting the wrong attachment cable from a terminal.

Note: Do not connect a 4683-xx2 terminal directly to the store loop. Problem determination can be difficult if you do.

PICTURE 40

Figure 3-1. Data Connectors for Store Loop Cable

3.6.2 Comparison of Data Connectors and 4-Pin Connectors

This section provides a comparison of the features of the data connectors and the 4-pin connectors used with previous IBM store systems. The 4-pin receptacles are usually referred to as Western Electric (WE) Type 404-B receptacles. The corresponding 4-pin plugs are referred to as WE Type 283-B plugs.

- The data connector is "self-shorting" when it is unplugged. It maintains the continuity of the store loop cable whenever the point-of-sale terminal attachment cable is disconnected from the store loop.

When using the existing 4-pin receptacles, it was necessary to insert a shorting plug whenever a terminal's attachment cable was disconnected from the store loop. The shorting plug then maintained the continuity of the store loop where it was plugged in.

- The data connector also maintains the continuity of the braided shield ground circuit through the connector. This provides continuity for the braided shield in the store loop cable through the data connector to the terminal's attachment cable. The attachment cable maintains this continuity on to the terminal.

The 4-pin connector did not provide a connection for the braided shield. The shield was connected outside the 4-pin receptacle. In this way, the braided shield continuity was maintained throughout the store loop from one terminal to the next, but the shield was not brought into each terminal.

- The data connector has interlocking tabs to keep it tightly secured to its matching data connector, as shown in Figure 3-1 in topic 3.6.1.

The 4-pin plug had no provisions to secure it to its matching receptacle.

Note: The data connector interlocking tabs will unlatch if you apply a high force to the side of the data connector or pull on the cable. This does not damage the connector but electrical continuity will be opened. You should install the connector in a secure place where normal activity will not dislodge it but that is convenient for installation and service.

3.6.3 IBM Cabling System

The IBM Cabling System can be used for many purposes, including store loop wiring. When installing new store loop wiring for the IBM 4680 Store System, the components of the IBM Cabling System (or equivalent) may be used. This cabling system includes the following:

- Indoor plenum style cable
- Indoor non-plenum style cable
- Cable suitable for outdoor use
- A self-shorting type of data connector
- Junction boxes and faceplates
- Patch cords
- Lightning protection for outdoor store loop cable.
- Loop Wiring Concentrators. These are devices for terminating lengths of store loop cable at the store controller. They can be installed in standard 483 mm (19 in.) equipment racks, not available from IBM.

When using the IBM Cabling System, you may need equipment racks to hold the Loop Wiring Concentrators and distribution panels to distribute and ground the store loop cables. The following manuals describe how to plan, install, and test the IBM Cabling System and how to order the necessary wiring components.

- IBM Cabling System Planning and Installation Guide.* This guide provides complete information on planning, installing, and testing the IBM Cabling System.
- Using the IBM Cabling System with Communication Products.* This manual describes how to use the IBM Cabling System with specific IBM communication products.
- IBM Cabling System Catalog.* This catalog describes and illustrates the wiring components and provides instructions for ordering them.

3.6.4 Other Types of Store Loop Cable

As an alternative to the IBM Cabling System, you can install store loop cable that is not part of the IBM Cabling System. This topic includes specifications for cable that is suitable for use as store loop cable. It also includes information regarding cable that is available from suppliers.

It is the user's responsibility to purchase, install, test, and maintain all store loop cables. Bulk cable can be purchased from either IBM or from another source that you select.

3.6.5 Using Existing Store Loop Cable

The IBM 4680 Store System can operate on installed store loop cable that meets the specifications described in this topic. Existing cable that does not meet these specifications may not perform satisfactorily when used with the IBM 4680 Store System.

3.6.6 Operating an Existing Store Loop During Conversion

IBM 4683-xx1 terminals cannot operate on the same store loop with any other type of terminals. When converting an existing store loop, considerable time may be necessary to convert from 4-pin Western Electric receptacles to data connectors. You must consider how to maintain the store loop during this interim period.

One method is to connect a data connector, IBM P/N 8310574, to any short length of store loop cable. Attach a WE Type 404-B 4-pin receptacle to the other end and tape up the braided shield. You can plug the data connector into your store loop and connect the WE 404-B receptacle to the store loop attachment cable from your present point-of-sale terminal. When you are ready to install the new IBM 4683 terminals, you can discard the short temporary cables.

3.6.7 Specifications for Store Loop Cable

The cable's physical and electrical characteristics should be considered in selecting store loop cable. Cables with large conductor sizes or large outside diameter may require different installation techniques to accommodate these factors.

The cable used in an installation must have the same electrical characteristics for the entire store loop (such as the same impedance, capacitance, and attenuation). Other characteristics of the cable must be as follows:

- Type of wire:** Solid annealed copper wire
- Conductor size:** Number 22 AWG to Number 18 AWG
- Shield:** Tinned copper braid or tape, or metalized foil with drain wire
- Impedance:** 75 to 125 ohms at 1 MHz
- Mutual Capacitance:** Less than 25 pF per 0.3 km (1000 ft) at 1 kHz
- Signal attenuation:** Less than 6.0 dB per 0.3 km (1000 ft) at 25 ±3° C (77 ±5° F) and at 772 kHz
- Crosstalk attenuation:** Not less than 60 dB per 0.3 km (1000 ft) at 150 kHz
- Conductor insulation:** Must meet national and local electrical codes for indoor installation, and the resistance must be no less than 1000 megohms per 1.6 km (1 mile).
- Sheath or jacket:** Must meet national and local electrical codes for indoor installation.
- Each pair must be twisted separately, with no less than two twists per 30.5 cm (1 ft). The pairs should be assembled to minimize crosstalk (interference between twisted pairs).

Be sure your cable vendor certifies that the cable meets these specifications. Contact your IBM Marketing Representative or your dealer if you need assistance before ordering store loop cable.

These specifications are primarily associated with electrical characteristics of the cable. It is equally important that the cable is suitable for physical attachment to the data connectors.

Some cables may meet the electrical specifications, yet may not be suitable for attachment to data connectors. For these cables, use an adapter kit, IBM P/N 6428954, when attaching each data connector.

All cables that are part of the IBM Cabling System meet these specifications and are approved for attachment to data connectors. The following table lists additional cables that have been tested for indoor installation as store loop cable for the IBM 4680 Store System. They meet the electrical specifications listed and are suitable for use with IBM data connectors. They may not necessarily meet the requirements of Article 725 of the U.S. National Electrical Code. Refer to "Cables that Meet Requirements of National Electrical Code Article 725" in topic 3.6.8.1 for information regarding store loop cable in areas in which the U.S. National Electrical Code applies.

This list is only a guide. There may be other cables that meet the electrical specifications and are suitable for attachment to data connectors. It remains the user's responsibility to purchase, install, and maintain store loop cable that meets the specifications listed here.

Table 3-5. Cable Suitable for Store Loop Cable	
Manufacturer or Supplier	Catalog or Part No.
Belden	9855
Brand Rex	T6173
IBM (specification only)	5165886

Figure 3-2 illustrates an example of store loop cable. Not all store loop cable contains a drain wire and foil shield.

PICTURE 41

Figure 3-2. Example of Store Loop Cable

3.6.8 *Cabling for United States Installations*

Safety Notice: The cable you install in your building **must** meet certain safety requirements if your installation is in the U.S. where the National Electrical Code Article 725 is now in effect.

Subtopics

3.6.8.1 Cables that Meet Requirements of National Electrical Code Article 725

3.6.8.1 Cables that Meet Requirements of National Electrical Code Article 725

Table 3-6. IBM Cabling System		
Cable Part Number	UL/NEC Rating	Suitable Installation
4716748	CL2	Type 1, Non-Plenum
6339585	CL2R	Type 1, Riser
4716749	CL2P	Type 1, Plenum

UL/NEC: Underwriters Laboratory/National Electrical Code

These cables are not available from IBM. Your IBM Marketing Representative can provide you with the names of suppliers.

3.6.9 Central Switch Panels

Instead of loop wiring concentrators, you may choose to install central switch panels where several lengths of store loop cable terminate. These panels are applicable *only* for radial store loop configurations. They are not intended for serial store loop configurations.

In a radial store loop configuration, you can run individual lengths of store loop cable from a central switch panel to each point-of-sale terminal. At the central panel, each cable terminates at a switch. You can insert or remove a terminal and its associated length of cable from the store loop simply by operating the switch. This is especially helpful in locating the problem when the store loop or a terminal is suspected to be the source.

By operating the switch for a particular terminal, you can completely disconnect that terminal and its length of store loop cable, while leaving the remainder of the store loop intact. If this removes the cause of the problem, the store loop can operate while you isolate the specific trouble in the cable or in the terminal.

In addition, the switch panel may provide circuitry to enable you to group several cables and their terminals into subloops. With this capability, you can easily switch an entire group of terminals in the subloop into or out of the store loop. Each terminal in the subloop can still operate under the control of its own individual switch as described above.

Switch panels are available from vendors in various sizes to suit your needs. Some switch panels contain only passive elements, such as terminal blocks or terminal strips, switches, and the wiring that connects the terminal blocks to the switches. Other switch panels include circuitry for generating test signals that can be transmitted on the store loop. They may have some automatic functions or they may require manual intervention for some operations, depending on the design of the switch panel. It is the user's responsibility to determine that such devices are compatible with the IBM 4680 Store System.

The switch panel should contain at least the following:

- Entry points to terminate the individual store loop cables that make the wiring readily accessible. These are usually in the form of terminal strips or terminal blocks. They provide the termination point for each segment of store loop cable.
- Switches that permit you to connect or disconnect individual terminals or groups of terminals to the store loop.
- Wiring or circuitry that connects the terminal blocks to the switches.
- Provision for grounding the braided shield in the store loop cables.

The switch panel should contain a sufficient quantity of unused positions to provide for future expansion and seasonal or special sales.

You should be sure that:

- The switch panel has terminal blocks and connections large enough to accommodate the size wires in the store loop cable.
- The screws and fittings can be used with conventional tools carried by electricians.
- The switch panel *must* be large enough for each store loop cable to enter the panel box and be routed to the appropriate terminal block.

Each length of store loop cable contains four circuit wires (two twisted-pairs) and one braided shield. Cables with outside diameters of 11 mm (7/16 in.) are not uncommon. Some cables are less flexible than others and have a more limited bending radius. For example, cable suitable for use in plenums and air ducts is often not as flexible as standard cable of the same wire size.

- The panel should provide strain relief for the store loop cables to avoid placing unnecessary strain on the wire connections.
- The switches should have high quality precious metal contacts capable of reliable operation at the low energy levels of the store loop signal.
- The switch panel should have clear color-coded labels for the wire termination points. In addition, it should have clear labels on the outside of the switch panel box designating the terminal positions and function of the switches.

The switch panel must meet national and local electrical codes for indoor installation.

3.6.10 Maximum Allowable Distance Between Terminals on a Store Loop

The maximum allowable cable distance between "active" terminals on a store loop (those with power switched on) is 1220 m (4000 ft). (The maximum allowable cable distance when using IBM Type 8 or Type 9 cable is 490 m (1600 ft.) Each active terminal receives the signal on the store loop from the previous active terminal (or from the store controller, if the terminal is the first one on the store loop) and sends it on to the next terminal.

In radial store loop configurations, you must consider the total length of wire from one terminal to another. (This length also applies between the first terminal and the store controller and between the last terminal and the store controller.) Refer to Figure 3-3 in topic 3.6.11 and note that there are two twisted-pairs of wires in the store loop cable. The signal travels from the store controller to the Loop Wiring Concentrator (LWC) over one twisted-pair of wires in that cable. It then goes out to the first terminal over one twisted-pair of wires and returns to the LWC over the other twisted-pair in that cable. It continues out and back to each terminal, and finally goes back to the store controller to complete the store loop.

Because the signal must travel from each terminal to the LWC before going on to the next terminal, you must consider the total length of wire the signal must travel over in planning each cable segment.

Figure 3-3 illustrates how to calculate distances between terminals. If either Terminal B or Terminal C is powered off, the distance from any active terminal to another active terminal does not exceed the maximum allowable distance of 1220 m (4000 ft). If both Terminal B and Terminal C are powered off, the distance between the active terminals (Terminals A and D) is 1470 m (4800 ft). This includes the total length of cable wires the signal must travel over to get from Terminal A to Terminal D. In this example, this distance exceeds the maximum allowable distance between active terminals.

In a radial store loop configuration, you can disconnect a segment of the store loop cable at the LWC and shorten the effective wire length between two terminals. When you unplug a segment of the store loop cable at the LWC, the self-shortening feature of the data connectors permits the signal to continue on through the LWC to the next data connector. For example, in Figure 3-3, consider the effect of disconnecting the cable segment going to Terminal B. This removes 490 m (1600 ft) of wire; 245 m (800 ft) from the LWC to Terminal B and 245 m (800 ft) back to the LWC. With Terminal B disconnected at the LWC, the signal from Terminal A can go to the LWC and directly on to Terminal C.

3.6.11 *Maximum Recommended Distance Between Terminals*

To ensure satisfactory operation in the event of outages at the terminals, IBM recommends that you limit the maximum distance of cable between terminals to 610 m (2000 ft). When using IBM Type 8 or Type 9 cable, we recommend that you limit the distance to 240 m (800 ft).

PICTURE 42

Figure 3-3. Example of Calculating Distances Between Terminals

3.6.12 Maximum Number of Terminals on a Store Loop

You can attach up to 64 4683-xx1 terminals to a store loop. However, you must consider the maximum number of terminals you can attach and still maintain a high level of performance. This is especially true when you consider that it is possible to attach a 4683-xx2 terminal to each 4683-xx1 on the store loop.

Some typical factors that may limit the number of terminals you should attach to a store loop include the distance between terminals, the number of transactions, and the activity per transaction. Contact your IBM Marketing Representative or your dealer for assistance in determining the maximum number of terminals you should attach to a store loop and still obtain satisfactory performance.

3.6.13 Radial Store Loop Configuration

In most stores, the store loop is wired in a "radial" configuration. In this configuration, the store controller is wired to a Loop Wiring Concentrator (LWC). Each 4683-xx1 terminal is connected by an individual leg of store loop cable to the same Loop Wiring Concentrator. In this way, individual terminals can be connected to, or disconnected from, the store loop without disrupting data flow on the store loop.

IBM recommends the radial configuration for store loops. It can aid store personnel in problem determination efforts when a problem appears to be in the store loop. In addition, it offers the most flexibility for future expansion and for relocating point-of-sale terminals.

PICTURE 43

Figure 3-4. Radial Store Loop Configuration

3.6.14 *Serial Store Loop Configuration*

In some stores, the store loop may be wired in a "serial" configuration. In this configuration, the store loop cable is routed from the store controller to a 4683-xx1 terminal and on to each successive 4683-xx1.

PICTURE 44

Figure 3-5. Serial Store Loop Configuration

3.7 Testing the Store Wiring

User-provided and installed store wiring must be thoroughly tested when it is installed. Testing procedures for the IBM Cabling System are described in the *IBM Cabling System Planning and Installation Guide* and *Using the IBM Cabling System with Communication Products*. These manuals describe test procedures using an IBM tester designed for the IBM Cabling System and test procedures using an ohmmeter.

The *IBM Cabling System Catalog* contains a description, illustration, and information for ordering the tester.

Appendix G of this manual contains test procedures for store loop wiring and the wiring to connect a 4683-xx2 terminal to a 4683-xx1.

3.8 Terminal Numbers and Locations

During the planning steps and in the configuration process, your personnel will assign an identifying number to each point-of-sale terminal. The two charts in Figure 3-6 provide a convenient place to document information about the terminals. You can make copies of the charts as needed.

The *IBM 4680 Store System: Messages, Symptoms, and Problem Resolution Guide* provides problem determination procedures to help isolate store loop problems. These procedures rely on accurate documentation regarding the terminal number and the relative position of each terminal on the store loop. Be sure to document this information, as it will be needed later if problems appear to be in the store loop. To complete the chart:

- Enter the number or designation of the appropriate store controller.
- The first column, labeled "Position on the Store Loop", is numbered 1 through 64 and provides a line to document information about each terminal you plan to install.
- In the second column, enter the terminal number of the first 4683-xx1. The terminal number is the 3-digit number your personnel assign.
- Enter the location and a nearby phone number for each 4683-xx1.
- If this 4683-xx1 terminal has a 4683-xx2 attached, enter the terminal number of the 4683-xx2, its location, and a nearby phone number.
- Repeat these steps for the remaining terminals.

The *IBM Cabling System Catalog* provides information for ordering labels, which the installer can attach to the store loop connectors during installation of the store loop.

PICTURE 45

PICTURE 46

Figure 3-6. Terminal Identification Chart

3.9 Data Flow Through a Store Loop

Figure 3-7 illustrates a store loop connected to Loop Wiring Concentrators. It shows the data path over the store loop, through data connectors that may or may not have a terminal connected.

In the figure, the store loop originates at the primary store controller. The data path is to the backup store controller (if one is present), and then to each terminal attached to the store loop. In this example, only a few of the possible connections are used. The path continues to all attached terminals and then returns to the primary store controller, completing the loop.

Note: Whenever present, a backup store controller always goes in the FIRST position on the store loop, immediately following the primary store controller.

This figure illustrates a store loop using Loop Wiring Concentrators. The same concept of data flow also applies for a store loop that uses a central switch panel. The data flow is from the primary store controller, to the central switch panel, and over individual cable segments to each terminal location. From each terminal, the data flows back to the central switch panel, and finally completes the loop back to the primary store controller.

PICTURE 47

Notes:

- This illustration represents a typical store loop, using the IBM Loop Wiring Concentrator. Your store loop may be like this, but the position of your 4683s on the loop and their relationship to the store controller may differ.
- The 4683-P can also be a 4683-001 or 4683-A01. The 4683-002 can also be a 4683-A02.
- The store controller transmits data to the first 4683 "down-loop" on the store loop. This 4683 receives the data and passes it to the next 4683 "down-loop". This continues with each 4683 receiving data from the 4683 immediately preceding it and passing it on to the next 4683 "down-loop". The last 4683 "down-loop" receives data from the 4683 "up-loop" from its position, and passing it on to the next 4683 "down-loop". The last 4683 "down-loop" then returns the data back to the store controller.

Figure 3-7. Illustration of the Data Path Over a Store Loop

3.10 Store Controller Backup

In an environment with only one store controller and one store loop, there is no provision to continue normal operation if the store controller fails or cannot function. In this environment, if the store controller becomes unavailable, the point-of-sale terminals can still operate in an *offline*, or *standalone*, mode. They can perform some point-of-sale functions and maintain totals, but they cannot perform all the functions possible when the store controller is operational.

The IBM 4680 Store System provides the capability for a backup store controller to take control of a store loop if the assigned store controller cannot function or is unavailable. It does this using the optional Multiple Controller feature. In addition, it can use either the optional IBM PC Network or the optional IBM Token-Ring Network, which allow the store controllers to communicate with each other in managing the data files in the store controllers. The *backup* store controller monitors the activity on a store loop while performing its other assigned duties. If it detects that activity has stopped on the store loop it is monitoring, it will assume control of that store loop.

Each store controller contains at least one Store Loop Adapter, which enables it to communicate with the 4683-xx1 terminals attached to its assigned store loop. If it also has a second Store Loop Adapter installed, it can control its assigned store loop and function as a backup store controller for another store loop.

To use this backup capability, you assign a store controller the primary responsibility for one store loop and connect this store loop to the first Store Loop Adapter. Assign the same store controller the backup responsibility for another store loop and connect this store loop to the second Store Loop Adapter.

Figure 3-8 illustrates how to connect store controllers for backup. In this illustration, Store Controller A has primary responsibility for Store Loop A and attaches to a Loop Wiring Concentrator through its first Store Loop Adapter (labeled Store Loop Adapter No. 1). Two Loop Wiring Concentrators are coupled to provide connections for up to 13 4683-xx1 terminals. Store Controller A's second Store Loop Adapter (labeled Store Loop Adapter No. 2) connects to the Loop Wiring Concentrator of Store Loop B, enabling Store Controller A to provide backup for Store Controller B.

