COVER Book Cover

Store Systems:

Technical Reference

Document Number SY27-0336-00

NOTICES Notices

Note
Before using this information and the products it supports, be sure to read the general information under "Notices" in topic FRONT_1. Additional notices begin on page FRONT_1.2.

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First Edition (June 1993)

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FRONT_1 Notices

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FRONT_1.1 Trademarks and Service Marks
FRONT_1.2 Electronic Emission Notices
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FRONT_1.4 Information about Translated Safety Notices

FRONT_1.1 Trademarks and Service Marks

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IBM	PS/2
Proprinter	PC DOS
Personal Computer AT	Personal System/2
OS/2	Operating System/2
NetView	OS/400
AIX	

FRONT_1.2 Electronic Emission Notices

Federal Communications Commission (FCC) Statement

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

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. IBM is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Note: The entire IBM 4680 Store System is designed to operate in a commercial environment. When detached from a store loop, the supported models of the IBM 5170 Personal Computer AT have been type tested and found to comply with the limits for a class B computing device in accordance with the specifications in Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against radio frequency interference in a residential environment.

Canadian Department of Communications compliance statement

This equipment does not exceed Class A limits per radio noise emissions for digital apparatus, set out in the Radio Interference Regulation of the Canadian Department of Communications. Operation in a residential area may cause unacceptable interference to radio and TV reception requiring the owner or operator to take whatever steps are necessary to correct the interference.

Avis de conformité aux normes du ministère des Communications du Canada

Cet équipement ne dépasse pas les limites de Classe A d'émission de bruits radioélectriques pour les appareils numériques, telles que prescrites par le Règlement sur le brouillage radioélectrique établi par le ministère des Communications du Canada. L'exploitation faite en milieu résidentiel peut entraîner le brouillage des réceptions radio et télé, ce qui obligerait le propriétaire ou l'opérateur à prendre les dispositions nécessaires pour en éliminer les causes.

FRONT_1.3 Laser Product Identification

IBM Point of Sale Scanners and the IBM 1520 Hand-Held Scanner are laser products. Where required, the scanner has a label that identifies its classification. The information on the label in the U.S.A. is shown below.

Class II Laser Product -
Avoid Long-Term
Viewing of Direct Light

FRONT_1.4 Information about Translated Safety Notices

The following table provides a listing of translated safety brochures for non-English languages.

Belgium	De Veiligheidsinstructies voor België kunt u vinden in het boekje met het referentienummer: GB11-7869. Vous trouverez les Instructions de Sécurité pour la Belgique dans la petite brochure numéro de référence: GB11-6669.
Canada	Vous trouverez la traduction des consignes de sécurité dans la brochure portant la référence GA09-0521.
Denmark	Sikkerhedsforskrifter for Danmark findes i bogen 4683/4684 POST, nr. G511-2111.
Finland	Suomenkieliset turvaohjeet ovat kirjasessa, GB11-7352.
France	Les notices de sécurité traduites se trouvent dans la brochure GA11-0734 (pour la France).
Germany	Die Sicherheitshinweise befinden sich im "Handelssystem IBM 4680/IBM 4684 Sicherheitshinweise", Teilenummer 25F6466.
Italy	Gli avvisi di sicurezza tradotti si trovano nel manuale di sicurezza, codice GA13-1531.
Norway	Du finner oversatte sikkerhetsmeldinger i håndboken 4683/4684 Kassaterminal, Sikkerhetsinformasjon, GA15-4011.
Portugal	Poderá encontrar as indicaç¦es de segurança traduzidas no manual de indicaç¦es de segurança do seu país, GS88-0012.
Spain	Puede encontrar las notas de seguridad traducidas en el manual de notas de seguridad de su país, GA10-8943.
Sweden	Svenska översättningar av varningstexterna finns i handboken *Säkerhetsföreskrifter*, GA14-2676.

PREFACE Preface

This manual is designed for service support personnel to use as a source of technical reference information about the:

- IBM 4693 Point of Sale Terminals
- IBM 4684 Point of Sale Terminals
- IBM 4683 Point of Sale Terminals
- Point of Sale Terminal I/O Devices
- Store Loop (Wiring and Theory of Operation)
- Cable Diagrams

Note: This manual is not intended to be used as an entry point for problem determination or general repair procedure information.

Problem determination should begin in the *Problem Determination Guide* or the *Hardware Service Manual* for your particular point-of-sale terminal or store system operating system.

Subtopics

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

PREFACE.1 Store System Libraries

IBM 4693 Point of Sale Terminals

IBM 4693 Point of Sale Terminals: Introduction and Planning Guide - SA27-3977

IBM 4693 Point of Sale Terminals: Configuration and Operation Guide - SA27-3978

IBM 4693 Point of Sale Terminals: Setup Instructions - P/N 73G1012

IBM 4693 Point of Sale Terminals: Quick Reference Card - P/N 73G1022

IBM 4693 Point of Sale Terminals: Maintenance Summary - SX27-3919

IBM 4693 Point of Sale Terminals: Hardware Service Manual - SY27-0337

IBM Store Systems: Hardware Service Manual for Input/Output Devices - SY27-0339

IBM 4693/4684/4683 Point of Sale Terminals: Parts Catalog - S131-0097

IBM 4683/4684 Point of Sale Terminals

IBM 4683 Point of Sale Terminal: Installation Guide - SA27-3783

IBM 4684 Point of Sale Terminal: Installation Guide - SA27-3837

IBM 4684 Point of Sale Terminal: Introduction and Planning Guide - SA27-3835

IBM 4684 Store Loop Adapter/A: Installation, Testing, Problem Determination, and Technical Reference - SD21-0045

IBM 4683/4684 Point of Sale Terminal: Operations Guide - SA27-3704

IBM 4680 Store System and IBM 4683/4684 Point of Sale Terminal: Problem Determination Guide - SY27-0330

IBM 4684 Point of Sale Terminal: Maintenance Summary Card - SX27-3885

IBM 4680 Store System: Terminal Test Procedures Reference Summary - GX27-3779

IBM 4683/4684 Point of Sale Terminal: Maintenance Manual - SY27-0295

IBM Store Systems: Hardware Service Manual for Input/Output Devices - SY27-0339

IBM 4693/4684/4683 Point of Sale Terminals: Parts Catalog - S131-0097

IBM 4680 Store System Library

IBM 4680 Store System: Planning and Configuration Guide - GC30-3532

IBM 4680 Store System: Selecting Hardware and Software Components - GA27-3691

IBM 4680 Store System: Preparing Your Site - GA27-3692

IBM 4680 BASIC: Language Reference - SC30-3356

IBM 4680 Store System: User's Guide - SC30-3518

IBM 4680 Store System: Display Manager User's Guide - SC30-3404

IBM 4680 Store System: Programming Guide - SC30-3517

IBM 4680 Store System: Terminal Test Procedures Reference Summary - GX27-3779

IBM 4680 Store System and IBM 4683/4684 Point of Sale Terminal: Problem Determination Guide - SY27-0330

IBM Personal System/2 Store Loop Adapter/A: Installation and Setup Instructions - SK2T-0318

IBM 4680 Store System: Messages Guide - SC30-3521

IBM Store Systems: Hardware Technical Reference - SY27-0336

IBM 4690 Store System Library

IBM 4690 Store System: Planning, Configuration, and Installation Guide

- SC30-3600

IBM 4690 Store System: Programming Guide - SC30-3602

IBM 4690 Store System: User's Guide - SC30-3597

IBM 4690 Store System: Communications Programming Reference - SC30-3582

IBM 4690 Store System: Messages Guide - SC30-3598.

PREFACE.2 Store System Related Publications -- Software

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 Point of Sale Subsystem/DOS: Programming Reference - SC30-3621

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 - 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

PREFACE.3 Store System Related Publications -- Hardware

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 4696 Point of Sale Scanner Scale: Physical Planning, Installation, and Operation Guide - GA27-3965

IBM 4696 Point of Sale Scanner Scale: Maintenance Manual - SY27-0333

IBM Personal Computer and IBM Personal System/2

IBM Guide to Operations - Personal Computer/AT - 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

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IBM Cabling System Catalog - G570-2040

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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 - 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

1.0 Topic 1. 4693 General Description

This topic contains a general description of the 4693 point-of-sale system.

Subtopics

1.1 General Description of the 4693 Point of Sale Terminals
1.2 Model 202 System Unit Description
1.3 PS/2 Option Adapter Support
1.4 PS/2 I/O Support
1.5 POS I/O Support
1.6 Operating System Software Compatibility

1.1 General Description of the 4693 Point of Sale Terminals

The following 4693 point-of-sale terminal models are available. The models are similar in appearance and can attach the same type of I/O devices.

- Single byte character set: 541, 421, 321, 202
- Double byte character set: 551, 431, 331, 212 **(Distributed by World Trade only.)**

The single byte character set models provide 38 V dc and the double byte character set models provide 24 V dc for their attached single byte or double byte I/O devices.

This manual discusses only the single byte character set models 541, 421, 321 and 202.

All models can, under software control, perform the functions necessary to process point-of-sale transactions including data collection, credit authorization, price lookup, and communication with a host processor or other systems. They can also handle general business and administrative operations.

Subtopics
1.1.1 Available Models
1.1.2 Features
1.1.3 Memory Subsystem Features
1.1.4 Port, Interface, and Storage Devices
1.1.5 Power Subsystem Features
1.1.6 Internal System Loads
1.1.7 Controls and Indicators for Models 541, 421, and 321
1.1.8 Security Features

1.1.1 Available Models

All models of the 4693 employ the modular design approach of the 4680 System with a distributed I/O architecture. All I/O devices are cable attached to the main processing unit, called the system unit. These devices can be arranged on the top of the system unit, or on top of a cash drawer, to appear as an integrated terminal, or located remotely up to 3.8m (12 ft.) away. All of the point-of-sale devices, except the cash drawer, communicate with the system unit using a 2-wire RS-485 interface with the serial input/output communication (SIOC) interface protocol.

Model 541: This model functions at the high end of the 4693 family. It can function both as a store controller and as a point-of-sale terminal. It can provide store controller support for other Model 541 terminals and for Model 421 terminals. It provides power to attached I/O devices and can provide point-of-sale support for one cable-attached Model 202.

Model 541 contains:

- 486SLC2 processor
- Logic circuitry and the power supply
- An I/O attachment panel (tailgate) for connecting point-of-sale devices
- Card sockets for installing four IBM PS/2 option adapters
- Video - standard
- An optional diskette drive for 2.88 MB 3-1/2 inch diskettes
- Optional 80, 160, or 250 MB 2-1/2 inch fixed disk drives

Model 421: Similar to the Model 541, Model 421 functions as an intelligent point-of-sale terminal, providing power to its own attached (I/O) devices, and can provide point-of-sale support for one cable-attached Model 202 terminal.

Model 421 contains:

- 386SLC2 processor
- Logic circuitry and the power supply
- An I/O attachment panel (tailgate) for connecting point-of-sale devices
- Card sockets for installing two IBM PS/2 option adapters
- Video - standard

Model 321: This model functions as an intelligent point-of-sale terminal, providing power to its own attached (I/O) devices, and can provide point-of-sale support for one cable-attached Model 202 terminal.

Model 321 contains:

- 386SX processor
- Logic circuitry and the power supply
- An I/O attachment panel (tailgate) for connecting point-of-sale devices
- Card sockets for installing two IBM PS/2 option adapters
- Video - optional

Model 202: As the non-intelligent model or the satellite terminal, Model 202 is dependent on a Model 541, a Model 421, or a Model 321 for operation. Each of the other models provide a satellite socket as a standard feature.

The Model 202 does not provide for any feature expansion capabilities for video. It does provide two RS-232C ports as a standard feature.

1.1.2 Features

Features of the 4693 include:

- Front access to internal components

  The internal components of the system unit can be easily installed or removed from the front of the system unit. This allows easy installation of features after system installation with minimal disturbance to the checkout stand.

- IBM Personal System/2 compatibility

  Applications written for a Personal System/2 should run with no change on Models 541, 421, and 321 assuming that operating system I/O configuration requirements are met.

- Programmable power control

  The 4693 family of terminals provide a programmable power control feature that allows the end user, under software control, to turn off the system and power back on at pre-determined times.

- Support for 4683 and 4684 I/O devices

  All models of the 4693 support many of the I/O devices used on the 4683 and 4684 terminals.

- Store networking

  The 4693 family supports token-ring, baseband, store loop, and Ethernet network architectures.

- Integrated features

  Models 541, 421, and 321 provide ports for video (optional on Model 321), two RS-232C ports, PS/2 keyboard, auxiliary input device (mouse, touchscreen), one parallel interface device, and RS-485 attached point-of-sale I/O. The point-of-sale ports allow attachment of devices such as cash drawers, scanners, displays, keyboards, and printers.

- Totals retention

  Model 541, 421, and 321 provide 36 KB nonvolatile random access memory for operating system and application use as totals retention. This memory area is powered by a 10-year battery.

  Model 202 provides 28 KB nonvolatile random access memory.

- Host independence

  Model 541 does not require a host system although it supports host communications.

- Media support

  Model 541 supports media. A 3-1/2 inch diskette and 2-1/2 inch small computer system interface (SCSI) fixed disk drives are optional.

1.1.3 Memory Subsystem Features

The Models 541, 421, and 321 use the following types of memory:

- Read-only memory (ROM)
- Random access memory (RAM)
- Nonvolatile random access memory (NVRAM)

Subtopics
1.1.3.1 ROM Subsystem
1.1.3.2 RAM Subsystem
1.1.3.3 NVRAM
1.1.3.4 Memory Map

1.1.3.1 ROM Subsystem

The ROM subsystem consists of 256 KB of physical memory mapped in two 128 KB pages. It is located at the top of the first and optionally at the last 1 MB of address space at power on time. The ROM is socketed.

Once power-on self test (POST) verifies proper functioning of the system RAM, the basic input/output system (BIOS) microcode is copied from ROM to RAM for faster BIOS operation (shadow ROM). The shadow RAM feature cannot be disabled.

1.1.3.2 RAM Subsystem

All system boards have two single inline memory module (SIMM) sockets for low power SIMMs. Each socket has the capability of supporting a 2 MB, 4 MB, or 8 MB low power SIMMs. With two 8 MB SIMMs installed, the maximum usable memory is 15999 KB. Refer to Figure 1 for the system memory map.

Note: Models 541 and 421 do not support standard PS/2 memory SIMMs or PS/2 memory option adapters in the PS/2 adapter slots.

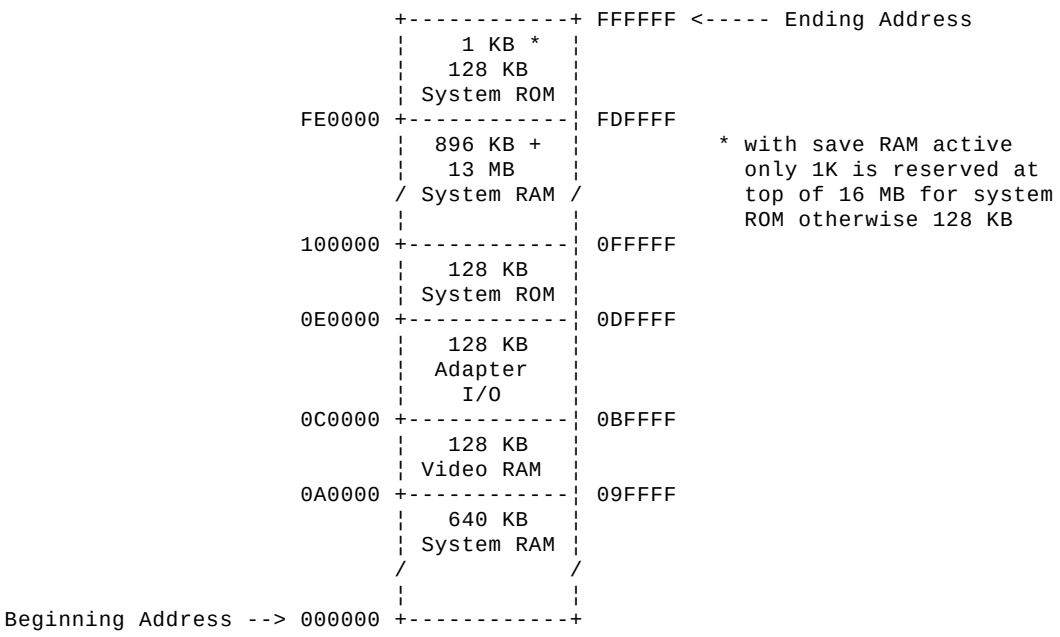


Figure 1. Model 541 and 421 Memory Map

1.1.3.3 NVRAM

Models 541, 421, and 321 each have 40 KB NVRAM. 32 KB is in the NVRAM section and 8 KB is included in the real time clock (RTC) chip. 4 KB is reserved for by hardware system.

1.1.3.4 Memory Map

Refer to Figure 2 for the SIOC subsystem memory map for adapter memory space usage.

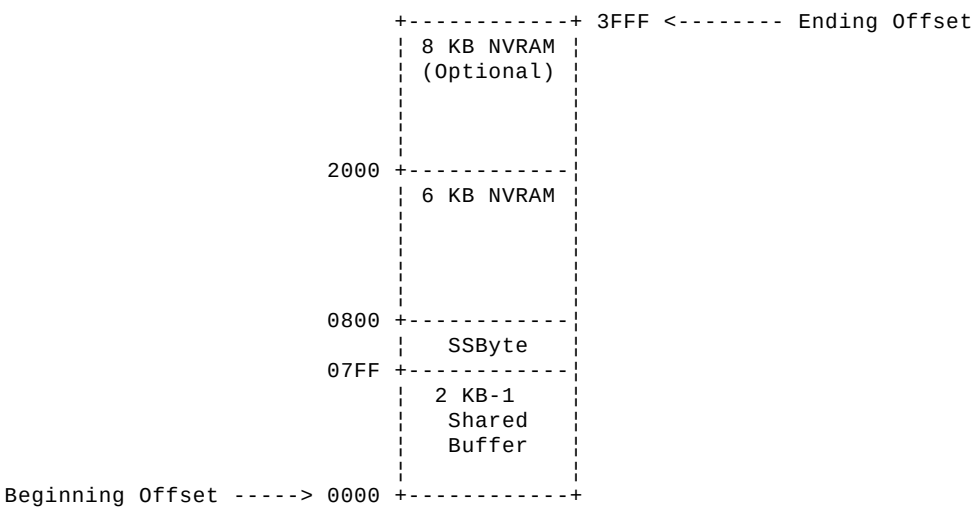


Figure 2. 4693 SIOC Subsystem Memory Map

The base address is configurable to any of the following addresses:

- 0C0000
- 0C8000
- 0D0000
- 0D8000

1.1.4 Port, Interface, and Storage Devices

Subtopics
1.1.4.1 PS/2 Keyboard/Aux Device
1.1.4.2 Video Support
1.1.4.3 Type 4 Serial (Asynchronous) Port
1.1.4.4 Parallel Port
1.1.4.5 Point of Sale I/O Device Channel (SIO/CD) Interface
1.1.4.6 Diskette Drive Interface
1.1.4.7 Type 2 Controller SCSI Subsystem
1.1.4.8 DASD Support (Model 541 only)

1.1.4.1 PS/2 Keyboard/Aux Device

Models 541, 421, and 321 provide attachment support for one PS/2 keyboard and one auxiliary device such as a pointing device. The connector pinout assignments are detailed in Table 1.

Table 1. Keyboard/Aux Device Pinout Assignments (x2).

Pin	**Signal**
1	data
2	reserved
3	ground
4	+5 V dc
5	clock
6	reserved

1.1.4.2 Video Support

Models 541 and 421 use the Speedway ISO chipset for super video graphics array adapter (SVGA) video support. The subsystem is capable of providing high resolution modes up to 1024x768x16 and extended modes up to 1053x768x16. The connector pinout is detailed in Table 2.

Video support is available in Model 321 with the SVGA video adapter option.

Table 2. Video Display Pinout Assignments

Pin	Planar Output	Monochrome	Color
1	red	no pin	red
2	green	mono	green
3	blue	no pin	blue
4	ID bit 2	no pin	no pin
5	digital ground	self test	self test
6	red return	dummy pin	red return
7	green return	mono return	green return
8	blue return	no pin	blue return
9	plug	no pin	no pin
10	digital ground	digital ground	digital ground
11	ID bit 0	no pin	digital ground
12	ID bit 1	digital ground	no pin
13	hsync	hsync	hysnc
14	vsync	vsync	vysnc
15	ID bit 3	no pin	no pin

Note: Red, green, blue return are analog grounds. Digital ground is for sync returns and self test. ID bit 0-3 is monitor ID bits.

1.1.4.3 Type 4 Serial (Asynchronous) Port

Models 541, 421, and 321 provide serial communication ports for asynchronous data transfers up to 345.6K bits per second. Data transfers to/from the serial ports may be via PIO or DMA with programmable arbitration levels. The external interface uses a standard 9-pin "D" shell connector and pinout defined for RS-232C.

The serial ports are designated Serial A and Serial B for identification. The connector pinout assignments are detailed in Table 3.

Table 3. Serial Port Pinout Assignments (x2)

Pin	Signal Name	Signal Direction
1	Data Carrier Detect	In (to DTE)
2	Receive Data	In
3	Transmit Data	Out (to DCE)
4	Data Terminal Ready	Out
5	Signal Ground	Common
6	Data Set Ready	In
7	Request to Send	Out
8	Clear to Send	In
9	Ring Indicator	In

1.1.4.4 Parallel Port

Models 541, 421, and 321 provide an enhanced parallel interface port that allows bidirectional output. The interface supports level sensitive interrupts with readable interrupt pending status. In addition, the parallel port may be configured for DMA operation with programmable arbitration levels. The connector pinout assignments are detailed in Table 4.

Table 4. Parallel Port Pinout Assignments

Pin	**Signal Name**
1	-Strobe
2	+Data bit 0
3	+Data bit 1
4	+Data bit 2
5	+Data bit 3
6	+Data bit 4
7	+Data bit 5
8	+Data bit 6
9	+Data bit 7
10	-Acknowledge
11	+Busy
12	+P End (out of paper)
13	+Select
14	-Auto feed
15	-Error
16	-Initialize printer
17	-Select input
18-25	Ground

1.1.4.5 Point of Sale I/O Device Channel (SIO/CD) Interface

The POS I/O device channel interface, also known as the serial I/O/cash drawer (SIO/CD) interface, provides connectivity for the POS I/O devices, including cash drawers. It also provides the ability to attach a Model 202 with associated I/O up to 150m (492 ft.). This feature is integrated on the system board on all models and appears as installed in PS/2 option adapter slot 5 with POSID 'FFE2'. This feature can be disabled.

1.1.4.6 Diskette Drive Interface

A diskette drive interface is provided on the system board. A 1.44 or 2.88 MB 1-inch slimline diskette drive is optional and is field installable. The diskette drive is located behind the front access panel on the system unit. The diskette opening can be locked by the system unit cover lock to prevent insertion or removal of a diskette. The specifications for the diskette drive are shown in Table 5. Model 541 is enabled to support the PS/2 removable media security diskette drive subsystem.