Store Controller B is connected in a comparable manner to control its own store loop and to provide backup for Store Controller A. Note where the cable from each Store Loop Adapter No. 2 connects at the Loop Wiring Concentrator. This places the backup store controller in the *first position* on the store loop, immediately following the primary store controller.

The data flow through a Loop Wiring Concentrator is from right-to-left. In this illustration, signals travel from Store Loop Adapter No. 1 of Store Controller A to the Loop Wiring Concentrator, then to the left to Store Loop Adapter No. 2 of the backup store controller (Store Controller B). After going to the backup store controller, the signals continue to the left through internal wiring in the Loop Wiring Concentrator to connectors where point-of-sale terminals may be plugged in. After going to any additional Loop Wiring Concentrators, the signals return to Store Controller A to complete the store loop. A comparable circuit path exists from the Store Loop Adapter No. 1 in Store Controller B. Figure E-2 in topic E.3.1 provides a schematic view of the Loop Wiring Concentrators. You can use it to follow the data path through the Loop Wiring Concentrators.

Note: It is important to connect the Store Loop Adapters and the store loops as shown in Figure 3-8. They must be connected in this manner for problem determination procedures.

PICTURE 48

Figure 3-8. Two Store Controllers Configured for Backup

Subtopics

3.10.1 Examples of Store Controller Backup

3.10.1 Examples of Store Controller Backup

Figure 3-9 illustrates four possible ways to configure store loops and store controllers for backup. Example 1 illustrates a store controller providing backup for another store controller. Store controller B controls its store loop. Store Controller A has no store loop responsibility, except as a backup for Store Controller B. If Store Controller B fails, Store Controller A will take control of the store loop. In this example, both store controllers need to have only one Store Loop Adapter installed.

Example 2 illustrates two store controllers, each controlling its own store loop while backing up the other's store loop. Store Controller A controls its store loop through its first Store Loop Adapter and monitors the activity on the other store loop through its second Store Loop Adapter. If it detects that activity has stopped on the store loop it monitors, it will take control of that store loop. A comparable situation applies for Store Controller B.

Example 3 illustrates Store Controllers A and B, each controlling a store loop. Store controller C has no store loop responsibility of its own, but uses its two Store Loop Adapters to monitor the other store loops. If either Store Controller A or B fails, Store Controller C can take control of their store loop. In this example, Store Controllers A and B need to have only one Store Loop Adapter installed, while Store Controller C must have both the first and second Store Loop Adapters installed.

Example 4 illustrates three store controllers, each one controlling its own store loop, while providing backup for another. Store Controller A controls its store loop through its first Store Loop Adapter and provides backup for Store Controller C through its second Store Loop Adapter.

Store Controller B controls its store loop through its first Store Loop Adapter and provides backup for Store Controller A through its second Store Loop Adapter.

Store Controller C controls its store loop through its first Store Loop Adapter and provides backup for Store Controller B through its second Store Loop Adapter.

As you can see in this example, you could place additional store controllers to the right of Store Controller C and increase the number of store controllers in the chain.

PICTURE 49

Figure 3-9. Examples of Configuration for Store Controller Backup

3.11 IBM PC Network

The IBM 4680 Store System provides optional hardware and software to support communications between store controllers. The IBM PC Network can link IBM 5170 Model 849 store controllers together in a network referred to as a *local area network* (LAN). When using this network, each store controller must have an IBM PC Network Adapter installed.

The IBM PC Network includes coaxial cable and additional hardware to link the store controllers together. Figure 3-10 illustrates three store controllers connected together through the IBM PC Network.

PICTURE 50

Figure 3-10. Store Controllers Connected to the IBM PC Network

The IBM PC Network is a broadband local area network that allows multiple store controllers to communicate with each other. Each store controller attaches to the network by coaxial cable to a device called an eight-way splitter, which provides a junction point for up to eight store controllers. Each store controller must be within a radius of 60 m (200 ft) of an eight-way splitter. The eight-way splitter, in turn, connects to an IBM Translator Unit through a short coaxial cable.

You can increase the distance between store controllers or link up to 72 store controllers together. The maximum distance possible between store controllers and the Translator Unit is 305 m (1000 ft).

This section contains a brief description of the components of the IBM PC Network. You should refer to the *IBM Personal Computer Hardware Reference Library, Technical Reference, PC Network*, if you plan to install the IBM PC Network. It contains detailed information regarding hardware and software considerations.

Subtopics

3.11.1 Basic Components of the IBM PC Network

3.11.1 Basic Components of the IBM PC Network

The basic components of the IBM PC Network are:

- An IBM PC Network Adapter, which must be present in each store controller.
- An IBM Translator Unit. It receives all transmissions from store controllers on the network, amplifies them, raises their frequency into a higher range, and retransmits them over the same coaxial cable.
- An IBM Base Expander, if you want to connect more than eight store controllers to the network or extend the distance between store controllers and the Translator Unit.
- IBM coaxial cable, which comes preassembled with connectors.
- IBM Short, Medium, or Long Distance Kits, if you want to connect more than eight store controllers to the network or extend the distance between store controllers and the Translator Unit.

Figure 3-11 illustrates how the components of the IBM PC Network can be connected. It illustrates the basic devices and the kits that permit increased distances between store controllers.

PICTURE 51

Figure 3-11. IBM PC Network Components

3.12 IBM Token-Ring Network

The IBM 4680 Store System provides optional hardware and software to support communications between store controllers. The IBM Token-Ring Network can link IBM 5170 Model 849 Personal Computer AT store controllers or IBM Personal System/2 store controllers together in a LAN network. To use this network, each store controller must have an IBM Token-Ring Network Adapter installed.

Subtopics

3.12.1 Basic Components of the IBM Token-Ring Network

3.12.1 Basic Components of the IBM Token-Ring Network

The basic components of the IBM Token-Ring Network are:

- An IBM Token-Ring Network PC Adapter Kit, which must be present in each store controller that you want to attach to the network.
- An IBM Token-Ring Network Adapter Cable, which is used to connect adapters in IBM PS/2s to the network
- The IBM Token-Ring Network 8228 Multistation Access Unit, which is a wiring concentrator that allows up to eight attaching devices to have access to a ring
- An IBM Token-Ring Network 8218 Copper Repeater or an IBM Token-Ring Network 8219 Optical Fiber Repeater, which increase the geographical coverage of the network. These devices are optional.

If you plan to install an IBM Token-Rink network, refer to the *IBM Token-Ring Network Introduction and Planning Guide* for a description of the network and instructions on planning for it.

3.13 Cables to Connect a 4683-xx2 to a 4683-xx1

A 4683-xx1 terminal on a store loop can have one 4683-xx2 terminal attached. The terminals can be connected with either:

- A preassembled cable for distances up to 20 m (65 ft)
- A user-provided cable, which can be up to 150 m (490 ft) long.

Subtopics

3.13.1 Preassembled Cables for Distances Up to 20 m (65 ft)

3.13.2 User-Provided Cable for Distances Up to 150 m (490 ft)

3.13.1 *Preassembled Cables for Distances Up to 20 m (65 ft)*

IBM has preassembled cables available to directly connect a 4683-xx2 terminal to a 4683-xx1 terminal. The cables are available in the following lengths:

- 6 m (20 ft) long
- 20 m (65 ft) long.

The cables have modular connectors at both ends to attach directly to the rear of the base unit at each terminal. When using either of these cables, no other cable is required.

Note: Do not install either of these cables in a plenum or air duct.

PICTURE 52

Figure 3-12. Preassembled Cable for Distances Up to 20 m (65 ft)

3.13.2 User-Provided Cable for Distances Up to 150 m (490 ft)

When the two terminals are separated by longer distances, you must provide and install a cable, similar to store loop cable, with a data connector at each end. This cable can be up to a maximum length of 150 m (490 ft).

When using IBM Type 8 or Type 9 cable, the maximum distance is 60 m (200 ft). Use the same type of cable and data connectors that are used with the IBM Cabling System (or equivalent).

You can route the cable within the same building from one location to another, as in other cable runs and install a data connector at each end.

When an Interconnect cable is ordered, two 4 m (13 ft) cables are shipped. They are used to connect the two terminals to your cable.

Appendix F contains instructions for installing the cable to connect a 4683-xx2 terminal to a 4683-xx1. The cable and data connectors are described in the *IBM Cabling System Planning and Installation Guide* and the *IBM Cabling System Catalog*.

PICTURE 53

Figure 3-13. User-Provided Cable to Connect a 4683-xx2 to a 4683-xx1

Notes:

1. Be sure to carefully label the data connectors you install, to avoid connecting the wrong attachment cable from a terminal.
2. Do not connect a 4683-xx2 terminal directly to the store loop. Problem determination can be difficult if you do.

3.14 Lightning Protection for Outdoor Store Loop Cable

IBM recommends that you do not run the store loop cable outside the building that contains the IBM 4680 Store System. If you must run the cable outdoors, you must use cable that is suitable for outdoor use.

In addition, you must take certain precautions for protection from lightning. It is impossible to provide complete protection from a direct lightning strike, or even a nearby strike. However, some protective steps can be taken to minimize the damage from lightning.

IBM has devices available that provide some measure of protection to store loop cable that runs outside a building. These devices, called surge suppressors, must be installed on the store loop cable at each point where the cable enters or leaves a building. The *IBM Cabling System Planning and Installation Guide* describes and provides information for installing IBM Type 1 outdoor cable, IBM P/N 4716734. In addition, the manual describes and illustrates the procedures for installing and testing surge suppressors. Information on ordering these components can be found in the *IBM Cabling System Catalog*.

In all cases, you should consult with competent installers of lightning protection devices and be sure that local and national electrical wiring code requirements are followed. In addition, you should consult with an IBM Installation Planning Representative if you plan to install any store loop cable outdoors.

4.0 Topic 4. *Planning the Communication Facilities*

Subtopics

- 4.1 Communication Facilities
- 4.2 Modems
- 4.3 Data Coupler
- 4.4 Line Attachment Types
- 4.5 Exclusion-Key Telephone
- 4.6 Ordering the Communication Facilities
- 4.7 Communications for Emergency Software Maintenance

4.1 *Communication Facilities*

To communicate with a host processor, the store controller must have a communications link. When the host processor is located in the store, the connection can be made directly.

When the host processor is in another location, most stores communicate over telephone lines. In these stores, a device called a modem connects the store controller to the telephone line and enables the transmission of data.

You must obtain and install a modem at both the store location and the host processor location. Before ordering the modem, determine which type of telephone line you will use.

Subtopics

4.1.1 Nonswitched Line

4.1.2 Switched Line

4.1.1 Nonswitched Line

One type of telephone line you can use is a nonswitched line. It is a voice-grade private telephone line dedicated to communication between the store controller and the host processor. It may also be referred to as a leased line.

4.1.2 *Switched Line*

Another type of line uses the public switched telephone network that is accessible to dial telephones and is referred to as a switched line. In the United States, the Federal Communications Commission (FCC) requires that any device connected to the public switched telephone network must be registered with the FCC. Users in World Trade countries should review the requirements for connecting modems to a switched network with their appropriate communication agencies.

4.2 Modems

You must provide a modem at both the store controller and host processor locations. There are many modems available that operate on either type of telephone line. Your choice may depend on the operating speed, error handling capability, and other data transmission options. You should review your modem requirements with your IBM Marketing Representative or other supplier of your modems.

4.3 Data Coupler

Not all modems have been registered with the FCC. If you plan to use a non-registered modem on a switched line, you must connect the modem to the switched line through an FCC-registered data coupler. The term data coupler has replaced the term Data Access Arrangement (DAA).

4.4 Line Attachment Types

The FCC-registered modems and data couplers attach to the switched network by one of three FCC-defined types of attachment:

- Programmed type
- Fixed loss loop (FLL) type
- Permissive type.

The type of attachment must be specified at the time the modem or data coupler is purchased. The programmed and FLL types are defined as data attachments. They may be used only on data lines that connect directly to the telephone company central exchange.

The permissive type of attachment is designed for use on lines that go through a private branch exchange (PBX) or a key telephone system (KTS), where data attachments are not allowed.

Of the three types of attachments, the programmed type is preferred. It provides optimum signal level into the network and it does not attenuate the signal being received from the network. Regardless of the type of attachment, the user is responsible for determining if the data transmission is satisfactory.

4.5 Exclusion-Key Telephone

An exclusion-key telephone contains a switch or button that permits a user to switch between voice mode and data mode. IBM recommends that you provide an exclusion-key telephone when using a switched line. The telephone should be near the modem to aid personnel at the store and host processor locations in problem determination. Exclusion-key telephones are available from suppliers of communication hardware.

4.6 *Ordering the Communication Facilities*

Once you determine the type of modem and telephone facilities you will use, you must order the telephone service and connection. If necessary, you must order a data coupler that has been registered with the FCC.

The procedures described here for ordering communication facilities apply to the United States. Users in World Trade countries should review their communication requirements with their IBM Marketing Representative and the appropriate communication agency.

Subtopics

- 4.6.1 How to Order the Telephone Connection for a Nonswitched Line
- 4.6.2 How to Order the Telephone Connection for a Switched Line
- 4.6.3 How to Order a Programmed or Fixed Loss Loop Data Coupler
- 4.6.4 How to Order the Telephone Connection for a Permissive Data Coupler
- 4.6.5 How to Order an Exclusion-Key Telephone

4.6.1 How to Order the Telephone Connection for a Nonswitched Line

Specify a connection for a nonswitched (private) voice grade line for data if you plan to use an IBM modem. If you plan to use a non-IBM modem, refer to the manufacturer's recommendations when ordering the telephone facilities.

It is important that you order the telephone facilities as early as possible to be sure the correct type of service and connector can be installed when needed.

You should consider locating a regular telephone near the modem to aid store personnel and host processor personnel in problem determination.

4.6.2 How to Order the Telephone Connection for a Switched Line

If you plan to use a switched line telephone facility, you must provide certain information to the telephone company at the time you order the service.

- Request a data line for FCC-registered equipment for data transmission at 1200 bps or greater.
- Provide the following information about the modem or data coupler to the telephone company:
 - The device name, manufacturer, and model number
 - The FCC registration number
 - The ringer equivalence number (REN)
 - The type of data jack required.

The FCC registration number and the ringer equivalence number is on the modem or data coupler and is available from the supplier.
- Order a telephone connection for the modem or data coupler. The telephone company usually refers to this connection as a *data jack*. Depending on the type of modem or data coupler, you will need one of the following types of data jacks:
 - Registered jack number RJ45S, which is a programmed type of data jack
 - Registered jack number RJ41S, which has a switch to enable it to operate either as a programmed type or as a fixed loss loop type data jack.

Notes:

1. The telephone company will install an RJ41S or RJ45S data jack on a line specified for use as a data line. Only lines that terminate at a telephone company central exchange can be specified as data lines. Extensions from a user-owned or telephone-company-owned private branch exchange (PBX) or key telephone system (KTS) cannot be considered as data lines.
2. The data jack should be located next to the modem or data coupler and within 1.8 m (6 ft) of an electrical outlet.

4.6.3 How to Order a Programmed or Fixed Loss Loop Data Coupler

If you plan to use a modem that has not been registered with the FCC, you must order a data coupler. Provide the following information to your supplier:

- Depending on the type of modem you will use, specify a data coupler of either the programmed or fixed loss loop type whose modem protective interface is equivalent to the USOC type CBS.
- Specify the service as: "Manual Originate/Automatic Answer".

The supplier of the data coupler can provide you with the FCC registration number and the ringer equivalence number. You must provide this information to the telephone company when you order the telephone connection.

4.6.4 How to Order the Telephone Connection for a Permissive Data Coupler

If you plan to connect your modem to a switched line through a user-owned or telephone company-owned private branch exchange (PBX) or key telephone system (KTS), you cannot use either a programmed or fixed loss loop data coupler. Instead, you must use a "permissive" data coupler. This type of coupler limits the signal level to prevent possible interference with other voice communications within the PBX or key telephone system. It is not as reliable for data transmission as a data line, as described earlier in this topic. If the quality of data transmission is unacceptable, you may want to consider the installation of a data line to bypass the PBX or key telephone system.

When using a permissive data coupler, you must order a voice jack, registered jack number RJ11C, rather than the RJ41S or RJ45S data jack. The type of voice jack you need depends on the requirements of the permissive data coupler. Provide the following information about the modem or data coupler to the telephone company:

- The device name, manufacturer, and model number
- The FCC registration number
- The ringer equivalence number (REN).

The FCC registration number and the ringer equivalence number is on the data coupler and is available from the supplier.

4.6.5 *How to Order an Exclusion-Key Telephone*

The exclusion-key telephone should meet the requirements of EIA RS514 (telephone exclusion-key standard). It may be either a Type 503, for use with pulse-dialing (rotary) facilities, or a Type 2503, for use with Dual-Tone Multi-Frequency (DTMF) push button tone-dialing facilities.

In the US, the exclusion-key telephone may be available with several options. When you order it, specify the following options:

- Data set controls the line
- Aural monitoring provided
- Touch-tone dial or rotary dial, as appropriate
- Voice mode indication.

As with other devices, the exclusion-key telephone must be registered with the FCC. Provide the FCC registration number and the ringer equivalence number to the telephone company when you order the telephone jack. These numbers are on the telephone or are available from the supplier.

Order a registered jack number, RJ36X series jack, from the telephone company to connect this phone. They will install the jack between the telephone line and the RJ41S or RJ45S data jack. If the modem is a permissive type, they will install a connecting arrangement. The 6-pin modular plug on the modem will connect to the RJ45S data jack.

4.7 Communications for Emergency Software Maintenance

IBM offers an optional software maintenance service in which a store controller can communicate with an IBM Field Support Center. This service can enable IBM software personnel to provide emergency diagnostic assistance and to apply emergency corrections to software problems.

This type of communication is usually done at the central, or host location that is responsible for software maintenance for the store system. If you plan to use this service, you must provide a switched line telephone and a modem capable of operating over that line. You can use this line for initiating dial-up communications to the IBM support center.

A.0 Appendix A. World Trade Considerations

Subtopics

A.1 Accessories for Use in European Countries

A.1 Accessories for Use in European Countries

For European single-device boxes, kits containing 1 a Type 1W faceplate and 2 a data connector mounting plate are available as part of the IBM Cabling System. Any of several types of European faceplates can be used instead of the part provided in the kit. Two of these are available from IBM, which are:

- Type 1 faceplate (87 mm square) and mounting plate (kit IBM P/N 6091048)
- Type 1W faceplate (80 mm square) and mounting plate (kit IBM P/N 6091049).

PICTURE 54

Figure A-1. Faceplate and Mounting Plate for Use in European Countries

B.0 Appendix B. Expendable Supplies and Replaceable Parts

You should plan to have expendable supplies available for both the store controller and the point-of-sale terminals. In addition, several replaceable parts, such as print heads and batteries are available and should be stocked according to your needs. This section describes some of the supplies and parts, and tells how to order them.

Subtopics

B.1 How to Order Expendable Supplies

B.2 How to Order Replaceable Parts

B.3 Replacement Locks Serial Numbers and Part Numbers

B.1 How to Order Expendable Supplies

In the U.S., order expendable supplies from IBM Direct, telephone 800-IBM-2468. In IBM World Trade countries, order from IBM Direct if it is available in your country. If IBM Direct is not available in your country, order through your IBM Marketing Representative or your dealer.

Table B-1. Expendable Supplies	
Item	IBM Part Number
Ribbon Cartridges (Point of Sale Printer Model 1 or 2)	4483015 (black ink) 1040247 (purple ink)
Ribbon Cartridges (Point of Sale Printer Model 3)	1040888 (black ink) 1040875 (purple ink) 1040900 (black Auto-Inking (*))
Roll Paper (Point of Sale Printer Model 1, 2, or 3)	432767 (1 Case, 50 Rolls per Case)
5-1/4 inch - Type 2HC Diskettes (IBM Personal Computer AT)	6109660 (Box of 10)
5-1/4 inch - Type 2D Diskettes (IBM Personal Computer AT)	6023450 (Box of 10)
3-1/2 inch - 2.0 Mb High Density Diskettes (IBM Personal System/2)	6404078 (Box of 10)

Subtopics

- B.1.1 Ribbon Cartridge for Point of Sale Printer Model 1, 2, or 3
- B.1.2 Ribbons for a Printer Attached to the Store Controller
- B.1.3 Roll Paper for Point of Sale Printer Model 1, 2, or 3
- B.1.4 Additional Forms for Point of Sale Printer Model 1 or 2
- B.1.5 Additional Forms for Point of Sale Printer Model 3
- B.1.6 Paper for a Printer Attached to the Store Controller

B.1.1 Ribbon Cartridge for Point of Sale Printer Model 1, 2, or 3

A ribbon cartridge is shipped with the printer cable. Replacement ribbon cartridges are available, that the salesperson can install. You should maintain a supply of spare ribbon cartridges at each store.

Note: Use the IBM printer ribbons listed in Table B-1 in topic B.1 or other equivalent ribbons that use dye-based ink. The use of carbon-particle ribbons or other ribbons that are not equivalent to the IBM ribbons will affect print head life and print quality.

B.1.2 Ribbons for a Printer Attached to the Store Controller

If you plan to have a printer attached to the store controller, you should have spare ribbons available. Refer to the documentation for your printer for the ribbon part number.

B.1.3 Roll Paper for Point of Sale Printer Model 1, 2, or 3

Two rolls of paper are shipped with the printer cable. One for the journal print station and the other for the document insert/customer receipt station. For additional rolls, you can order the IBM part numbers listed in Table B-1 in topic B.1 or equivalent. Both print stations use standard adding machine roll paper. The roll paper must meet the specifications in the following table.

Table B-2. Specifications - Roll Paper for Point of Sale Printers	
Width	69.85 +0.5 mm -0.76 mm (2.75 +0.02 in. -0.03 in.) The maximum the core may protrude on either side is 0.76 mm (0.030 in.).
Outside Diameter	89 mm (3.5 in.) Maximum (Model 1 or 2) 81 mm (3.2 in.) Maximum (Model 3)
Thickness	0.076 ±10% (0.003 ±10%)
Weight	61 grams/m ² (16 lb)
Grade	Service or High Grade (Economy or Bond)
Attachment	The inner end of the roll must be secured by a reverse-tuck-start with a 19 mm (0.75 in.) maximum fold back. Paper must not be attached to the core in any way.
Splices	There must be no splices within the paper roll.
Marking	Dye stripes must be on the paper beginning 122 ±15 cm (48 ±6 in.) from the inner end of the roll and extending to within 30 cm (12 in.) of the end of the roll.
Core	Core material and center hole diameter are optional.

B.1.4 Additional Forms for Point of Sale Printer Model 1 or 2

The use of printed forms at the document insert station is optional. The following specifications apply to forms that may be used at the document insert station.

Table B-3. Specifications - Document Insert Forms	
Paper - Size	Single-Part Form - 216 mm x 330 mm (8.5 in. x 13 in.) is the recommended maximum. 69.9 mm x 152.4 mm (2.75 x 6 in.) is the recommended minimum. 69.9 mm x 82.5 mm (2.75 in. x 3.25 in.) is the minimum single-part form that can be used but it will only allow approximately 3 lines of printing.
	Multipart Form - 216 mm x 330 mm (8.5 in. x 13 in.) is the recommended maximum. 82.5 mm x 187.3 mm (3.25 in. x 7.37 in.) is the recommended minimum.
Tab Card - Size	82.5 mm x 123.2 mm (3.25 in. x 4.85 in.)
Weight	57 to 90 grams/m ² (15 to 24 lb) Paper or Tab Card Stock
Thickness	0.0762 mm (0.003 in.) paper to 0.2 mm (0.008 in.) Ledger Card Stock Maximum (uncoated card stock only)

Subtopics

B.1.4.1 Multipart Forms for Point of Sale Printer Model 1 or 2

B.1.4.1 Multipart Forms for Point of Sale Printer Model 1 or 2

Multipart forms may be used in the document insert station. The maximum form thickness is 0.47 mm (0.0185 in.)

Top fastening is recommended on all forms regardless of size. Fastening is permitted on the left side of forms that are a minimum of 101.6 mm (4 in.) wide. Fastening on the right side is not permitted. Fastening must not extend more than 19.05 mm (.75 in.) from the top, bottom, or left edge of a form.

When bottom fastening is used, printing must start at least 63.5 mm (2.5 in.) from the fastening to help eliminate potential document feeding problems.

Note: No staples or metal inserts may be used on any area of the form that is inserted in the machine. No holes or openings are allowed on the form or its fastening. Forms with pre-printed lines or boxes located in areas to be printed can be used. However, the accuracy of printing between lines or in the boxes depends on the positioning of the document by the operator.

B.1.5 Additional Forms for Point of Sale Printer Model 3

The following specifications apply to forms that may be used for document insertion.

Paper - size	
	Single-part form - 216 mm x 330 mm (8.5 in. x 13 in.) is the recommended maximum. 82.5 mm x 69.9 mm (3.25 x 2.75 in.) is the recommended minimum. 69.9 mm (2.75 in.) is the minimum width for check franking.
	Multipart Form - 216 mm x 330 mm (8.5 in. x 13 in.) is the recommended maximum. 82.5 mm x 69.9 mm (3.25 in. x 2.75 in.) is the recommended minimum.

Subtopics

B.1.5.1 Multipart Forms for Point of Sale Printer Model 3

B.1.5.1 Multipart Forms for Point of Sale Printer Model 3

Multipart forms may be used for document insertion. The maximum form thickness is 0.47 mm (0.0185 in.) when inserted into the front of the printer and 0.25 mm (0.010 in.) when inserted into the top of the printer. The front sheet should not exceed 0.08 mm (0.003 in.) in thickness and if the multipart form contains card stock, the card stock must be the last copy and not exceed 0.2 mm (0.008 in.) in thickness. Also, the sheets of a multipart form should be the same size, not uneven or stepped.

Forms handling works best if the binding or glued edge of the form goes into the printer first. On all inserted forms, regardless of size, top or bottom binding (glued edge) is recommended depending on whether the document is inserted in the top or the front of the printer. When forms are inserted bind-edge-first, significantly less form damage and jamming occur.

If multipart forms are inserted other than binding first, they can curl and separate. This is especially true when the edge of the form opposite the binding is uneven or stepped. When the form curls and separates, it can catch inside the printer, get crumpled, and jam. This causes lost time for the operator and terminal operations.

We suggest that information about how to insert a form into the printer be printed on the top of form. We also suggest that when printing on an inserted form, the printing be done on a blank section of the form. If printing is done inside boxes on the form, the boxes should be three characters high and the margins should be three characters wide to allow for printer tolerances and operator variances.

If it becomes necessary to print on a damaged form, the printer works best if the damaged part of the form remains outside the printer. Once the form is in place the operator can tell the application to print on the form by pressing the application's "print" key.

No staples or metal inserts should be used on any area of the forms that are inserted in the machine and no holes or openings are allowed on the forms or their fastening.

B.1.6 Paper for a Printer Attached to the Store Controller

If you plan to have a printer attached to the store controller, you should plan to have a supply of paper. Refer to the documentation for your printer to determine the type and size of paper to use.

B.2 How to Order Replaceable Parts

In the U.S., see your IBM Marketing Representative or your dealer for the address for ordering these parts. In World Trade countries, order from IBM Direct if it available in your country. If IBM Direct is not available in your country, order through your IBM Marketing Representative or your dealer.

Note: Replaceable parts identified for the MSR are also for the dual-track MSR and the low-profile dual-track MSR.

Table B-5. Miscellaneous Replaceable Parts	
Item	IBM Part Number
Battery for 4683-xx1 Storage Retention	4783928
Cash Till with Fixed Bill Dividers (Without Cover)	4783879
Cash Till with Adjustable Bill Dividers (Without Cover)	4783880
Cash Till Cover with Lock and Keys	6316718
Print Head for Point of Sale Printer Model 1	4483100 - or - 25F6405
Print Head for Point of Sale Printer Model 2	25F6405
Replacement Tip for the Magnetic Wand Reader	1756864
Test Card for the Single-Track MSR (One shipped with each MSR)	4055210
Test Card for the Dual-Track MSR (One shipped with each MSR)	90X9640
Note: The Single-Track MSR can also be tested with this card.	
Cleaning Card for MSRs	6019483
Wrap Kit	96X5047
4684 Wrap Plug	96X4974
4684 Terminator Plug	96X4975
4684 Baseband Network Cable Adapter	96X5037

Subtopics

- B.2.1 Storage Retention Battery for IBM 4683-xx1
- B.2.2 Print Head for Point of Sale Printer Model 1 or 2
- B.2.3 Cleaning Card for the Magnetic Stripe Reader
- B.2.4 Replaceable Parts for the 50-Key Keyboard or Combined Keyboard/Display
- B.2.5 Replaceable Parts for the Alphanumeric Keyboard
- B.2.6 Replaceable Parts for the ANPOS Keyboard
- B.2.7 Replaceable Parts for the Matrix Keyboard
- B.2.8 Replaceable Parts for the Enhanced Alphanumeric Keyboard

B.2.1 Storage Retention Battery for IBM 4683-xx1

The 4683-xx1 point-of-sale terminals are shipped with a storage retention battery, that the salesperson can replace. The battery should remain useful for 2 to 4 years.

Note: The Storage Retention battery is a nickel-cadmium battery. Dispose of defective batteries according to your local government regulations.

B.2.2 Print Head for Point of Sale Printer Model 1 or 2

A print head is shipped with the printer in the initial order. (Printers that you receive as part of an exchange do not contain a print head.) Replacement print heads are available, that the salesperson can replace without the use of tools. If the availability of printers is critical, you should consider having a spare print head available. The print head for the Model 2 printer can also be used in the Model 1 printer.

B.2.3 Cleaning Card for the Magnetic Stripe Reader

The cleaning card is available for all MSR models. The salesperson can occasionally pass the cleaning card through the reader to clean the read head.

B.2.4 Replaceable Parts for the 50-Key Keyboard or Combined Keyboard/Display

Table B-6. Preprinted Label Sheets (50-Key Keyboard or Combined Keyboard/Display)	
Item	IBM Part Number
Preprinted Keybutton Label Sheets (U.S. English)	6316691
Preprinted Keybutton Label Sheets (Canadian English)	6316691
Preprinted Keybutton Label Sheets (Canadian French)	6316702
Preprinted Keybutton Label Sheets (Spanish)	6316700
Preprinted Keybutton Label Sheets (Swedish)	6316697
Preprinted Keybutton Label Sheets (Norway)	6316698
Preprinted Keybutton Label Sheets (Dutch)	6316696
Preprinted Keybutton Label Sheets (Danish)	6316695
Preprinted Keybutton Label Sheets (Spanish)	6317000
Preprinted Keybutton Label Sheets (Italian)	6316699
Preprinted Keybutton Label Sheets (French)	6316693
Preprinted Keybutton Label Sheets (German)	6316692
Preprinted Keybutton Label Sheets (U.K. English)	6316694

Table B-7. Blank Label Sheets (50-Key Keyboard or Combined Keyboard/Display)	
Item	IBM Part Number
Blank Label Sheets (white)	63X5179
Blank Label Sheets (yellow)	63X5180
Blank Label Sheets (red)	63X5181
Blank Label Sheets (blue)	63X5182
Blank Label Sheets (green)	63X5183
Blank Label Sheets (tan)	63X5184

Table B-8. Miscellaneous Devices (50-Key Keyboard or Combined Keyboard/Display)			
Item	Height	Package Quantity	IBM Part Number
Single Lens	Standard	50	63X5169
Double Lens	Standard	25	63X5170
Single Lens	Raised	25	63X5171
Double Lens	Raised	25	63X5172
Single Keybutton	Raised	25	63X5173
Key Shield		10	63X5174
Keybutton Removal Tool		3	63X5175

B.2.5 Replaceable Parts for the Alphanumeric Keyboard

Table B-9. Preprinted Label Sheets (Alphanumeric Keyboard)	
Item	IBM Part Number
Preprinted Keybutton Label Sheets (U.S. English)	76X0060
Preprinted Keybutton Label Sheets (Canadian French)	76X0051
Preprinted Keybutton Label Sheets (Spanish)	76X0052
Preprinted Keybutton Label Sheets (Swedish)	76X0067
Preprinted Keybutton Label Sheets (Norway)	76X0055
Preprinted Keybutton Label Sheets (Danish)	76X0056
Preprinted Keybutton Label Sheets (French)	76X0051
Preprinted Keybutton Label Sheets (Swiss)	76X0068
Preprinted Keybutton Label Sheets (German)	76X0054
Preprinted Keybutton Label Sheets (U.K. English)	76X0060

B.2.6 Replaceable Parts for the ANPOS Keyboard

Table B-10. Preprinted Label Sheets (ANPOS Keyboard)	
Item	IBM Part Number
Preprinted LED Label Sheets (U.S. English)	IBM P/N 25F6352 (left side of keyboard) IBM P/N 25F6353 (right side of keyboard)
Preprinted LED Label Sheets (Canadian French)	IBM P/N 25F6348 (left side of keyboard) IBM P/N 25F5159 (right side of keyboard)
Preprinted LED Label Sheets (Spanish)	IBM P/N 25F6358 (left side of keyboard) IBM P/N 25F5162 (right side of keyboard)
Preprinted LED Label Sheets (French)	IBM P/N 25F6347 (left side of keyboard) IBM P/N 25F5158 (right side of keyboard)
Preprinted LED Label Sheets (German)	IBM P/N 25F6357 (left side of keyboard) IBM P/N 25F5161 (right side of keyboard)
Preprinted LED Label Sheets (U.K. English)	IBM P/N 25F6359 (left side of keyboard) IBM P/N 25F5163 (right side of keyboard)

B.2.7 Replaceable Parts for the Matrix Keyboard

Table B-11. Blank Label Sheets (Matrix Keyboard)	
Item	IBM Part Number
Blank Label Sheets (white)	76X0120
Blank Label Sheets (yellow)	76X0121
Blank Label Sheets (red)	76X0122
Blank Label Sheets (blue)	76X0123
Blank Label Sheets (green)	76X0124
Blank Label Sheets (tan)	76X0125

Table B-12. Overlays and Devices (Matrix Keyboard)	
Item	IBM Part Number
Protective Overlay Shield	76X0128
Paper Overlay	76X0129
Keybutton Removal Tool	1647720

B.2.8 Replaceable Parts for the Enhanced Alphanumeric Keyboard

Item	IBM Part Number
Blank light key caps	1351710
Blank dark key caps	1351728
Clear key caps	6341707
Paper Inserts	6341704
Key cap removal tool	1351717

B.3 Replacement Locks Serial Numbers and Part Numbers

Table B-14 is a list of the IBM lock serial numbers and part numbers for devices attached to the 4683 or 4684. When replacement locks are needed, order the part number that corresponds to the IBM lock serial number stamped in your lock insert. Two keys are included with each lock insert. Replacement keys are not available separately.

Table B-14. Lock Serial Numbers and Part Numbers		
Type of Lock	IBM Lock Serial Number	IBM Part Number
Random Lock	MM750 through MM925	4783901
Specific Lock	MM926	4783902
	MM927	4783903
	MM987	4783904
	MM929	4783905
	MM930	4783906
	MM931	4783907
	MM932	4783908
	MM933	4783909
	MM934	4783910
	MM935	4783911
	MM936	4783912
	MM937	4783913
	MM938	4783914
	MM939	4783915
	MM940	4783916
	MM941	4783917
	MM942	4783918
	MM943	4783919
	MM944	4783920
MM945	4783921	
Blank Insert	Blank	4783923

Subtopics

B.3.1 Lock Installation and Removal Tools

B.3.1 Lock Installation and Removal Tools

The following items are shipped with each store controller or 4684. Use them when you install or remove lock cylinders or blank lock inserts. Order these parts in a kit (IBM P/N 4783922):

- Lock Cylinder Aligner (IBM P/N 4783941)
- Lock Installation-Removal Key (IBM P/N 4783943)
- Dummy Lock Insert Handle (IBM P/N 7231).

C.0 Appendix C. Dimensions of Units and Devices

This section provides dimensions of the machines and individual devices. It also provides additional information and dimensions to help you plan the design of your checkout stations. It includes the dimensions of connectors that are attached to device cables, to aid in routing cables to distributed devices.

PICTURE 55

Figure C-1. IBM PS/2 Store Controller

PICTURE 56

Figure C-2. IBM Personal Computer AT Store Controller

PICTURE 57

Figure C-3. IBM 4683 Point of Sale Terminal with Model 1 or Model 2 Printer

| PICTURE 58

| Figure C-4. IBM 4683 Point of Sale Terminal with Model 3 Printer

PICTURE 59

Figure C-5. Security Base

PICTURE 60

Figure C-6. Security Base for Integrating a 9-Inch Monochrome Display

PICTURE 61

Figure C-7. Base Unit

PICTURE 62

Figure C-8. Cash Drawer

PICTURE 63

Figure C-9. Flip-Top Cash Drawer

PICTURE 64

Figure C-10. 40-Character Alphanumeric Display

PICTURE 65

Figure C-11. Operator Display on a Tray Base

PICTURE 66

Figure C-12. Shopper Display on a Post

PICTURE 67

Figure C-13. Shopper Display and Mounting Arm

PICTURE 68

Figure C-14. 9-Inch Monochrome Display

PICTURE 69

Figure C-15. IBM 8503 12-Inch Monochrome Display

PICTURE 70

Figure C-16. IBM 8513 12-Inch Color Display

PICTURE 71

Figure C-17. 50-Key Modifiable Keyboard

PICTURE 72

Figure C-18. Alphanumeric Keyboard

PICTURE 73

Figure C-19. ANPOS Keyboard

PICTURE 74

Figure C-20. Matrix Keyboard

PICTURE 75

Figure C-21. Combined Keyboard/Display

PICTURE 76

Figure C-22. Hand-Held Bar Code Reader

PICTURE 77

Figure C-23. Model 1 or Model 2 Printer

PICTURE 78

Figure C-24. Model 3 Printer

PICTURE 79

Figure C-25. IBM 3687 Checkout Scanner Model 2

PICTURE 80

Figure C-26. IBM 3687 Checkout Scanner Model 2 Dimensions (Top View)

PICTURE 81

Figure C-27. IBM 3687 Checkout Scanner Model 2 Dimensions (Front View)

PICTURE 82

Figure C-28. IBM 3687 Checkout Scanner Model 2 Dimensions (Rear View)

PICTURE 83

Figure C-29. Lifting Strap and Optional Mounting Brackets

PICTURE 84

Figure C-30. Optional Mounting Brackets Attached to Scanner (End View)

PICTURE 85

Figure C-31. Baffle for Checkout Scanner (World Trade Countries)

PICTURE 86

Figure C-32. IBM 1520 Hand-Held Scanner

The following figures provide the dimensions and weight of the IBM 1520 Hand-Held Scanner. The dimensions are in millimeters and (inches).