Table 5. 4.0 MB 3.5-inch Diskette Drive

Specification	**1.0 MB Mode**	**2.0 MB Mode**	**4.0 MB Mode**
Unformatted capacity	1.0 MB/diskette	2.0 MB/diskette	4.0 MB/diskette (4.0 MB Drive Only)
Formatted capacity	720 KBytes/diskette	1.44 MB/diskette	2.88 MB/diskette
Track density	135 TPI (tracks/inch)	135 TPI (tracks/inch)	135 TPI (tracks/inch)
Number of tracks	80 (00-79) per side	80 (00-79) per side	80 (00-79) per side
Number of heads	2	2	2
Data rate	250 Kbits/sec	500 Kbits/sec	1.0 MBits/sec
Access Time:			
Track to track	3 msec maximum	3 msec maximum	3 msec maximum
Head settle time	15 msec maximum	15 msec maximum	15 msec maximum
Single track access	18 msec maximum	18 msec maximum	18 msec maximum
Rotation Speed	300 RPM ±1.5%	300 RPM ±1.5%	300 RPM ±1.5%

Note: For more detailed information, refer to Engineering Specification P/N 5897662, *2.0 MB--3.5-inch Flexible Diskette Drive, 1 Inch High*. or Engineering Specification P/N 5897633, *4.0 MB--3.5-inch Flexible Diskette Drive, 1 Inch High*.

1.1.4.7 Type 2 Controller SCSI Subsystem

Model 541 provides SCSI subsystem support for two internally mounted drives. Terminators are included on the system board so external terminators are not required. Model 541 does not provide an external SCSI port for attaching additional SCSI devices. Additional SCSI devices can be attached by installing a PS/2 SCSI option adapter in an available option adapter slot. A diskette drive is required with a fixed disk drive.

Model 541 supports the 80 MB and 160 MB, 2½ inch fixed disk drives. Factory installed drives are pre-configured by location. The first drive is always located in the left position when viewed from the front. This drive is assigned SCSI ID 6, LUN 0. The second drive is assigned SCSI ID 5, LUN 0. The SCSI ID numbers can be changed using the reference diskette utilities. The selectable boot drive feature is also supported which allows selection of the default drive. The default boot drive is the diskette drive followed by the drive with SCSI ID 6.

The first fixed disk drive has the system partition that contains the reference diskette function. The system partition uses 3 MB of available disk space.

The file characteristics are detailed in Table 6.

Table 6. 2 1/2-inch Fixed Disk Drive Specifications

Type	**80 MB**	**160 MB**
BIOS Capacity	80 MB	160 MB
Bytes/Sector	512	512
Sectors/Track	47+1	47+1
Number of Heads	1	2
Number of Disks	1	1
Media Data Rate (Mbits/sec)	16.2/24.0	16.2/24.0

1.1.4.8 DASD Support (Model 541 only)

Model 541 accommodates two internally mounted 2½" fixed disk drives and one 25mm (1-in.) high diskette drive. Model 541 also supports medialess configurations.

1.1.5 Power Subsystem Features

Subtopics
1.1.5.1 Programmable Power Control/RAM Retention
1.1.5.2 System States
1.1.5.3 Battery Operation
1.1.5.4 Battery Performance
1.1.5.5 Power Supply Description
1.1.5.6 Power Supply Output Voltages and Currents
1.1.5.7 Auxiliary Power Source Requirements

1.1.5.1 Programmable Power Control/RAM Retention

Models 541, 421, and 321 provide programmable power control capability. Unlike the 4683 and 4684 terminals, power state changes are now controlled by hardware logic. This allows software to control machine operating state without the use of a mechanical switch. For example, an application can instruct a terminal to power off and either set a timer (alarm clock feature) or allow a ring indicate signal on one of the base RS-232C ports to power back on.

Note: The RAM retention feature is only supported by 4690 OS and SDOS.

Models 541, 421, and 321 include a memory subsystem to provide a feature similar to the 4683 that allows the terminal to be non-operational yet retain the program load in memory. As long as AC or battery power is available to the system, power is provided to the memory subsystem. With the proper operating system support, this feature allows the system to have an "instant on" mode by eliminating the need to reload the operating system and application during each power sequence. For Model 541, the operating system is given control within 15 seconds of restoration of power and within 10 seconds for Model 421 and Model 321.

When the terminal is in a non-operational mode (that is, not ON), the memory retention feature does ***not*** power the installed PS/2 option adapters. Therefore, the 4693 does not support memory added with PS/2 memory option cards. Whenever the terminal is powered ON from a non-operational state (for example, as standby or backup), the microchannel bus is reset.

1.1.5.2 System States

The terminal has two basic modes, operational and non-operational. The operational mode is defined as a fully functioning system with power applied to the attached I/O devices. The non-operational mode appears as non-functioning. The non-operational mode has five different states plus two fault conditions depending on the hardware and software conditions which are defined in Table 7.

Table 7. System States

State	**AC**	**+5CONT**	**+5PPC**	**+5LM**	**Main Converter**	**Ready LED**	**O/T LED**	**O/C LE**
ON Fully Operational	Present	ON	ON	ON	ON	ON	OFF	OFF
POWER DOWN Mem Ret disabled or battery power absent	Absent	OFF	OFF	OFF	OFF	OFF	OFF	OFF
INTERLOCK SHUTDOWN Interlock or battery absent	Absent or Present	ON	ON	OFF	OFF	ON	OFF	OFF
OFF Mem retention disabled	Present	ON	ON	OFF	OFF	OFF	OFF	OFF
BACKUP Mem Retention Enabled, battery power present	Absent	ON	OFF	ON	OFF	OFF	OFF	OFF
STANDBY Mem Retention Enabled	Present	ON	ON	ON	OFF	OFF	OFF	OFF
Overtemperature	Present	ON	ON	OFF	OFF	OFF	ON	OFF
Overcurrent	Present	ON	ON	OFF	OFF	OFF	OFF	ON

1.1.5.3 Battery Operation

If the RAM retention function is enabled and AC power is removed, the memory is preserved when battery power is available. There are two battery capacity options: 500 milliamp hour (mah) and 3600 mah. Actual discharge time depends on battery capacity, state of charge of the battery, and memory installed on the system board. The system automatically disconnects the battery when voltage drops below 5 V, protecting the battery from deep discharges. The battery also contains a positive temperature coefficient (PTC) switch to guard against direct shorts on the battery.

The battery is located behind the front customer service cover. It does not require any tools to install or remove and is readily accessible without disturbing the system components. Once the warranty period has expired, the batteries are a customer maintenance item. Batteries have a two year shelf life and should not be purchased in bulk as spares. No provision for testing the battery is available except through actual use.

Note: These batteries are nickel-cadmium type composition. Because of country laws, these batteries require special disposal procedures according to local country regulations. Batteries cannot be disposed in landfills.

1.1.5.4 Battery Performance

The battery is rated for 4 years or 1000 recharge cycles whichever comes first when used in typical environments (25°C). Recharge time is 6 hours for the 500 mah battery and 23 hours for the 3600 mah battery. Battery performance is reduced by 20% when used at the upper supported ambient environments (40°C).

Refer to Table 8 for retention times at 25°C based on memory configurations.

Table 8. Battery Run Times by Memory Configuration at 25°C

Memory Size	**500 mah Battery**	**3600 mah Battery**
2 MB - 10 MB	5 Hours	36 Hours

1.1.5.5 Power Supply Description

Power requirements are supplied by a 177 Watt, 4 output level switching regulated power supply. It provides a +38 V dc output for the printers and cash drawers for the 4683/4684 family.

It is available in two voltage ranges. The low voltage nominal input range is 100-127 V rms and the high nominal input range is 200-240 V rms. For more detailed information refer to *177 Watt +38 V dc Version Multi-Output Power Supply Specification*, P/N 74F6263.

AC input is applied through an appliance coupler per IEC 320 Sheet C14. AC input protection is provided by a non-replaceable fuse located internal to the power supply. A convenience outlet, per IEC 320-2-2 Sheet F, is provided for the attachment of a supported monitor. The power to the convenience outlet is controlled by the Mode Control switch and is fused for overcurrent protection with an externally accessible fuse. The fuse rating for low voltage applications is 2.5 A, 250 V Time Delay (1.25-inch x .25 inch) and for high voltage applications 2.5 A, 250 V IEC12 /Sheet III Time Lag (5mm x 20mm).

Note: Only supported video displays should be attached to the convenience outlet. Attachment of any other devices, including power strips, **violates safety certifications**.

The power supply also provides overtemperature, overvoltage, and overcurrent protection. The power supply resets to normal operation if the fault is removed and the Mode Control switch cycled. In addition, the power supply illuminates indicator lights identifying overtemperature and overcurrent conditions.

1.1.5.6 Power Supply Output Voltages and Currents

Table 9. Output Voltage and Load Current Distribution

Output Level (V)	Nominal Voltage (V)	Tolerance %	Maximum Current (A)	Minimum Current (A)	Ripple (pk-pk mV)
+5L	5.000	+5, -4	12.000	0.250	50
+12L	12.000	+5, -4	0.800	0.020	100
-12L	-12.000	+5, -4	0.350	0.120	240
+5SDL	5.000	+5, -2	2.600	0.200	50
+12SDL	12.000	+5, -4	2.600	0.000	100
+38SDL	38.000	+8, -8	1.300	0.000	600
+5LM	5.000	+5, -4	1.200	0.000	50
+5PPC	5.000	+5, -4	0.070	0.000	50
+5CONT	5.000	+5, -4	0.230	0.000	50
+BATTERY	7.250	4.9 V dc - 7.5 V dc	0.240	0.055	100

1.1.5.7 Auxiliary Power Source Requirements

AC input power may be provided by a back-up power source. This may be accomplished using an auxiliary power source such as a motor generator or uninterruptible power source (UPS). Refer to Table 10 for requirements for a backup power source.

Table 10. Electrical Power Requirements for Standby Power Supply

Features of a Standby Power Supply	**Requirements of the 4693 Point-of-Sale Terminals**	
rms Voltage Output	100-127 V AC ±5 V AC	200-240 V AC ±10 V AC
Waveform:	Sinewave approximation. A squarewave is acceptable if the peak voltage requirements are met. (Peak voltage is to be =128 V AC.)	
Harmonic content	<10%	<10%
Output frequency	60 Hz ±3	50 Hz ±3
Transfer time (length of interruption to the critical load)	=10 milliseconds	=10 milliseconds
Transfer threshold when switching from utility power to standby power supply	96 to 104 V AC	192 to 208 V AC
Transfer threshold when switching from standby power supply to utility power	=104 V AC	=208 V AC
Overcurrent protection:	Current limiting circuitry (output should remain stable)	
Battery:	Sealed lead acid, maintenance-free is recommended	

1.1.6 Internal System Loads

The system unit provides power for the internal DASD and microchannel cards per Table 11.

Table 11. Internal DC Loads. Loads are listed in milliamps.

Load	**+5VL**	**+12VL**	**-12VL**	**+5LM**	**+5PPC**	**+5CONT**	**+BATTERY**
System Board (inc. SCSI logic)	3750	40	40	1200	40	230	240
Fan	0	0	150	0	0	0	0
MCA Cards per slot	1600	175	40	0	0	0	0
Diskette Drive 1.44 MB/2.88 MB	600	0	0	0	0	0	0
Fixed Disk Drive, 2½" per device (operating)	600	0	0	0	0	0	0

Subtopics
1.1.6.1 System Operation Interlock

1.1.6.1 System Operation Interlock

An access interlock is provided to prevent the removal of logic cards or power supply when the terminal is operational or ram retention (+5LM) active. This is to prevent hot-plugging of system board, possibly causing damage.

This interlock is accomplished by a sequential disassembly procedure. The power supply or logic cards cannot be removed without removing the battery or the interlock connector (for systems without batteries such as the Model 202 or some Model 541s). If the terminal is still on, when the battery or the interlock connector is removed, the system powers down and the memory retention voltage to the terminal system board (+5LM) is removed.

Note: The terminal does not operate without the battery or the interlock installed in the power supply. However, the battery does not have to be 'good' in order for the terminal to operate.

1.1.7 Controls and Indicators for Models 541, 421, and 321

The operator access areas for Models 541, 421, and 321 are shown in Figure 3 and Figure 4. This area is accessible by opening the front access door on the front of the terminal. Refer to Table 12 for the relationships between system state and indicator status.

Note: No method is provided to test the LEDs for proper operation.

Mode Control Switch: A single white momentary contact pushbutton located behind the access door on the front of the terminal. Switch actuation causes the terminal to toggle between the ready and non-ready modes. There is a marking adjacent to the switch (open circle, ISO/DIS-6329) to identify this control.

Ready Indicator: A green LED located adjacent to the Mode Control switch indicates the operational status of the terminal. When the indicator is illuminated, the power is applied to the terminal including I/O for normal operation. When the indicator is off, the terminal is not operational.

Fixed Disk Drive Access Indicator: A yellow LED to the right of the Ready indicator indicates fixed disk drive access activity when illuminated. There is a marking adjacent to the LED to identify this indicator. In Model 541 without a fixed disk drive, this indicator is present but non-functional.

System Board Good Indicator: A green LED with a numeral '1' marked adjacent to it indicates the state of the system board. After completion of power-on self tests (POST), with no errors detected on the system board, this indicator is illuminated.

Power Supply Good Indicator: A green LED with a numeral '2' marked adjacent to it indicates the state of the power supply. When the indicator is illuminated, AC is available to the terminal and the power supply is good (not defective). This control is provided to help isolate problems between the system board and the power supply.

Overtemperature Indicator: A yellow LED with a numeral '2' marked adjacent to it indicates a terminal overtemperature condition. When an overtemperature condition is detected, the indicator is illuminated and the power supply is shutdown except for the power supply control circuitry. The temperature sensing element and the circuitry to initiate the power supply shutdown and LED illumination is located within the power supply. After the overtemperature condition is corrected, actuating the Mode Control switch resets the power supply overtemperature circuit and changes the state to operational.

Overcurrent Indicator: A yellow LED with a numeral '4' adjacent to it indicates an overcurrent (external to the power supply) condition. The indicator is illuminated when an overcurrent condition is detected and is controlled by the control voltage circuitry in the power supply. After the overcurrent condition is corrected, actuating the Mode Control switch resets the power supply overcurrent circuit.

Reset Switch: A momentary contact pushbutton switch is located in a recess on the operator panel access door provides a method to reset the hardware to a known state. An adjacent symbol identifies the Reset switch. Actuating the switch causes a non-maskable interrupt (NMI) to be generated. The system's handling of the NMI depends on the system's state when the NMI occurs:

- If the system is not operational, power is removed to the memory subsystem (disable RAM retention) and disables any programmed power on condition.
- If the actuation occurs during POST when the indicator on the cursor is on the right side of the display (video or POS display), the system is reset to a default state (NVRAM is cleared) and the reference diskette is automatically invoked.
- If the system is operational, without software trapping of the interrupt, the system performs a warm boot procedure.

Mechanical Keylock (Model 541 only): The keylock is available as a feature to provide security for diskette drive media and fixed disks.

When the keylock is in the locked position, a flag is extended across the diskette media slot which prevents insertion or removal of media. The keylock also prevents removal of the system unit front access cover. This prevents access to the interior and provides security to data on the fixed disk drive.

Table 12. Indicator Matrix

State	AC	Main Power Converter	Ready Indicator	System Board Good Indicator	Power Supply Good Indicator	O/T Indicator	O/C Indicato
ON Fully Operational	Present	ON	ON	ON	ON	OFF	OFF
POWER DOWN Mem Ret disabled, battery power absent	Absent	OFF	OFF	OFF	OFF	OFF	OFF
INTERLOCK SHUTDOWN Interlock or battery absent	Absent or Present	ON	ON	OFF	OFF	ON	OFF
OFF Mem retention disabled	Present	OFF	OFF	ON	ON	OFF	OFF
BACKUP Mem Retention Enabled, battery power present	Absent	OFF	OFF	OFF	OFF	OFF	OFF
STANDBY Mem Retention Enabled	Present	OFF	OFF	ON	ON	OFF	OFF
Overtemperature	Present	OFF	OFF	OFF	OFF	ON	OFF
Overcurrent	Present	OFF	OFF	OFF	OFF	OFF	ON

PICTURE 1

Figure 3. Model 541 Operator Access Area with Access Door Open

PICTURE 2

Figure 4. Models 421 and 321 Operator Access Area with Access Door Open

PICTURE 3

Figure 5. Model 541 Rear I/O Connector Panel Area

PICTURE 4

Figure 6. Model 421 Rear I/O Connector Panel Area

PICTURE 5

Figure 7. Model 321 Rear I/O Connector Panel Area

1.1.8 Security Features

The 4693 provides both physical and password security including:

- Support for PS/2 power on password enabled by using the reference diskette.
- Support for PS/2 keyboard password enabled by using the reference diskette.
- Lockable diskette drive access area (Model 541 only)
- Lockable system unit covers (Model 541 only)

There is no provision to electronically sense lock position (locked/unlocked).

1.2 Model 202 System Unit Description

Model 202 is the 4693 version of the 4683 Model 2 system unit except that Model 202 does not provide the off-line capability mode provided by the 4683 Model A02. Like the 4683 Model 002, Model 202 is a non-intelligent unit that provides the capability to attach a second POS workstation to each Model 541, Model 421, and Model 321. The Model 202 system unit provides power to the I/O and handles the serial I/O communication with the main system unit. Model 202 does not have an application processing capability. The application running in the intelligent system unit (Model 543, Model 421, or Model 321) sees the Model 202 I/O as a second set of attached I/O.

Model 202 is controlled by the microcode in the two 805X processors on the system unit logic card. One processor acts as the primary interface to the intelligent system units and also controls access to the hard totals, cash drawers, and power control functions. The other processor handles the RS-232C communications.

Subtopics
1.2.1 Implementation Overview
1.2.2 Subsystem Features
1.2.3 Internal System Loads
1.2.4 Controls and Indicators for Model 202

1.2.1 Implementation Overview

- 2 12Mhz Intel 805X processors
- 32K NVRAM (4K reserved for hardware)
- Programmable power (through Model 541, Model 421, Model 321)
- 89mm high system unit
- 4680 device channel support (468X I/O devices)
- Ten POS I/O ports
- 2 RS-232C ports (9-pin D shell style)
- No DASD support
- No PS/2 keyboard, mouse, parallel printer support
- No PS/2 speaker support
- No video support
- Not upgradeable
- No feature expansion options

1.2.2 Subsystem Features

Subtopics
1.2.2.1 Programmable Power Control
1.2.2.2 Serial (Asynchronous) Port
1.2.2.3 Power Supply and Auxiliary Power Source Requirements

1.2.2.1 Programmable Power Control

Model 202 supports the programmable power control function provided by the Model 541, Model 421, and Model 321 system. When the Model 541, Model 421, or Model 321 powers down for any event (Mode Control switch activation, software shutdown, or a fault condition) or powers up (timer on or Mode Control switch activation), the attached Model 202 system, by default, follows the same sequence. The Model 202 Mode Control switch can also control the system unit's operational state.

1.2.2.2 Serial (Asynchronous) Port

Model 202 provides serial communication ports using a 16450 UART for asynchronous data transfers up to 9600 bps. The external interface uses a standard 9-pin "D" shell connector and pinout defined for RS-232C. The voltage levels are EIA only on the RS-232C interface.

The serial ports are designated Serial A and Serial B for identification. The connector pinout assignments are detailed in Table 13 for a DTE device.

Table 13. Serial Port Pinout Assignments (x2)

Pin	Signal Name	Signal Direction
1	Reserved	In (to DTE)
2	Receive Data	In
3	Transmit Data	Out (to DCE)
4	Data Terminal Ready	Out
5	Signal Ground	Common
6	Data Set Ready	In
7	Request to Send	Out
8	Clear to Send	In
9	Reserved	

1.2.2.3 Power Supply and Auxiliary Power Source Requirements

The requirements are the same as other models. Refer to "Power Subsystem Features" in topic 1.1.5.

1.2.3 Internal System Loads

The system unit power supply provides power for internal and external loads. The internal loads are defined in Table 14.

Table 14. Internal DC Loads. Loads are listed in milliamps.

Load	**+5VL**	**+12VL**	**-12VL**	**+5LM**	**+5PPC**	**+5CONT**
System Board	400	170	0	380	40	0
Fan	0	0	150	0	0	0

1.2.4 Controls and Indicators for Model 202

The operator access area is shown in Figure 8 and is identical to Models 421 and 321 except that the reset function is not provided in Model 202. Refer to Figure 4 in topic 1.1.7.

PICTURE 6

Figure 8. Model 202 Operator Access Area

PICTURE 7

Figure 9. Model 202 Rear I/O Connector Panel Area

1.3 PS/2 Option Adapter Support

Architecturally, Models 541, 421, and 321 support up to five PS/2 option adapters with one of these slots occupied by the POS I/O device channel feature. Model 541 can accommodate four physical adapters and Models 421 and 321 can accommodate two adapters. For configuration, the slots are assigned as shown in Table 16 in topic 1.3.1. The actual number of option adapters that can be installed and configured is dependent on the specific system configuration. In the 128K adapter memory map space available, 8K (default, optionally 16K) is used by the POS I/O device channel feature.

Note: None of the 4693 models support 4683 feature cards. Devices connected through these adapters on existing models should be attached using the RS-232C ports.

Models 541, 421, and 321 support the PS/2 option adapters and features listed in Table 15. These devices have been tested to function as intended in the hardware and can be installed and maintained with IBM procedures using 4693 devices, particularly non-PS/2 keyboards and displays unless otherwise stated. These models also can use numerous other IBM and non-IBM PS/2 adapters. However, these other adapters may require the use of a PS/2-like keyboard and compatible video display unit.

Auto-configuration support is provided for a core set of microchannel adapter cards. There is no need to use option diskettes or manual input during the configuration process, which is a significant usability enhancement over standard PS/2 or competitive products. Refer to Table 15 for the supported list of adapters. All other adapters require the use of the reference diskette configuration utilities to provide complete configuration using normal PS/2 procedures. The reference diskette is required to change the defaults provided by auto-configuration, such as memory map usage or interrupt selection.

Table 15. PS/2 Adapter Auto-Configuration Support

PS/2 Adapter name	**POS ID**
POS I/O device channel	FFE2
4684 Store Loop	EEBF
Token Ring (4 MB)	E000
Token Ring 4/16	E001
Ethernet	EFD4
PC Network Baseband	EFEF
Dual Async	EEFF
300/1200/2400 Modem	EFE1
4684 V.32 Modem	DDCD
STUMPY Loop	Not Available
STUMPY NVRAM/SIOC	EFCB
PCMCIA Adapter	EFDA
SVGA Adapter	90EE

Note: In the Model 421 and 321, a maximum of one LAN adapter (Token-Ring, Baseband, Ethernet, Loop, or Wireless) is supported for auto-configuration.

Note: Memory expansion cards installed in adapter slots are not supported.

Subtopics
1.3.1 Feature Slot Assignment

1.3.1 Feature Slot Assignment

Table 16. PS/2 Option Adapter Assignments

Slot	Model 541 Location	Model 421 and Model 321 Location	Remarks
1	lower left	lower left	reserved for first LAN card
2	lower right	lower right	auxiliary video connection capable
3	upper left	not present	-
4	upper right	not present	-
5	integrated on system board	integrated on system board	POS I/O device channel

1.4 PS/2 I/O Support

Keyboards

PS/2 101-key/102-key enhanced alphanumeric keyboard

Video Displays

The 4690 229mm (9-inch) color or monochrome CRT can be installed on the terminal using a mounting system to integrate with the terminal. All other displays must be used in a distributed configuration. Displays may be distributed up to 2.7 m (9 ft.) from the system unit. A switched convenience outlet is provided for attaching the video displays. The video displays supported include:

- 229mm (9-inch) color display (integrated or distributed)
- 229mm (9-inch) monochrome display (integrated or distributed)

The 229mm (9-inch) monochrome display does not meet ANSI Standards, German Workplace Law requirements in 25x80 text mode, or ISO requirements.