Table C-1. Dimensions and Weight of IBM 1520 Hand-Held Scanner Model A01				
1520 Model A01	Length	Width	Height	Weight
Hand-Held Scanner	200 (8)	54 (2-1/8)	180 (7-1/8)	567 g (20 oz)

Control Unit	140 (5-1/2)	120 (4-3/4)	23 (7/8)	426 g (15 oz)
Power Supply	120 (4-3/4)	79 (3-1/8)	63 (2-1/2)	850 g (30 oz)

Table C-2. Dimensions and Weight of IBM 1520 Hand-Held Scanner Model A02

1520 Model A02	Length	Width	Height	Weight
Hand-Held Scanner	200 (8)	54 (2-1/8)	180 (7-1/8)	567 g (20 oz)
Control Unit	191 (7-1/2)	140 (5-1/2)	25 (1)	624 g (22 oz)
Power Supply	120 (4-3/4)	79 (3-1/8)	63 (2-1/2)	850 g (30 oz)

PICTURE 87

Figure C-33. Base Unit (Bottom Dimensions)

PICTURE 88

Figure C-34. Cash Drawer (Bottom Dimensions)

PICTURE 89

Figure C-35. Flip-Top Cash Drawer (Bottom Dimensions)

Subtopics

C.1 Cable Connector Dimensions for Distributed Devices

C.1 Cable Connector Dimensions for Distributed Devices

PICTURE 90

Table C-3. Dimensions of Connectors on Distributed Device Cables			
Cable Connector To Distributed:	Width mm (in.)	Length mm (in.)	Height mm (in.)
Cash Drawer	17 (3/4)	22 (7/8)	9 (3/8)
Flip-Top Cash Drawer	17 (3/4)	22 (7/8)	9 (3/8)
40-Character Alphanumeric Display	17 (3/4)	22 (7/8)	9 (3/8)
Operator Display	35 (1-3/8)	40 (1-5/8)	22 (7/8)
Shopper Display	35 (1-3/8)	40 (1-5/8)	22 (7/8)
9-Inch Monochrome Display	70 (3)	50 (2)	40 (1-5/8)
8503 12-Inch Monochrome Display	70 (3)	50 (2)	40 (1-5/8)
8513 12-Inch Color Display	70 (3)	50 (2)	40 (1-5/8)
50-Key Modifiable Keyboard	22 (7/8)	22 (7/8)	9 (3/8)
Alphanumeric Keyboard	22 (7/8)	22 (7/8)	9 (3/8)
ANPOS Keyboard	22 (7/8)	22 (7/8)	9 (3/8)
Matrix Keyboard	22 (7/8)	22 (7/8)	9 (3/8)
Combined Keyboard/Display	22 (7/8)	22 (7/8)	9 (3/8)
Printer	32 (1-1/4)	22 (7/8)	9 (3/8)
Magnetic Wand Reader	32 (1-1/4)	33 (1-1/4)	21 (7/8)
IBM 3687 Checkout Scanner Model 2	32 (1-1/4)	22 (7/8)	9 (3/8)
IBM 1520 Hand-Held Scanner Model A01	32 (1-1/4)	65 (2-5/8)	17 (3/4)
IBM 1520 Hand-Held Scanner Model A02	22 (7/8)	22 (7/8)	9 (3/8)
Hand-Held Bar Code Reader	17 (3/4)	22 (7/8)	9 (3/8)
4683-xx2 (modular connector)	17 (3/4)	22 (7/8)	9 (3/8)
Non-IBM Coin Dispenser	31 (1-1/4)	49 (2)	16 (5/8)
Non-IBM OCR Reader	55 (2-1/4)	65 (2-5/8)	17 (3/4)
Non-IBM Scale	55 (2-1/4)	65 (2-5/8)	17 (3/4)

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Cable Connector Dimensions for Distributed Devices

RS-232 Interface	55 (2-1/4)	65 (2-5/8)	17 (3/4)
Non-IBM Special Attachment Cable	31 (1-1/4)	49 (2)	16 (5/8)

D.0 Appendix D. Power Plugs and Receptacles

A power cord to match the most commonly used ac voltage in your country will be shipped with the terminals. Table D-1 identifies the type of plug shipped with the terminals to each country. Figure D-1 illustrates the different types of plugs and receptacles.

Table D-1. Types of Power Plugs			
Country	Number	Country	Number
Australia	6	Italy	25
Austria	18	Malaysia	23
Argentina	2	Mexico	4
Belgium	18	Netherlands	18
Canada	4	New Zealand	6
Chile	25	Norway	18
Columbia	4	Peru	5
Denmark	19	Philippines	4
Finland	18	Singapore	23
France	18	South Africa	22
Germany	18	Spain	18
Guatemala	4	Sweden	18
Hong Kong	23	Switzerland	24
Indonesia	18	Thailand	5
Ireland	23	United Kingdom	23
Israel	32	United States	4,7

PICTURE 91

Figure D-1. Types of Plugs and Receptacles

E.0 Appendix E. Store Loop and 4683-xx2 to 4683-xx1 Wiring

When installing new store loop cable, you can use cable that is part of the IBM Cabling System or other cable that is approved for use as store loop cable with the IBM 4680 Store System.

Topic 3, "Planning the Store Wiring" contains information regarding cable that is approved for use as store loop cable. The *IBM Cabling System Planning and Installation Guide* and *Using the IBM Cabling System with Communication Products* provide instructions for installing and testing the IBM Cabling System cable and accessories. These books include information on equipment racks and distribution panels, not available from IBM.

You should provide the electrical contractor with a layout of the store. It should show the location of equipment, location and type of required power receptacles, and how the store loop cables should be routed.

Subtopics

- E.1 Splices in the Store Loop Cable
- E.2 Protecting the Store Loop Cable From Accidental Damage
- E.3 Installing a Radial Store Loop
- E.4 Installing a Serial Store Loop
- E.5 Procedure to Install Two Cables in Housing
- E.6 Modifying Existing Store Loop Wiring
- E.7 Connecting 4683-xx2 Terminals
- E.8 Testing Store Wiring

E.1 Splices in the Store Loop Cable

No splicing is permitted to the store loop cable. You must install data connectors on the ends of cable where a splice might otherwise be required. This provides proper termination for the twisted-pair wiring and for the braided shield. Note the location of any such connections for your records.

E.2 Protecting the Store Loop Cable From Accidental Damage

If the store loop cable is installed during original construction or extensive building rearrangement, protect the cable from accidental damage. Cable that is installed but not used should be covered or secured out of the way of physical construction, heavy loads, or traffic.

E.3 Installing a Radial Store Loop

A radial store loop configuration is connected so that individual cables are routed to each terminal location. With the IBM Cabling System, route the cable from the store controller to the Loop Wiring Concentrator. Route a separate cable from the Loop Wiring Concentrator to each 4683-xx1 terminal and install a data connector at each end of the cables.

Subtopics

E.3.1 Loop Wiring Concentrator

E.3.2 Grounding the Cable in a Radial Store Loop Configuration

E.3.1 Loop Wiring Concentrator

The Loop Wiring Concentrator (LWC) serves as a junction point for radial store loop cables and can be mounted in a standard distribution rack. Each LWC contains eight receptacles. If the store loop is to have more than seven terminals, additional LWCs can be used.

Figure E-1 illustrates how LWCs can be connected together to terminate more than eight cables. IBM recommends that you plug the store controller and the point-of-sale terminals into the LWC as shown. Because the signal path in the LWC is from right to left, terminals should be ordered corresponding to the numbers in Figure E-1. You may choose to label the LWCs and to label the terminals differently, but keep in mind the order of the terminals on the store loop.

Copy the Terminal Identification Charts in the section on "Terminal Numbers and Locations" in topic 3.8 and identify each terminal number and its position on the store loop. This information will be necessary when testing the store loop and in performing problem determination on the store loop.

Note: Use the connector labeled "I/O" only to connect one LWC to another LWC. Do not connect a terminal or the store controller to this connector.

PICTURE 92

Figure E-1. Connecting Multiple Loop Wiring Concentrators

Figure E-2 illustrates the wiring of a Loop Wiring Concentrator connected by radial store loop cables to a store controller and to IBM 4683-xx1 terminals. Do not confuse the numbers printed on the LWC with the position of the terminals on the store loop. Note that the data flow through the Loop Wiring Concentrator is from *right to left*.

Note: The braided shield remains connected through each data connector, providing a continuous path.

PICTURE 93

Figure E-2. Radial Store Loop Wiring Connected to a Loop Wiring Concentrator

E.3.2 Grounding the Cable in a Radial Store Loop Configuration

The braided ground shield of the store loop cable must be properly grounded to maintain optimum performance of the store loop.

- Each leg of the radial store loop cable must be grounded.
- The ground connection must be made as near as possible to the Loop Wiring Concentrator or distribution panel.
- Grounding must be in accordance with applicable national, state, or local electrical codes.
- The grounding must use the same grounding electrode as that used for the electrical power service.
- The ground path must be permanent and continuous and the resistance must not exceed 1 ohm, measured from the Loop Wiring Concentrator or distribution panel to the grounding electrode.
- All grounding electrodes of different systems in the building must be bonded together to minimize any differences in ground potential.
- Metallic conduit that encloses a grounding conductor must be bonded to the grounding conductor at both ends to minimize the impedance.

Leave enough slack between the ground connections and the end of the cables so you can connect the cables to other Loop Wiring Concentrators, if necessary. The *IBM Cabling System Planning and Installation Guide* provides instructions for grounding the store loop cables at distribution panels. Figure E-3 is a schematic of grounding radial store loop cables.

PICTURE 94

Figure E-3. Grounding of Radial Store Loop Cables

Figure E-4 illustrates the proper grounding for a radial store loop cable at the Loop Wiring Concentrator.

PICTURE 95

Figure E-4. Grounding of Radial Store Loop Cable at Loop Wiring Concentrator

E.4 Installing a Serial Store Loop

When installing a store loop in a serial configuration, the store loop cable is routed from the store controller directly to the first 4683-xx1 terminal. From there it goes to each successive 4683-xx1 terminal. From the last terminal, the cable goes back to the store controller to complete the store loop. Figure E-5 illustrates the wiring for a serial store loop.

Use IBM cable, P/N 4716748 or P/N 4716749 (or equivalent), when installing new store loop cable. This cable is part of the IBM Cabling System. The cable contains four wires, made up of two twisted-pairs, surrounded by a braided shield, and covered with an appropriate sheath. One twisted-pair is Black/Orange and the other twisted-pair is Green/Red.

There is more than one way you can install serial store loop wiring. In the procedure described here, only the Black/Orange twisted-pair is used. The unused Green/Red twisted-pair is terminated at each data connector to reduce the possibility of electrical interference.

You must install two cables at each terminal location: one cable coming from the previous terminal and one going to the next terminal. This also applies to the store controller location, where one cable goes to the first terminal on the store loop and one cable comes from the last terminal on the store loop.

In Figure E-5, you can see in the schematic of the data connector that one pair of connections is labeled Green and Red. It serves as the "Send" pair. The other pair of connections is labeled Black and Orange, and it serves as the "Receive" pair. The dotted lines in the data connector indicate connections that are self-shorting inside the data connector *only* when no matching data connector is plugged in. These dotted-line connections do not remain when the store loop attachment cable on the terminals or on the store controller is plugged in.

Trace the signal path in Figure E-5. The attachment cable of the store controller is plugged into a store loop data connector. The signal goes from this data connector over a twisted-pair to each terminal location and finally comes back to the store controller. If no terminal is plugged in, the self-shorting feature of the store loop data connector automatically passes the signal to the next location. Wherever a terminal is plugged in, the self-shorting feature is not in effect; the signal passes into the terminal and then continues around the store loop.

A standard data connector can accept only one cable. In order to attach two cables, you must use an adapter. The adapter contains a data connector with a short cable attached that has wire leads you can crimp to the Black/Orange wires in your cables. The section on "Adapter for Terminating Two Cables" in topic E.4.2 describes two kits that are required to connect the cables at the store controller and at each terminal location. Figure E-8 in topic E.4.2 illustrates how the two kits are installed on your store loop cables.

Note: The braided shield remains connected through each data connector, providing a continuous path.

PICTURE 96

Figure E-5. Schematic of Serial Store Loop Cabling

Because you will use only the Black/Orange twisted-pair in each segment of your store loop cable, it is important that you follow the wiring as shown on the schematic. The following section summarizes the steps to install a serial store loop:

- Route the store loop cable from the store controller to the first 4683-xx1 terminal.
- Route the cable to each succeeding 4683-xx1 terminal.
- Route the cable from the last 4683-xx1 terminal to the store controller.
- At the location of the store controller and each terminal, attach your two cable segments to the adapter and install the adapter.

Figure E-6 shows a schematic illustration of the connections at each data connector. Figure E-7 illustrates how two segments of store loop cable attach to the data connector adapter.

PICTURE 97

Figure E-6. Schematic of Serial Store Loop Connections

PICTURE 98

Figure E-7. Illustration of Serial Store Loop Connections

Subtopics

E.4.1 Restrictions to Installing Store Loop Cable

E.4.2 Adapter for Terminating Two Cables

E.4.1 Restrictions to Installing Store Loop Cable

The following restrictions apply to store loop wiring:

- The maximum cable distance between active terminals (those with power switched on) is 1220 m (4000 ft). This cable distance is the length of wire the signal must travel from one active terminal to another, as described in "Maximum Allowable Distance Between Terminals on a Store Loop" in topic 3.6.10. To ensure satisfactory operation in the event of outages at the terminals, IBM recommends that you limit the maximum distance of cable between terminals to 610 m (2000 ft).
- Do not place the cable in the same duct with other signal cable.
- To prevent unwanted electrical interference from electrical power wiring, you must maintain certain minimum distances between store loop cable and electrical power wiring. Plan the routing of your store loop cable to keep it separated from electrical power wiring.

The minimum distances to maintain between the store loop cable and electrical power wiring or fixtures are shown in Table E-1. The distances shown are a guide for voltages only up to 440 V ac. Do not route the cable near power lines or equipment that have voltages higher than 440 V ac.

Table E-1. Cable Separation Guide			
Minimum Distance Between Store Loop Cable With Braided Shield and:	Less Than 2 kVA	2-5 kVA	More Than 5 kVA
Unshielded power lines or electrical equipment	127 mm (5 in.)	305 mm (12 in.)	610 mm (24 in.)
Unshielded power lines or electrical equipment, with store loop cable enclosed in a grounded metallic conduit	64 mm (2.5 in.)	152 mm (6 in.)	305 mm (12 in.)
Power lines enclosed in grounded metallic conduit (or lead sheathed or aluminum sheathed power lines) with store loop cable enclosed in a separate metallic conduit	38 mm (1.5 in.)	76 mm (3 in.)	152 mm (6 in.)

Notes:

1. Local codes may require greater distances and take precedence over the distances shown.
2. The minimum distance between the store loop cable and fluorescent, neon, incandescent, or high intensity discharge (HID) lighting fixtures is 127 mm (5 in.).

E.4.2 Adapter for Terminating Two Cables

Two adapter kits are required to attach two cables to one data connector. One kit provides the hardware needed to house a data connector and the other kit contains a data connector with a short jumper cable attached, and the appropriate hardware to attach the store loop cables.

Junction Box Kit IBM P/N 4760486 contains one Type 1 Surface Mount Device, which is the outlet box and necessary hardware for housing the data connector. This kit is available as a part of the IBM Cabling System. It contains the following components:

- A rectangular plastic housing, which is a surface mount outlet box
- A grommet for routing a store loop cable into the housing
- A cable tie to provide strain relief for a store loop cable
- A faceplate, which is the front cover for the housing
- An adapter for attaching the faceplate to the housing
- Screws for installing the faceplate. (Screws for attaching the housing to a wall surface are not provided.)

Cable Adapter Kit IBM P/N 6428954 contains the data connector and the hardware for connecting the data connector to two store loop cables. This kit is not a part of the IBM Cabling System; it must be ordered separately. It contains the following components:

- A data connector and cable assembly. (The cable is approximately 100 mm (4 in.) long.)
- A locking clip
- Ferrules for crimping the data connector and cable assembly to a twisted-pair of wires in each of the store loop cables.
- A grommet and cable tie for routing the second store loop cable into the housing.
- Ring connectors to attach to the braided shields and to any unused wires of the two store loop cables.
- Screws for securing the braided shields, adapter cable ground wire, and unused twisted-pair wires to the housing.

You must provide a crimping tool, AMP, Inc. P/N 47100 (or equivalent) to use in this procedure. Figure E-8 illustrates the two adapter kits installed at the store loop cable. Figure E-9 is a schematic illustration of the data connector and cable assembly.

PICTURE 99

Figure E-8. Adapter Terminating Two Store Loop Cables at One Location

PICTURE 100

Figure E-9. Schematic of Data Connector and Cable Assembly

E.5 Procedure to Install Two Cables in Housing

PICTURE 101

The housing for the data connector should be mounted vertically as shown. The housing is provided with removable knockout tabs to permit the cables to enter at different places. Determine which two cable entries you will use.

For cable entry into the rear of the housing, remove the magnetic backing plate, or cut a hole in the magnetic material opposite the rear knockout, and knock out the cable entry hole.

For cable entry into the side, top, or bottom of the housing, carefully break out the proper tabs.

Attach the housing to the wall surface. Two options are available:

- Use the magnetic backing plate for easy attachment to a metal surface.
- Use screws (not provided) to attach the housing to a wall surface.

PICTURE 102

For cable entry into the top, side, or bottom of the housing, insert the store loop cable through the grommets. Insert each of the two cables into a grommet. Pull approximately 150 mm (6 in.) of cable through each grommet. Attach the cable ties around the cables next to the grommets for strain relief.

Slide the grommets into the knockout slots of the housing.

Strip the outer jacket from each cable, approximately 50 mm (2 in.). Be careful not to damage the braided shield.

PICTURE 103

Separate the braided shield from around the twisted-pair wires of both cables.

Using your fingers, twist each braided shield into a single conductor. You will later crimp a ring-type connector to each of these braided shields.

Carefully strip approximately 6 mm (1/4 in.) of insulation from each of the twisted-pair wires.

Note: You will attach one pair of the twisted-pair wires in your store loop cable to the data connector and cable assembly. In a later step, you will attach the other twisted-pair to ground.

Match the Black and Orange wires from each segment of store loop cable with the proper wires of the data connector and cable assembly, as illustrated in Figure E-6 and Figure E-7 in topic E.4.

Insert the wires into ferrules and crimp them.

PICTURE 104

Insert each pair of unused Green and Red wires from each segment of store loop cable into a ring connector and crimp the ring connector. You will later use screws to attach the ring connectors to the housing.

Insert the braided shield of each store loop cable into a ring connector and crimp the ring connector.

Note: You should now have ring connectors attached to the braided shields, to the unused Green and Red twisted-pair wires, and to the ground wire coming from the data connector and cable assembly.

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Remove and discard the two screws that attach the magnetic backing plate to the housing.

Using the longer screws provided in the kit, put three of the ring connectors under one screw and tighten the screw.

Put the two remaining ring connectors under the second screw and tighten the screw.

PICTURE 105

Be sure the grommets are in place in the knockout slots of the housing.

Attach the adapter plate to the housing, using the two screws provided.

Remove the locking clip from the data connector. The locking clip is a U-shaped plastic clip that prevents movement of the data connector tabs. The data connector will snap into place when you insert it into the back of the faceplate.

Insert the locking clip back on the data connector as shown. The locking clip helps keep the data connector secured to the faceplate.

Attach the faceplate to the housing with the two screws provided.

Attach an identifying label to the faceplate, according to the store planner's instructions.

Subtopics

E.5.1 Grounding the Cable in a Serial Store Loop Configuration

E.5.1 Grounding the Cable in a Serial Store Loop Configuration

The braided shield of the store loop must be properly grounded to maintain optimum store loop performance.

- The serial store loop cable shield must be grounded at one point as near as possible to the store controller.
- Grounding must be in accordance with applicable national, state, and local electrical codes.
- The grounding must use the same grounding electrode as that used for the electrical power service.
- The ground path must be permanent and continuous and the resistance must not exceed 1 ohm, measured from the ground point to the grounding electrode.
- All grounding electrodes of different systems in the building must be bonded together to minimize any differences in ground potential.
- Metallic conduit which encloses a grounding conductor must be bonded to the grounding conductor at both ends to minimize the impedance.

Figure E-10 illustrates the proper method of grounding the serial store loop cable.

PICTURE 106

Figure E-10. Proper Grounding of Serial Store Loop Cable

Figure E-11 illustrates grounding the serial store loop near the store controller.

PICTURE 107

Figure E-11. Grounding the Serial Store Loop Near the Store Controller

E.6 Modifying Existing Store Loop Wiring

The IBM 4680 Store System will operate on installed store loop cable that meets the specifications described in Topic 3, "Planning the Store Wiring." Existing cable that does not meet these specifications may not perform satisfactorily when used with the IBM 4680 Store System.

Although existing store loop cable can be used, a new type of store loop connector must be installed. You must remove the existing 4-pin Western Electric (WE) Type 404-B store loop receptacles and install the new connectors, which are referred to as data connectors.

IBM has parts available to replace the WE Type 404-B receptacles with data connectors. The parts required and the procedures to follow, include the following:

- Remove the old 4-pin WE Type 404-B receptacle.
- Install a new housing to contain the data connector.
- Crimp the wires on the data connector to the two twisted-pair wires of the store loop cable.
- Crimp a ring connector to the shield of the existing store loop cable.
- Attach the shield connection from the data connector to the existing braided shield.
- Install the data connector into a new faceplate, attach the faceplate to the housing, and install a label.