1.5 POS I/O Support

All 4693 system units provide support for attachment of devices that communicate using the RS-485 interface using the POS I/O device channel architecture protocol plus cash drawers. Unless otherwise stated, device support applies to all models of the 4693. Models 541, 421, and 321 support one 4693 satellite to the base satellite socket (socket 11).

These I/O devices are supported by Models 541, 421, 321, and 202:

- POS printers (socket 7)
- POS displays (sockets 4A/4B/9A/9B/9C)
- Hand scanners (sockets 4B/9A/9B/9C)
- POS keyboards (sockets 5A/5B)
- POS scanners (socket 4B/9A/9B/9C)
- Cash drawers (sockets 3A/3B)

1.6 Operating System Software Compatibility

The 4693 supports multiple operating systems. The support is based on family and model.

PS/2 compatibility mode indicates that the system functions as a PS/2-like system with similar PS/2 I/O device restrictions (PS/2 keyboard, displays, printers).

Subtopics
1.6.1 Model 541
1.6.2 Models 421 and 321

1.6.1 Model 541

- IBM DOS 5.02
  POS I/O supported by DOS Device Drivers

- DOS T5.0/V
  POS I/O supported by DOS Drivers Drivers

- 4690 OS V1

- OS/2 2.1 (PS/2 compatible mode)

1.6.2 Models 421 and 321

- 4690 OS V1

- IBM DOS 5.02
  POS I/O supported by DOS device Drivers

- OS/2 2.1

2.0 Topic 2. 4693 Configuration, Tests, and Utilities

DANGER

```
+-------------------------------------------------------------------------+
¦ Never work on equipment or connect or disconnect signal cables during   ¦
¦ periods of lightning activity.                                          ¦
+-------------------------------------------------------------------------+
```

CAUTION:
For your safety, connect equipment requiring electrical power to a properly wired and grounded outlet.

Subtopics

2.1 Introduction
2.2 4690 Store Loop Remote Initial Program Load (RIPL)
2.3 Test Programs Summary
2.4 Configuration Programs Summary
2.5 Utility Programs Summary
2.6 Using the System Programs
2.7 Configuration Procedure
2.8 Utilities Procedure Using System Programs
2.9 Test Procedure Using Operating System Exercisers
2.10 Resetting Configuration and the Terminal Load
2.11 POS I/O Device Channel Adapter Failure Status Bytes
2.12 Device Channel Adapter System Status Byte
2.13 Shared Buffer Request Byte
2.14 Shared Buffer Status Byte
2.15 Device IDs for the 4693 Point of Sale Terminal
2.16 4693 Real Time Clock Nonvolatile Random Access Memory Map

2.1 Introduction

Subtopics
2.1.1 Reference, Diagnostic, and Support Diskettes
2.1.2 System Partition
2.1.3 IML Image
2.1.4 Keyboard Differences

2.1.1 Reference, Diagnostic, and Support Diskettes

There are three diskettes available to support the 4693 family of terminals:

IBM 4693 Point of Sale Terminal Reference Diskette, SX27-3918
IBM 4693 Point of Sale Terminal Diagnostic Diskette, SX27-3928
IBM 4693 Point of Sale Terminal Support Diskette for Medialess Terminals, SX27-3929.

The reference and diagnostic diskettes, commonly referred to as **system diskettes**, are not shipped with each terminal. They reside in the system partition of the fixed disk on a 4693 Model 541. The support diskette for medialess terminals is shipped as part of the bill of materials for store controller or LAN server machines. The programs on these diskettes, called **system programs**, are used to configure, test, and run utilities on 4693 terminals.

The preferred method of operation on a Model 541 is to run the system programs from the system partition. If there is a fixed disk failure, you can use the system diskettes.

For Models 421 and 321 (medialess terminals), the image of the support diskette is downloaded from the store controller or network server when requested at the medialess terminal. The instructions for installation and use of the support diskette at the store controller or network server are in a README.DOC file present on each diskette. Each medialess terminal that requires the diskette image must be defined at the controller or server.

2.1.2 System Partition

The system partition is a protected area on the fixed disk that contains the initial machine load (IML) image and the system programs.

Model 541 may have 0, 1, or 2 fixed disks installed. The fixed disk drive in the left position, when viewed from the front, contains the system partition. If no fixed disk is present, it is considered a medialess terminal and no system partition is assigned.

2.1.3 IML Image

The 4693 uses the IML image to store the power-on self test (POST) and Basic Input/Output System (BIOS) code. With IML, some of the code stored in ROM is used for preliminary testing immediately after the Mode Control switch is pressed to switch Ready ON. The balance of the POST and BIOS code, called the IML image, is stored in the system partition. The IML image is loaded on the fixed disk when the terminal is manufactured.

Note: The IML code in the system partition must be at the same program revision level as the code in ROM on the system board. In some instances, replacing the system board may require an update of the code on the fixed disk. If required, use UPDATE SYSTEM PROGRAMS.

If a fixed disk is replaced, use BACKUP/RESTORE SYSTEM PROGRAMS to create the system partition on the new fixed disk.

2.1.4 Keyboard Differences

There are many different keyboards that may be attached to the 4693 terminal and all keyboards do not have the same control keys defined. See *4693 Point of Sale Terminals: Hardware Service Manual* to identify the keyboards.

The system programs will prompt the user on which keys to use according to the type of keyboard.

Note: When using keyboards that have a **Ctrl** key, the S1 and S2 functions require a combination of two keys. First press and hold the **Ctrl** key then press the **S1 or S2** key.

2.2 4690 Store Loop Remote Initial Program Load (RIPL)

When a 4693 terminal Ready mode is switched to ON, the power-on self test (POST) runs to verify the hardware. In turn, the loop card diagnostic code is passed control by POST to verify the operation of the loop card. When the diagnostic completes, it passes control to a remote initial program load (RIPL) routine which contains a pointer to the bootstrap loader routine. It returns control to the diagnostic code which returns control to POST.

POST selects RIPL if no disk is available or if RIPL has been specified as the primary load option via reference diskette on a 4693 terminal that has a disk. When POST completes, it executes a beginning IPL.

The first stage of 4690 RIPL is the bootstrap load. The bootstrap program gives the terminal the initial "intelligence" required to continue with subsequent phases of loading the terminal "personality." If RIPL is required, it occurs automatically when the terminal Ready mode is switched to ON.

The loop RIPL code resides in ROM on the 4690 loop card along with the loop card diagnostic code.

The loop RIPL code builds a bootstrap load request, sends it to the controller, receives each load block, stores it in the 4693 terminal RAM (when it is the next block in sequence), and gives control to the bootstrap program after completion of the load. If a block of the bootstrap load is missed, the loader requests the entire load again and resumes the load when the missed block is received.

The 4693 terminal must be on a working store loop that is attached to a controller supporting RIPL. At the terminal, the following is displayed:

U003 - the "bootstrap" loader has control
U004 - the link has been established with the controller
U004 xxxxxxxx - the load is in progress

Note: **xxxxxxxx** is a count of the load blocks that have been loaded into the 4693 terminal. The count increments with the progress of the loading. If a block is missed, the count stops incrementing and resumes when the needed block is received on a subsequent broadcast.

The loader support in the loop controller for loop RIPL must be able to receive and recognize a 1 byte load request (X'C1'), open the terminal bootstrap file (ADXLPBSL.286 for 4690), and broadcast the file non-sequenced in 512 byte blocks to group address X'C1'.

This support is in the 4690 Operating System, remote file system server.

4693 Terminal "bootstrap" load request example:

X '8008 03C1 9FEA'

This message is a non-sequenced "bootstrap" load request from terminal number 8.

The bootstrap file has a 28 byte header:

- The first 4 byte field must contain the terminal RAM address at which the first byte of the load file is stored.
- The second 4 byte field contains the address at which the bootstrap load is given control.
- The third 4 byte field contains the length of the load in bytes.
- The remaining 16 bytes are available for future expansion. The addresses are expected to be passed as segment:offset.

Example of the header:

X 'E40F 0000 0000 C007 6C44 0300.............................'

It translates to the following:

X '00FE:0004 07C0:0000 0003 446C ....'

The "bootstrap" is to be loaded at physical address X '0FE4', given control at physical address X '7C00', and is X '03446C' bytes long.

The load messages on the loop should be 518 bytes long with the last message being the length of the remaining bytes in the bootstrap file plus 6. There is a 1 byte address (X 'C1'), a 1 byte next sequential

instruction (NSI) command (X'03'), a 2 byte sequence number (X'0000', X'0100', sequentially to X 'nnnn'), the next sequential 512 bytes or the remaining bytes in the bootstrap file, and 2 CRC characters (the CRC is modulo 8).

Example of a load block on the loop: (nnnn = CRC)

X 'C103 0400 .... (1 to 512 bytes of data) .... nnnn'

This message is an example of "bootstrap" load block number 4 that has 512 bytes of data unless it is the last block in which case it has the number of bytes of data left in the file (up to 512). The actual load data consists of a 2 byte sequence number followed by the next sequential 512 bytes of the "bootstrap" file.

2.3 Test Programs Summary

The following are available for 4693 terminals:

- Power-on self test (POST)
- System unit tests
- Verification tests
- Point-of-sale (POS) device tests
- POS Exercisers

Except for POST, the tests for Model 541 are part of the system programs that reside in the system partition as well as on the diagnostic diskette. For medialess Models 421 and 321, connected via the store loop or local area network (LAN), the tests are downloaded over the store loop or network upon request.

Subtopics

2.3.1 Power-On Self Tests (POST)
2.3.2 System Unit Tests
2.3.3 Verification Tests
2.3.4 Point of Sale Device Tests
2.3.5 Point-of-Sale Exercisers

2.3.1 Power-On Self Tests (POST)

The power-on self test, that resides in the read-only memory (ROM), runs automatically when Ready mode is switched ON and storage retention is disabled. All basic functions of the terminal hardware are tested and errors are reported via an eight digit error code displayed on the console display. See "Messages" in *4693 Point of Sale Terminals: Hardware Service Manual*.

2.3.2 System Unit Tests

The system unit tests reside on the fixed disk of the controller and on the backup diagnostic diskette. These tests are designed primarily for use by service personnel. A test is provided for each device in the terminal such as the diskette drive, the fixed disk drive, and option adapters.

2.3.3 Verification Tests

The verification tests reside on the fixed disk of the controller and on the backup diagnostic diskette. The verification tests test the basic functions of the master terminal and satellite terminal with a minimum of operator intervention. These tests are used primarily to verify operation after initial installation or after a service call. These tests can be used by the operator or service personnel.

2.3.4 Point of Sale Device Tests

The point-of-sale device tests reside on the fixed disk of the controller and on the backup diagnostic diskette. These tests are designed for use by operator or service personnel. A test is provided for each point-of-sale device attached to the terminal.

2.3.5 Point-of-Sale Exercisers

These exercisers reside on the fixed disk of the store controller. They are designed for use by operator or service personnel. An exerciser is provided for each point-of-sale device that is attached and configured. See *4690 Store System: Messages Guide* for instructions on how to request these exercisers.

2.4 Configuration Programs Summary

There are several configuration programs available in the system programs. Some are only available when a video display and an enhanced A/N keyboard console are attached. This is known as a video console. Also, some programs that deal specifically with the fixed disk and diskette drive are only available when running on a Model 541 that has a fixed disk.

The configuration programs are:

- View configuration
- Print configuration
- Change configuration
- Auto configuration
- Save configuration
- Restore configuration
- Set and view SCSI device configuration

Running configuration should only be necessary when the options and devices attached to the terminal are changed. Most of the time automatic configuration is all that is necessary.

Subtopics

2.4.1 View Configuration
2.4.2 Print Configuration
2.4.3 Change Configuration
2.4.4 Auto Configuration
2.4.5 Save and Restore Configuration
2.4.6 Set and View SCSI Device Configuration

2.4.1 View Configuration

This displays the current configuration data that is stored in NVRAM.

2.4.2 Print Configuration

This prints the same data that is displayed by *View* on the POS printer or parallel printer.

2.4.3 Change Configuration

This allows the user to select configuration options other than the defaults. This function is limited when no video display is present.

2.4.4 Auto Configuration

This allows the user to configure the terminal and select the default options. It requires very little manual intervention.

2.4.5 Save and Restore Configuration

These functions allow the user to backup (save) the configuration data to the system partition or to a diskette. This data is used to restore the configuration to a 4693 terminal.

2.4.6 Set and View SCSI Device Configuration

This function allows the user to display the SCSI ID for each installed SCSI device. The ID appears in a set of two numbers separated by a comma. The first number is the assigned ID. All fixed disks for the 4693 are shipped preset to SCSI ID 6.

2.5 Utility Programs Summary

There are several utility programs available on the reference diskette. Some are only available when a video display and an enhanced A/N keyboard console are attached. This is known as a video console. Also, some of the utilities that deal specifically with the fixed disk and diskette drive are only available when running on a Model 541 that has a fixed disk.

The utility programs are:

- Backup and restore system programs
- Copy option diskette
- Set time and date
- Set password
- Set keyboard rate
- Display revision level
- Update system programs
- Set startup sequence
- Display memory map
- Display NVRAM error log
- Enter/Print vital product data

Subtopics

2.5.1 Backup and Restore System Programs (Model 541)
2.5.2 Copy Option Diskette
2.5.3 Set Time and Date
2.5.4 Set Password
2.5.5 Set Keyboard Rate
2.5.6 Display Revision Level
2.5.7 Update System Programs (Model 541 only)
2.5.8 Set Startup Sequence (Model 541 only)
2.5.9 Display Memory Map (Video Console only)
2.5.10 Display NVRAM Error Log
2.5.11 Enter/Print Vital Product Data

2.5.1 Backup and Restore System Programs (Model 541)

The backup function of this utility copies the system programs from the system partition to diskettes. Backup copies of the original system diskettes are created using this utility.

The restore function copies all system programs from the system diskettes to the fixed disk system partition. Since it erases any option files that have been added to the system partition since the last restore, you may have to copy the option diskettes to the system partition. See "Update System Programs (Model 541 only)" in topic 2.5.7.

Restore creates a system partition if none is present when this utility is started from a reference diskette.

Note: The 4693 has two fixed disk drive slots. If only one drive is installed it must be located in the left slot and contains the system partition. If two drives are present, the one on the left side is always considered the first fixed disk drive and contains the system partition.

2.5.2 Copy Option Diskette

This utility is used to copy option files for an optional adapter to the reference and diagnostic diskettes or to the system partition. If the reference diskette is loaded from the diskette drive the option files are copied from the option diskette to the appropriate reference or diagnostic diskette. If the reference diskette is loaded from the system partition, the option files are copied from the option diskette to the system partition.

2.5.3 Set Time and Date

This utility allows the user to set or change the current date and time in nonvolatile RAM (NVRAM).

2.5.4 Set Password

This utility allows the user to set or change the power-on password. When a power-on password is active (set), the user must type the password each time Ready mode is switched ON.

2.5.5 Set Keyboard Rate

This utility allows selection of the typamatic keyboard rate for the enhanced A/N keyboard connected to keyboard socket 1. The normal rate is 10.9 characters per second (CPS) and the fast rate is 30 CPS.

2.5.6 Display Revision Level

This utility displays the revision level of:

- POST/BIOS part number
- Revision date of the POST/BIOS
- Model and submodel of the system board
- Revision level of the POST/BIOS
- Reference diskette version
- Diagnostic program version
- Configuration program version
- IML file name (if available)
- Serial I/O level
- Power control level

2.5.7 Update System Programs (Model 541 only)

This utility is used to update the programs in the system partition from the system diskettes.

2.5.8 Set Startup Sequence (Model 541 only)

This utility allows selection of the search sequence for a boot device. Boot devices are devices such as a diskette drive, a fixed disk or a remote initial program load (RIPL) adapter such as a token-ring, Ethernet, PC network baseband, or store loop adapter.

A default sequence is selected automatically when there is no video display.

2.5.9 Display Memory Map (Video Console only)

This utility displays a map indicating how the memory is being utilized by the installed adapters. This utility is not available when there is no video display.

2.5.10 Display NVRAM Error Log

This utility displays the NVRAM error log entries and allows you to clear the log data.

2.5.11 Enter/Print Vital Product Data

This utility allows entry and printing of the vital product data. See *4693 Point of Sale Terminals: Hardware Service Manual*.

2.6 Using the System Programs

After loading the system programs there are three procedures available: test, configuration, and utilities. Read the notes below before beginning and then use the appropriate procedure.

Notes:

1. If a power-on password is active you have to either enter the correct password or remove the power-on password. See the procedure to remove the password jumper in "4693 Point of Sale Terminals: Hardware Service Manual.

2. When using any of the retail point-of-sale (RPOS) keyboard family of keyboards or some of the older 4680-type keyboards, the S1 and S2 functions require a combination of two keys. If your keyboard has a **Ctrl** key, first press and hold the **Ctrl** key then press the S1 or S2 key.

3. When more than one keyboard is attached, only one (the primary keyboard) is defined for use when running system programs. In this situation, if the keyboard you try does not work, try the other keyboard.

4. System programs load automatically under certain error conditions detected during POST.

Subtopics
2.6.1 Loading the System Programs
2.6.2 Flow of 4693 System Programs Menus
2.6.3 Test Procedure

2.6.1 Loading the System Programs

Depending upon the model of the 4693, there are different methods of loading the system programs.

- Model 541 - system programs can be loaded from the fixed disk system partition or from the system diskettes using the diskette drive.

- Models 421 and 321 - system programs can be loaded only from a controller or server using the network or store loop. This is often referred to as downloading the system programs.

- Model xx2 (satellite terminal) does not receive a load. It uses its master terminal load.

Subtopics
2.6.1.1 Procedure to Load From System Partition or Controller/Server
2.6.1.2 Procedure to Load From System Diskettes

2.6.1.1 Procedure to Load From System Partition or Controller/Server

1. Use the store procedures to stop any application programs that are running.

2. Switch Ready mode OFF at the 4693 terminal.

3. Press the Reset switch to disable storage retention.

   Note: A special keying sequence is required at a specific time during the POST sequence to initiate the loading of system programs. This key sequence must occur during a three second (approximately) period when the cursor or minus (-) appears in the upper right corner of the display. The key sequence required varies depending on the type of keyboard you are using and where it is attached.

   - For keyboards attached to socket 5A or 5B that have a *Ctrl* key:, press and hold the **Ctrl** key then press **S1** (Ctrl + S1) when the cursor appears at the right side.

   - For keyboards attached to socket 5A or 5B that has no *Ctrl* key, just press the **S1**.

   - For keyboards attached to the Kybd PICTURE 8 socket (PS/2 Type), press and hold the **Ctrl** key and the **Alt** key and then press the **Insert** key (Ctrl + Alt + Ins) when the cursor appears at the right side.

4. Switch Ready mode ON and look for the cursor to appear in the upper right corner of the display.

5. When the cursor appears, enter the appropriate key sequence as defined above.

   This enables the terminal to load the system programs from the fixed disk system partition or from the store controller/server.

   - If an error code is displayed before the main menu appears, see "Messages" in *4693 Point of Sale Terminals: Hardware Service Manual*.

   - If you have an audible or visible symptom, see "Symptoms" in *4693 Point of Sale Terminals: Hardware Service Manual*.

2.6.1.2 Procedure to Load From System Diskettes

If for some reason you cannot load the system programs from the fixed disk system partition, you can load them from backup copies of the system diskettes. These backup diskettes were created when the terminal is installed.

1. Use the store procedures to stop any application programs that are running.

2. Switch Ready mode OFF at the 4693 terminal. (The Ready indicator will be OFF.)

3. Press the Reset switch to disable storage retention (Indicators 1 and 2 will remain ON.)

4. Insert the reference diskette in the diskette drive.

5. Switch Ready mode ON. (The Ready indicator will be ON.)

6. Follow the displayed instructions.

- If an error code is displayed before the main menu appears, see "Messages" in *4693 Point of Sale Terminals: Hardware Service Manual*.

- If you have an audible or visible symptom, see "Symptoms" in *4693 Point of Sale Terminals: Hardware Service Manual*.

PICTURE 9

Figure 10. 4693 Operator Panel

2.6.2 Flow of 4693 System Programs Menus

PICTURE 10

Notes:

1. The contents of these menus will vary with the models and with the features installed on the terminal.

2. MENU TEST-7 appears only if a model xx2 satellite terminal is attached to the 4693 terminal.

2.6.3 Test Procedure

1. Load the system programs. See "Loading the System Programs" in topic 2.6.1.

2. When the main menu appears, select START TESTS.

3. When the test menu appears, select the desired test:

   - RUN POS DEVICE TESTS
   - RUN SYSTEM UNIT TESTS
   - RUN VERIFICATION TESTS

4. Follow the instructions that are displayed or select from the next menu that is displayed.

   Note: If a device that you want to test does not appear in the list of devices to be tested (MENU TEST-4 OR MENU TEST-6), switch Ready mode OFF and then load the reference diskette and run AUTO CONFIGURATION. If the device still fails to appear in the test menu, it is failing to communicate. Go to "Start Here" in *4693 Point of Sale Terminals: Hardware Service Manual* to help isolate the I/O device problem.

2.7 Configuration Procedure

1. Load the system programs. See "Loading the System Programs" in topic 2.6.1.

2. When the MAIN MENU appears, select START CONFIGURATION.

3. When the CONFIGURATION MENU appears, select the desired configuration function. See "Configuration Programs Summary" in topic 2.4.

Follow the instructions that are displayed. See "Flow of 4693 System Programs Menus" in topic 2.6.2.

2.8 Utilities Procedure Using System Programs

1. Load the system programs. See "Loading the System Programs" in topic 2.6.1.

2. When the MAIN MENU appears, select START UTILITIES.

3. When the UTILITY MENU appears, select the desired utility program. See "Utility Programs Summary" in topic 2.5.

Follow the instructions that are displayed or select from the next menu that is displayed. See "Flow of 4693 System Programs Menus" in topic 2.6.2.

2.9 Test Procedure Using Operating System Exercisers

When the 4693 is running in the 4690 Store System environment, you can download point-of-sale device exercisers from the store controller. See *IBM 4690 Store System: Messages Guide* for the procedure to load and run these exercisers.

2.10 Resetting Configuration and the Terminal Load

> **Important**
> This procedure destroys the configuration record currently stored in NVRAM. Use it only when the terminal system board has been exchanged or when it seems necessary due to hang conditions, undetermined problems, or an inoperative system.
>
> Depending on the installed option adapters, you may be asked several questions regarding configuration. Be prepared to select the appropriate configuration for this terminal.

1. Use the store procedures to stop any application programs that are running.

2. Switch Ready mode OFF at the 4693 terminal. (The Ready indicator will be OFF.)

3. Press the Reset switch to disable storage retention (Indicators 1 and 2 will remain ON.)

   Note: When you switch Ready mode ON in the next step, start looking for the cursor to appear in the upper right corner of the display. It will display for only 3 seconds (approximately) and during this period of time you must press and release the Reset switch to cause the configuration record to clear.

4. Switch Ready mode ON.

5. Look for the cursor or minus (-) to appear in the upper right of the display. When the cursor appears, press and immediately release the Reset switch on the operator panel. This enables the terminal to clear the configuration record.

   The system programs load then several error messages are displayed. These messages are expected messages after clearing the configuration record and should be ignored.

6. Follow the displayed prompts to exit each error message.

7. When message M0101 is displayed, answer YES. The configuration program reconfigures the terminal. Follow the displayed prompts and answer any questions that appear. After reconfiguration the terminal restarts and loads the operating system.

   To take an operating system program dump, see the documentation for your operating system.

2.11 POS I/O Device Channel Adapter Failure Status Bytes

The device channel adapter failure status bytes appear on the screen when the device channel adapter tests detect a failure.