Subtopics

E.6.1 Kits to Replace Existing Store Loop Receptacles

E.6.2 Procedure to Replace Existing Store Loop Receptacles

E.6.1 Kits to Replace Existing Store Loop Receptacles

Two kits described below are available for replacing 4-pin receptacles with data connectors. One kit provides the hardware needed to house a data connector and the other one contains a data connector and the appropriate hardware to replace a WE Type 404-B 4-pin receptacle.

Junction Box Kit, IBM P/N 4760486 contains one Type 1 Surface Mount Device, which is the outlet box and the necessary hardware for housing the data connector. This kit is available as a part of the IBM Cabling System. It contains the following components:

- A rectangular plastic housing, which is a surface mount outlet box
- A grommet for passing the store loop cable into the housing
- A cable tie for attachment to the cable as a strain relief
- A faceplate, which is the front cover for the housing
- An adapter for attaching the faceplate to the housing
- Screws for installing the adapter and faceplate. (Screws for attaching the housing to a wall surface are not provided.)

Cable Adapter Kit, IBM P/N 6428954, contains a data connector assembly and the hardware to replace a WE Type 404-B store loop receptacle. This kit is not a part of the IBM Cabling System; it must be ordered separately. It contains the following components:

- A data connector and cable assembly. (The cable is approximately 100 mm (4 in.) long.)
- Ferrules for crimping the data connector and cable assembly to the twisted-pair wires of the store loop cable.
- A ring connector for attachment to the braided shield ground in the store loop cable.
- A screw for securing the store loop cable's braided shield ground and the ground wire in the data connector and cable assembly to the housing.

You must provide a crimping tool, AMP, Inc. P/N 47100 (or equivalent), to use in this procedure.

Figure E-12 illustrates the two adapter kits installed with the store loop cable. Figure E-13 is a schematic illustration of the data connector and cable assembly.

PICTURE 108

Figure E-12. Replacing WE Type 404-B Receptacle with Data Connector

PICTURE 109

Figure E-13. Schematic of Data Connector and Cable Assembly

E.6.2 Procedure to Replace Existing Store Loop Receptacles

Follow the procedures on the following pages to replace existing WE Type 404-B 4-pin store loop receptacles with data connectors. If your store loop has a different type of store loop connector, the pins on your connector may be identified differently. Identify your Receive and Send wires and label them before removal. Follow the instructions for installing the new kits.

PICTURE 110

Before removing the wires from the existing WE Type 404-B 4-pin receptacle, determine the function of the existing wires and label the wires. Write the color of each wire in the chart.

Remove the existing WE Type 404-B 4-pin receptacle from the store loop cable.

The housing for the data connector should be mounted vertically as shown. The housing is provided with removable knockout tabs to permit the cable to enter at different places. Determine which cable entry to use.

For cable entry into the rear of the housing, remove the magnetic backing plate, or cut a hole in the magnetic material opposite the rear knockout, and knock out the cable entry hole.

PICTURE 111

For cable entry into the side, top, or bottom of the housing, carefully break out the proper tab.

Attach the housing to the wall surface. Two options are available:

- Use the magnetic backing plate for easy attachment to a metal surface.
- Use screws (not provided) to attach the housing to a wall surface.

For cable entry into the side, top, or bottom of the housing, insert the store loop cable through the grommet. Pull approximately 150 mm (6 in.) of cable through the grommet and attach the cable tie around the cable next to the grommet for strain relief.

Slide the grommet into the knockout slot of the housing.

PICTURE 112

Strip the outer jacket from the store loop cable, approximately 50 mm (2 in.). Be careful not to damage the braided shield.

Separate the braided shield from around the twisted-pair wires. Using your fingers, twist the braided shield into a single conductor. You will later crimp a ring-type connector to this shield.

Carefully strip approximately 6 mm (1/4 in.) of insulation from each of the twisted-pair wires.

Match the wires according to the chart below. If your wires are of different colors, use the labels you attached at the beginning of this procedure to match the proper wire colors.

Adapter Cable Wire Color	Store Loop Cable Wire Color	Function
Green	Green	+ Send
Red	Red	- Send
Black	Black	+ Receive
Orange	Yellow	- Receive

PICTURE 113

Be sure you have properly matched the wires in each cable.

Insert each pair of wires into a ferrule and crimp the ferrules.

Crimp the ring connector to the braided shield of the store loop cable.

Two screws attach the magnetic backing plate to the housing. Remove and discard one of the screws. Replace the screw with the longer screw provided, to secure the ring connector on the braided shield and the ring connector on the data connector and cable assembly to the housing.

PICTURE 114

Be sure the grommet is in place in the knockout slot. Attach the adapter plate to the housing, using the two screws provided.

Remove the locking clip from the data connector and insert the data connector into the back of the faceplate. The data connector will snap into place when it is properly inserted in the opening.

Insert the locking clip back on the data connector. The locking clip helps keep the data connector secured to the faceplate.

Be sure the faceplate is positioned correctly. Attach the faceplate to the housing with the two screws provided.

Attach an identifying label to the faceplate, according to the store planner's instructions.

E.7 Connecting 4683-xx2 Terminals

Two methods are available for connecting a 4683-xx2 terminal to a 4683-xx1 terminal. If the cable distance between the terminals is less than 20 m (65 ft), you can connect the terminals directly with a preassembled cable that plugs into the rear of each terminal. When the terminals are farther apart, you must provide and install a cable to connect them. This cable can be a maximum length of 150 m (490 ft).

Subtopics

E.7.1 Preassembled Cables for Cable Distances Up to 20 Meters (65 Feet)

E.7.2 User-Provided Cable for Distances More than 20 Meters (65 Feet)

E.7.3 Restrictions When Cabling Terminals

IBM 4680 Store System: Preparing Your Site
Preassembled Cables for Cable Distances Up to 20 Meters (65 Feet)

E.7.1 Preassembled Cables for Cable Distances Up to 20 Meters (65 Feet)

When the 4683-xx1 and the 4683-xx2 terminals are located near one another, you can directly attach them with a preassembled cable. The cables are available from IBM in two lengths:

- 6 m (20 ft)
- 20 m (65 ft).

The preassembled cables have modular connectors at both ends, which plug directly to the rear of the base unit in each terminal. When using either of these cables, no other wiring is required to connect the two terminals.

You cannot remove the modular connectors from the cables, so be sure the connectors will pass through any conduit you use. The cable and modular connectors are fragile. Be careful not to damage them when placing them in conduit. Do not install this cable in a plenum or air duct. Figure E-14 illustrates the cable and modular connectors.

PICTURE 115

Figure E-14. Preassembled Cable for Distances Up to 20 m (65 ft)

E.7.2 User-Provided Cable for Distances More than 20 Meters (65 Feet)

When the 4683-xx1 and the 4683-xx2 terminals are separated by greater distances, you must install a separate cable, which can have a maximum length of 150 m (490 ft). Although this is not a part of the store loop, you must use the same type of cable as that approved for use as store loop cable and the same type of data connectors.

Route the cable from one terminal to the other and attach a data connector at each end. Each terminal will attach to your cable through a separate 4 m (13 ft) attachment cable.

The *IBM Cabling System Planning and Installation Guide* provides complete instructions for installing outlet boxes and data connectors using cable that is part of the IBM Cabling System. Refer to the section on "Accessories Installation" of that manual for installation instructions. Figure E-15 illustrates the wiring to connect the terminals.

PICTURE 116

Figure E-15. Cable to connect a 4683-xx2 terminal to a 4683-xx1

E.7.3 Restrictions When Cabling Terminals

The following restrictions apply to installing the wiring that connects a 4683-xx1 terminal to a 4683-xx2 terminal.

- The maximum length of cable is 150 m (490 ft).
- Do not route the cable outside a building.
- There must be no splices in the cable. You must install data connectors on the ends of cable where a splice might otherwise be required. This provides proper termination for both the twisted-pair wiring and the braided shield. You should note the location of any such connections for a permanent record.
- Do not place the cable in the same duct with other signal cable.
- To prevent unwanted electrical interference from electrical power wiring, you must maintain certain minimum distances between the cable and electrical power wiring. Plan the routing of the cable to keep it separated from electrical power wiring.

The minimum distances to maintain between the cable and electrical power wiring or fixtures are shown in the following chart. The distances shown are a guide for voltages only up to 440 V ac. Do not route the cable near power lines or equipment that have voltages higher than 440 V ac.

Table E-2. Cable Separation Guide			
Minimum Distance Between Cable With Braided Shield and:	Less Than 2 kVA	2-5 kVA	More Than 5 kVA
Unshielded power lines or electrical equipment	127 mm (5 in.)	305 mm (12 in.)	610 mm (24 in.)
Unshielded power lines or electrical equipment, with store loop cable enclosed in a grounded metallic conduit	64 mm (2.5 in.)	152 mm (6 in.)	305 mm (12 in.)
Power lines enclosed in grounded metallic conduit (or lead sheathed or aluminum sheathed power lines) with store loop cable enclosed in a separate metallic conduit	38 mm (1.5 in.)	76 mm (3 in.)	152 mm (6 in.)

Notes:

1. Local codes may require greater distances and take precedence over the distances shown here.
2. Maintain at least 127 mm (5 in.) between the store loop cable and all fluorescent, neon, incandescent, or high intensity discharge (HID) lighting fixtures.

E.8 Testing Store Wiring

This section provides procedures for testing the store loop wiring and the wiring that connects a 4683-xx2 terminal to a 4683-xx1 terminal. It provides procedures for testing the Loop Wiring Concentrator patch cables and describes how to make some test cables that are required in these procedures.

Some tests permit using either the IBM Cabling System Tester, IBM P/N 476500, or an ohmmeter. In these cases, the preferred method is to use the IBM tester. In other tests, you must use an ohmmeter. "Test Procedure Index" in topic E.8.3 indicates the type of test device that can be used in each test.

The IBM tester and test procedures that apply to the IBM Cabling System are described in the *IBM Cabling System Planning and Installation Guide* and *Using the IBM Cabling System With Communication Products*. Information on ordering the tester is included in the *IBM Cabling System Catalog*.

Note: Some ohmmeters give false readings if an ac or dc voltage potential is present. The ohmmeter you use should have an iron vane meter movement. It should be accurate within $\pm 10\%$.

The following definitions apply only to these test procedures:

- Continuity.* An uninterrupted data wire or shield having a resistance of less than 500 ohms.
- Open.* A data wire or shield that is normally not connected and has a resistance greater than 10,000 ohms.
- Short circuit or short.* A connection of two normally unconnected wires or shield with a resistance of less than 1000 ohms.

Before disconnecting any cables, note the proper location of each cable.

Subtopics

- E.8.1 Testing the IBM PC Network
- E.8.2 Testing the IBM Token-Ring Network
- E.8.3 Test Procedure Index
- E.8.4 Data Wire Test Cable
- E.8.5 How to Make a Serial Loop Test Cable
- E.8.6 Test Procedure A. Patch Cable Test Using the IBM Tester
- E.8.7 Test Procedure B. Patch Cable Test Using an Ohmmeter
- E.8.8 Test Procedure C. Serial Store Loop Cable Test
- E.8.9 Test Procedure D. Loop Wiring Concentrator Test Using the IBM Tester
- E.8.10 Test Procedure E. Loop Wiring Concentrator Test Using an Ohmmeter
- E.8.11 Test Procedure F. Radial Store Loop Cable Test Using an Ohmmeter
- E.8.12 Test Procedure G. IBM 4683-xx2 to 4683-xx1 Cable Test Using an Ohmmeter

E.8.1 Testing the IBM PC Network

For test procedures regarding the IBM PC Network, refer to the *IBM Personal Computer Hardware Reference Library, Technical Reference, PC Network*.

E.8.2 Testing the IBM Token-Ring Network

For test procedures for the IBM Token-Ring Network, refer to the *IBM Token-Ring Network Problem Determination Guide, SY27-0280*.

E.8.3 Test Procedure Index

Identify the cable or accessories to be tested on the following list. Some test procedures can be done using either the IBM Cabling System Tester or an ohmmeter, while others can only be performed using an ohmmeter. Whenever both procedures are listed, the preferred method is to use the IBM tester.

Table E-3. Test Procedure Index		
Cable or Accessory	Test Procedure Using IBM Tester	Test Procedure Using Ohmmeter
Patch Cable	A in topic E.8.6	B in topic E.8.7
Serial Store Loop Cable <i>Note: This test requires both the IBM Cabling System Tester and an ohmmeter.</i>	C in topic E.8.8	C in topic E.8.8
Loop Wiring Concentrator	D in topic E.8.9	E in topic E.8.10
Radial Store Loop Cable	-	F in topic E.8.11
IBM 4683-xx2 to 4683-xx1	-	G in topic E.8.12

E.8.4 Data Wire Test Cable

When you are using an ohmmeter for testing cables, you need to have either one or two test cables available. In this section, they are referred to as data wire test cables. Some test procedures require one test cable; however, test procedures C, F, and G require two of these cables. These data wire test cables have a data connector on one end. You can use the IBM General Purpose Attachment Cable, IBM P/N 8310554, which comes with spade lugs on the wire ends. If you prefer, you can make your own test cables using the following procedure. You can either attach spade lugs to the cables you make, or strip away enough insulation so you can attach your ohmmeter test leads.

1. Cut a 2.44 m (8 ft) patch cable, IBM P/N 8642551, in half. (This cable has a data connector on each end.)
2. Strip off about 200 mm (8 in.) of the cable outer jacket.
3. Carefully cut the exposed shield along the cable and twist it into a single strand.
4. Remove the foil and plastic wrap around the data wires.
5. Strip off approximately 25 mm (1 in.) of insulation from each of the data wires. In the test procedures, you will connect the ohmmeter leads to these wires.

You may also choose to make a Data Wire Test Cable by attaching a data connector to a short length of cable. Refer to the *IBM Cabling System Planning and Installation Guide* for the recommended type of cable and instructions on how to install the data connectors.

PICTURE 117

Figure E-16. Data Wire Test Cable

E.8.5 How to Make a Serial Loop Test Cable

In order to test a serial store loop, you must make a special test cable. The test cable enables the IBM tester to check the polarity of the twisted-pair wires and to test the continuity of the braided shield in each cable segment.

Make a test cable in either of the following ways:

- Prepare a cable approximately 2.44 m (8 ft) long, and install a data connector at each end. Refer to the *IBM Cabling System Planning and Installation Guide* for the recommended type of cable and instructions on how to install the data connectors.

Note: Connect the cable and data connectors as shown in the schematic on this page.

- Join two General Purpose Attachment Cables, IBM P/N 8310554, to form one cable. These 2.44 m (8 ft) cables have a data connector on one end and wire leads with spade connectors at the other end. Connect the spade lugs or splice the two cable ends as shown in the schematic on this page.

Follow the color coding and wire the test cable as shown in Figure E-17. Be sure to connect the braided shield.

Note: This test cable can only be used to test a serial store loop. Label it to ensure that it will be used only for this purpose.

PICTURE 118

Figure E-17. Serial Store Loop Test Cable

E.8.6 Test Procedure A. Patch Cable Test Using the IBM Tester

1. See Figure E-18 and connect the tester data cord to one end of the patch cable.
2. Make sure no devices are connected to the other end of the patch cable.
3. Set the tester mode switch to position 1.
4. Press the test button:
 - a. If the green light comes on, continue with Step 5.
 - b. If any red lights come on, the patch cable is defective. Replace it and repeat Test Procedure A, or go to Step 11.
5. Disconnect the tester data cord from the patch cable and connect it to the other end. (This permits both connectors on the cable to be tested.)
6. Leave the tester mode switch in position 1.
7. Press the test button:
 - a. If the green light comes on, continue with Step 8.
 - b. If any red lights come on, the patch cable is defective. Replace it and repeat Test Procedure A, or go to Step 11.
8. Connect the wrap plug, IBM P/N 4760507, to the other end of the cable. (The wrap plug comes with the IBM tester.)
9. Set the tester mode switch to position 2.
10. Press the test button:
 - a. If the green light comes on, continue with Step 11.
 - b. If any red lights come on, the patch cable is defective. Replace it and repeat Test Procedure A, or go to Step 11.
11. The test is complete. Continue with any other testing to be done.

PICTURE 119

Figure E-18. Testing a Patch Cable Using the IBM Tester

E.8.7 Test Procedure B. Patch Cable Test Using an Ohmmeter

1. See Figure E-19 and plug the data wire test cable into connector 1 of the patch cable.
2. Using an ohmmeter, check for continuity between:
 - The red and orange wires of the data wire test cable
 - The green and black wires of the data wire test cable
 - The data wire test cable shield and the shield contact in Connector number 2.

If you do not get continuity in every case, go to Step 7.

3. Using an ohmmeter, check for an open circuit between:
 - The red and orange wires and the green or black wires of the data wire test cable
 - Each of the data wires and the shield of the data wire test cable.

If you do not get an open circuit in every case, go to Step 7.

4. Disconnect the data wire test cable and plug it into the other end of the patch cable.
5. Using an ohmmeter, check for continuity between:
 - The red and orange wires of the data wire test cable
 - The green and black wires of the data wire test cable.

If you do not get continuity in each case, go to Step 7.

6. Disconnect the data wire test cable.

The test is complete. Continue with any other testing to be done.
7. The patch cable is defective. Replace it.

PICTURE 120

Figure E-19. Testing a Patch Cable Using an Ohmmeter

E.8.8 Test Procedure C. Serial Store Loop Cable Test

Testing the serial store loop cable consists of three steps:

- Testing the entire store loop for continuity
- Checking each cable segment for continuity and determining if the resistance of any segment exceeds the maximum allowable resistance
- Testing each cable segment for proper polarity of the twisted-pair wiring and checking the continuity of the braided shield.

To test a serial store loop, you must have two data wire test cables and a serial loop test cable. Refer to "Data Wire Test Cable" in topic E.8.4 and "How to Make a Serial Loop Test Cable" in topic E.8.5 for instructions on making these test cables. In addition, you must have a wrap plug, IBM P/N 4760507, to use during part of the test. (The wrap plug comes with the IBM tester.)

Subtopics

- E.8.8.1 Serial Store Loop Cable Test - Part C-1
- E.8.8.2 Serial Store Loop Cable Test - Part C-2
- E.8.8.3 Serial Store Loop Cable Test - Part C-3

E.8.8.1 Serial Store Loop Cable Test - Part C-1

Use this procedure to test the entire store loop for continuity.

1. Refer to Figure E-20. Unplug all attachment cables that are plugged into the store loop.
2. Set the mode switch on the IBM tester to position 1 and plug the tester data cord into store loop data connector number 1.
3. Press the test button on the tester.
 - If the green light comes on, the continuity of the serial store loop is good. Go to Step 4.
 - If any red lights come on, the store loop is open at some location. Serial Store Loop Cable Test - Part C-2 will help you to locate the open cable segment(s).
4. Disconnect the tester from the store loop data connector.
5. Go to Serial Store Loop Cable Test - Part C-2 and continue testing.

PICTURE 121

Figure E-20. Testing Serial Store Loop Cable for Continuity

E.8.8.2 Serial Store Loop Cable Test - Part C-2

Use this procedure to determine:

The open cable segment(s), if the preceding test indicated an open circuit in the store loop cable
The resistance of each cable segment.

1. Refer to Figure E-21. Unplug all attachment cables that are plugged into the store loop.
2. Plug a data wire test cable into store loop data connector number 1.
3. Plug a second data wire test cable into store loop data connector number 2. This isolates the cable segment between store loop data connectors number 1 and 2 for testing.
4. At data connector number 2, prepare the test leads of the data wire test cable by twisting the orange and black leads together. The red and green wires will not be used here. Tape each one back separately to prevent any shorts.
5. At data connector number 1, connect an ohmmeter to the red and green wires of the data wire test cable. Check for a maximum resistance reading of 72 ohms. If the resistance exceeds 72 ohms, see the Note in this test procedure.
6. Remove the data wire test cables from the store loop data connectors.
7. Plug a data wire test cable into store loop data connector number 2.
8. Plug a second data wire test cable into store loop data connector number 3. This isolates the cable segment between store loop data connectors number 2 and 3 for testing.
9. Repeat the procedures in Steps 4 to 6. to check continuity and to measure the resistance of this cable segment. Make any necessary corrections to this cable segment.
10. Check all remaining cable segments in this manner, using the procedures in Steps 4 to 6. Make any necessary corrections to each store loop cable segment.
11. Go to Serial Store Loop Cable Test - Part C-3 and continue testing.