XX represents a FAILURE STATUS BYTE. It may be any number depending on the type of adapter failure that occurred.

The device channel adapter failure status bytes are numbered as follows:

XX	0	*XX*	6
XX	1	*XX*	7
XX	2	*XX*	8
XX	3	*XX*	9
XX	4		
XX	5		

The tables on the following topics define the meaning of the device channel adapter failure status bytes. These bytes are displayed only when a failure is detected by the device channel adapter tests.

Use Table 17 to find information on the device channel adapter failure status bytes.

Table 17. Failure Status Byte Information

For	**Go to**
Byte 0	"Error Code - Failure Status Byte 0" in topic 2.11.1
Byte 1	"Microprocessor Status Codes - Failure Status Byte 1" in topic 2.11.2
Byte 2 and Byte 3	"Shared Buffer Latch Error Codes and Extended Data - Failure Status Bytes 2 and 3" in topic 2.11.3
Byte 4 and Byte 5	"Shared Buffer Error Codes and Test Patterns - Failure Status Bytes 4 and 5" in topic 2.11.4
Byte 6	"CMOS Error Codes - Failure Status Byte 6" in topic 2.11.5
Byte 7	"Dump Error Codes - Failure Status Byte 7" in topic 2.11.6
Byte 8	Contains the EC level of the device channel adapter microprocessor.
Byte 9	Contains the EC level of the device channel adapter power-on self test microcode in ROS.

Subtopics

2.11.1 Error Code - Failure Status Byte 0
2.11.2 Microprocessor Status Codes - Failure Status Byte 1
2.11.3 Shared Buffer Latch Error Codes and Extended Data - Failure Status Bytes 2 and 3
2.11.4 Shared Buffer Error Codes and Test Patterns - Failure Status Bytes 4 and 5
2.11.5 CMOS Error Codes - Failure Status Byte 6
2.11.6 Dump Error Codes - Failure Status Byte 7

2.11.1 Error Code - Failure Status Byte 0

Table 18 defines the meaning of each bit of failure status byte 0 of the device channel adapter.

Table 18. Failure Status Byte 0 Bit Definition

Bit	**Error**	**Values**
7	Reset switch	0 = Good 1 = Bad
6	Reserved	0 = Good 1 = Bad
5	ROS scan error	0 = Good 1 = Bad
4	Device channel adapter microprocessor status	0 = Good 1 = Bad
3	Shared buffer latch test error code	0 = Good 1 = Bad
2	Shared Buffer Test Error Code	0 = Good 1 = Bad
1	CMOS test error code	0 = Good 1 = Bad
0	Reset switch test error code	0 = Good 1 = Bad

2.11.2 Microprocessor Status Codes - Failure Status Byte 1

Table 19 defines the meaning of failure status byte 1 of the device channel adapter.

Table 19. Device Channel Adapter Microprocessor Status Codes

Byte 1 Status Code	**Definition**
00	No errors occurred
10 through 16	Device channel adapter operational error
15 through 17	Not valid
20 through 23	Operational error
24 through 70	Not valid
71 through 76	Self test error
77 through 80	Not valid
81 through 84	Self test error
86 through 8F	Not valid
90	External wrap error
91 through FF	Not valid

2.11.3 Shared Buffer Latch Error Codes and Extended Data - Failure Status Bytes 2 and 3

Table 20 defines the meaning of failure status bytes 2 and 3 of the device channel adapter.

Table 20. Shared Buffer Latch Error Codes and Extended Data

Byte 2 Error Code	**Byte 3 Extended Data**	**definition**
00	00	No errors detected.
01	Device channel adapter system status byte See topic 2.12.	The device channel adapter microprocessor was not at a "Ready and Not Enabled" condition after initial POR was complete.
02	Device channel adapter interrupt flag byte See topic 2.14.1.	A level 7 software interrupt was not received when expected.
03	Device channel adapter system status byte See topic 2.12.	A level 7 hardware interrupt was not received when expected.
04	Shared buffer request byte See topic 2.13.	The system unit microprocessor was unable to find the shared buffer after initial POR was complete.
05	Device channel adapter system status byte See topic 2.12.	The device channel adapter microprocessor was not at a "Ready and Not Enabled" condition after initial POR was complete.
06	Shared buffer request byte See topic 2.13.	The system unit microprocessor was unable to return the shared buffer to the device channel adapter microprocessor after initial POR was complete.
07	Device channel adapter system status byte See topic 2.12.	The system unit microprocessor was unable to acquire the shared buffer for a software POR request.
08	Shared buffer request byte See topic 2.13.	The system unit microprocessor was unable to find the shared buffer after acquiring it for a software POR request.
09	Device channel adapter system status byte See topic 2.12.	A level 7 hardware interrupt was not received from a software POR request.
0A	Device channel adapter system status byte See topic 2.12.	The device channel adapter microprocessor internal diagnostic test failed to complete during the software POR.
0B	Shared buffer error codes See topic 2.11.4.	The alternate shared buffer failed.
0C	Shared buffer error codes See topic 2.11.4.	The primary shared buffer failed.
10	Device channel adapter system status byte See topic 2.12.	The system unit microprocessor was unable to acquire the shared buffer for a software POR request.
11	Device channel adapter system status byte See topic 2.12.	The software POR request failed.
12	Device channel adapter system status byte See	The system unit microprocessor was unable to acquire the shared buffer for a read EC level request.

	topic 2.12.	
13	Device channel adapter system status byte See topic 2.12.	The read EC level request failed.
20	Device channel adapter system status byte See topic 2.12.	Timeout while waiting for a level 7 hardware interrupt.
30	Device channel adapter system status byte See topic 2.12.	Timeout while waiting for a response from a request to acquire the shared buffer for a software POR request.
31	Device channel adapter system status byte See topic 2.12.	Timeout while waiting for a response from a software POR request.
32	Device channel adapter system status byte See topic 2.12.	Timeout while waiting for a response from a request to acquire the shared buffer for a read EC level request.
33	Device channel adapter system status byte See topic 2.12.	Timeout while waiting for a response from a read EC level request.
40	Device channel adapter interrupt flag byte See topic 2.14.1.	A level 7 interrupt was received with unexpected status.
80	Device channel adapter interrupt flag byte See topic 2.14.1.	A level 7 interrupt was received when not expected.
90	Device channel adapter interrupt flag byte See topic 2.14.1.	A level 7 interrupt was received when not expected.

2.11.4 Shared Buffer Error Codes and Test Patterns - Failure Status Bytes 4 and 5

Table 21 defines the meaning of failure status bytes 4 and 5 of the device channel adapter.

Table 21. Shared Buffer Error Codes and Test Patterns

Byte 4 Error Code	**Byte 5 Test Pattern**	**Definition**
00	00	No errors detected
01	01	Data test pattern failed
02	02	Data test pattern failed
03	04	Data test pattern failed
04	08	Data test pattern failed
05	10	Data test pattern failed
06	20	Data test pattern failed
07	40	Data test pattern failed
08	80	Data test pattern failed
09	FE	Data test pattern failed
0A	FD	Data test pattern failed
0B	FB	Data test pattern failed
0C	F7	Data test pattern failed
0D	EF	Data test pattern failed
0E	DF	Data test pattern failed
0F	BF	Data test pattern failed
10	7F	Data test pattern failed
11	F1	Buffer address 0400 failed
12	02	Buffer address 0200 failed
13	F3	Buffer address 0100 failed
14	04	Buffer address 0080 failed
15	F5	Buffer address 0040 failed
16	06	Buffer address 0020 failed
17	F7	Buffer address 0010 failed
18	08	Buffer address 0008 failed
19	F9	Buffer address 0004 failed
1A	0A	Buffer address 0002 failed
1B	FB	Buffer address 0001 failed
1C	0C	Buffer address 0000 failed
1D	0E	Buffer address 0400 failed
1E	FD	Buffer address 0200 failed
1F	0C	Buffer address 0100 failed
20	FB	Buffer address 0080 failed
21	0A	Buffer address 0040 failed
22	F9	Buffer address 0020 failed
23	08	Buffer address 0010 failed
24	F7	Buffer address 0008 failed

25	06	Buffer address 0004 failed
26	F5	Buffer address 0002 failed
27	04	Buffer address 0001 failed
28	F3	Buffer address 0000 failed

2.11.5 CMOS Error Codes - Failure Status Byte 6

Table 22 defines the meaning of failure status byte 6 of the device channel adapter.

Table 22. CMOS Error Codes

Byte 6 Error Code	**Definition**
00	No errors detected
01	Battery failure
02	Storage failure
04	Addressing failure
10	Restore "Save Area" failure
20	Save "Save Area" failure

2.11.6 Dump Error Codes - Failure Status Byte 7

Table 23 defines the meaning of failure status byte 7 of the device channel adapter failure status bytes.

Table 23. Dump Error Codes

Byte 7 Error Code	**Definition**
00	No errors detected
01	Software-invoked dump request error
02	Dump switch-invoked dump request error
04	Hardware "Dump Request Bit" error

2.12 Device Channel Adapter System Status Byte

Table 24 describes the bits of the device channel adapter system status byte (SSB). The values in the SSB represent the current state of the store loop adapter hardware.

Table 24. Device Channel Adapter System Status Byte

Bit	**Definition**
Bit 7 (Read Only)	Reserved
Bit 6 (Read/Write)	1 = Generated a device channel adapter soft POR. 0 = Reset the POR mechanism.
Bit 5 (Read/Write)	1 = Requested a dump. 0 = Reset the dump mechanism.
Bit 4 (Read Only)	Reserved
Bit 3 (Read/Write)	1 = Enable the interrupt mechanism. 0 = Disable the interrupt mechanism.
Bit 2 (Read Only)	1 = Level 7 Interrupt is active. 0 = Level 7 Interrupt is inactive.
Bit 1 (Read/Write)	1 = Shared Buffer Access is complete. 0 = Shared Buffer Return is complete.
Bit 0 (Read/Write)	1 = Request(ed) Shared Buffer Access. 0 = Shared Buffer Return is complete.

2.13 Shared Buffer Request Byte

Table 25 describes the bits of the shared buffer request bytes. This byte is updated by the system unit microprocessor after each access of the message buffer.

Table 25. Shared Buffer Request Byte

Bit	**Definition**
Bit 7	1 = Diagnostic Self Test Request.
Bit 6	1 = Read and process the "Timer Function" bytes.
Bit 5	1 = Read the Device Channel Function command byte.
Bit 4	1 = Process the "Transmit Message(s)" held in the Shared Buffer.
Bit 3	1 = New poll list.
Bit 2	1 = Device Channel Internal Storage Dump Request.
Bit 1	1 = Read EC Level Request.
Bit 0	1 = Reserved

2.14 Shared Buffer Status Byte

Table 26 describes the bits of the shared buffer status byte. This byte is updated by the device channel adapter microprocessor before it interrupts the system unit microprocessor.

Table 26. Shared Buffer Status Byte

Bit	**Definition**
Bit 7	1 = The diagnostic self test is complete
Bit 6	1 = Stress test is active
Bit 5	Reserved
Bit 4	1 = Device channel received
Bit 3	1 = An error message is present
Bit 2	1 = A device channel internal storage dump is present
Bit 1	1 = An EC level message is present
Bit 0	Reserved

Subtopics
2.14.1 Device Channel Adapter Interrupt Flag Byte
2.14.2 POST Test Device Channel Adapter Errors

2.14.1 Device Channel Adapter Interrupt Flag Byte

Table 27 describes the bits of the device channel adapter interrupt flag byte. This byte is updated by the software interrupt service routine when a level 7 hardware interrupt occurs.

Table 27. Device Channel Adapter Interrupt Flag Byte

Bit	**Definition**
Bit 7	1 = The level 7 interrupt is not from the device channel adapter
Bit 6	1 = An interrupt occurred when not expected (Bit 0 = 0)
Bit 5	1 = More than one interrupt occurred when only one was expected (Bit 0 = 1)
Bit 4	Not used, always zero (0)
Bit 3	Not used, always zero (0)
Bit 2	Not used, always zero (0)
Bit 1	**1 =** A device channel adapter level 7 hardware interrupt has occurred
Bit 0	**1 =** A device channel adapter level 7 hardware interrupt is expected

2.14.2 POST Test Device Channel Adapter Errors

Press **F1** and continue with the test.

Table 28. POST Device Channel Errors

Symptom	**Cause**
14517	Multiple errors
14527	8051 POR errors
14537	Latch test errors
14547	Shared buffer errors
14557	CMOS test errors
14567	Dump latch errors

2.15 Device IDs for the 4693 Point of Sale Terminal

The device IDs are used by set terminal characteristics (STC) to identify devices that are configured for or attached to a point-of-sale terminal. The device ID is also required when requesting a trace report of the device channel for a unique device. Table 29 in topic 2.15.1 is a list of the device IDs by the ID number. Table 30 in topic 2.15.2 is a list of the device IDs by the device type.

Subtopics
2.15.1 Device IDs by ID Number
2.15.2 Device IDs by Device Type

2.15.1 Device IDs by ID Number

Table 29. Device IDs by ID Number

ID	Device	Socket Number
X'10'	Keyboard, 50-key or Combined Keyboard/Display	5A
X'11'	Keyboard, 50-key or Combined Keyboard/Display	5B
X'12'	Keyboard, Alphanumeric	5A
X'13'	Keyboard, Alphanumeric	5B
X'16'	Keyboard, Matrix	5A
X'17'	Keyboard, Matrix	5B
X'1A'	Keyboard, ANPOS	5A
X'1B'	Keyboard, ANPOS	5B
X'1C'	RPOS Keyboards	5A
X'1D'	RPOS Keyboards	5B
X'20'	Display, Alphanumeric	4A
X'21'	Display, Alphanumeric	4B
X'22'	Display, Operator or Combined Keyboard/Display	4A (5A if Combined Keyboard/Display)
X'23'	Display, Operator or Combined Keyboard/Display	4B (5B if Combined Keyboard/Display)
X'26'	Display, Shopper	4A
X'27'	Display, Shopper	4B
X'2A'	Character/Graphics Display	4A
X'2B'	Character/Graphics Display	4B, 9A, 9B
X'30'	Printer Model 1 or 2	7
X'34'	Printer Model 3 or 4	7
X'36'	Printer Model 2A Fiscal	7
X'38'	Printer Model 3A Fiscal	7
X'40'	MSR (Single-Track)	6 on the keyboard attached to Socket 5A
X'41'	MSR (Single-Track)	6 on the keyboard attached to Socket 5B
X'46'	MSR (Dual-Track) ANPOS or Combined Keyboard/Display (Low-Profile)	5A
X'47'	MSR (Dual-Track)	5B
X'48'	MSR (3-Track)	5A
X'49'	MSR (3-Track)	5B
X'4A'	Point-of-Sale Scanner	9A, 9B, 9C, 4B
X'4B'	1520 Hand-Held Scanner Model A02	5B
	Hand-Held Bar Code Reader	9B
X'50'	Totals Retention	Internal to the base unit
X'54'	Cash Drawer	3A
X'54'	Cash Drawer	3B

X'64'	RS-232C Device	Serial A (All models except 2X2)
X'66'	RS-232C Device	Serial A (Model 2X2 only)
X'67'	RS-232C Device	Serial B (Model 2X2 only)
X'68'	RS-232C Device	Serial B (All models except 2X2)
X'6E'	Scale	9A, 9B, 9C, 4B

2.15.2 Device IDs by Device Type

Table 30. Device IDs by Device Type

Device	**Socket Number**	**ID**
Cash Drawer	3A	X'54'
	3B	X'54'
Display, Alphanumeric	4A	X'20'
	4B	X'21'
Display, Operator or Combined Keyboard/Display	4A (5A if Combined Keyboard/Display)	X'22'
	4B (5B if Combined Keyboard/Display)	X'23'
Display, Shopper	4A	X'26'
	4B	X'27'
Character/Graphics Display	4A	X'2A'
	4B, 9A, 9B	X'2B'
Hand-Held Bar Code Reader	9B	X'4B'
Keyboard, 50-key or Combined Keyboard/Display	5A	X'10'
	5B	X'11'
Keyboard, Alphanumeric	5A	X'12'
	5B	X'13'
Keyboard, ANPOS	5A	X'1A'
	5B	X'1B'
RPOS Keyboards	5A	X'1C'
	5B	X'1D'
Keyboard, Matrix	5A	X'16'
	5B	X'17'
MSR (Single-Track)	6 on the keyboard attached to Socket 5A	X'40'
	6 on the keyboard attached to Socket 5B	X'41'
MSR (Dual-Track)	5A (ANPOS or Combined Keyboard/Display)	X'46'
	5B	X'47'
MSR (3-Track)	5A	X'48'
	5B	X'49'
Point-of-Sale Scanner	9A, 9B, 9C, 4B	X'4A'
Printer Model 1 or 2	7	X'30'
Printer Model 3 or 4	7	X'34'
Printer Model 2A Fiscal	7	X'36'
Printer Model 3A Fiscal	7	X'38'
RS-232C Device	Serial A (All models except 2X2)	X'64'
RS-232C Device	Serial A (Model 2X2 only)	X'66'
RS-232C Device	Serial B (Model 2X2 only)	X'67'
RS-232C Device	Serial B (All models	X'68'

	except 2X2)	
Scale	9A, 9B, 9C, 4B (Shares socket with Point-of-Sale Scanner)	X'6E'
Totals Retention	Internal to the base unit.	X'50'
1520 Hand-Held Scanner Model A02	5B	X'4B'

2.16 4693 Real Time Clock Nonvolatile Random Access Memory Map

ADDRESS	DESCRIPTION	CHECKSUM: byte sum: CRC: no	CHECKSUM: byte sum: CRC	CHECKSUM: byte sum
0000-0009	Reserved	x		
000A-000D	Power control alarm save area	x		
000E-000F	POST Resume status and PPC hardware status	x		
0010-007F	Master terminal SIO configuration data			x
0080-00EF	Satellite terminal SIO configuration data			x
00F0-01CF	Reserved for SIO configuration data growth	x		
01D0-01F2	Information and POS data for feature card 1		x	
01F3-0215	Information and POS data for feature card 2		x	
0216-0238	Information and POS data for feature card 3		x	
0239-025B	Information and POS data for feature card 4		x	
025C-027E	Information and POS data for feature card 5		x	
027F-02A1	Information and POS data for feature card 6		x	
02A2-02C4	Information and POS data for feature card 7		x	
02C5-02E7	Information and POS data for feature card 8		x	
02E8-030A	Information and POS data for feature card 9		x	
030B-032D	Information and POS data for feature card 10		x	
032E-0330	Reserved		x	
0331-0332	POS lookup table CRC (checksum for bytes 1D0-330)	x		
0333-07BF	Reserved	x		
07C0-07FF	Master terminal vital product data		x	

0800-1FFF	System Data (operating system and application)			

Figure 11. 4693 Real Time Clock (RTC) NVRAM Memory Map

Subtopics
2.16.1 000A-000D Power Control Alarm Save Area
2.16.2 000E POST Resume Status Byte
2.16.3 000F PPC Hardware Status Byte
2.16.4 0010-007F Master Terminal SIO Configuration Data
2.16.5 0080-00EF Satellite Terminal SIO Configuration Data
2.16.6 07C0-07FF Master Terminal Vital Product Data

2.16.1 000A-000D Power Control Alarm Save Area

000A Alarm hour - 1 byte of packed decimal, values 00 - 23
000B Alarm minute - 1 byte of packed decimal, values 00 - 59
000C Alarm day-of-month - 1 byte of packed decimal, values 01 - 31
000D Real time clock register A - 1 byte of hex data, value = xx. The
      value determines the RTC square wave output when the power is off.

2.16.2 000E POST Resume Status Byte

The POST resume status byte is 1 byte of hex data.

00H = Non-Resume POST path (cold start, warm start, etc.)

03H = PPC hardware "read power-on events" command failed.

04H = Memory retention was disabled. The Reset switch was pressed when main power was off or the battery discharged before the main power returned.

05H = PPC hardware "read power-on status" command failed.

06H = Memory contents were bad The operating system failed to complete Suspend functions before the main power was lost.

07H = Memory parity error was detected. The PPC hardware failed to keep memory refreshed when the main power was off.

A0H = POST Resume completed successfully

2.16.3 000F PPC Hardware Status Byte

The PPC hardware status byte is 1 byte of hex data.

When byte 000EH = 00H or 03H,

Bits 7-0 = 0

When byte 000EH = 04H,

Bit 7 = 1
Bit 6 x
Bit 5 x
Bit 4 = 1. Mode Control switch turns power on.
Bit 3 = 1 = Ring Detect at serial port 2 turns power on.
Bit 2 = 1 = Ring Detect at serial port 1 turns power on.
Bit 1 = 1 = RTC alarm turns power on.
Bit 0 = 1 = Memory contents are bad.

When byte 000EH = 05H,

Bits 7-0 = 0

When byte 000EH = 06H,

Bit 7 = 1
Bit 6 = x
Bit 5 = x
Bit 4 = 1 = Mode Control switch turns power on.
Bit 3 = 1 = Ring detect 2 turned power on.
Bit 2 = 1 = Ring detect 1 turned power on.
Bit 1 = 1 = RTC alarm turned power on.
Bit 0 = 1 = Memory contents bad

When byte 000EH = 07H or A0H,

Bits 7-0 = 0

2.16.4 0010-007F Master Terminal SIO Configuration Data

Subtopics
2.16.4.1 Keyboard Devices
2.16.4.2 Display Devices
2.16.4.3 Printer Devices
2.16.4.4 Readers and Scanning Devices
2.16.4.5 Monetary Devices
2.16.4.6 External Devices
2.16.4.7 Reserved Device Addresses
2.16.4.8 Master Terminal Configuration Record Header

2.16.4.1 Keyboard Devices

SIO Keyboards connect to the 4693 via tailgate sockets 5A and 5B.

NVRAM Address	Device Address	Device Type
0010	10	50-key 5A or operator keyboard
0011	11	50-key 5B
0012	12	Alphanumeric 5A
0013	13	Alphanumeric 5B
0014	14	Reserved
0015	15	Reserved
0016	16	4680 Matrix 5A
0017	17	4680 Matrix 5B
0018	18	4682 PIN pad
0019	19	PLU keyboard
001A	1A	ANPOS 5A
001B	1B	ANPOS 5B
001C	1C	RPOS Keyboard 5A
001D	1D	RPOS Keyboard 5B
001E	1E	OEM
001F	1F	OEM

2.16.4.2 Display Devices

SIO Displays connect to the 4693 via tailgate sockets 4A, 4B, 9A, 9B, and 9C.

NVRAM Address	Device Address	Device Type
0020	20	A/N Fluorescent 4A
0021	21	A/N Fluorescent 4B, 9A, 9B, 9C
0022	22	A/N Operator in Keyboard 5A
0023	23	A/N Operator in Keyboard 5B
0024	24	Reserved
0025	25	Reserved
0026	26	Retail Shopper 4A
0027	27	Retail Shopper 4B, 9A, 9B, 9C
0028	28	Reserved
0029	29	Reserved
002A	2A	Character/graphics #1 operator
002B	2B	Character/graphics #1 customer
002C	2C	Character/graphics #2 operator
002D	2D	Character/graphics #2 customer
002E	2E	OEM
002F	2F	OEM

2.16.4.3 Printer Devices

SIO Printers connect to the 4693 via tailgate socket 7.

NVRAM Address	Device Address	Device Type
0030	30	4680 Printer Model 2
0031	31	Reserved
0032	32	Reserved
0033	33	Reserved
0034	34	4680 Printer Model 3
0035	35	Reserved
0036	36	Fiscal Printer Model 2
0037	37	SRJ Printer
0038	38	Fiscal Printer Model 3
0039	39	Reserved
003A	3A	25 character R/J-2
003B	3B	30 character R/J-2
003C	3C	5956 Kanji R/J
003D	3D	5957 compact R/J
003E	3E	OEM
003F	3F	OEM

2.16.4.4 Readers and Scanning Devices

Readers and scanners connect to the 4693 via tailgate sockets 4B, 5A, 5B, 9A, 9B and 9C.

NVRAM Address	Device Address	Device Type
0040	40	1-track MSR 5A or MSR on keyboard
0041	41	1-track MSR 5B
0042	42	PIN Pad
0043	43	Reserved
0044	44	OCR 9A
0045	45	OCR 9B
0046	46	2-track MSR 5A
0047	47	2-track MSR 5B
0048	48	3-track MSR 5A or MSR on keyboard
0049	49	3-track MSR 5B or MSR on keyboard
004A	4A	Checkout scanner 4B, 9A, 9B, 9C
004B	4B	Hand-held scanner 4B, 9A, 9B, 9C
004C	4C	Reserved
004D	4D	Reserved
004E	4E	OEM
004F	4F	OEM

2.16.4.5 Monetary Devices

Cash Drawers connect to the 4693 via tailgate sockets 3A and 3B.

NVRAM Address	Device Address	Device Type
0050	50	Reserved
0051	51	Reserved
0052	52	Reserved
0053	53	Reserved
0054	54	Cash Drawers
0055	55	Reserved
0056	56	Reserved
0057	57	Reserved
0058	58	Reserved
0059	59	Reserved
005A	5A	Reserved
005B	5B	Reserved
005C	5C	Reserved
005D	5D	Reserved
005E	5E	OEM
005F	5F	OEM

2.16.4.6 External Devices

NVRAM Address	Device Address	Device Type
0060	60	Reserved
0061	61	Reserved
0062	62	Reserved
0063	63	Reserved
0064	64	Reserved
0065	65	Reserved
0066	66	Reserved
0067	67	Reserved
0068	68	Reserved
0069	69	Reserved
006A	6A	Reserved
006B	6B	Reserved
006C	6C	Reserved
006D	6D	Reserved
006E	6E	Scale
006F	6F	OEM

2.16.4.7 Reserved Device Addresses

This range of SIO addresses is reserved for future I/O devices.

NVRAM Address	Device Address	Device Type
0070	70	Reserved
0071	71	Reserved
0072	72	Reserved
0073	73	Reserved
0074	74	Reserved
0075	75	Reserved
0076	76	Reserved
0077	77	Reserved

2.16.4.8 Master Terminal Configuration Record Header

SIO devices are not permitted to have addresses within the range X'78' through X'7F'. This space is allocated to store configuration record header information for the master terminal.

NVRAM Address	Device Address	Device Type
0078	N/A	Reserved
0079	N/A	Reserved
007A	N/A	Reserved
007B	N/A	Master Terminal Workstation status
		Bit 7 = 1 = One or more SIO devices are present. Bits 6-1 = reserved Bit 0 = 1 = SIO configuration data was erased when the Reset switch was pressed during POST.
007C	N/A	Video display status
		Bit 7 = 1 = A video monitor is present. Bit 6 = 1 = A video monitor is configured. Bits 5-0 = reserved
007D	N/A	PS/2 keyboard status
		Bit 7 = 1 = A PS/2 keyboard is present. Bit 6 = 1 = A PS/2 keyboard is configured. Bits 5-0 = reserved
007E	N/A	Record ID = x'01'
007F	N/A	Record checksum = Checksum of bytes 10H through 7EH.

2.16.5 0080-00EF Satellite Terminal SIO Configuration Data

Subtopics
2.16.5.1 Keyboard Devices
2.16.5.2 Display Devices
2.16.5.3 Printer Devices
2.16.5.4 Readers and Scanning Devices
2.16.5.5 Monetary Devices
2.16.5.6 External Devices
2.16.5.7 Reserved Device Addresses
2.16.5.8 Satellite Terminal Configuration Record Header

2.16.5.1 Keyboard Devices

SIO Keyboards connect to the 4693 via tailgate sockets 5A and 5B.

NVRAM Address	Device Address	Device Type
0080	10	50-Key 5A or operator keyboard
0081	11	50-Key 5B
0082	12	Alphanumeric 5A
0083	13	Alphanumeric 5B
0084	14	Reserved
0085	15	Reserved
0086	16	4680 matrix 5A
0087	17	4680 matrix 5B
0088	18	4682 PIN pad
0089	19	PLU keyboard
008A	1A	ANPOS 5A
008B	1B	ANPOS 5B
008C	1C	RPOS Keyboard 5A
008D	1D	RPOS Keyboard 5B
008E	1E	OEM
008F	1F	OEM

2.16.5.2 Display Devices

SIO Displays connect to the 4693 via tailgate sockets 4A, 4B, 9A, 9B, and 9C.

NVRAM Address	Device Address	Device Type
0090	20	A/N Fluorescent 4A
0091	21	A/N Fluorescent 4B, 9A, 9B, 9C
0092	22	A/N Operator in Keyboard 5A
0093	23	A/N Operator in Keyboard 5B
0094	24	Reserved
0095	25	Reserved
0096	26	Retail Shopper 4A
0097	27	Retail Shopper 4B, 9A, 9B, 9C
0098	28	Reserved
0099	29	Reserved
009A	2A	Character/graphics #1 operator
009B	2B	Character/graphics #1 customer
009C	2C	Character/graphics #2 operator
009D	2D	Character/graphics #2 customer
009E	2E	OEM
009F	2F	OEM

2.16.5.3 Printer Devices

SIO Printers connect to the 4693 via tailgate socket 7.

NVRAM Address	Device Address	Device Type
00A0	30	4680 Printer Model 2
00A1	31	Reserved
00A2	32	Reserved
00A3	33	Reserved
00A4	34	4680 Printer Model 3
00A5	35	Reserved
00A6	36	Fiscal Printer Model 2
00A7	37	Reserved
00A8	38	Fiscal Printer Model 3
00A9	39	Reserved
00AA	3A	25 character R/J-2
00AB	3B	30 character R/J-2
00AC	3C	5956 Kanji R/J
00AD	3D	5957 compact R/J
00AE	3E	OEM
00AF	3F	OEM

2.16.5.4 Readers and Scanning Devices

Readers and scanners connect to the 4693 via tailgate sockets 4B, 5A, 5B, 9A, 9B and 9C.

NVRAM Address	Device Address	Device Type
00B0	40	1-track MSR 5A or MSR on keyboard
00B1	41	1-track MSR 5B
00B2	42	PIN Pad
00B3	43	Reserved
00B4	44	OCR 9A
00B5	45	OCR 9B
00B6	46	2-track MSR 5A
00B7	47	2-track MSR 5B
00B8	48	3-track MSR 5A or MSR on keyboard
00B9	49	3-track MSR 5B or MSR on keyboard
00BA	4A	Checkout scanner 4B, 9A, 9B, 9C
00BB	4B	Hand-held scanner 4B, 9A, 9B, 9C
00BC	4C	Reserved
00BD	4D	Reserved
00BE	4E	OEM
00BF	4F	OEM

2.16.5.5 Monetary Devices

Cash Drawers connect to the 4693 via tailgate sockets 3A and 3B.

NVRAM Address	Device Address	Device Type
00C0	50	4683-002 Hard Totals
00C1	51	4693-xx2 Hard Totals
00C2	52	Reserved
00C3	53	Reserved
00C4	54	Cash Drawers
00C5	55	Reserved
00C6	56	Reserved
00C7	57	Reserved
00C8	58	Reserved
00C9	59	Reserved
00CA	5A	Reserved
00CB	5B	Reserved
00CC	5C	Reserved
00CD	5D	Reserved
00CE	5E	OEM
00CF	5F	OEM

2.16.5.6 External Devices

NVRAM Address	Device Address	Device Type
00D0	60	Reserved
00D1	61	Reserved
00D2	62	Reserved
00D3	63	Reserved
00D4	64	Reserved
00D5	65	Reserved
00D6	66	4693 RS232 #1 (connector J20)
00D7	67	4693 RS232 #2 (connector J21)
00D8	68	Reserved
00D9	69	Reserved
00DA	6A	Reserved
00DB	6B	Reserved
00DC	6C	Reserved
00DD	6D	Reserved
00DE	6E	Scale
00DF	6F	OEM

2.16.5.7 Reserved Device Addresses

This range of SIO addresses is reserved for future I/O devices.

NVRAM Address	Device Address	Device Type
00E0	70	Reserved
00E1	71	Reserved
00E2	72	Reserved
00E3	73	Reserved
00E4	74	Reserved
00E5	75	Reserved
00E6	76	Reserved
00E7	77	Reserved

2.16.5.8 Satellite Terminal Configuration Record Header

SIO devices are not permitted to have addresses within the range X'78' through X'7F'. This space is allocated to store configuration record header information for the satellite terminal.

NVRAM Address	Device Address	Device Type
00E8	N/A	Reserved
00E9	N/A	Reserved
00EA	N/A	Reserved
00EB	N/A	Satellite terminal workstation status
	Bit 7	= 1 = One or more SIO devices are present.
	Bits 6-2	= reserved
	Bit 1	= 1 = 4693-xx2 AutoPower function is enabled by master terminal POST (default = 1).
	Bits 0	= reserved
00EC	N/A	Reserved
00ED	N/A	Reserved
00EE	N/A	Record ID = x'02'
00EF	N/A	Record checksum = Checksum of bytes 80H through EEH.

2.16.6 07C0-07FF Master Terminal Vital Product Data

07C0-07C1	VPD Record ID and length (1 word of hex data)
x'A840'	(length includes bytes x'07C0' through x'07FF')
07C2-07C8	Machine type and model (7 bytes of ASCII data) i.e. "4693101"
07C9-07D0	Mfg. plant code and serial number (8 bytes of ASCII data) i.e. "23-00001"
07D1-07D7	Planar card EC number (7 bytes of ASCII data) i.e. "395822A"
07D8-07DE	Power supply EC number (7 bytes of ASCII data) i.e. "395822A"
07DF-07FD	nulls (31 bytes of x'00')
07FE-07FF	VPD CRC (checksum for bytes x'07C0' through x'07FD')

Note: Satellite terminal vital product data is stored in 4693-xx2 NVRAM at address 0C00H. Master terminal and satellite terminal VPD records have the same format.

3.0 Topic 3. 4693 Power-On Self Test (POST)

The Power-On Self Test (POST) uses the speaker subsystem to communicate to the user when an error is being reported. All error codes are written to the primary display, which is the video display if present, or is the alphanumeric display configured as the primary system display.

Subtopics

3.1 Power-On Self Test and the Meaning of Beeps
3.2 Checkpoint Codes
3.3 POST Interface Reference Information
3.4 BIOS Data Areas

3.1 Power-On Self Test and the Meaning of Beeps

The POST code uses the speaker to communicate the results of some tests. The following describes what the beeps mean and which device, or devices, are involved in the failing test. **A failing component could cause a following test to fail.**

The following definitions are accurate for most POST detected errors.

No Beeps. If POST completes and no beeps are heard, the speaker is failing or the planar board is failing.

One Beep. The normal POST completion. No errors were detected.

Two Beeps. An error was detected during POST. Most POST errors are two beeps.

Continuous Beep. The system planar board is failing or the speaker subsystem is failing.

Repeating Short Beeps. A keyboard key is stuck, or the keyboard is failing, or the system board is failing.

One Long and One Short Beep. The video adapter card is failing.

One long beep and Two Short Beeps. The video subsystem is failing, or a video I/O adapter ROM is not readable. If the one long and two short beep sequence is sounded twice, both the system planar board and an option adapter video are failing.

On a terminal that does not have a video display, the serial I/O adapter is failing.

3.2 Checkpoint Codes

Table 31 lists the checkpoints displayed on the primary display of a terminal during Power-On Self Test (POST). These checkpoint codes are used primarily during manufacturing test and are seen in the lower right corner of a video display during POST. When a POST error is detected, a checkpoint code may be visible. They are listed here for reference only, and need not be used during normal maintenance activity.

Table 31. Checkpoint Codes

Code	Description
01	R/W test the 80386 registers with pattern disable CMOS clock interrupts turn off video perform channel reset
02	ROM checksum
03	verify planar enable/setup latch verify planar RAM enabled
04	verify planar POS register
05	verify card enable/-setup latch (port 96h)
06	verify CMOS shutdown byte
07	verify 2K CMOS shutdown byte
08	8237 DMA 0 initialization channel register test perform the following tests on DMA compatibility registers: 1. write base target, read base target (extended) read current target (compatibility) 2. write base transfer count, read base transfer count (extended) read transfer count (compatibility) 3. page registers compat_targ test the compatibility base and current target address registers for the channel currently being tested compat_tc test the compatibility base and current transfer count registers for the channel currently being tested compat_pagereg the page register for the channel currently being tested
09	dma_setup mode set all DMA channels
0A	storage refresh test
0B	8042 interface test
0C	reset 8042
0D	write byte 0 of 8042 memory
0E	memory controller
0F	Base 512k read/write memory test
10	set base memory parity flag
11	write the high byte of failing memory address to mfg_port+2 write the low byte of failing memory address to mfg_port+3
12	verify 386 lgdt/sgdt lidt/sidt instructions and registers
13	initialize 8259 interrupt controllers master
14	initialize 8259 interrupt controllers slave
15	initialize hardware interrupt vectors
16	initialize bios calls interrupt vectors

18	verify CMOS CRC
19	set defective battery flag if battery is low
1B	enable protected mode
1C	set pmode stack
1D	protected mode test and memory size determine (0 640k)
1E	HOW_BIG_END, set base memory size
1F	protected mode test and memory size determine (above 1024k)
20	HOW_BIG_END1, set expansion memory size in CMOS
21	test address lines 19-23
22	shutdown back to real mode
23	return 1 from shutdown setup @tos stack pointer reset 0:0 vector
24	initialize the equip flag in Bios Data Area
25	check for manufacturing boot request
34	return to real mode
35	test for addressing error
40	setup and test video check for video feature ROM (c000h to c800h)
41	check planar id
42	test 8259 controller test interrupt mask registers w/zero
43	disable device interrupts
44	check for hot interrupts display 101 error
45	hot NMI int. w/o i/o memory parity enabled
46	display 107 error
47	test timer0, timer1 and timer3
48	verify timer 2 output low and that timer 0 interrupt did not occur
49	verify that all bits go on for timer 0
4A	verify timer 2 output hi
4B	verify timer 0 interrupt generated
4C	verify that timer 0 does not count too fast/slow (use refresh)
4D	verify that timer 3 generates NMI (watchdog)
4E	check 8042 for last command accepted *** error 105 displayed here maybe
4F	additional read/write storage test ** must run in protected mode
50	set shutdown return
51	enable protected mode
52	set es and ds to memory block display size count for memory < 640k
53	point to next 64k block display size count for memory > 640k
54	memory tests done - back to real mode
55	keyboard test

56	not a manufacturing mode, test kybd
57	check kybd clock
58	check for stuck keys
59	print stuck key scan code on screen
5A	test auxiliary device (mouse)
5B	initialize 8042 to honor keylock
5C	setup hardware interrupt vector table level 0-7
5D	setup hardware interrupt vectors level 8-15 (vectors start at int 70h)
5E	set up other interrupts
5F	initialize keyboard bios parameters
60	diskette attachment test
61	enable diskette interrupts
62	turn drive 0 motor on ** display 601 error message
63	turn drive 0 motor off
64	system board asynchronous communication chip test
65	enable timer interrupts check CMOS battery and checksum and card id mismatch error test clock updating ** display 163 error message check memory size determined = CMOS ** display 164 error message check for CRT adapter error ** display 2401 error message
66	initialize floppy for drive type check for second floppy
67	initialize hard file
68	RPL ROM scan if bad battery, CMOS CRC error or Card ID mismatch
69	Feature card ROM scan (ROM at C000 --> E000)
6A	setup @printer_base setup @rs232_base
6B	setup @equip_flag, for printers and RS232's
6C	enable hardware interrupt if 80387 present
6D	set kybd state flags check for change typamatic request enable keyboard/timer interrupts read kybd id to initialize kybd and numlock check for second fixed disk ; not defined test for errors ** display 162 error message initialize printer (alternate display device)
90	address line 0 15 failure Base 512k storage failure send failing pattern to mfg ports initialize the video subsystem initialize video controller program controller to allow load of character generator load of 8x16 character generator program controller for after character generator load blank video buffer initialize dac initialize cursor
BE	entry to sysinit1; build gdt and idt tables switch to protected mode

BF	exit to sysinit1 set return address in double word 40:67
C1	Cache test
DA	switch memory refresh control from backup to normal mode
DB	check for Resume enabled
DC	check for memory refresh during Suspend
DD	save memory data that could be destroyed by POST Resume
DE	Setup a memory stack for POST Resume
DF	Test the SIO adapter
F0	additional protected (virtual mode) test set up for protected mode verify protected mode
F1	ensure software interrupt 32h works
F2	force an exception 0dh, ensure it happens
F3	verify ldt,sdt,ltr and str instructions
F4	verify the bounds instruction
F5	verify push all and pop all instructions
F6	verify access rights function correctly
F7	verify arpl instruction works
F8	verify lsl instruction works
F9	verify lar instruction works
FA	low meg chip select test set descriptor to screen buffer and ensure that address the correct buffer

Table 32 lists the checkpoints that occur during the IML process in Stage I:

Table 32. Checkpoint Codes during IML Stage I

Code	**Description**
6E	check for password manufacturing ROM scan jump to IML routine SCSI/ESDI initialization code is called and IML boot record is read in
81	Diskette IML Load in and verify IML boot record from diskette
82	Disk IML Load in and verify IML boot record from disk
83	Diskette IML Diskette recovery from SCSI IML failure Load in and verify IML boot record from diskette
84	Copy media Stage II image into system RAM
85	Verify Stage II image checksum
86	Store system partition pointer and system partition type Jump to Stage II reset vector

Table 33 lists the checkpoints that occur during the initial program load in Stage II:

Table 33. Checkpoint Codes during IPL Stage II

Code	Description
6E	interrupt to bootstrap load routine
6F	clear screen reset the disk parameter table vector clear @boot_locn
70	read in the single sector to the boot location validate the boot record
71	read INT 13H devices (disk/diskette) boot record read successful insure first byte of loaded boot is not zero insure data pattern first 8 words not all equal reset the diskette/disk system if the read is unsuccessful test for password request go to boot code
72	attempt to RPL via INT 18H test for password request
73	ripple or halt with error I9990305
74	Copy ROM BASIC to RAM

Table 34 lists the checkpoints that are exceptions that can occur while the POST code is running in protected mode.

Table 34. Checkpoint Exceptions During Protected Mode

Code	Description
90	divide error
91	single step
92	NMI, system request for D1
93	breakpoint
94	into detect
95	bound
96	invalid opcode
97	processor ext not avail
98	double exception
99	processor ext segment err
9A	tss bad in gate transfer
9B	segment not present
9C	stack segment not present
9D	general protection
9E	page fault
9F - AF	reserved
B0	processor extension error
B1 - BD	reserved

3.3 POST Interface Reference Information

Subtopics
3.3.1 Memory Retention
3.3.2 Store Loop Adapter RIPL Initialization
3.3.3 Boot Device Selection
3.3.4 Feature Slot Setup
3.3.5 POS Data Lookup Table

3.3.1 Memory Retention

Memory retention hardware saves the contents of memory while AC line voltage is missing or main power is turned off. This feature makes it possible to suspend the application program when power is lost (or turned off) and to resume the application program when power returns.

The system goes through the following sequence of events to make this process work:

1. Application program and operating system software are suspended when a power loss is imminent. This is accomplished by a hardware interrupt.

2. The software execution environment and application context are saved.

3. The microprocessor is halted while power goes off.

4. Some time later, power returns to the system.

5. The software execution environment and application context are restored. This is done in two stages:

    a. POST reinitializes common hardware functions and recreates a generic software execution environment without destroying the operating system and application programs.

    b. Basic Input Output System (BIOS) routines restore customized hardware functions and data areas to their original state.

6. Application program and operating system software are resumed at the next sequential instruction.

Subtopics
3.3.1.1 POST Memory Retention Support
3.3.1.2 External Dependencies - BIOS
3.3.1.3 PLD Recovery Code Path

3.3.1.1 POST Memory Retention Support

Memory retention support function in POST is as follows:

1. The code path is structured to resume the application program as quickly as possible.

2. The POST process is power line disturbance (PLD) fault tolerant, also. But, POST does not resume at the next sequential instruction following a PLD. POST is restarted. This allows the system to recover from multiple PLDs that occur in a short time span.

3. The system is NOT halted for non-critical errors.

   Note: A memory retention failure is classified non-critical. Should one occur, however, POST forces the system to re-IPL.

4. Hardware functions initialized by "PLD Recovery", "Warm Start" and "Cold Start" code paths are the same.

5. Modified memory data is restricted to 2 areas during PLD recovery:

   a. Specific offsets in the first 1,280 bytes of memory (X'0000' through X'0500'). This area contains microprocessor interrupt vectors, the POST stack, and the BIOS Data Area.

   b. Specific offsets in the extended BIOS data area (EBDA). POST allocates this data area below the 640K memory address boundary on "Cold Starts", but it is relocatable. The segment address is stored in the BIOS Data Area at memory address X'040E'. The operating system can relocate the extended BIOS data area on almost any 1K boundary between 1K and 639K.

6. Some option adapters steal system memory for their use by growing the EBDA. This can occur near the end of the POST process, when option adapters are being initialized. To prevent EBDA overgrowth, POST restores the EBDA to its original size before reinitializing option adapters.

7. On "Warm Starts" and "PLD Recoveries", POST protects the integrity of adjacent memory by not moving or re-creating the EBDA.

8. IPL reason codes, dump reason codes, and similar problem determination data are stored in NVRAM.

3.3.1.2 External Dependencies - BIOS

POST memory retention functions have the following dependencies on BIOS routines:

1. BIOS routines store the RESUME flag (5678H) into memory address 40:72 before power is lost, to indicate the application should be resumed when power returns.

2. BIOS routines restore hardware operating parameters that are customized for specific operating system or application program requirements.

3. BIOS routines restore memory data destroyed by POST during the RESUME process.

3.3.1.3 PLD Recovery Code Path

The 4693 runs with memory retention enabled most of the time. Following is an overview of the PLD recovery path through POST:

1. Program the BIC chip to re-enable memory.

2. Read hardware status to determine if memory retention is ON. Take the "Cold Start" or "Warm Start" code path if memory retention is OFF. Else, assume this is a "PLD Recovery".

3. Scan memory for parity errors to determine if memory retention was successful. Store the WARMBOOT flag (1234H) at memory address 40:72 and set the MR_Failed bit in the IPL_REASON flag byte, if memory retention failed.

4. Check for the RESUME flag at memory address 40:72 to determine if the application program should be resumed. Skip BIOS data area setup, extended BIOS data area setup, and hardware diagnostics if RESUME is true. Else, take the "Cold Start" or "Warm Start" path to POST Stage II IML.

5. Check for the RESUME flag at memory address 40:72 to determine if POST Stage II is already memory resident. Skip IML and switch directly to shadow ROM (POST Stage II) if RESUME is true. Else, use the IML process to load Stage II into memory and then switch to shadow ROM.

6. Check for the RESUME flag at memory address 40:72 to determine if Stage II diagnostics should be run. Skip diagnostics and initialize planar hardware if RESUME is true. Else, run diagnostics first; then, initialize planar hardware.