Note: The resistance value of 72 ohms is calculated to meet the maximum *recommended* distance of 610 m (2000 ft) between terminals. You should always examine your configuration carefully to ensure that the absolute maximum distance between terminals is not exceeded during the time the store loop is operating. See "Maximum Allowable Distance Between Terminals on a Store Loop" in topic 3.6.10.

PICTURE 122

Figure E-21. Testing Serial Store Loop Cable Continuity and Resistance

E.8.8.3 Serial Store Loop Cable Test - Part C-3

Use this procedure to verify:

The correct polarity of each cable segment
The continuity of the braided shield in each cable segment.

1. Refer to Figure E-22. Unplug all attachment cables that are plugged into the store loop.
2. Connect the serial loop test cable to the IBM tester.
3. Set the tester mode switch to position 2.
4. Plug the serial store loop test cable into store loop data connector number 1.
5. Plug the wrap plug into store loop data connector number 2.
6. Press the test button on the tester:
 - a. If the green light comes on, the polarity of the twisted-pair wires is correct.
 - b. If any of the top two red lights come on, the polarity is wrong in one of the two connectors under test. Make the necessary corrections to the twisted-pair wire connections in the data connectors.
 - c. If the lower (ground) red light comes on, the shield connection is faulty at one or both data connectors. Make the necessary corrections to the shield connection in the data connectors.
7. Remove the serial loop test cable and the wrap plug from the data connectors.
8. Plug the serial store loop cable into store loop data connector number 2.
9. Plug the wrap plug into store loop data connector number 3.
10. Repeat Step 6 to check polarity of the twisted-pair wires and to check for continuity of the braided shield of this cable segment. Make any necessary corrections to this cable segment.
11. Check all remaining cable segments in this manner. Make any necessary corrections to each store loop cable segment.

Testing the serial store loop cable is complete.

PICTURE 123

Figure E-22. Testing Serial Store Loop Cable Polarity and Shield Continuity

E.8.9 Test Procedure D. Loop Wiring Concentrator Test Using the IBM Tester

1. See Figure E-23 and connect the tester data cord to the I/O port of the Loop Wiring Concentrator (LWC).
2. Make sure no other devices are connected to the LWC.
3. Set the tester mode switch to position 1.
4. Press the test button:
 - a. If the green light comes on, continue with Step 5.
 - b. If any red lights come on, the LWC is defective. Repair or replace it and repeat Test Procedure D.
5. Disconnect the tester data cord from the I/O port and connect it to one of the radial ports.

Note: The reason for performing this test from one of the radial ports is to check the shorting bars in the I/O port.
6. Press the test button:
 - a. If the green light comes on, continue with Step 7.
 - b. If any red lights come on, the LWC is defective. Repair or replace it and repeat Test Procedure D.
7. Insert the wrap plug into the I/O port.
8. Set the tester mode switch to position 2.
 - a. If the green light comes on, continue with Step 9.
 - b. If any red lights come on, the LWC is defective. Repair or replace it and repeat Test Procedure D.
9. Disconnect the wrap plug and the tester.
10. The test is complete. Continue with testing other elements of the system.

PICTURE 124

Figure E-23. Testing Loop Wiring Concentrator Using the IBM Cabling System Tester

E.8.10 Test Procedure E. Loop Wiring Concentrator Test Using an Ohmmeter

Note: This procedure tests the internal wiring of the Loop Wiring Concentrator (LWC), but does not test the contacts of individual connectors. If you think you have a faulty contact, test for continuity between the same-color wires using one data wire test cable plugged into the I/O port and another data wire test cable plugged into the connector being tested.

1. Make sure that all cables currently connected to the LWC are labeled so that you can reconnect them properly after this test.
2. Disconnect all cables currently plugged into the LWC.
3. See Figure E-24 and plug the data wire test cable into the I/O port of the LWC.
4. Using an ohmmeter, check for continuity between:
 - The red and orange wires of the data wire test cable
 - The green and black wires of the data wire test cable
 - The data wire test cable shield and the LWC shield contact in all radial ports.

If you do not find continuity in every case, go to Step 11.

5. Using an ohmmeter, check for an open circuit between:
 - The red or orange wires and the green or black wires of the data wire test cable
 - All the data wires and the shield of the data wire test cable.
- If you do not find an open circuit in every case, go to Step 11.
6. Disconnect the data wire test cable and plug it into any radial port.
 7. Using an ohmmeter, check for continuity between:
 - The red and orange wires of the data wire test cable
 - The green and black wires of the data wire test cable.

If you do not find continuity in every case, go to Step 11.

8. Disconnect the data wire test cable.
9. Reconnect all cables that were disconnected in Step 2.
10. The test is complete. Continue with testing other elements of the system.
11. The LWC is defective. Replace it.

PICTURE 125

Figure E-24. Testing Loop Wiring Concentrator Using an Ohmmeter

E.8.11 Test Procedure F. Radial Store Loop Cable Test Using an Ohmmeter

A radial store loop consists of individual cables that go from the Loop Wiring Concentrator to each terminal and from the Loop Wiring Concentrator to the store controller. Follow this test procedure to test each cable that is part of a radial store loop.

1. See Figure E-25 and plug the data wire test cable into the data connector at the Loop Wiring Concentrator end of the cable.
2. Using an ohmmeter, check for a maximum resistance reading of 36 ohms at the data wire test cable (red and orange wires, and green and black wires). If the resistance exceeds 36 ohms, see the Note in this test procedure.
3. Using an ohmmeter, check for an open circuit between:
 - The red or orange wires and the green or black wires of the data wire test cable
 - All the data wires and the shield of the data wire test cable.

If you do not find an open circuit in every case, the cable is defective or the connections are faulty. Go to Step 11.
4. Disconnect the data wire test cable and plug it into the other end of the Radial Store Loop Cable at the 4683-xx1 terminal.
5. Using an ohmmeter, repeat Step 3.
6. To check the continuity of the Radial Store Loop Cable shield, plug a data wire test cable into one end of the cable.
7. Twist the red lead with the cable shield.
8. Plug a second data wire test cable into the other end of the Radial Store Loop Cable.
9. Using an ohmmeter, check for continuity between the red wire and the shield.

If continuity is not found, the cable is defective. Go to Step 11.
10. The test is complete. Continue with testing other elements of the system.
11. Disconnect the data wire test cable(s).
12. Repair or replace the Radial Store Loop Cable and repeat Test Procedure F.

Note: The resistance value of 36 ohms is calculated to meet the maximum *recommended* distance of 610 m (2000 ft) between terminals. You should always examine your configuration carefully to ensure that the absolute maximum distance between terminals is not exceeded during the time the store loop is operating. See "Maximum Allowable Distance Between Terminals on a Store Loop" in topic 3.6.10.

PICTURE 126

Figure E-25. Testing Radial Store Loop Cable Using an Ohmmeter

E.8.12 Test Procedure G. IBM 4683-xx2 to 4683-xx1 Cable Test Using an Ohmmeter

1. See Figure E-26 and plug the data wire test cable into the data connector at the 4683-xx1 terminal.
2. Using an ohmmeter, check for a maximum resistance reading of 10 ohms at the data wire test cable (red and orange wires, and green and black wires). If resistance exceeds 10 ohms, the cable is too long or its connections are faulty. Go to Step 11.
3. Using an ohmmeter, check for an open circuit between:
 - The red or orange wires and the green or black wires of the data wire test cable
 - All the data wires and the shield of the data wire test cable.If you do not find an open circuit in every case, the cable is defective. Go to Step 11.
4. Disconnect the data wire test cable and plug it into the data connector at the 4683-xx2 terminal.
5. Using an ohmmeter, repeat Step 2.
6. To check the continuity of the cable shield, plug a data wire test cable into one end of the cable.
7. Twist the red lead with the cable shield.
8. Plug a second data wire test cable into the other end of the cable.
9. Using an ohmmeter, check for continuity between the red wire and the shield.

If continuity is not found, the cable is defective. Go to Step 11.
10. The test is complete. Continue with testing other elements of the system.
11. Disconnect the data wire test cable(s).
12. Repair or replace the cable.

PICTURE 127

Figure E-26. Testing 4683-xx2 to 4683-xx1 Cable Using an Ohmmeter

F.0 Appendix F. Cables for Realtime Interface Co-Processor Multiport Adapter

The Realtime Interface Co-processor Multiport Adapter is an optional feature for the store controller that provides a means to attach up to eight devices that use the standard EIA RS-232 or RS-422 interface. These devices can include printers, displays, and modems. Eight 25-pin connectors are provided at the end of a 3 m (10 ft) cable. The user must provide the device, cable, and connectors to attach to this cable.

The adapter provides eight connectors, called ports, labeled 0 through 7. Depending on how the adapter is ordered, the ports can be used as follows:

- Ports 0-7 can connect to RS-232 devices
- Ports 0-3 can connect to RS-232 devices and ports 4-7 can connect to RS-422 devices.

This appendix provides information regarding cables and pin assignments for user-provided cables for attaching the RS-232 and RS-422 devices.

PICTURE 128

Figure F-1. Realtime Interface Co-processor Multiport Adapter Cable

Subtopics

- F.1 Bulk Cable Requirements for RS-232 User Cables
- F.2 Conductor Requirements for RS-232 User Cables
- F.3 Connector Requirements for RS-232 User Cables
- F.4 Cables for RS-422 Interface
- F.5 Pin Assignments for User-Provided Cables

F.1 Bulk Cable Requirements for RS-232 User Cables

Overall Shield	Shield must be polyester-backed aluminum foil with continuous drain wire. Conductive surface and drain wire out. 100% coverage with minimum 50% overlap.
Outside Jacket	PVC
Capacitance	Total capacitance as measured from any lead to all other leads and shields tied together must not exceed 40 PF/ft maximum.
Dielectric Strength	Wire in the finished cable must withstand, without breakdown at room ambient temperature, a minimum test voltage of 300 V 50/60 Hz rms for 1 minute between individual conductors and between individual conductors and shields.

F.2 Conductor Requirements for RS-232 User Cables

Conductors	#24 AWG 7/32 stranded, tinned copper
Individual Conductor	Polyester-backed aluminum foil outside to ensure contact with central drain wire.
No. of Shielded Conductors	Variable
Insulation	Solid polypropylene
Voltage Rating	300 V at 60 degrees C.
Drain Wires	Both central and outside, #24 AWG, 7x32 stranded

Table F-1. Cable Requirements for Noisy Environments					
Number of Conductors	Voltage Rating at 60°C	Conductor Information	Cable Diameter	Impedance	Capacitance per Foot
14	30 V	28 AWG 7 x 36 strands	0.4 in. maximum	68 Ohms	20.5 pF/ft

Note: The cable you install must meet certain safety requirements if your installation is in the U.S. where the National Electrical Code Article 725 is in effect.

UL/NEC Rating	Suitable Installation
CL2	Non-plenum general purpose
CL2R	Riser
CL2P	Plenum

F.3 Connector Requirements for RS-232 User Cables

Connector Housing	25-pin D connector with tin-plated metal housing with grounding indents
Contacts	<ul style="list-style-type: none"><input type="checkbox"/> Female pins at end of cable that connects to the Realtime Interface Co-processor Multiport Adapter.<input type="checkbox"/> Male or female for other connectors, depending on the device being attached.
Shell	Metal with captivated retainer screws long enough to be grasped and turned with the fingers
Ferrule	Split ring, aluminum

F.4 Cables for RS-422 Interface

The cable length should not exceed 1220 meters (4000 feet). Surge suppressor attachment are recommended on cable lengths that exceed 120 meters (400 feet). This is necessary for cables that exit the building.

Subtopics

- F.4.1 Bulk Cable Requirements for RS-422 User Cables
- F.4.2 Conductor Requirements for RS-422 User Cables
- F.4.3 Connector Requirements for RS-422 User Cables

F.4.1 Bulk Cable Requirements for RS-422 User Cables

Overall Shield	Shield must be #36 tinned copper braid with a minimum coverage of 85%.
Outside Jacket	PVC

F.4.2 Conductor Requirements for RS-422 User Cables

Conductors	Two twisted pairs (four conductors). The lay of the individual pairs is not to exceed one inch. The two twisted pairs may be twisted together. If they are twisted together, the lay must be greater than the lay of the individual twisted pairs.
Materials	#22 AWG, 7x30 stranded, tinned copper
Insulation	SRPVC
Voltage Rating	UL Rating of 300 V at 80 degrees C.

F.4.3 Connector Requirements for RS-422 User Cables

Connector Housing	25-pin D connector with tin-plated metal housing with grounding indents
Contacts	<ul style="list-style-type: none"><input type="checkbox"/> Female pins at end of cable that connects to the Realtime Interface Co-processor Multiport Adapter<input type="checkbox"/> Male pins at end of cable that connects to IBM 3161/3164.<input type="checkbox"/> Male pins at end of cable that connects to the Proprinter converter.<input type="checkbox"/> Male or female pins at end of cable that connects to other devices, depending on the device.
Shell	Metal with captivated retainer screws long enough to be grasped and turned with the fingers
Ferrule	Split ring, aluminum

F.5 Pin Assignments for User-Provided Cables

The user is responsible for providing cables and connectors for attaching devices to the optional IBM Realtime Interface Co-processor Multiport Adapter in the store controller. The following topics provide information regarding pin assignments for cables using the EIA RS-232 and RS-422 interfaces.

PICTURE 129

Figure F-2. Cable for Direct Attachment of an RS-232 Device

PICTURE 130

Figure F-3. Data Communication Equipment (DCE) Cable to Connect a Modem

PICTURE 131

Figure F-4. Cable for Direct Attachment of an RS-422 Device

PICTURE 132

Figure F-5. Cables for Attaching Devices Through an RS-422 to RS-232 Converter

G.0 Appendix G. Miscellaneous Information

This section contains miscellaneous information, including:

- Ambient light guidelines and measurements for IBM 3687 Checkout Scanner
- Dimensions of machines, devices, and cable connectors
- Information about expendable supplies.

Subtopics

- G.1 Ambient Light Guidelines for the Checkout Scanner
- G.2 Measuring Ambient Light Level at the IBM 3687 Model 2
- G.3 Ambient Light Guidelines for the Model 3 Printer
- G.4 Declaration of Noise Emission Values

G.1 Ambient Light Guidelines for the Checkout Scanner

The red content of the store lighting and sunlight can affect the operation of the IBM 3687 Checkout Scanner Model 2. Therefore, lamps used for store lighting in the vicinity of the scanner should have low emissions of red light. Table G-1 shows some recommended lamp types, as well as some lamp types that should be avoided in the area of the scanner. The amount of sunlight in the vicinity of the scanner should be minimized. Although the level of red light is the primary concern, the luminance in the area of the scanner surface should not exceed 100 footcandles.

Table G-1. Lamp Types Used Near the IBM 3687 Checkout Scanner	
LOW RED EMISSION (RECOMMENDED)	HIGH RED EMISSION (TO BE AVOIDED)
A. Fluorescent: 1. Daylight 2. Cool white	A. Fluorescent: 1. Deluxe cool white 2. Deluxe warm white 3. Soft white 4. Pink 5. Red
B. High Intensity Discharge: 1. Clear mercury vapor 2. White mercury vapor	B. High Intensity Discharge: 1. Warm deluxe mercury vapor
	C. Incandescent: 1. Tungsten

The following methods are recommended to reduce the incident light that reaches the scanner:

- Avoid directional-type light fixtures
- Avoid light fixtures that do not have diffusers
- Reduce lighting intensity
- Reduce the number of lamps
- Move the scanner or the lighting fixtures
- Block or shield any incident light
- Position the scanner so that item flow is toward the store windows
- Avoid ceilings less than 3 m (10 ft) high.

G.2 Measuring Ambient Light Level at the IBM 3687 Model 2

A Minolta (**) Illuminance Meter, stock number 1519-207, or equivalent, can be used to measure the ambient light level in the vicinity of an IBM 3687 Checkout Scanner Model 2. Contact your IBM Installation Planning Representative for assistance in obtaining the meter and an accessory hood.

Subtopics

- G.2.1 Stores With Fluorescent Lighting
- G.2.2 Stores With High Intensity Discharge (HID) Lamps
- G.2.3 Checking the Level of Sunlight in All Stores

G.2.1 Stores With Fluorescent Lighting

The ambient light level caused by fluorescent lighting should not exceed 100 footcandles at the scanner window. The meter should be placed flat on the scanner window, as shown in Figure G-1. When you are making this measurement, you must shield the meter from daylight entering the store window. Do this by positioning yourself between the scanner and any outside window when taking the meter reading.

PICTURE 133

Figure G-1. Measuring the Light Level of Fluorescent Lighting

G.2.2 Stores With High Intensity Discharge (HID) Lamps

Two measurements must be made for stores that use high intensity discharge lamps. (These lamps are also referred to as HID lamps, multivapor lamps, or metal halide lamps.)

The first measurement is identical to the one made for fluorescent lighting. The meter reading should not exceed 100 footcandles.

The second measurement is made with an accessory hood placed over the meter, as shown. The meter should be centered on the scanner window, with the hood pointing toward the oncoming items (usually toward the inner part of the store). With the meter and hood in this position, the meter reading should not exceed two (2) footcandles. If the reading exceeds two footcandles, move the lamp causing the excessive reading (the one toward which the hood is pointing).

PICTURE 134

Figure G-2. Measuring Light Level of High Intensity Discharge Lamps

G.2.3 Checking the Level of Sunlight in All Stores

For all stores, regardless of the type of lighting, a situation may exist during certain hours of the day (early morning or late afternoon) where direct sunlight shines through the store windows. If this sunlight shines on the vertical surfaces of the items as they pass over the scanner window, the scanner will have difficulty reading the symbols on the vertical surfaces.

A meter reading should be taken to determine whether this is a potential problem. As shown below, the meter should be placed in a vertical position, centered on the scanner window, with the dome on the meter pointed toward the sunlight. The meter reading must not exceed 750 footcandles. If the reading exceeds 750 footcandles, some steps must be taken to reduce the amount of sunlight shining on the scanner window. This can be done by installing sunscreen material, using shading material, or by using some other blocking method. For example, you can place advertising at strategic locations on the store windows.

PICTURE 135

Figure G-3. Measuring Light Level of Sunlight at the Checkout Scanner

G.3 Ambient Light Guidelines for the Model 3 Printer

The IBM 4683 Model 3 printer uses optical sensors to detect the presence of forms inserted into the printer. Fluorescent lamps used for store lighting have no affect on printer operation.

Very bright incandescent light or sunlight entering the top forms entry chute of the printer can cause a sensor error, with a form being detected when none is present. For lighting levels less than 2,000 footcandles (21,530 lux), no precautions are necessary. Bright store lighting does not normally exceed 200 footcandles (2,153 lux).

Light levels exceeding 2,000 footcandles can occur if direct sunlight hits the printer. In this case, form sensor errors can be avoided by preventing direct sunlight from shining straight down into the forms entry slot on top of the printer.

G.4 Declaration of Noise Emission Values

PICTURE 136

Figure G-4. Declaration of Noise Emission Values for IBM 4683 Terminals

GLOSSARY Glossary

This glossary defines terms and abbreviations used in this book. Consult the *IBM Dictionary of Computing*, SC20-1699, and the index of this book for terms that you do not find in this glossary.

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accessory. An IBM designation for a separately ordered part that (a) has no type number, (b) is for purchase only, and (c) does not receive normal IBM maintenance.

access unit. A unit that allows multiple attaching devices access to a token-ring network at a central point such as a wiring closet or in an open work area.

acoustic coupler. A type of telecommunication equipment that permits use of a telephone handset as a connection to a telecommunication line for data transmission by means of sound transducers.

active. (1) Able to communicate on the network. A token-ring network adapter is active if it is able to transmit and receive on the network. (2) Operational. (3) Pertaining to a node or device that is connected or is available for connection to another node or device. (4) Currently transmitting or receiving.

adapter. (1) In the point-of-sale terminal, a circuit card that, with its associated software, enables the terminal to use a function or feature. (2) In a LAN, within a communicating device, a circuit card that, with its associated software and/or microcode, enables the device to communicate over the network.

address. (1) In data communication, the IEEE-assigned unique code or the unique locally administered code assigned to each device or workstation connected to a network. (2) A character, group of characters, or a value that identifies a register, a particular part of storage, a data source, or a data sink. The value is represented by one or more characters. (3) To refer to a device or an item of data by its address. (4) The location in the storage of a computer where data is stored. (5) In word processing, the location, identified by the address code, of a specific section of the recording medium or storage. (6) In word processing, the location, identified by the address code, of a specific section of the recording medium or storage.

alphanumeric. Pertaining to a character set containing letters, digits, and other characters, such as punctuation marks.

ambient light. Light in the surrounding area, as from electric lights, sunlight, or reflected light.

American National Standards Institute (ANSI). An organization for the purpose of establishing voluntary industry standards.

analog. Pertaining to data consisting of continuously variable physical quantities. Contrast with *digital*.

ANPOS keyboard. The alphanumeric point-of-sale keyboard. This keyboard consists of a section of alphanumeric keys, a programmable set of point-of-sale keys, a numeric keypad, and system function keys.

ANSI. American National Standards Institute.

application program. (1) A program written for or by a user that applies to the user's own work. (2) A program written for or by a user that applies to a particular application. (3) A program written for or by a user that is specific to the user's own application. (4) A program used to connect and communicate with stations in a network, enabling users to perform application-oriented activities.

architecture. A logical structure that encompasses operating principles including services, functions, and protocols. See *computer architecture*, *network architecture*, *Systems Application Architecture (SAA)*, *Systems Network Architecture (SNA)*.

asynchronous. (1) Pertaining to two or more processes that do not depend upon the occurrence of a specific event such as a common timing signal. (2) In Fiber Distributed Data Interface (FDDI) rings, a type of data traffic that does not need bounded access delay to the medium and guaranteed throughput.

attach. (1) To connect a device physically. (2) To make a device a part of a network logically.

attaching device. Any device that is physically connected to a network and can communicate over the network.

attenuation. A decrease in magnitude of current, voltage, or electrical or optical power of a signal in transmission between points. It may be expressed in decibels or nepers.

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backup. Pertaining to a system, device, file, or facility that can be used in the event of a malfunction or the loss of data.

baseband. (1) A frequency band that uses the complete bandwidth of a transmission medium. Contrast with *broadband*, *carrierband*.. (2) A method of data transmission that encodes, modulates, and impresses information on the transmission medium without shifting or altering the frequency of the information signal.

base unit. The part of the IBM 4683 Point of Sale terminal that contains the power supply and the interfaces.

BASIC. Beginner's All-purpose Symbolic Instruction Code. A programming language that uses common English words.

baud. The rate at which signal conditions are transmitted per second. Contrast with *bits per second (bps)*.

binary. (1) Pertaining to a system of numbers to the base two; the binary digits are 0 and 1. (2) Pertaining to a selection, choice, or condition that has two possible different values or states.

binary synchronous communication (BSC). A form of telecommunication line control that uses a standard set of transmission control characters and control character sequences, for binary synchronous transmission of binary-coded data between stations. Contrast with *synchronous data link control (SDLC)*.

bits per second (bps). The rate at which bits are transmitted per second. Contrast with *baud*.

bps. Bits per second.

Bps. Bytes per second.

bridge. (1) An attaching device connected to two LAN segments to allow the transfer of information from one LAN segment to the other. A bridge may connect the LAN segments directly by network adapters and software in a single device, or may connect network adapters in two separate devices through software and use of a telecommunications link between the two adapters. (2) A functional unit that connects two LANs that use the same logical link control (LLC) procedures but may use the same or different medium access control (MAC) procedures. Contrast with *gateway* and *router*.

broadband. A frequency band divisible into several narrower bands so that different kinds of transmissions such as voice, video, and data transmission can occur at the same time. Synonymous with *wideband*. Contrast with *baseband*.

BSC. Binary synchronous communication.

bypass. To eliminate an attaching device or an access unit from a ring network by allowing the data to flow in a path around it.

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C. A high-level programming language designed to optimize run time, size, and efficiency.

cable loss (optical). The loss in an optical cable equals the attenuation coefficient for the cables fiber times the cable length.

cable segment. A section of cable between components or devices on a network. A segment may consist of a single patch cable, multiple patch cables connected together, or a combination of building cable and patch cables connected together. See *LAN segment*, *ring segment*.

carrierband. A frequency band in which the modulated signal is

superimposed on a carrier signal (as differentiated from baseband), but only one channel is present on the medium. Contrast with *baseband*, *broadband*.

cash drawer. A drawer at a point-of-sale terminal that can be programmed to open automatically. See *till*.

chain. (1) Transfer of control from the currently executing program to another program or overlay. (2) Referencing a data record from a previous data record.

charge. A sales transaction in which a customer has the partial or total value of purchased merchandise added to an account for later payment.

circuit. (1) A logic device. (2) One or more conductors through which an electric current can flow.

clear. To delete data from a screen or from memory.

coaxial (coax) cable. A cable consisting of one conductor, usually a small copper tube or wire, within and insulated from another conductor of a larger diameter, usually copper tubing or copper braid.

COBOL. (Common Business-Oriented Language) A high-level programming language, based on English, that is used primarily for business applications.

command. (1) A request for performance of an operation or execution of a program. (2) A character string from a source external to a system that represents a request for system action.

communication adapter. A circuit card and its associated software that enable a device, such as a personal computer, to be connected to a network or another computer (examples include binary synchronous, asynchronous, modem, and LAN adapters).

computer architecture. The organizational structure of a computer system, including hardware and software.

concentrator. (1) In data transmission, a functional unit that permits a common transmission medium to serve more data sources than there are channels currently available within the transmission medium. (2) Any device that combines incoming messages into a single message (concentration) or extracts individual messages from the data sent in a single transmission sequence (deconcentration). (3) See also *access unit*, *wiring concentrator*.

conduit. A tube or duct used to enclose electrical wiring or cables.

configuration. (1) The group of devices, options, and programs that make up a data processing system or network as defined by the nature, number, and chief characteristics of its functional units. More specifically, the term may refer to a hardware configuration or a software configuration. (2) See also *system configuration*.

connect. In a LAN, to physically join a cable from a station to an access unit or network connection point. Contrast with *attach*.

controller. A unit that controls input/output operations for one or more devices.

converter. In an IBM Token-Ring Network, a device that converts electronic signals to light pulses or vice versa for use in an optical fiber subsystem.

core. The central region of an optical fiber through which light is transmitted.

coupler. A device that connects a modem to a telephone network. See also *acoustic coupler*.

crosstalk. The disturbance caused in a circuit by an unwanted transfer of energy from another circuit.

customer receipt. An itemized list of merchandise purchased and paid for by the customer.

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DAA. Data access arrangement. See *data coupler*.

data. (1) A representation of facts, concepts, or instructions in a formalized manner suitable for communication, interpretation, or processing by human or automatic means. (2) Any representations such as characters or analog quantities to which meaning is or might be assigned.

data access arrangement (DAA). Circuitry that allows privately owned data-terminal equipment (DTE) and telecommunication equipment to be connected to the public switched telephone network. See also *data coupler*.

data circuit-terminating equipment (DCE). In a data station, the equipment that provides the signal conversion and coding between the data terminal equipment (DTE) and the line.

data communication. (1) Transfer of information between functional units by means of data transmission according to a protocol. (2) The transmission, reception, and validation of data.

data coupler. An electrical device for connecting modems to the public switched network in the United States. The data coupler limits the amount of signal applied to the network. It is sometimes referred to as a data access arrangement (DAA).

data file. A collection of related data records organized in a specific manner; for example, a payroll file (one record for each employee, showing such information as rate of pay and deductions) or an inventory file (one record for each inventory item, showing such information as cost, selling price, and number in stock.) See also *data set, file*.

data link. (1) Any physical link, such as a wire or a telephone circuit, that connects one or more remote terminals to a communication control unit, or connects one communication control unit with another. (2) The assembly of parts of two data terminal equipment (DTE) devices that are controlled by a link protocol, and the interconnecting data circuit, that enable data to be transferred from a data source to a data sink. (3) In SNA, see also *link*. **Note:** A telecommunication line is only the physical medium of transmission. A data link includes the physical medium of transmission, the protocol, and associated devices and programs; it is both physical and logical.

data processing system. A network, including computer systems and associated personnel, that accepts information, processes it according to a plan, and produces the desired results.

data set. Logically related records treated as a single unit. See also *file*.

data terminal equipment (DTE). (1) That part of a data station that serves as a data source, data receiver, or both. (2) Equipment that sends or receives data, or both.

data transmission. The conveying of data from one place for reception elsewhere by means of telecommunications.

dB. Decibel.

DCE. Data circuit-terminating equipment.

decibel (dB). (1) One tenth of a bel. (2) A unit that expresses the ratio of two power levels on a logarithmic scale. (3) A unit for measuring relative power. The number of decibels is 10 times the logarithm base (base 10) of the ratio of the measured power levels; if the measured levels are voltages (across the same or equal resistance), the number of decibels is twenty times the log of the ratio. See also *neper*.

device. (1) A mechanical, electrical, or electronic contrivance with a specific purpose. (2) An input/output unit such as a terminal, display, or printer. See also *attaching device*.

dialing. Using a dial or pushbutton telephone to initiate a telephone call. In telecommunication, attempting to establish a connection between a terminal and a telecommunication device over a switched line.

digital. (1) Pertaining to data in the form of digits. Contrast with *analog*. (2) Pertaining to data consisting of numerical values or discrete units.

disabled. (1) Pertaining to a state of a processing unit that prevents the occurrence of certain types of interruptions. (2) Pertaining to the state in which a transmission control unit or audio response unit cannot accept incoming calls on a line.

disk. A round, flat plate coated with a magnetic substance on which computer data is stored. See also *integrated disk, fixed disk*.

diskette. A thin, flexible magnetic disk permanently enclosed in a protective jacket. A diskette is used to store information for processing.

Disk Operating System. An operating system for computer systems that use disks and diskettes for auxiliary storage of programs and data.

display. (1) A visual presentation of data. (2) A device that presents visual information to the point-of-sale terminal operator and to the customer, or to the display station operator.

distributed. Physically separate but connected by cables.

Distributed Systems Executive (DSX). An IBM licensed program available for IBM host systems that allows the host system to get, send, and remove files, programs, formats and procedures in a network of computers.

distribution panel. In the IBM Token-Ring Network, a wiring board that provides a patch panel function and mounts in a rack. See also *patch panel*.

down-loop. The position of a terminal or store controller on the store loop in relation to the direction of data flow on the store loop. For example, each terminal or store controller transmits loop data to the next terminal "down-loop" from its position on the store loop and it receives loop data from the next terminal "up-loop" from its position on the store loop. See *up-loop*.

DTE. Data terminal equipment.

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EAN. European article number.

EIA. Electronic Industries Association. See *EIA interface*.

EIA interface. An industry-accepted interface for connecting devices having voltage related limits.

emulation. (1) The imitation of all or part of one computer system by another, primarily by hardware, so that the imitating system accepts the same data, executes the same programs, and achieves the same results as the imitated computer system. (2) The use of programming techniques and special machine features to permit a computing system to execute programs written for another system.

equipment rack. A metal stand for mounting network components, such as distribution panels and IBM 8228 Multistation Access Units. Synonymous with *rack*.

European article number (EAN). A number that is assigned to and encoded on an article of merchandise for scanning in some countries.

evaluation. Reduction of an expression to a single value.

event. (1) Processing unit containing price changes and item file updates. All records in an event share common characteristics such as type of change and event due date. (2) An occurrence of significance to a task; for example, the completion of an asynchronous operation, such as an I/O operation.

exit. To execute an instruction or statement within a portion of a program in order to terminate the execution of that portion. **Note:** Such portions of programs include loops, routines, subroutines, and modules.

expansion board. In an IBM personal computer, a panel containing microchips that a user can install in an expansion slot to add memory or special features. Synonymous with *expansion card*, *extender card*.

expansion card. Synonym for *expansion board*.

extender card. Synonym for *expansion board*.

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faceplate. A wall-mounted or surface-mounted plate for connecting data and voice connectors to a cabling system.

FCC. Federal Communications Commission.

feature. A part of an IBM product that may be ordered separately by the customer.

Feature Expansion. A card that plugs into an IBM 4683 Point of Sale Terminal and allows additional devices to be used.

Federal Communications Commission (FCC). A board of commissioners appointed by the President under the Communications Act of 1934, having the power to regulate all interstate and foreign communications by wire and radio originating in the United States.

field. On a data medium or a storage medium, a specified area used for a particular category of data; for example, a group of character positions used to enter or display wage rates on a panel.

file. A named set of records stored or processed as a unit. For example, an invoice may form a record and the complete set of such records may form a file. See also *data set*, *data file*.

frame. (1) The unit of transmission in some LANs, including the IBM Token-Ring Network and the IBM PC Network. It includes delimiters, control characters, information, and checking characters. On a token-ring network, a frame is created from a token when the token has data appended to it. On a token bus network (IBM PC Network), all frames including the token frame contain a preamble, start delimiter, control address, optional data and checking characters, end delimiter, and are followed by a minimum silence period. (2) A housing for machine elements. (3) In synchronous data link control (SDLC), the vehicle for every command, every response, and all information that is transmitted using SDLC procedures. Each frame begins and ends with a flag.

franking. Printing an indication on a document that the document has been processed. This franking may be a store header line, a "total" line, or a transaction number that is printed when a check, a discount coupon, or a gift certificate is inserted in the document insert station of the point-of-sale terminal during certain types of transactions.

frequency. The rate of signal oscillation, expressed in hertz (cycles per second).

function. (1) A specific purpose of an entity, or its characteristic action. (2) A subroutine that returns the value of a single variable. (3) In data communications, a machine action such as a carriage return or line feed.

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gateway. A device and its associated software that interconnect networks of systems of different architectures. The connection is usually made above the reference model network layer. For example, a gateway allows LANs access to System/370 host computers. Contrast with *bridge* and *router*.

group. (1) A set of related records that have the same value for a particular field in all records. (2) A collection of users who can share access authorities for protected resources. (3) A list of names that are known together by a single name.

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hardware. Physical equipment as opposed to programs, procedures, rules, and associated documentation.

header. The portion of a message that contains control information for the message such as one or more destination fields, name of the originating station, input sequence number, character string indicating the type of message, and priority level for the message.

hertz (Hz). A unit of frequency equal to one cycle per second. **Note:** In the United States, line frequency is 60Hz or a change in voltage polarity 120 times per second; in Europe, line frequency is 50Hz or a change in voltage polarity 100 times per second.

host computer. (1) The primary or controlling computer in a multi-computer installation or network. (2) In a network, a processing

unit in which resides a network access method. Synonymous with *host processor*.

host processor. (1) In a network, a computer that primarily provides services such as computation, data base access, or special programs or programming languages. (2) Synonym for *host computer*.

Hz. See *hertz*.

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impedance. The combined effect of resistance, inductance, and capacitance on a signal at a particular frequency.

input/output (I/O). (1) Pertaining to a device whose parts can perform an input process and an output process at the same time. (2) Pertaining to a functional unit or channel involved in an input process, output process, or both, concurrently or not, and to the data involved in such a process.

insert. To make an attaching device an active part of a LAN.

integrated. Arranged together as one unit.

integrated disk. An integral part of the processor that is used for magnetically storing files, application programs, and diagnostics. Synonymous with *disk*.

interface. (1) A shared boundary between two functional units, defined by functional characteristics, common physical interconnection characteristics, signal characteristics, and other characteristics as appropriate. (2) A shared boundary. An interface may be a hardware component to link two devices or a portion of storage or registers accessed by two or more computer programs. (3) Hardware, software, or both, that links systems, programs, or devices.

interference. (1) The prevention of clear reception of broadcast signals. (2) The distorted portion of a received signal.

International Organization for Standardization (ISO). An organization of national standards bodies from various countries established to promote development of standards to facilitate international exchange of goods and services, and develop cooperation in intellectual, scientific, technological, and economic activity.

I/O. Input/output.

ISO. International Organization for Standardization.

item. (1) One member of a group. (2) In a store, one unit of a commodity, such as one box, one bag, or one can. Usually an item is the smallest unit of a commodity to be sold.

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jack. A connecting device to which a wire or wires of a circuit may be attached and which is arranged for insertion of a plug.

jumper. A connector between two pins on a network adapter that enables or disables an adapter option, feature, or parameter value.

jumper cable. Synonym for *patch cable*.

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keyboard. A group of numeric keys, alphabetic keys, special character keys, or function keys used for entering information into the terminal and into the system.

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label. Constant, either numeric or literal, that references a statement or function.

LAN. Local area network.

LAN segment. (1) Any portion of a LAN (for example, a single bus or ring) that can operate independently but is connected to other parts of the establishment network via bridges. (2) An entire ring or bus network without bridges. See *cable segment, ring segment*.

layer. (1) One of the seven levels of the Open Systems Interconnection reference model. (2) In open systems architecture, a collection of related functions that comprise one level of hierarchy of functions. Each layer specifies its own functions and assumes that lower level functions are provided. (3) In SNA, a grouping of related functions that are logically separate from the functions of other layers. Implementation of the functions in one layer can be changed without affecting functions in other layers.

leased line. Synonym for *nonswitched line*.

line. On a terminal, one or more characters entered before a return to the first printing or display position.

link. (1) In the IBM 4680 Store System, the logical connection between nodes including the end-to-end link control procedures. (2) The combination of physical media, protocols, and programming that connects devices on a network. (3) In computer programming, the part of a program, in some cases a single instruction or an address, that passes control and parameters between separate portions of the computer program. (4) To interconnect items of data or portions of one or more computer programs. (5) In SNA, the combination of the link connection and link stations joining network nodes. See also *link connection*. **Note:** A link connection is the physical medium of transmission; for example, a telephone wire or a microwave beam. A link includes the physical medium of transmission, the protocol, and associated devices and programming; it is both logical and physical.

link connection. (1) All physical components and protocol machines that lie between the communicating link stations of a link. The link connection may include a switched or leased physical data circuit, a LAN, or an X.25 virtual circuit. (2) In SNA, the physical equipment providing two-way communication and error correction and detection between one link station and one or more other link stations. (3) In the IBM 4680 Store System, the logical link providing two-way communication of data from one network node to one or more other network nodes.

load. In computer programming, to enter data into memory or working registers.

lobe receptacle. In the IBM Token-Ring Network, an outlet on an access unit for connecting a lobe.

local area network (LAN). A computer network located on a user's premises within a limited geographical area. **Note:** Communication within a LAN is not subject to external regulations; however, communication across the LAN boundary may be subject to some form of regulation.

logon (n), log on (v). The procedure for starting up a point-of-sale terminal or store controller for normal sales operations by sequentially entering the correct security number and transaction number. Synonymous with *sign-on, sign on*.

loop. (1) A set of instructions that may be executed repeatedly while a certain condition prevails. See also *store loop*. (2) A closed unidirectional signal path connecting input/output devices to a network.

Loop Wiring Concentrator (LWC). A device that serves as a junction to connect the store loop cable from individual terminals to the store controller.

LWC. Loop Wiring Concentrator.

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magnetic stripe. The magnetic material (similar to recording tape) on merchandise tickets, credit cards, and employee badges. Information is recorded on the stripe for later "reading" by the magnetic stripe reader (MSR) or magnetic wand reader attached to the point-of-sale terminal.

magnetic stripe reader (MSR). A device that reads coded information from a magnetic stripe on a card, such as a credit card, as it passes through a slot in the reader.

magnetic wand reader. A device that reads coded information from a magnetic stripe on merchandise tickets, employee badges, or credit cards.

Mb. Megabit

MB. Megabyte

medium. A physical carrier of electrical or optical energy.

megabit (Mb). A unit of measure for throughput. 1 megabit = 1,048,576 bits.

megabyte (MB). A unit of measure for data. 1 megabyte = 1,048,576 bytes.

megahertz (MHz). A unit of measure of frequency. 1 megahertz = 1,000,000 hertz.