7. Shrink the size of the extended BIOS data area if required.

8. Reinitialize option adapters by running secondary ROM scan.

9. Check for the RESUME flag at memory address 40:72 to determine if the application program should be resumed. Call the resume operating system BIOS function if RESUME is true. Else, take the cold start or warm start path through the bootstrap loader (interrupt 19h).

3.3.2 Store Loop Adapter RIPL Initialization

The store loop adapter has an on-board ROM chip that contains POST diagnostics for the adapter, RIPL microcode, and functions to initialize the RIPL microcode. A POST sub-process called "secondary ROM scan" starts the RIPL initialization sequence by CALLing the on-board adapter ROM code. After diagnostics complete successfully, the store loop adapter ROM code initializes the RIPL microcode and then, returns to the POST secondary ROM scan. This action does not start the RIPL process; it only initializes an interface so that RIPL can be started later by the bootstrap loader (interrupt 19H).

The interface between RIPL and the bootstrap loader is established through interrupt 18H. At the beginning of secondary ROM scan, interrupt 18H points to a procedure in POST ROM that displays an error message.

Note: In PC products and older PS/2 products, interrupt 18H was the interface to ROM BASIC.

Initialization microcode in the store loop adapter ROM chip replaces this interrupt vector so that interrupt 18H points to the RIPL microcode entry point. This is accomplished by storing the RIPL entry point offset into memory address 0060H and storing the RIPL entry point segment into memory address 0062H.

This technique of replacing interrupt 18H also eliminates contention between two or more RPL adapters that might be installed in the system at the same time. The secondary ROM scan process starts at the bottom of memory-mapped I/O space (memory address C000:0000) and ends when it reaches the top (memory address E000:0000). During the process, each RPL adapter steals interrupt 18H from its previous owner. Therefore, the RPL adapter (token-ring, store loop, PC LAN, etc.) installed at the highest address in the memory-mapped I/O space is the final owner of interrupt 18H.

Subtopics
3.3.2.1 RPL Configuration

3.3.2.1 RPL Configuration

RTC CMOS address 13H, bit 5 (RPL Installed) is set by the reference diskette software to enable RPL. Under normal conditions, the "RPL Installed" configuration bit in the RTC CMOS determines if the interrupt 18H interface is used to IPL the system. However, if RTC CMOS or NVRAM setup data is corrupted and the reference diskette is not found, the bootstrap loader calls interrupt 18H as a last resort.

3.3.3 Boot Device Selection

Bootstrap loader (interrupt 19H) microcode selects an appropriate IPL device from a prioritized list. The hardware system can have two boot device lists that it can act on. A default boot priority list is always imbedded in POST ROM. A selectable boot device list can optionally be stored in NVRAM. Implementation of both lists conform to current PS/2 architecture.

Subtopics
3.3.3.1 Default Boot Priority List
3.3.3.2 Selectable Boot

3.3.3.1 Default Boot Priority List

The 4693 default boot priority list is the same as the PS/2 Model 57, except that the Store Loop Adapter is added to a sub-list of supported RPL devices. Following is the 4693 default boot priority list:

1. Diskette drive A
2. RPL device
    a. Token-ring adapter
    b. Store loop adapter
    c. PC-LAN adapter
    d. Ethernet adapter
3. Fixed disk
4. "Insert Diskette" icon, if diskette drive A is present.
5. Error message "I9990305", if no IPL device is present.

If POST detects hardware errors or configuration setup errors, boot record selection criteria and the boot device search process are as follows:

1. The fixed disk system partition is enabled, if a fixed disk is present.

2. The bootstrap loader ignores normal boot records and searches for a reference diskette boot record.

3. If RTC CMOS or NVRAM setup data is corrupted, all card slots are searched for the presence of RPL adapters. The last RPL adapter found in the system is setup, using default setup data imbedded in ROM, and initialized via the secondary ROM scan process.

3.3.3.2 Selectable Boot

The selectable boot device option is supported via data stored in NVRAM by reference diskette software. This option allows the user to create a prioritized boot device list that the bootstrap loader uses instead of the default list resident in ROM. The selectable boot device list can specify up to four boot devices.

SCSI devices and logical drives on a LAN are acceptable choices for selectable boot devices. No new functions are required in the 4693 POST code to support this feature.

3.3.4 Feature Slot Setup

The feature slot setup functions in POST add more automation to hardware configuration and reduce much of the dependency on the reference diskette when hardware configuration changes are made.

In the 4693, setup data for uninstalled features is stored in NVRAM. POST automatically reconfigures the hardware when option adapters are added, removed, and relocated.

In current PS/2 products, card setup data is stored in the feature slot POS data area of NVRAM. This data structure contains an entry for every architectured card slot that a PS/2 can have, even though some may not actually exist. Entries in the data structure are assigned sequentially to specific card slots and cannot be reassigned. POST keeps this data structure, without alteration, to maintain downward compatibility with PS/2 products. The feature slot POS data area contains **installed** option adapter setup data, only.

Table 35. Feature Slot POS Data Area

NVRAM Address	**Description**
0000H - 0022H	POS data for feature slot 1
0023H - 0045H	POS data for feature slot 2
0046H - 0068H	POS data for feature slot 3
0069H - 008BH	POS data for feature slot 4
008CH - 00AEH	POS data for feature slot 5
00AFH - 00D1H	POS data for feature slot 6
00D2H - 00F4H	POS data for feature slot 7
00F5H - 0117H	POS data for feature slot 8
0118H - 013AH	POS data for feature slot 9
013BH - 015DH	POS data for feature slot 10
015EH - 0160H	Reserved for expansion memory growth
0161H - 0162H	Configuration CRC

Subtopics
3.3.4.1 POS Data Record Structure

3.3.4.1 POS Data Record Structure

Feature slot POS data records are formatted as follows:

1. Feature adapter card ID (low byte, high byte).

2. One byte of information that contains the number of POS data bytes required for this feature. Allowable values can range from 0 to 32 bytes.

3. Four POS data bytes for POS registers 102 through 105, respectively.

4. 28 bytes reserved.

3.3.5 POS Data Lookup Table

POS data for uninstalled option adapters are stored in a new NVRAM data structure called the POS data lookup table. This data structure is similar to the feature slot POS data area, but is used differently.

- Entries in the lookup table are not assigned to specific card slots.
- Each lookup table entry can be used to setup only one card slot.
- The lookup table can have more than one entry that matches a specific feature adapter card ID.
- Card slots are setup sequentially, starting with slot 1, using the first lookup table entry that matches the card ID and is not already in use.
- The feature slot POS data area is updated from the POS data lookup table when configuration changes are detected.
- The POS data lookup table contains at least one entry that matches an empty card slot. This entry can be used to setup more than one empty card slot.

Table 36. Card POS Data Lookup Table

RTC NVRAM Address	**Description**
01D0H - 01F2H	POS data for card ID nnnn
01F3H - 0215H	POS data for card ID nnnn
0216H - 0238H	POS data for card ID nnnn
0239H - 025BH	POS data for card ID nnnn
025CH - 027EH	POS data for card ID nnnn
027FH - 02A1H	POS data for card ID nnnn
02A2H - 02C4H	POS data for card ID nnnn
02C5H - 02E7H	POS data for card ID nnnn
02E8H - 030AH	POS data for card ID nnnn
030BH - 032DH	POS data for card ID nnnn
032EH - 0330H	Reserved
0331H - 0332H	Configuration CRC

3.4 BIOS Data Areas

The system has two data segments that are called BIOS data areas: the original IBM PC BIOS data area and the PS/2 extended BIOS data area (EBDA). POST allocates both of these data segments specifically as work areas for system BIOS and adapter BIOS. The original BIOS data area is 256 bytes of memory starting at address X'0400' and extending through address X'04FF'. The extended BIOS data area was developed to expand the BIOS data area.

The extended BIOS data area is relocatable and expandable. Access to this data segment should be established via the segment address stored at address 40:0E or via BIOS interrupt 15H, function number C1H. Other vectors or fixed segment values must not be used to point to the EBDA because they are not updated when the EBDA is relocated or expanded.

4.0 Topic 4. 4693 Basic Input/Output System (BIOS)

Subtopics

4.1 Basic Input/Output System (BIOS) Routines
4.2 Interrupt 02h - PPC NMI
4.3 Interrupt 0Fh - IRQ7
4.4 Interrupt 10h - Point Of Sale (POS) Video BIOS
4.5 Interrupt 13h - Disk/Diskette
4.6 Interrupt 15h - System Services
4.7 Interrupt 16h - POS Keyboard BIOS
4.8 Advanced Basic Input/Output System (ABIOS) Routines
4.9 Device ID 02h - Disk
4.10 Device ID 09h - System Services
4.11 Device ID 0Ah - PPC NMI

4.1 Basic Input/Output System (BIOS) Routines

This section describes software interrupt routines that are called from an application and get control from hardware interrupts and that have been modified and added to support the 4690 system. Access to BIOS is through software interrupt routines. Each BIOS entry point is available through its own interrupt with the (AH) register. All of the software routines described in this section are used when the processor is in "real" mode (DOS operating environment or equivalent).

The software interrupt routines are:

- Interrupt 02h - PPC NMI
- Interrupt 0Fh - IRQ7
- Interrupt 10h - video
- Interrupt 13h - disk/diskette
- Interrupt 15h - system services
- Interrupt 16h - keyboard

4.2 Interrupt 02h - PPC NMI

The nonmaskable interrupt (NMI) routine supports the programmable power control (PPC) hardware. If the PPC NMI routine gets control and finds that the PPC hardware did not generate the NMI, the existing ROM NMI routines are executed as normal.

4.3 Interrupt 0Fh - IRQ7

The IRQ7 hardware interrupt routine transmits and receives operations for the SIO channel hardware. The IRQ7 routine is used by the system service BIOS routine for POS device control. See interrupt 15h, "(AH) = 92h - POS Device Control BIOS" in topic 4.6.2.

4.4 Interrupt 10h - Point Of Sale (POS) Video BIOS

The POS video BIOS interrupt routine redirects video BIOS functions to an SIO channel-attached display if a PS/2 video display is not attached. This allows POST to display diagnostic error codes and provides a standard display interface for the reference diskette.

It is the responsibility of the operating system to disable interrupt 10h redirection if the video BIOS function is not desired. See INT 15h, (AH)= 92h, (AL)= 00h in topic 4.6.2 for a way to disable this redirection feature.

POS video BIOS supports only VGA (modes 13h and below). Any request to set the video mode above 13h is ignored by BIOS.

When the POS video BIOS is active, a 2 x 20 display viewport of the 25 x 80 screen is shown at the last written character position.

Notes:

1. The cursor is not displayed on the SIO displays.

2. Mode 0-13h is not supported. Displays are 2 lines x 20 columns of alphanumeric data. APA graphics are not supported.

3. Displayable characters include code page 437, 20h through 7Fh. There is no support for characters outside this range because the characters are not represented consistently across all POS displays.

4. Some displays fold lower case letters to upper case.

5. Power on default mode is 3.

6. In mode 2, all off-screen actions set the carry flag on return.

7. In mode 3, the carry flag retains the video BIOS return state.

The POS video BIOS intercepts the following video BIOS calls for displaying data on the POS attached display:

(AH) = 00h - Set mode (clear screen only)
(AH) = 02h - Set cursor position
(AH) = 03h - Read cursor position
(AH) = 06h - Clear screen only
(AH) = 07h - Not supported
(AH) = 08h - Not supported
(AH) = 09h - Write character attribute at cursor
(AH) = 0Ah - Write character at cursor position
(AH) = 0Eh - Write teletype
(AH) = 0Fh - Get video state
(AH) = 13h - Write string

All functions not supported by the POS video BIOS are passed on to the standard 4693 video BIOS.

4.5 Interrupt 13h - Disk/Diskette

The disk/diskette BIOS routine supports the 2.5 inch SCSI fixed disk drive.

4.6 Interrupt 15h - System Services

There are three system services supporting the 4693 hardware:

(AH) = 42h - Programmable power control
(AH) = 92h - Point-Of-Sale (POS) device control
(AH) = CAh - NVRAM

These BIOS services:

- Preserve all registers that are not used for returning information.
- Clear the carry flag if the operation was successful.
- Set the carry flag if the operation failed to complete.

Subtopics
4.6.1 (AH) = 42h - Programmable Power Control BIOS
4.6.2 (AH) = 92h - POS Device Control BIOS
4.6.3 (AH) = CAh - NVRAM System Services BIOS

4.6.1 (AH) = 42h - Programmable Power Control BIOS

The PPC BIOS provides an application interface to the PPC hardware. This interface gives the user the ability to control the 4693 power on/off states.

The following functions are accessed by interrupt 15h with register (AH) = 42 and register (AL) equal to the number below:

(AL) = 20h - Reserved
(AL) = 21h - Suspend system
(AL) = 22h - Set the power-on events
(AL) = 23h - Reserved
(AL) = 24h - Reserved
(AL) = 25h - Read PPC status and power-on events
(AL) = 26h - Reserved
(AL) = 27h - Diagnosis PPC hardware
(AL) = 28h - Reserved
(AL) = 29h - Enable PDI and use direct NMI to the processor
(AL) = 2Ah - Enable PDI and use channel check NMI
(AL) = 2Bh - Disable PDI

On return from these functions, register (AH) contains condition code:

00h - No error
01h - Function call not valid
02h - Input parameters not valid
03h - Interface error. PPC hardware not responding .
04h - Device busy. Resend command.

Subtopics
4.6.1.1 (AL) = 21h - Suspend System
4.6.1.2 (AL) = 22h - Set the Power-On Event
4.6.1.3 (AL) = 25h - Read PPC Status and Power-On Events
4.6.1.4 (AL) = 27h - Diagnosis PPC Hardware
4.6.1.5 (AL) = 29h - Enable PDI and Use Direct NMI to the Processor
4.6.1.6 (AL) = 2Ah - Enable PDI and Use Channel Check NMI
4.6.1.7 (AL) = 2Bh - Disable PDI

4.6.1.1 (AL) = 21h - Suspend System

This function sets the 4693 power to off. When this command is issued to the PPC hardware, an NMI is generated at least 4 ms before the system power is completely removed. Assuming that the NMI vector has not been modified, the PPC NMI routine gains control of the system.

Note: The application should set the power-on events before using this function. If no power-on events are previously set, the system resumes only when the Mode Control switch is pressed and AC power is present.

4.6.1.2 (AL) = 22h - Set the Power-On Event

This function sets up a future event for automatically turning the 4693 power on. These power-on events remain in effect until changed by the application or AC and battery power is lost.

On entry, the power-on events are defined in register (BL):

Bit 7 Reserved
Bit 6 Reserved
Bit 5 Reserved
Bit 4 Reserved
Bit 3 Ring detect 2
Bit 2 Ring detect 1
Bit 1 Clock alarm
Bit 0 Reserved

Setting the appropriate bit enables the corresponding power-on event. Multiple bits may be set in register (BL) for any combination of power-on events. If no bits are set in register (BL), the system powers on when the Mode Control switch is pressed. The Mode Control switch is always enabled as a power-on event.

Note: The 4693 does not switch to ready mode (power on) if AC power is not present.

On entry, if the clock alarm event is selected as a power-on event, the following alarm registers must be loaded with the alarm time:

(CH) = Hour Hour is in 24 hour BCD format. Valid values are **00h** through **23h**.

(CL) = Minute Minute is in BCD format. Valid values are **00h** through **59h**.

(DL) = Day Day is the day of the month. Valid values are **01h** through **31h**.

4.6.1.3 (AL) = 25h - Read PPC Status and Power-On Events

This function returns the current PPC power-on status and power-on events.

On return, register (BH) contains the power-on status:

Bit 7 Reserved

Bit 6 Reserved

Bit 5 Reserved

Bit 4 Set if the Mode Control switch on event enabled power, otherwise clear

Bit 3 Set if the ring detect #2 power-on event enabled power, otherwise clear

Bit 2 Set if the ring detect #1 power-on event enabled power, otherwise clear

Bit 1 Set if the RTC alarm power-on event enabled power, otherwise clear

Bit 0 Set if memory contents are known to be bad, otherwise clear

On return, register (BL) contains the enabled power-on events:

Bit 7 Reserved
Bit 6 Reserved
Bit 5 Reserved
Bit 4 Reserved
Bit 3 Set if the ring detect #2 power-on event is enabled, otherwise clear
Bit 2 Set if the ring detect #1 power-on event is enabled, otherwise clear
Bit 1 Set if the RTC alarm power-on event is enabled, otherwise clear
Bit 0 Set if memory retention is enabled, otherwise clear

4.6.1.4 (AL) = 27h - Diagnosis PPC Hardware

The function allows direct communication to the PPC hardware. This function should be used for diagnostic purposes only. The value in register (BL) is written into the PPC command register. On return, register (BH) contains the PPC response register.

4.6.1.5 (AL) = 29h - Enable PDI and Use Direct NMI to the Processor

This function enables the power down interrupt (PDI) to use a direct NMI to the processor that cannot be masked through I/O port 70h or port 61h. This NMI can only be disabled (masked) by interrupt 15h, (AH)= 42h, (AL)= 2Bh. This is the default PDI operating mode.

4.6.1.6 (AL) = 2Ah - Enable PDI and Use Channel Check NMI

This function enables the standard method of generating a NMI with a channel check. Because I/O port 70h or port 61h can disable the PDI notification, this function is not recommended. Control of the system unit power will not work correctly if the PPC NMI code is not executed when the power is going away.

4.6.1.7 (AL) = 2Bh - Disable PDI

This function disables the PPC hardware from generating a PDI when power is going away. This function is used when the user wants to control the system unit power from the front panel Mode Control switch only.

4.6.2 (AH) = 92h - POS Device Control BIOS

The POS device control BIOS provides an application interface to the POS devices attached to the SIO channel. This interface allows initialization, transmit, receive and error handling for each POS device.

The following functions are accessed by interrupt 15h with register (AH) = 92h and register (AL) equal to the number below:

(AL) = 00h - Initialize SIOC functions
(AL) = 01h - Add device to poll list
(AL) = 02h - Add device to poll list with receive routine pointer
(AL) = 03h - Remove device from poll list
(AL) = 04h - Transmit message to device (includes broadcasts)
(AL) = 05h - Receive message from device
(AL) = 06h - Transmit message status and device status

On return from these functions, register (AH) contains condition codescolon.

00h - No error
01h - Function call not valid
02h - Input parameters not valid
03h - Interface error, corrupted or missing SIOC EBDA
04h - Device busy. Resend command.
05h - Device poll list full
06h - No receive data to return
07h - Receive buffer overflow, data truncated
08h - Duplicate device found
09h - Device being transmitted not online

Subtopics
4.6.2.1 (AL) = 00h - Initialize SIOC Functions
4.6.2.2 (AL) = 01h - Add Device to Poll List
4.6.2.3 (AL) = 02h - Add Device to Poll List With Receive Routine Pointer
4.6.2.4 (AL) = 03h - Remove Device From Poll List
4.6.2.5 (AL) = 04h - Transmit Message to Device (Includes Broadcasts)
4.6.2.6 (AL) = 05h - Receive Message From Device
4.6.2.7 (AL) = 06h - Transmit Message Status and Device Status

4.6.2.1 (AL) = 00h - Initialize SIOC Functions

This function initializes the serial I/O channel hardware.

On entry, register (BX) enables or disables the following functions:

Bit 0 (0) = Disable SIOC interface.
(1) = Enable SIOC interface.

Bit 1 (0) = Do not change device poll list.
(1) = Remove all devices from poll list.

Bit 2 (0) = Disable interrupt 10h, video redirection.
(1) = Enable interrupt 10h, video redirection.

Bit 3 (0) = Disable interrupt 16h, keyboard redirection.
(1) = Enable interrupt 16h, keyboard redirection.

Bit 4 (0) = Do not reset SIOC hardware.
(1) = Reset SIOC hardware.

On entry, if video or keyboard redirection is selected as a device, register (CX) contains a wait parameter. If the wait parameter = 0 , the wait is disabled.

4.6.2.2 (AL) = 01h - Add Device to Poll List

This function adds a device to the poll list.

Registers on entry:

(CX) Size of buffer
(DX) Port or device address
(DS:SI) Pointer to device work or receive buffer

4.6.2.3 (AL) = 02h - Add Device to Poll List With Receive Routine Pointer

This function adds a device to the poll list and allows the application to be called when information frame data is received.

Registers on entry:

(BX) Bit 0 is set when the application wants to be called on all receive data

(CX) Size of buffer

(DX) Port or device address

(DS:SI) Pointer to device work or receive buffer

(ES:DI) Pointer to application receive routine

4.6.2.4 (AL) = 03h - Remove Device From Poll List

This function removes a device from the poll list. On entry, register (DX) is loaded with the port or device address.

4.6.2.5 (AL) = 04h - Transmit Message to Device (Includes Broadcasts)

This function transmits a message to a device. On entry, register (DS:SI) is the pointer to the transmit messages.

4.6.2.6 (AL) = 05h - Receive Message From Device

This function receives a message from a device. Registers on entry:

(CX)   Length of application receive buffer
(DX)   Port or device address
(DS:SI) Pointer to receive buffer

4.6.2.7 (AL) = 06h - Transmit Message Status and Device Status

This function transmits message status and device status. On entry register (DX) is loaded with the port or device address. On return, register (CL) contains the number of messages pending and register (CH) contains:

80h Reserved
40h Command reject received
20h Sequence error received
10h Poll timeout received
08h Receive buffer overflow
04h Receive routine received
02h SNA received
01h ROL received

4.6.3 (AH) = CAh - NVRAM System Services BIOS

The NVRAM system service provides a common application interface to all of the NVRAM in the 4690 system. The 4693 has a total of 40K bytes of NVRAM dedicated for internal, operating system and application use. As illustrated in Figure 12, type 0 and 1 is for operating system and application use. Type 2 is for operating system and internal use.

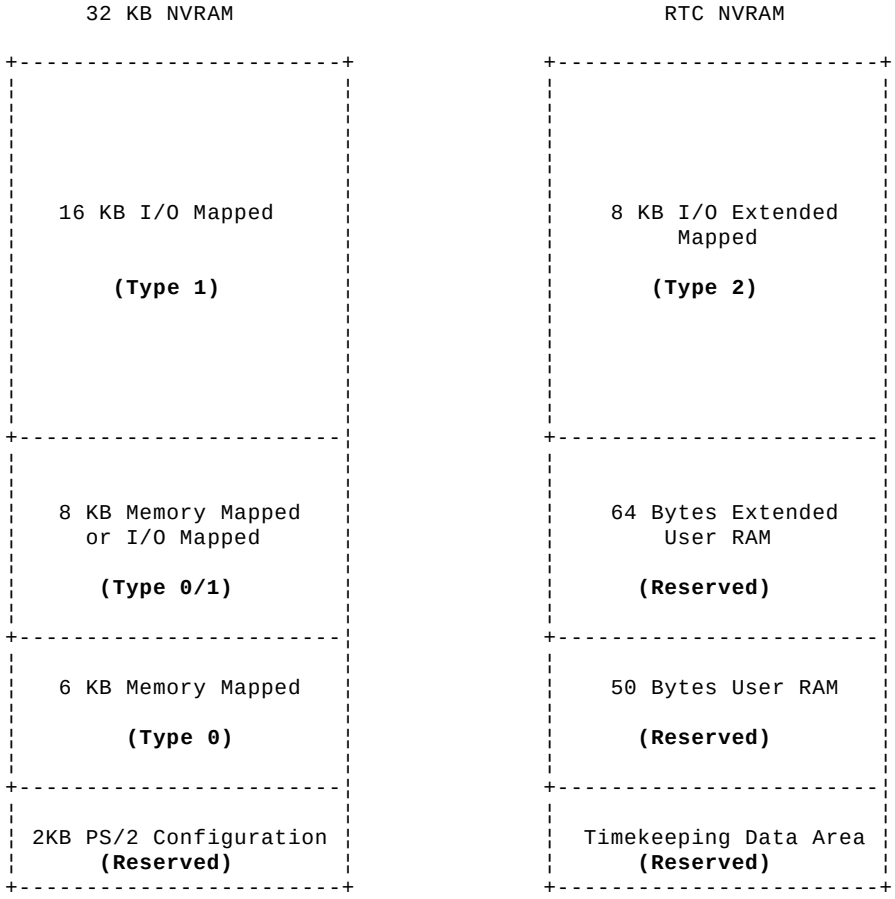


Figure 12. 4693 NVRAM

This application program interface (API) differentiates access to the 32 KB NVRAM and the 8 KB RTC NVRAM by use of a control flag in the (CH) register. I/O requests to the 32 KB NVRAM area include a check of the diagnostic byte that indicates data integrity.