MHz. Megahertz.

modem (MODulator/DEModulator). A device that converts digital data from a computer to an analog signal that can be transmitted in a telecommunication line, and converts the analog signal received to data for the computer.

monitor. (1) A functional unit that observes and records selected activities for analysis within a data processing system. Possible uses are to show significant departures from the norm, or to determine levels of utilization of particular functional units. (2) Software or hardware that observes, supervises, controls, or verifies operations of a system.

monochrome display. See *video display*.

MSR. Magnetic stripe reader.

multistation access unit (MSAU). (1) A lobe concentrator that allows multiple attaching devices access to the ring at a central point such as a wiring closet or in an open work area. In the IBM Token-Ring Network, a wiring concentrator that can connect multiple lobes to a ring network. Synonymous with *access unit*.

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name. An alphanumeric term that identifies a data set, statement, program, or cataloged procedure.

neper. A unit for measuring power. The number of nepers is the logarithm (base e) of the ratio of the measured power level.

NetView. A host-based IBM network management licensed program that provides communication network management (CNM) or communications and systems management (C&SM) services.

NetView Distribution Manager (NetView DM). A component of the NetView family supporting resource distribution within *Change Management*, and providing central control of software and microcode distribution and installation, to processors in a distributed/departmental (SNA) network system. It allows a similar control of user data objects across the network, and provides the facilities to support the remote initiation of command lists.

network. (1) A configuration of data processing devices and software connected for information interchange. (2) An arrangement of nodes and connecting branches. Connections are made between data stations.

network architecture. The logical structure and operating principles of a computer network. See also *systems network architecture (SNA)* and *Open System Interconnection (OSI) architecture*. **Note:** The operating principles of a network include those of services, functions, and protocols.

noise. (1) A disturbance that affects a signal and that can distort the information carried by the signal. (2) Random variations of one or more characteristics of any entity, such as voltage, current, or data. (3) Loosely, any disturbance tending to interfere with normal operation of a device or system.

nonswitched line. (1) A connection between systems or devices that does not have to be made by dialing. Contrast with *switched line*. (2) A telecommunication line on which connection does not have to be established by dialing. Synonymous with *leased line*.

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OCR. Optical character recognition.

OCR reader. A device that reads hand-written or machine-printed symbols into a computing system.

office. See *work area*.

offline. Operation of a functional unit without the control of a computer or control unit.

online. Operation of a functional unit that is under the continual control of a computer or control unit. The term also describes a user's access to a computer using a terminal.

open. (1) To make an adapter ready for use. (2) A break in an electrical circuit. (3) To make a file ready for use.

open circuit. An electrical circuit that has a break in it.

Open Systems Interconnection (OSI). (1) The interconnection of open systems in accordance with specific ISO standards. (2) The use of standardized procedures to enable the interconnection of data processing systems. **Note:** OSI architecture establishes a framework for coordinating the development of current and future standards for the interconnection of computer systems. Network functions are divided into seven layers. Each layer represents a group of related data processing and communication functions that can be carried out in a standard way to support different applications.

Open Systems Interconnection (OSI) architecture. Network architecture that adheres to a particular set of ISO standards that relates to Open Systems Interconnect.

Open Systems Interconnection (OSI) reference model. A model that represents the hierarchical arrangement of the seven layers described by the Open Systems Interconnection architecture.

operating system. Software that controls the execution of programs. An operating system may provide services such as resource allocation, scheduling, input/output control, and data management. Examples are IBM PC DOS and IBM OS/2.

Operating System/2 (OS/2). A set of programs that control the operation of high-speed large-memory IBM personal computers (such as the IBM Personal System/2 computer, Models 50 and above), providing multitasking and the ability to address up to 16 MB of memory. Contrast with *Disk Operating System (DOS)*.

operation. (1) A defined action, namely, the act of obtaining a result from one or more operands in accordance with a rule that completely specifies the result for any permissible combination of operands. (2) A program step undertaken or executed by a computer. (3) An action performed on one or more data items, such as adding, multiplying, comparing, or moving.

operator. (1) A symbol that represents the action being performed in a mathematical operation. (2) A person who operates a machine.

optical character recognition (OCR). The machine identification of printed characters through the use of light-sensitive devices.

optical fiber. A small-diameter strand made from glass and/or polymer that consists of a core surrounded by a lower-index-of-refraction cladding. It guides light from one end to another by a combination of a graded index in the core and internal reflectance.

option. (1) A specification in a statement, a selection from a menu, or a setting of a switch, that may be used to influence the execution of a program. (2) A hardware or software function that may be selected or enabled as part of a configuration process. (3) A piece of hardware (such as a network adapter) that can be installed in a device to modify or enhance device function.

OS. Operating system.

OSI. Open Systems Interconnect.

OS/2. Operating System/2.

overlay. Part of a larger program read into a computer's main memory only when needed. An overlay replaces other portions of the larger program that are no longer needed. The use of overlays reduces the amount of main memory required by a program. An overlay is only supported on the store controller and requires its own copy of the runtime subroutine library.

owner. In relation to files, an owner is the user that creates the file and therefore has complete access to the file.

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page. (1) The portion of a panel that is shown on a display surface at one time. (2) To move back and forth among the pages of a multiple-page panel. See also *scroll*. (3) In a virtual storage system, a fixed-length block that has a virtual address and is transferred as a unit between main storage and auxiliary storage.

panel. The complete set of formatted information that appears in a single display on a visual display unit.

patch cable. A length of cable with data connectors at both ends that is normally used to interconnect two sections of building cable at a patch panel or to connect a product to the building cable. Synonymous with *jumper cable*.

patch panel. An organized concentration of cable terminations, usually mounted in a flat panel, that facilitates the interconnection of communication cables.

path. (1) Reference that specifies the location of a particular file within the various directories and subdirectories of a hierarchical file system. (2) In a network, any route between any two nodes. (3) The route traversed by the information exchanged between two attaching devices in a network. (4) A command in IBM PC DOS and IBM OS/2 that specifies directories to be searched for commands or batch files that are not found by a search of the current directory.

PBX. Private branch exchange.

PC Network. An IBM broadband or baseband LAN with a bus topology in which messages are broadcast from PC Network adapter to PC Network adapter.

permanent virtual circuit (PVC). A virtual circuit that has a logical channel permanently assigned to it at each data terminal equipment (DTE). A call establishment protocol is not required.

personal computer (PC). A desk-top, free-standing, or portable microcomputer that usually consists of a system unit, a display, a monitor, a keyboard, one or more diskette drives, internal fixed-disk storage, and an optional printer. PCs are designed primarily to give independent computing power to a single user and are inexpensively priced for purchase by individuals or small businesses. Examples include the various models of the IBM Personal Computers, and the IBM Personal System/2 computer.

phase. The relative timing (position) of periodic electrical signals.

plug. (1) A connector for attaching wires from a device to a cable, such as a store loop. A plug is inserted into a receptacle or plug. (2) To insert a connector into a receptacle or socket.

point-of-sale terminal. (1) The IBM 4683 Point of Sale Terminal: A unit that provides point-of-sale transaction, data collection, credit authorization, price look-up, and other inquiry and data entry functions. (2) The IBM 4684 Point of Sale Terminal: A unit that provides central processing, point-of-sale transaction, data collection, credit authorization, price look-up, and other inquiry and data entry functions.

point-to-point wiring. A method of wiring a network by which wires are run between terminals or components of the network using the shortest route.

polling characters (address). A set of characters specific to a terminal and the polling operation; response to these characters indicates to the computer whether the terminal has a message to enter.

port. (1) An access point for data entry or exit. See also *medium access port*. (2) A connector on a device to which cables for other devices such as display stations and printers are attached. Synonymous with *socket*.

post. (1) To affix to a usual place. (2) To provide items such as return code at the end of a command or function. (3) To define an appendage routine. (4) To note the occurrence of an event.

POST. Power-On Self Test.

Power-On Self Test (POST). A series of diagnostic tests that are run automatically each time the computer's power is switched on.

primary store controller. The store controller designated to control the store loop under normal conditions.

private branch exchange (PBX). (1) A private telephone exchange, automatic or manual, that provides for the transmission of calls to and from the public telephone network on the user's premises and operated by an attendant supplied by the user. (2) Technology used to interconnect different types of equipment (computer terminals, printers) and exchange different forms of information (data and voice).

problem determination. The process of determining the source of a problem as being a program component, a machine failure, a change in the environment, a common-carrier link, a user-supplied device, or a user error.

PROCEDURE. (1) A sequenced set of statements that may be used at one or more points in one or more computer programs, and that usually has one or more input parameters and yields one or more output parameters. (2) A set of instructions that gives a service representative a step-by-step procedure for tracing a symptom to the cause of failure.

processor. In a computer, a functional unit that interprets and executes instructions.

PS. Presentation space.

public switched (telephone) network (PSN). A telephone network that provides lines and exchanges to the public. It is operated by the communication common carriers in the USA and Canada, and by the PTT Administrations in other countries.

PVC. Permanent virtual circuit.

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rack. Synonym for *equipment rack*.

radio frequency (RF). Any frequency in the range within which radio waves may be transmitted, from about 10 KHz to about 300,000 MHz.

read. To acquire or to interpret data from a storage device, from a data medium, or from another source.

realtime. (1) Pertaining to the actual time during which a physical process occurs. (2) Pertaining to data collected concurrently with physical events, so that the results of the collection operation may be used to influence the sequence of events.

receive. To obtain and store information transmitted from a device.

receptacle. Electrically, a fitting equipped to receive a plug and used to complete a data connection or electrical path. See also *lobe receptacle*.

record. A collection of related items of data, treated as a unit; for example, in stock control, each invoice could constitute one record. A complete set of such records may form a file.

Reference Diskette. (1) A diskette shipped with the IBM Personal System/2 computers with Micro Channel architecture. The diskette contains code and files used for configuration of options and for hardware diagnostic testing. (2) A diskette shipped with the IBM 4684 Point of Sale Terminal. It contains code and files used for configuration of options and for hardware diagnostic testing.

register. (1) A storage area in a computer's memory where specific data is stored. Registers are used in the actual manipulation of data values during the execution of a program. (2) A storage device having a specified storage capacity such as bit, byte, or computer word, and usually intended for a special purpose. (3) In the IBM 4680 Store System, a term that refers to the point-of-sale terminal.

remodulator. In broadband networks, an active device that demodulates inbound information and remodulates it on the higher frequency outbound channel. A remodulator may or may not provide frame error detection and does not amplify inbound noise distortion. It provides network clocking by broadcasting continuous idle when the inbound channel is not transmitting information. Contrast with *translator*.

remove. (1) To take an attaching device off a network. (2) To stop an adapter from participating in data passing on a network.

repeater. In a network, a device that amplifies or regenerates data signals in order to extend the distance between attaching devices.

ring network. A network configuration in which a series of attaching devices is connected by unidirectional transmission links to form a closed path. A ring of an IBM Token-Ring Network is referred to as a LAN segment or as a Token-Ring Network segment.

ring segment. Any section of a ring that can be isolated (by unplugging connectors) from the rest of the ring. A segment can consist of a single lobe, the cable between access units, or a combination of cables, lobes, and/or access units. See *cable segment*, *LAN segment*.

router. An attaching device that connects two LAN segments, which use similar or different architectures, at the reference model network layer. Contrast with *bridge* and *gateway*.

routing. (1) The assignment of the path by which a message will reach its destination. (2) The forwarding of a message unit along a particular path through a network, as determined by the parameters carried in the message unit, such as the destination network address in a transmission header.

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SAA. Systems Application Architecture.

scanner. A device that examines the bar code on merchandise tickets, credit cards, and employee badges and generates analog or digital signals corresponding to the bar code.

scroll. To move all or part of the display image vertically or horizontally to display data that cannot be observed within a single display image. See also *page (2)*.

SDLC. Synchronous Data Link Control.

segment. See *cable segment*, *LAN segment*, *ring segment*.

service clearance. Minimum space required to allow working room for a person installing or servicing a unit.

signal. (1) A time-dependent value attached to a physical phenomenon for conveying data. (2) A variation of a physical quantity, used to convey data.

SNA. Systems Network Architecture.

socket. Synonym for *port (2)*.

source. The origin of any data involved in a data transfer.

splitter. A passive device used at a node to connect two or more branches. The device is coupled inline to a main trunk or branch for splitting the power and information signal two or more ways. A splitter does not amplify or regenerate data signals.

state. See *conversation state*.

station. (1) A point-of-sale terminal that consists of a processing unit, a keyboard, and a display. It can also have input/output devices, such as a printer, a magnetic stripe reader or cash drawers. (2) A communication device attached to a network. The term used most often in LANs is an *attaching device* or *workstation*. (3) An input or output point of a system that uses telecommunication facilities; for example, one or more systems, computers, terminals, devices, and associated programs at a particular location that can send or receive data over a telecommunication line. See also *attaching device*, *workstation*.

store controller. A programmable unit in a network used to collect data, to direct inquiries, and to control communication within a system. In the IBM 4680 Store System, the store controller is an IBM Personal Computer AT

or IBM PS/2 with a Store Loop Adapter feature installed.

store loop. In the IBM 4680 Store System, a cable over which data is transmitted between the store controller and the point-of-sale terminals.

Store Loop Adapter. A hardware component used to connect the loop to a control unit, such as the IBM Personal Computer AT.

switch. On an adapter, a mechanism used to select a value for, enable, or disable a configurable option or feature.

switched line. A telecommunication line in which the connection is established by dialing. Contrast with *nonswitched line*.

synchronous. (1) Pertaining to two or more processes that depend upon the occurrence of a specific event such as a common timing signal.
(2) Occurring with a regular or predictable timing relationship.

synchronous data link control (SDLC). A discipline conforming to subsets of the Advanced Data Communication Control Procedures (ADCCP) of the American National Standards Institute (ANSI) and High-level Data Link Control (HDLC) of the International Organization for Standardization, for managing synchronous, code-transparent, serial-by-bit information transfer over a link connection. Transmission exchanges may be duplex or half-duplex over switched or nonswitched links. The configuration of the link connection may be point-to-point, multipoint, or loop.

system. In data processing, a collection of people, machines, and methods organized to accomplish a set of specific functions. See also *data processing system* and *operating system*.

system configuration. A process that specifies the devices and programs that form a particular data processing system.

Systems Application Architecture (SAA). An architecture developed by IBM that consists of a set of selected software interfaces, conventions, and protocols, and that serves as a common framework for application development, portability, and use across different IBM hardware systems.

Systems Network Architecture (SNA). The description of the logical structure, formats, protocols, and operational sequences for transmitting information units through, and controlling the configuration and operation of, networks. **Note:** The layered structure of SNA allows the ultimate origins and destinations of information, that is, the end users, to be independent of, and unaffected by, the specific SNA network services and facilities used for information exchange.

system unit. (1) A part of a computer that contains the processing unit, and may contain devices such as disk and diskette drives. (2) In an IBM personal computer, the unit that contains the processor circuitry, read-only memory (ROM), random-access memory (RAM), and the I/O channel. It may have one or more disk or diskette drives. (3) In an IBM 4684 terminal, the part of the terminal that contains the processing unit, ROM, RAM, disk and diskette drives, and the I/O channel.

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task. A basic unit of work.

terminal. In data communication, a device, usually equipped with a keyboard and a display, capable of sending and receiving information over a communication channel.

terminal number. A number assigned to a terminal to identify it for addressing purposes.

threshold. (1) A level, point, or value above which something is true or will take place and below which it is not true or will not take place.
(2) In IBM bridge programs, a value set for the maximum number of frames that are not forwarded across a bridge due to errors, before a "threshold exceeded" occurrence is counted and indicated to network management programs. (3) An initial value from which a counter is decremented from an initial value. When the counter reaches zero or the threshold value, a decision is made and/or an event occurs.

till. A tray in the cash drawer of the point-of-sale terminal, used to keep the different denominations of bills and coins separated and easily accessible.

token. A sequence of bits passed from one device to another on the token-ring network that signifies permission to transmit over the network.

It consists of a starting delimiter, an access control field, and an end delimiter. The frame control field contains a token bit that indicates to a receiving device that the token is ready to accept information. If a device has data to send along the network, it appends the data to the token. When data is appended, the token then becomes a frame. See *frame*.

token ring. A network with a ring topology that passes tokens from one attaching device (node) to another. A node that is ready to send can capture a token and insert data for transmission.

token-ring network. (1) A ring network that allows unidirectional data transmission between data stations by a token-passing procedure over one transmission medium so that the transmitted data returns to and is removed by the transmitting station. The IBM Token-Ring Network is a baseband LAN with a star-wired ring topology that passes tokens from network adapter to network adapter. (2) A network that uses a ring topology, in which tokens are passed in a circuit from node to node. A node that is ready to send can capture the token and insert data for transmission. (3) A group of interconnected token rings.

trace. (1) A record of the execution of a computer program. It exhibits the sequences in which the instructions were executed. (2) A record of the frames and bytes transmitted on a network.

transaction. (1) The process of recording item sales, processing refunds, recording coupons, handling voids, verifying checks before tendering, and arriving at the amount to be paid by or to a customer. The receiving of payment for merchandise or service is also included in a transaction. (2) In an SNA network, an exchange between two programs that usually involves a specific set of initial input data that causes the execution of a specific task or job. Examples of transactions include the entry of a customer's deposit that results in the updating of the customer's balance, and the transfer of a message to one or more destination points.

translator. In broadband networks, an active device for converting an inbound channel to a higher frequency outbound channel. The conversion is done by removing the inbound carrier, adding the outbound carrier, and amplifying the signal. (A translator amplifies inbound errors and noise distortion.) Contrast with *remodulator*.

transmission. The sending of data from one place for reception elsewhere.

transmit. To send information from one place for reception elsewhere.

twisted pair. A transmission medium that consists of two insulated conductors twisted together to reduce noise.

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UL. Underwriters Laboratory.

uninterruptible power supply (UPS). A device connected between the electric utility power and a user's equipment. Its output supplies constant electrical power in the event of power line fluctuations or a complete loss of utility power for a limited time.

universal product code (UPC). An encoded number that can be assigned to and printed on or attached to an article of merchandise for scanning.

UPC. Universal product code.

up-loop. The position of a terminal or store controller on the store loop in relation to the direction of data flow on the store loop. For example, each terminal or store controller receives loop data from the next terminal "up-loop" from its position on the store loop and it transmits loop data to the next terminal "down-loop" from its position on the store loop. See *down-loop*.

UPS. Uninterruptible power source.

user. (1) Category of identification defined for file access protection. (2) A person using a program or system.

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variable. (1) A named entity that is used to refer to data and to which values can be assigned. Its attributes remain constant, but it can refer to different values at different times. (2) In computer programming, a

character or group of characters that refers to a value and, in the execution of a computer program, corresponds to an address. (3) A quantity that can assume any of a given set of values.

version. A separate IBM-licensed program, based on an existing IBM-licensed program, that usually has significant new code or new function.

video display. (1) An electronic transaction display that presents visual information to the point-of-sale terminal operator and to the customer. (2) An electronic display screen that presents visual information to the display operator.

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wand. A commercially available device used to read information encoded on merchandise tickets, credit cards, and employee badges.

waveform. The mathematical representation of a wave, especially a graph of deviation at a fixed point versus time.

wideband. Synonym for *broadband*.

wiring concentrator. A unit that allows multiple attaching devices access to the ring at a central point such as a wiring closet or in an open work area. A star-wired ring consists of one or more concentrators connected together to form a ring. See also *access unit*.

work area. An area in which terminal devices (such as displays, keyboards, and printers) are located. Access units may also be located in work areas.

workstation. (1) An I/O device that allows either transmission of data or the reception of data (or both) from a host system, as needed to perform a job: for example, a display station or printer. (2) A configuration of I/O equipment at which an operator works. (3) A terminal or microcomputer, usually one connected to a mainframe or network, at which a user can perform tasks.

world. Category of identification defined for file access protection.

4683-xx1. A point-of-sale terminal in the IBM 4680 Store System that loads and executes programs. A 4683-xx1 can be any of the following models: 4683-001, 4683-A01, 4683-P11, 4683-P21, 4683-P41.

4683-xx2. A point-of-sale terminal in the IBM 4680 Store System that does not load and execute programs, but attaches to a terminal that does. A 4683-xx2 can be either of the following models: 4683-002, 4683-A02.

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