The following functions are accessed by interrupt 15h with register (AH) = CAh and register (AL) equal to the number below:

(AL) = 22h - Read Byte From NVRAM (With CRC check)
(AL) = 23h - Write Byte To NVRAM (With CRC check)
(AL) = 28h - Read Byte From NVRAM (Without CRC check)
(AL) = 29h - Write Byte To NVRAM (Without CRC check)
(AL) = 2Ah - Read String From NVRAM (With CRC check)
(AL) = 2Bh - Write String To NVRAM (With CRC check)
(AL) = 2Ch - Write String To NVRAM (Without CRC check)

On return from these functions, register (AH) contains condition code:

00h - No error
02h - NVRAM data is corrupt
03h - Address out of range
86h - Function call not valid

Subtopics
4.6.3.1 (AL) = 22h - Read Byte From NVRAM (With CRC Check)
4.6.3.2 (AL) = 23h - Write Byte To NVRAM (With CRC Check)
4.6.3.3 (AL) = 28h - Read Byte From NVRAM (Without CRC Check)
4.6.3.4 (AL) = 29h - Write Byte To NVRAM (Without CRC Check)
4.6.3.5 (AL) = 2Ah - Read String From NVRAM (With CRC Check)
4.6.3.6 (AL) = 2Bh - Write String To NVRAM (With CRC Check)
4.6.3.7 (AL) = 2Ch - Write String To NVRAM (Without CRC Check)

4.6.3.1 (AL) = 22h - Read Byte From NVRAM (With CRC Check)

This function reads a byte of information from either the 32 KB or the 8 KB NVRAM areas. The CRC code is checked to verify that it is good before a read operation from the 32 KB area is performed. No checks are performed on the 8 KB RTC NVRAM area. The read address is supplied in the (BX) register with bit 15 indicating the desired state of NMI upon exit of this call. Control information is provided in the (CH) register with bit 7 indicating the I/O location for this operation and bit 6 indicating address incrementation.

On entry, register (BX) contains the address to read:

Bits 0 through 14 Source address
Bit 15 (0) = NMI is enabled on exit.
(1) = NMI is disabled on exit.

On entry, register (CH) contains control information:

Bit 6 (1) = Increment address
Bit 7 (0) = 32 KB NVRAM area location.
(1) = 8 KB RTC NVRAM area location.

On return, register (AH) contains the return code:

00h Completed successfully
02h NVRAM data is corrupt (32 KB area only)
86h Function not supported

On return, register (BX) contains the address modified based on bit 6 of register (CH) and register (CL) contains the data read.

4.6.3.2 (AL) = 23h - Write Byte To NVRAM (With CRC Check)

This function writes a byte of information to either the 32 KB or the 8 KB NVRAM areas. The CRC code is checked to verify that it is good before a write operation to the 32 KB area is performed. No checks are performed on the 8 KB RTC NVRAM area. The address to write to is supplied in the (BX) register with bit 15 indicating the desired state of NMI upon exit of this call. Control information is provided in the (CH) register with bit 7 indicating the I/O location for this operation and bit 6 indicating address increments.

On entry, register (BX) contains the address to write:

Bits 0 through 14 Target address
Bit 15 (0) = NMI is enabled on exit.
(1) = NMI is disabled on exit.

On entry, register (CH) contains control information:

Bit 6 (1) = Increment address
Bit 7 (0) = 32 KB NVRAM area location.
(1) = 8 KB RTC NVRAM area location.

On entry, register (CL) contains the data to write.

On return register (AH) contains the return code:

00h Completed successfully
02h NVRAM data is corrupt (32 KB area only)
86h Function not supported

On return, register (BX) contains the address modified based on bit 6 of register (CH).

4.6.3.3 (AL) = 28h - Read Byte From NVRAM (Without CRC Check)

This function reads a byte of information from either the 32 KB or the 8 KB NVRAM areas. No checks are performed on the 8 KB RTC NVRAM or the 32 KB NVRAM areas. The read address is supplied in the (BX) register with bit 15 indicating the desired state of NMI upon exit of this call. Control information is provided in the (CH) register with bit 7 indicating the I/O location for this operation and bit 6 indicating address incrementation.

On entry, register (BX) contains the address to read:

Bits 0 through 14 Source address
Bit 15 (0) = NMI is enabled on exit.
(1) = NMI is disabled on exit.

On entry, register (CH) contains control information:

Bit 6 (1) = Increment address
Bit 7 (0) = 32 KB NVRAM area location.
(1) = 8 KB RTC NVRAM area location.

On return, register (AH) contains the return code:

00h Completed successfully
86h Function not supported

On return, register (BX) contains the address modified based on bit 6 of register (CH) and register (CL) contains the data read.

4.6.3.4 (AL) = 29h - Write Byte To NVRAM (Without CRC Check)

This function writes a byte of information to either the 32 KB or the 8 KB NVRAM areas. No checks are performed on the 8 KB RTC NVRAM or the 32 KB NVRAM areas. The address to write to is supplied in the (BX) register with bit 15 indicating the desired state of NMI upon exit of this call. Control information is provided in the (CH) register with bit 7 indicating the I/O location for this operation and bit 6 indicating address increments.

On entry, register (BX) contains the address to write:

Bits 0 through 14 Target address
Bit 15 (0) = NMI is enabled on exit.
(1) = NMI is disabled on exit.

On entry, register (CH) contains control information:

Bit 6 (1) = Increment address
Bit 7 (0) = 32 KB NVRAM area location.
(1) = 8 KB RTC NVRAM area location.

On entry, register (CL) contains the data to write.

On return, register (AH) contains the return code:

00h Completed successfully
86h Function not supported.

On return, register (BX) contains the address modified based on bit 6 of register (CH).

4.6.3.5 (AL) = 2Ah - Read String From NVRAM (With CRC Check)

This function reads a string of information from either the 32 Kb or the 8 KB NVRAM areas. The CRC code is checked to verify that it is good before a read operation from the 32 KB area is performed. No checks are performed on the 8 KB RTC NVRAM area. The starting address to read from is supplied in the (BX) register with bit 15 indicating the desired state of NMI upon exit of this call. Control information is provided in the (CX) register with bit 15 indicating the I/O location to read, bit 14 indicating address incrementation and bits 13-0 indicating the number of bytes to read.

On entry, register (BX) contains the address to read:

Bits 0 through 14 Source starting address
Bit 15 (0) = NMI is enabled on exit.
(1) = NMI is disabled on exit.

On entry, register (CX) contains control information:

Bits 0 through 13 Number of bytes to read. (0) = No operation.
Bit 14 (1) = Increment address
Bit 15 (0) = 32 KB NVRAM area location.
(1) = 8 KB RTC NVRAM area location.

On entry, register (ES) contains the segment address of the destination buffer and register (DI) contains the offset address of the destination buffer.

On return, register (AH) contains the return code:

00h Completed successfully
02h NVRAM data is corrupt (32 KB area only)
03h Address out of range
86h Function not supported

On return, register (BX) contains the address modified based on bit 6 of register (CH).

4.6.3.6 (AL) = 2Bh - Write String To NVRAM (With CRC Check)

This function writes a string of information to either the 32 KB or the 8 KB NVRAM areas. The CRC code is checked to verify that it is good before a write operation to the 32 KB area is performed. No checks are performed on the 8 KB RTC NVRAM area. The starting address to write to is supplied in the (BX) register with bit 15 indicating the desired state of NMI upon exit of this call. Control information is provided in the (CX) register with bit 15 indicating I/O location for to read, bit 14 indicating address incrementation and bits 13-0 indicating the number of bytes to write.

On entry, register (BX) contains the address to write:

Bits 0 through 14 Target starting address

Bit 15 (0) = NMI is enabled on exit.
(1) = NMI is disabled on exit.

On entry, register (CX) contains control information:

Bits 0 through 13 Number of bytes to write.
(0) = No operation.
Bit 14 (1) = Increment address
Bit 15 (0) = 32 KB NVRAM area location.
(1) = 8 KB RTC NVRAM area location.

On entry, register (DS) contains the segment address of the source buffer and register (SI) contains the offset address of the source buffer.

On return from these functions, register (AH) contains the condition code:

- 00h - Completed successfully
- 02h - NVRAM data is corrupt (32 KB area only)
- 03h - Address in out of range
- 86h - Function is not supported

On return, register (BX) contains the address modified based on bit 6 of register (CH).

4.6.3.7 (AL) = 2Ch - Write String To NVRAM (Without CRC Check)

This function writes a string of information to either the 32 KB or the 8 KB NVRAM areas. No checks are performed on the 8 KB RTC NVRAM or the 32 KB NVRAM areas. The starting address to write to is supplied in the (BX) register with bit 15 indicating the desired state of NMI upon exit of this call. Control information is provided in the (CX) register with bit 15 indicating the I/O location to read, bit 14 indicating address incrementation and bits 13-0 indicating the number of bytes to write.

On entry, register (BX) contains the address to write:

Bits 0 through 14 Target starting address
Bit 15 (0) = NMI is enabled on exit.
(1) = NMI is disabled on exit.

On entry, register (CX) contains control information:

Bits 0 through 13 Number of bytes to write. (0) = No operation.

Bit 14 (1) = Increment address

Bit 15 (0) = 32 KB NVRAM area location.
(1) = 8 KB RTC NVRAM area location.

On entry, register (DS) contains the segment address of the source buffer and register (SI) contains the offset address of the source buffer.

On return, register (AH) contains the return code:

00h Completed successfully
03h Address in out of range
86h Function is not supported

On return, register (BX) contains the address modified based on bit 6 of register (CH).

4.7 Interrupt 16h - POS Keyboard BIOS

The keyboard BIOS redirects keyboard BIOS functions to a SIO channel-attached keyboard if the PS/2 keyboard is not attached to the 4693. This allows POST to continue in the event of a diagnostic error. POS keyboard BIOS provides a standard keyboard interface for the reference diskette. It is the responsibility of the operating system to redirect the interrupt 16h vector if this function is not desired. See INT 15h, (AH)= 92h, (AL)= 00h in topic 4.6.2 for a way to disable this redirection feature.

The POS keyboard BIOS intercepts the following keyboard BIOS functions for interfacing to the SIO attached keyboard.

(AH) = 00h - Keyboard read
(AH) = 01h - Keystroke status
(AH) = 10h - Extended keyboard read
(AH) = 11h - Extended keystroke status

All of these functions operate the same as before except that they pass back the POS specific scan codes for the POS keyboard that is attached.

All other functions are not supported by the POS keyboard BIOS and return with no error.

4.8 Advanced Basic Input/Output System (ABIOS) Routines

Access to the ABIOS is through a parameter block called the request block. Within the request block are fields that identify the target device, requested function, and details of the request. This section describes the single-staged ABIOS routines that have been modified and added to support the 4690 system. All of the ABIOS routines described in this section can be used in any of the "processor-protected" modes of operation (OS/2, 4690, or equivalent).

The ABIOS routines are:

- Device ID 02h - Disk
- Device ID 09h - System services
- Device ID 0Ah - PPC NMI

4.9 Device ID 02h - Disk

The disk/diskette BIOS routine supports the 2.5 inch SCSI fixed disk drive.

4.10 Device ID 09h - System Services

The programmable power control function is the additional ABIOS routine added to support the 4693 system.

Subtopics
4.10.1 Function 20h - Programmable Power Control (PPC) ABIOS

4.10.1 Function 20h - Programmable Power Control (PPC) ABIOS

The PPC ABIOS provides an application interface to the PPC hardware that controls the system power on/off state and is the control mechanism for battery backup and refresh of the system DRAM during the absence of AC power.

The following routines are accessed by function number **20h** with a subfunction number as described below. The subfunction number is a word at offset 10h.

- **(AL) = 00h** - Reserved
- **(AL) = 01h** - Suspend system
- **(AL) = 02h** - Set the power-on events
- **(AL) = 03h** - Reserved
- **(AL) = 04h** - Reserved
- **(AL) = 05h** - Read PPC status and power-on events
- **(AL) = 06h** - Reserved
- **(AL) = 07h** - Reserved (diagnostic use only)
- **(AL) = 08h** - Register OS PLD notification pointer
- **(AL) = 09h** - Enable PDI and use direct NMI to the processor
- **(AL) = 0Ah** - Enable PDI and use channel check NMI
- **(AL) = 0Bh** - Disable PDI

Subtopics

4.10.1.1 Subfunction 01h - Suspend System
4.10.1.2 Subfunction 02h - Set the Power-On Event
4.10.1.3 Subfunction 05h - Read PPC Status and Power-On Events
4.10.1.4 Subfunction 08h - Register OS PLD Notification Pointer
4.10.1.5 Subfunction 09h - Enable PDI and Use Direct NMI to the Processor
4.10.1.6 Subfunction 0Ah - Enable PDI and Use Channel Check NMI
4.10.1.7 Subfunction 0Bh - Disable PDI

4.10.1.1 Subfunction 01h - Suspend System

This subfunction sets the 4693 power to off. When this command is issued to the PPC hardware it generates an NMI at least 4 ms before the system power is completely removed. Assuming that the NMI vector has not been modified, the PPC NMI routine gains control of the system.

Note: The application should set the power-on events before using this function. If no power-on events are previously set, the system only resumes when the Mode Control switch is pressed and AC power is present.

4.10.1.2 Subfunction 02h - Set the Power-On Event

This subfunction setups a future event for automatically turning the 4693 power on. These power-on events remain in effect until changed by the application or AC and battery power is lost. On entry, the power-on events are defined in request block offset 1Bh:

Bit 7 Reserved
Bit 6 Reserved
Bit 5 Reserved
Bit 4 Reserved
Bit 3 Ring detect 2
Bit 2 Ring detect 1
Bit 1 Clock alarm
Bit 0 Reserved

Setting the appropriate bit enables the corresponding power-on event. Multiple bits may be set for any combination of power-on events. If no power-on event bits are set, the system powers on when the Mode Control switch is pressed. The Mode Control switch is always enabled as a power-on event.

Note: The 4693 does not switch to ready mode (power on) if AC power is not present.

On entry, if the clock alarm event is selected as a power-on event, the following request block offsets must be loaded with the alarm day and time.

12h = Hour Hour is in 24 hour BCD format. Valid values are **00h** through **23h**.

13h = Minute Minute is in BCD format. Valid values are **00h** through **59h**.

18h = Day Day is the day of the month. Valid values are **01h** through **31h**.

4.10.1.3 Subfunction 05h - Read PPC Status and Power-On Events

This subfunction returns the current PPC power-on status and power-on events.

On return, request block offset 1Ah contains the power-on status:

Bit 7 Reserved

Bit 6 Reserved

Bit 5 Reserved

Bit 4 Set if the Mode Control switch on event enabled power, otherwise clear

Bit 3 Set if the ring detect #2 power-on event enabled power, otherwise clear

Bit 2 Set if the ring detect #1 power-on event enabled power, otherwise clear

Bit 1 Set if the RTC alarm power-on event enabled power, otherwise clear

Bit 0 Set if memory contents are known to be bad, otherwise clear

On return, request block offset 1Bh contains the enabled power-on events:

Bit 7 Reserved
Bit 6 Reserved
Bit 5 Reserved
Bit 4 Reserved
Bit 3 Set if the ring detect #2 power-on event is enabled, otherwise clear
Bit 2 Set if the ring detect #1 power-on event is enabled, otherwise clear
Bit 1 Set if the RTC alarm power-on event is enabled, otherwise clear
Bit 0 Set if memory retention is enabled, otherwise clear

4.10.1.4 Subfunction 08h - Register OS PLD Notification Pointer

This subfunction stores a double word pointer in the EBDA for calling the application during a PLD suspend/resume sequence. Request block offset 12h contains the double word pointer that is saved into the EBDA.

4.10.1.5 Subfunction 09h - Enable PDI and Use Direct NMI to the Processor

This subfunction enables the power down interrupt (PDI) to use a direct NMI to the processor that cannot be masked through I/O port 70h or port 61h. This NMI can only be disabled (masked) by device ID 09h, function 20h, subfunction 0Bh. This is the default PDI operating mode.

4.10.1.6 Subfunction 0Ah - Enable PDI and Use Channel Check NMI

This subfunction enables the standard method of generating a NMI with a channel check. Because I/O port 70h or port 61h can disable the PDI notification, this function is not recommended. Control of the system unit power will not work correctly if the PPC NMI code is not executed when the power is going away.

4.10.1.7 Subfunction 0Bh - Disable PDI

This subfunction disables the PPC hardware from generating a PDI when power is going away. This function is used when the user wants to control the system unit power from the front panel Mode Control switch only.

4.11 Device ID 0Ah - PPC NMI

The nonmaskable interrupt (NMI) routine supports the programmable power control (PPC) hardware. If the PPC NMI routine gets control and finds that the PPC hardware did not generate the NMI, the existing ROM NMI routines are executed as normal.

5.0 Topic 5. 4683 and 4684 General Description

This topic contains reference information about the 4683/4684 point-of-sale terminals.

Subtopics

5.1 General Description of the 4683 Point of Sale Terminal
5.2 General Description of the 4684 Point of Sale Terminal
5.3 4684 Configuration and Utility Procedures
5.4 Preparing to Run Configuration
5.5 Introduction to Utilities
5.6 Preparing to Run Utilities
5.7 Remote IPL (RIPL) for Token-Ring and Baseband LAN
5.8 4684 Device Channel Adapter Failure Status Bytes
5.9 4684 Communication Adapters Port Assignments
5.10 4683 Serial Input/Output Channel (Device Channel)

5.1 General Description of the 4683 Point of Sale Terminal

The following 4683 point-of-sale terminal models are available. The models are similar in appearance and can attach the same type of I/O devices. The basic terminal consists of a base unit, a keyboard, and a display.

4683-P11: This model has 1 megabyte of memory and is functionally equivalent to the 4683-001. It can be programmed to perform the user's point-of-sale functions. To perform all available point-of-sale functions, the 4683-P11 must be connected to a store loop and it must be communicating with a store controller on the store loop. After the 4683-P11 has received a program load from the store controller, some point-of-sale functions can be performed without communication with the store controller. The 4683-P11 base card has pluggable memory modules that allow you to increase the base card memory by replacing the existing modules with larger capacity modules.

4683-P21: This model has 2 megabytes of memory and is functionally equivalent to the 4683-A01. Except for the additional memory, the 4683-P21 is the same as the 4683-P11.

4683-P41: This model has 4 megabytes of memory. Except for the additional memory, the 4683-P41 is the same as the 4683-P11.

4683-001: This model has 1 megabyte of memory and is functionally equivalent to the 4683-P11. The memory on this model is fixed and cannot be changed.

4683-A01: This model has 2 megabytes of memory and is functionally equivalent to the 4683-P21. The memory on this model is fixed and cannot be changed.

4683-002: To perform the user's point-of-sale functions, each 4683-002 must be connected to a 4683-*xx*1 or a 4684 that is running the 4680 Operating System, the retail industry program support services (RIPSS) operating system, or an independently developed operating system.

4683-A02: This model is functionally equivalent to the 4683-002. Other than the addition of socket 9A, it is the same as the 4683-002.

Note: In a 4680 Store System, a 4683-*xx*2 relies on a 4683-*xx*1 or 4684 for all of its processing and storage capability.

Subtopics
5.1.1 4683 Input Voltages

5.1.1 4683 Input Voltages

The two input voltage options for the 4683 are:

- Low voltage: 100 to 125 V AC rms (nominal), single phase, 50 or 60 Hz
- High voltage: 200 to 240 V AC rms (nominal), single phase, 50 or 60 Hz

5.2 General Description of the 4684 Point of Sale Terminal

The following 4684 point-of-sale terminal models are available. The models are similar in appearance and can attach the same type of I/O devices. All models can be programmed to perform the user's point-of-sale functions. Models 110, 130 and 160 are distributed by World Trade only.

Model 110
- System board **without** baseband network
- 1.44 MB diskette drive

Model 111
- System board **with** baseband network
- 1.44 MB diskette drive

Model 130
- System board **without** baseband network
- 30 MB fixed disk
- 1.44 MB diskette drive

Model 131
- System board **with** baseband network
- 30 MB fixed disk
- 1.44 MB diskette drive

Model 160
- System board **without** baseband network
- 60 MB fixed disk
- 1.44 MB diskette drive

Model 161
- System board **with** baseband network
- 60 MB fixed disk
- 1.44 MB diskette drive

Model 200
- System board with 80286 processor
- Up to 8 MB system board memory
- Up to 160 MB fixed disk
- 1.44 MB diskette drive

Model 300

- System board with 80386SX processor
- System board side card attachment for baseband network or token-ring adapter
- Up to 8 MB system board memory
- Up to 160 MB fixed disk
- 1.44 MB diskette drive

Subtopics
5.2.1 4684 Input Voltages

5.2.1 4684 Input Voltages

The two input voltage options for the 4684 are:

- Low voltage: 100 to 125 V AC rms (nominal), single phase, 50 or 60 Hz
- High voltage: 200 to 240 V AC rms (nominal), single phase, 50 or 60 Hz.

5.3 4684 Configuration and Utility Procedures

Subtopics

5.3.1 MENUs for Configuration Procedures
5.3.2 Understanding the Configuration Process
5.3.3 Primary Keyboards and Displays for the 4684 Terminal
5.3.4 4684 and 4683 Point-of-Sale Configuration Record
5.3.5 Resetting the POS Configuration in the 4684
5.3.6 Resetting the System Unit Configuration in the 4684

5.3.1 MENUs for Configuration Procedures

PICTURE 11

Figure 13. Flow Chart of MENUs for Configuration Procedures

5.3.2 Understanding the Configuration Process

The configuration process can be done in two ways: automatic configuration and manual configuration.

Subtopics
5.3.2.1 Automatic Configuration
5.3.2.2 Manual Configuration

5.3.2.1 Automatic Configuration

Automatic configuration is a process that determines the internal devices, option adapters, and POS devices that are attached and where they are connected. This process occurs under two circumstances:

- When you answer **yes** to the question:

```
M0101 A CONFIGURATION ERROR OCCURRED.
     DO YOU WANT TO RUN CONFIGURATION ?
                                1=YES 0=N0
```

- When you select CREATE/CHANGE CONFIGURATION from MENU-C1.

The automatic configuration process may cause some questions to be asked concerning attached devices.

The configuration information is not permanently saved until you select ACTIVATE NEW CONFIGURATION from MENU-C2.

5.3.2.2 Manual Configuration

Manual configuration consists of two parts:

- Deleting or removing a device from the configuration even though it is attached and has been previously configured.

- Adding a device that is not attached and therefore cannot be automatically configured.

In all of the above cases, the configuration information is not permanently saved until you select ACTIVATE NEW CONFIGURATION from MENU-C2.

5.3.3 Primary Keyboards and Displays for the 4684 Terminal

A primary display and primary keyboard is assigned either automatically or by selecting CHANGE 4684 DEFAULT CONFIGURATION from MENU-C4.

- The primary display is where all messages appear while using the reference diskette.

- The primary keyboard is where all input is expected while using the reference diskette.

There can be only one primary display and one primary keyboard.

Initially, the primary devices are assigned during automatic configuration. They are assigned based on the devices that are attached and where they are attached. Normally, you have no reason to change the primary display and primary keyboard that are assigned automatically. However, if you need to change these assignments, select CHANGE 4684 DEFAULT CONFIGURATION from MENU-C2. MENU-C4 displays a choice to change the primary assignments. Be aware that the next time automatic configuration is run, the primary keyboard and primary display assignments are selected automatically and the changes you made are lost.

Normally, the primary display is assigned as follows:

1st choice The video display attached to the system unit video display socket

2nd choice The display attached to socket 4A

3rd choice The display attached to socket 4B, 9A, or 9B

Normally, the primary keyboard is assigned as follows:

1st choice The enhanced A/N or ANPOS keyboard attached to socket 1
2nd choice The keyboard attached to socket 5A
3rd choice The keyboard attached to socket 5B

5.3.4 4684 and 4683 Point-of-Sale Configuration Record

Subtopics
5.3.4.1 The Configuration Record
5.3.4.2 Create/Change Configuration
5.3.4.3 Activate New Configuration
5.3.4.4 Backup Configuration
5.3.4.5 Restore Configuration

5.3.4.1 The Configuration Record

As part of the configuration process, the 4684 terminal creates a record that identifies each attached device and the sockets that are used. If you also have a 4683 terminal, the configuration process creates a similar record for that terminal.

Both configuration records are stored in the 4684 terminal nonvolatile random access memory (NVRAM). Nonvolatile RAM is also used to store vital product data and real-time clock date and time.

It is kept active by the battery when the system is powered-off. If the stored data is lost (because of a depleted or removed battery), the data can be restored by running **restore configuration** or **Automatic configuration** from the reference diskette.

When you switch the power ON, the terminal uses this information as it performs the power-on self test.

5.3.4.2 Create/Change Configuration

This option of the configuration process *automatically* configures both the system unit's internal devices and options as well as it's external point-of-sale devices. It creates the configuration data record that reflects the hardware configuration.

5.3.4.3 Activate New Configuration

This option *activates* the new or changed configuration by saving the new or changed configuration data in the 4684 terminal memory.

5.3.4.4 Backup Configuration

This option allows you to *save* the 4684 and 4683 configuration data by writing the current configuration in the 4684 memory to the backup reference diskette. A copy of the configuration data is written to a binary image file called 4684CONF on the backup reference diskette.

5.3.4.5 Restore Configuration

This option allows you to *retrieve* the 4684 and 4683 configuration data from the backup reference diskette and make it the current configuration. The configuration data is saved in the 4684CONF file by the backup configuration process.

5.3.5 Resetting the POS Configuration in the 4684

This procedure should only be used when:

- A POS configuration conflict or problem cannot be resolved with the normal configuration process.
- You are adding a new POS option or feature to the 4684 system unit.

This procedure resets the configuration data, allowing you to configure only those devices attached to the 4684 or the 4683.

If you have not had an error detected during the power-on self test, this procedure does not work. You know if an error is detected during power-on self test (POST) if you hear two short tones. If no errors are detected, you hear only one tone.

If you hear the two short tones during the POST, continue at step 1.

If no errors are detected during the POST, do the following:

a. Switch **POWER OFF** at the 4684.

   Warning: Switching **POWER OFF** at a 4684 affects operations at all point-of-sale terminals attached to it.

b. Unplug one of the keyboards to cause an error.

c. Continue to the next step.

1. Switch **POWER OFF** at the 4684 and insert the backup reference diskette.

2. Switch power ON at the 4683 (if attached).

3. Switch power ON at the 4684. Wait for two tones.

4. Locate the dump switch at the rear of the 4684 system unit, press it momentarily and then release it. You hear a tone and U004 is displayed.

5. Switch **POWER OFF** at the 4684.

6. Reconnect the keyboard if you unplugged it to create an error. Wait five seconds.

7. Switch the 4684 power ON.

   One or more error messages display and you should hear two tones.

8. Press **S1** (ESC on the enhanced A/N keyboard).

9. If message *M0001 Press the 1 key* displays, press **1**.

   Each error that was detected displays along with additional information about the error. Press **S1** (ESC on the enhanced A/N keyboard) for each that displays.

   The following message displays:

   ```
   M0101 A Configuration Error has occurred.
         Do you want to run configuration?
   ```

10. Answer "YES" to this question. The system unit devices and point-of-sale devices that are attached are automatically configured. Depending on the devices that are attached, you may be asked additional questions.

11. Select ACTIVATE NEW CONFIGURATION and follow the instructions on the display.

5.3.6 Resetting the System Unit Configuration in the 4684

This procedure should only be used when:

- A system unit configuration conflict or problem cannot be resolved with the normal configuration process.
- You are adding a new system unit option or feature to the 4684.

This procedure resets the configuration data, allowing you to configure only those devices attached to the 4684.

If you have not had an error detected during the power-on self test, this procedure does not work. You know if an error is detected during power-on self test (POST) if you hear two short tones. If no errors are detected, you hear only one tone.

If you hear two short tones during the POST, continue at step 1.

If no errors are detected during the POST, do the following:

a. Switch **POWER OFF** at the 4684.

   Warning: Switching **POWER OFF** at a 4684 affects operations at all point-of-sale terminals attached to it.

b. Unplug one of the feature option cards or any POS device to cause an error.

c. Continue to the next step.

1. Switch **POWER OFF** at the 4684 and insert the backup reference diskette.

2. Switch power ON at the 4683 (if attached).

3. Switch power ON at the 4684. Wait for the two tones.

4. Locate the dump switch at the rear of the 4684 system unit, press it momentarily and then release it. You hear a tone and U004 displays.

5. If message *M0001 Press the 1 key* displays, press **1**.

   Each error that was detected displays along with additional information about the error. Press **S1** (ESC on the enhanced A/N keyboard) for each error that displays.

   If the following message displays:

   ```
   M0101 A Configuration Error has occurred.
         Do you want to run configuration?
   ```

   Answer "YES" to this question. MENU-C2 displays following automatic configuration.

6. Switch **POWER OFF** at the 4684.

7. If you unplugged any feature option card or POS device to cause an error, reconnect it.

8. Switch 4684 power ON.

9. When you hear two tones, press **S1** (ESC on the enhanced A/N keyboard).

10. If message *M0001 Press the 1 key* displays, press **1**.

    Each error that was detected displays along with additional information about the error. Press **S1** (or ESC) for each error that displays.

    The following message displays:

    ```
    M0101 A Configuration Error has occurred.
          Do you want to run configuration?
    ```

11. Answer "YES" to this question. The system unit devices and point-of-sale devices that are attached are automatically configured.

12. Depending on the devices that are attached, you may be asked additional questions.

13. Select ACTIVATE NEW CONFIGURATION and follow the instructions on the display.

5.4 Preparing to Run Configuration

Read the following before beginning the configuration. Some of the events happen quickly. Be careful not to miss them if you are reading the book as the IPL proceeds.

1. Use your store procedures to stop any application programs that are running.

2. Do the following to IPL (Initial Program Load):

   a. Switch **POWER OFF** at the 4684.
   b. Insert the reference diskette in the 4684 diskette drive.
   c. Switch power ON at the 4683 (if attached).
   d. Switch power ON at the 4684.

3. Power-on self test runs automatically when power is switched ON. The messages that **normally** display during the IPL process are as follows:

   a. The video display (if present) displays characters that represent the memory test progress.

   b. A series of Unnn messages display that represent the progress of the IPL.

   c. A reference diskette Copyright message displays.

   d. Message M0001 PRESS THE 1 KEY displays (alphanumeric display only), otherwise MENU-M1 displays.

      Press the 1 key on the *primary* keyboard.

   e. MENU-M1 displays.

      - If message M0101 is displayed, answer YES. MENU-C2 is displayed after automatic configuration is run. See MENU-C2 at "Creating or Changing Configuration" in topic 5.4.1.

      - If an error number(s) is displayed, note the number(s) and then press **S1**. Additional information or instructions are displayed to help continue problem determination.

        Note: On the ANPOS keyboard (during some procedures) and on the enhanced alphanumeric keyboard, **Esc** = S1 and **Enter** = S2.

        If the IPL does not continue after pressing **S1**, go to the *IBM 4680 Store Messages Guide* and follow the *User Response* for the displayed message(s).

When MENU-M1 is displayed you are prepared to start configuration.

To create or change configuration, see "Creating or Changing Configuration" in topic 5.4.1.

To backup the configuration see "Backing Up the Configuration" in topic 5.4.6.

To restore configuration, see "Restoring the Configuration" in topic 5.4.7.

To view the active configuration, see "Viewing the Active Configuration" in topic 5.4.8.

Subtopics
5.4.1 Creating or Changing Configuration
5.4.2 Descriptions of Items in Configuration Menu-C1
5.4.3 Descriptions of Items in Configuration Menu-C2
5.4.4 Descriptions of Items in Configuration Menu-C3 and Menu-C4
5.4.5 Restrictions When Connecting Displays
5.4.6 Backing Up the Configuration
5.4.7 Restoring the Configuration
5.4.8 Viewing the Active Configuration
5.4.9 Using Optional 4684 System Unit Configuration

5.4.1 Creating or Changing Configuration

To start configuration, begin at "Preparing to Run Configuration" in topic 5.4.

1. Select START CONFIGURATION from MENU-M1.

2. Select CREATE/CHANGE CONFIGURATION from MENU-C1.

3. The 4684 system unit devices that are attached are automatically configured.

4. All POS devices that are attached and powered ON are automatically configured.

   Note: If you want to configure a device that will be attached at a later time, you can select CHANGE 4684 DEFAULT CONFIGURATION or CHANGE 4683 DEFAULT CONFIGURATION from MENU-C2. Then select ADD A DEVICE NOT ATTACHED from MENU-C3 or MENU-C4.

Table 37. MENU-C1
VIEW ACTIVE CONFIGURATION
CREATE/CHANGE CONFIGURATION
BACKUP CONFIGURATION
RESTORE CONFIGURATION
OPTIONAL SYSTEM UNIT CONFIGURATION
QUIT

5.4.2 Descriptions of Items in Configuration Menu-C1

VIEWING ACTIVE CONFIGURATION: Allows you to view the currently active 4684 or 4683 configuration before any changes are made.

CREATE/CHANGE CONFIGURATION: Automatically configures both the 4684 system unit internal devices and option adapters, as well as the external point-of-sale devices. It allows you to manually change the configuration of the 4683 and 4684 point-of-sale devices if necessary.

If a multiprotocol communications adapter is configured, you are allowed to change the protocol options.

If a token-ring network adapter is configured, you may be asked to select the correct network data rate.

If a Real-time Interface Coprocessor Multiport/2 (ARTICm/2) or X.25/2 (ARTICx/2) adapter is configured, you are asked to select the correct transmit and receive clock settings.

There may be other option adapters configured that cause questions to be asked as well.

BACKUP CONFIGURATION: Allows you to save the 4684 and 4683 configuration data by writing the current configuration to the backup reference diskette.

RESTORE CONFIGURATION: Allows you to retrieve the 4684 or 4683 configuration data from the backup reference diskette and make it the current configuration by writing it into memory in the 4684.

Table 38. MENU-C2
VIEW NEW 4684 CONFIGURATION
VIEW NEW 4683 CONFIGURATION
ACTIVATE NEW CONFIGURATION
CHANGE 4684 DEFAULT CONFIGURATION
CHANGE 4683 DEFAULT CONFIGURATION
QUIT CONFIGURATION

5.4.3 Descriptions of Items in Configuration Menu-C2

VIEW NEW 4684/4683 CONFIGURATION: Allows you to view the configuration of the 4684 or 4683 after changes have been made but before they are activated. See Figure 14 in topic 5.4.8 for information on the 4684 slots.

ACTIVATE NEW CONFIGURATION: The 4684 IPLs to activate new (new or changed) configuration data. Select this when you have finished entering all configuration data.

CHANGE 4684/4683 DEFAULT CONFIGURATION: Allows you to change the default options of the 4684 or 4683. These options include deleting and adding devices, primary display and keyboard selection and changing the numeric keypad layout.

Note: Each time automatic configuration is run, any changes that were made to the primary display and the primary keyboard assignments are lost.

You must ACTIVATE NEW CONFIGURATION after you change the defaults to make the change effective.

Table 39. MENU-C3
DELETE AN ATTACHED 4683 DEVICE
ADD A 4683 DEVICE NOT ATTACHED
CHANGE THE KEYPAD LAYOUT
RETURN TO MENU-C2

Table 40. MENU-C4
DELETE AN ATTACHED 4684 DEVICE
ADD A 4684 DEVICE NOT ATTACHED
CHANGE THE PRIMARY DISPLAY
CHANGE THE PRIMARY KEYBOARD
CHANGE THE KEYPAD LAYOUT
ENTER THE FIXED DISK TYPE
RETURN TO MENU-C2

5.4.4 Descriptions of Items in Configuration Menu-C3 and Menu-C4

DELETE AN ATTACHED DEVICE: Allows you to delete a device from the 4684 or 4683 configuration. If you want to delete an entire 4683 terminal from the configuration, you must select this menu item. You must ACTIVATE NEW CONFIGURATION after you DELETE the device to make the change effective.

ADD A DEVICE NOT ATTACHED: Allows you to add a new device to the 4684 or 4683 configuration that was not attached when the POS automatic configuration was run. You must ACTIVATE NEW CONFIGURATION after you ADD the device to make the change effective.

5.4.5 Restrictions When Connecting Displays

There are a few restrictions and limitations to be aware of when connecting or configuring displays to the 4684 or 4683.

If these restrictions and limitations are not observed, unpredictable problems may occur.

- If you have **TWO** alphanumeric (A/N) displays, one must be connected to socket 4A and the other to **ONE** of the following sockets: 4B, 9A, or 9B.

- If you have **TWO** operator displays, one must be connected to socket 4A and the other to **ONE** of the following sockets: 4B, 9A, or 9B.

- If you have **TWO** shopper displays, one must be connected to socket 4A and the other to **ONE** of the following sockets: 4B, 9A, or 9B.

- If you have a combined keyboard/display connected to socket 5A, **DO NOT** connect an operator display to socket 4A.

- If you have a combined keyboard/display connected to socket 5B, **DO NOT** connect an operator display to socket 4B, 9A, or 9B.

5.4.6 Backing Up the Configuration

To start configuration, begin at "Preparing to Run Configuration" in topic 5.4.

1. Select START CONFIGURATION from MENU-M1.
2. Select BACKUP CONFIGURATION from MENU-C1.
3. Follow the instructions on the display to perform the backup.

5.4.7 Restoring the Configuration

To start configuration, begin at "Preparing to Run Configuration" in topic 5.4.

1. Select START CONFIGURATION from MENU-M1.
2. Select RESTORE CONFIGURATION from MENU-C1.
3. Follow the instructions on the display to restore the configuration.

5.4.8 Viewing the Active Configuration

To start configuration, begin at "Preparing to Run Configuration" in topic 5.4.

1. Select START CONFIGURATION from MENU-M1.

2. Select VIEW ACTIVE CONFIGURATION from MENU-C1.

3. The current or active configuration record that is saved in the 4684 is displayed.

4. Follow the instructions on the display. See Figure 14 for information on the 4684 slots.

Slot 1 (option adapter)
- Dual asynchronous adapter
- ISDN interface coprocessor/2 adapter
- Multiprotocol communication adapter
- Token-ring network adapter
- X.25 interface coprocessor/2 (ARTICx/2)
- 2-8 MB 80286 memory expansion adapter

Slot 2 (option adapter)
- ISDN interface coprocessor/2
- Dual asynchronous adapter
- Multiprotocol communication adapter
- Token-ring network adapter
- X.25 interface coprocessor/2 (ARTICx/2)
- 2-8 MB 80286 memory expansion adapter

Slot 3 (Reserved)
Slot 4 (Reserve)
Slot 5 (4684 feature card and memory expansion adapter)
Slot 6 (Baseband network) Models 111, 131, and 161 only
Slot 7 (Device channel)
Slot 8 (Fixed disk) Models 130, 131, 160 and 161 only

Figure 14. 4684 Device List For Option Slots 1-8

5.4.9 Using Optional 4684 System Unit Configuration

This special program is provided for situations when the normal 4684 system unit configuration functions are inadequate to configure the system unit. It can be invoked when it is necessary to have a full function change or view configuration for the 4684 system unit.

To use this procedure, the following requirements must be met:

- An enhanced A/N or ANPOS keyboard must be attached and configured as the primary keyboard.

- A video display must be attached and configured as the primary display.

To start this program MENU-C1 must be displayed. Then select OPTIONAL SYSTEM UNIT CONFIGURATION.

5.5 Introduction to Utilities

BACKUP REFERENCE DISKETTE - Allows you to make a *backup* copy of the original reference diskette. Once you have a copy (backup reference diskette), store the original in a safe place and use the copy.

COPY OPTION DISKETTE TO REFERENCE DISK - Allows you to copy files from an option diskette (provided with option adapters) to the backup reference diskette. This procedure is normally done during the initial 4684 setup or when additional options are added to the 4684.

SET SYSTEM DATE AND TIME - Allows you to view or change the system date and time settings.

SET VITAL PRODUCT DATA - Allows you to view or change the 4684 vital product data.

MOVE THE 4684 - Secures the fixed disk read/write heads so that no damage occurs during a move.

QUIT UTILITIES - Returns to MENU-M1.

Subtopics
5.5.1 Flow Chart of MENUs

5.5.1 Flow Chart of MENUs

PICTURE 12

Figure 15. Flow Chart of MENUs for Running Tests

5.6 Preparing to Run Utilities

Read the following before beginning. Some of the events happen quickly. Be careful not to miss them if you are reading the book as the initial program load (IPL) proceeds.

1. Use your store procedures to stop any application programs that are running.

2. Do the following to IPL:

   a. Switch **POWER OFF** at the 4684.
   b. Insert the reference diskette in the 4684 diskette drive.
   c. Switch power ON at the 4683 (if attached).
   d. Switch power ON at the 4684.

3. Power-on self test runs automatically when power is switched ON. The messages that **normally** display during the IPL process are as follows:

   a. The video display (if present) displays characters that represent the memory test progress.

   b. A series of Unnn messages display that represent the progress of the IPL.

   c. A reference diskette Copyright message displays.

   d. Message M0001 PRESS THE 1 KEY displays (alphanumeric display only), otherwise MENU-M1 displays.

      Press the 1 key on the *primary* keyboard.

   e. MENU-M1 is displayed.

      - If message M0101 is displayed, answer YES. MENU-C2 displays after automatic configuration is run. See MENU-C2 at "Creating or Changing Configuration" in topic 5.4.1.

      - If an error number(s) is displayed, note the number(s) and then press **S1**. Additional information or instructions are displayed to help continue problem determination.

        Note: On the ANPOS keyboard (during some procedures) and on the enhanced alphanumeric keyboard, **Esc** = S1 and **Enter** = S2.

        If the IPL does not continue after pressing **S1**, go to the *IBM 4680 Store Messages Guide* and follow the *User Response* for the displayed message.

When MENU-M1 is displayed you are prepared to start utilities.

To backup the reference diskette, see "Making a Backup Reference Diskette" in topic 5.6.1.

To copy an option diskette to the reference diskette, see "Copying an Option Diskette to the Reference Diskette" in topic 5.6.2.

To set the system date and time, see "Setting System Date And Time" in topic 5.6.3.

To set the vital product data, see "Setting Vital Product Data" in topic 5.6.4.

To move the 4684, see "Moving the 4684 (Securing the Fixed Disk)" in topic 5.6.5.

Subtopics

5.6.1 Making a Backup Reference Diskette
5.6.2 Copying an Option Diskette to the Reference Diskette
5.6.3 Setting System Date And Time
5.6.4 Setting Vital Product Data
5.6.5 Moving the 4684 (Securing the Fixed Disk)
5.6.6 Logging Errors
5.6.7 Formatting the Fixed Disk
5.6.8 Device IDs for the Point-of-Sale Terminal
5.6.9 Displaying POS Terminal Configuration Using Set Terminal Characteristics
5.6.10 Displaying a Point-of-Sale Terminal Message
5.6.11 Displaying the Terminal Number
5.6.12 Changing the Terminal Number
5.6.13 Entering the Terminal Number
5.6.14 Resetting the Terminal Number
5.6.15 Initial Program Load (IPL)
5.6.16 Power-On Self Test for the Point of Sale Terminal

5.6.1 Making a Backup Reference Diskette

To start utilities, begin at "Preparing to Run Utilities" in topic 5.6.

1. Select START UTILITIES from MENU-M1.
2. Select BACKUP REFERENCE DISKETTE from MENU-U1.
3. Follow the instructions on the display.

5.6.2 Copying an Option Diskette to the Reference Diskette

To start utilities, begin at "Preparing to Run Utilities" in topic 5.6.

1. Select START UTILITIES from MENU-M1.
2. Select COPY OPTION DISKETTE TO REFERENCE DISKETTE from MENU-U1.
3. Follow the instructions on the display.

5.6.3 Setting System Date And Time

To start utilities, begin at "Preparing to Run Utilities" in topic 5.6.

1. Select START UTILITIES from MENU-M1.
2. Select SET SYSTEM DATE AND TIME from MENU-U1.
3. Follow the instructions on the display.

5.6.4 Setting Vital Product Data

To start utilities, begin at "Preparing to Run Utilities" in topic 5.6.

1. Select START UTILITIES from MENU-M1.
2. Select SET VITAL PRODUCT DATA from MENU-U1.
3. Follow the instructions on the display.

5.6.5 Moving the 4684 (Securing the Fixed Disk)

To start utilities, begin at "Preparing to Run Utilities" in topic 5.6.

1. Select START UTILITIES from MENU-M1.
2. Select MOVE THE 4684 from MENU-U1.
3. Follow the instructions on the display.

5.6.6 Logging Errors

To start an error log:

1. Select START TESTS from MENU-M1.
2. Select RUN SYSTEM UNIT TESTS from MENU-T1.
3. Select TEST SYSTEM UNIT from MENU-T2.
4. Select LOG OR DISPLAY ERRORS from MENU-T3.
5. MENU-T5 allows several selections. Select the desired function.
6. Follow the instructions on the display.

5.6.7 Formatting the Fixed Disk

Note: Formatting the fixed disk destroys all data that is now on the fixed disk.

1. Select START TESTS from MENU-M1.
2. Select RUN SYSTEM UNIT TESTS from MENU-T1.
3. Select FORMAT FIXED DISK from MENU-T2.
4. Follow the instructions on the display.

   If a message error occurs follow the *User Response* for the message in the *IBM 4680 Store Messages Guide*.

5.6.8 Device IDs for the Point-of-Sale Terminal

The following is a list of the device IDs. The device IDs are used by set terminal characteristics (STC) to identify devices that are configured for or attached to a point-of-sale terminal. The device ID is also required when requesting a trace report of the device channel for a unique device.

Subtopics
5.6.8.1 Device IDs by ID Number
5.6.8.2 Device IDs by Device Type

5.6.8.1 Device IDs by ID Number

Table 41. Device IDs by ID Number

ID	Device	Socket Number
X'10'	Keyboard, 50-key or Combined Keyboard/Display	5A
X'11'	Keyboard, 50-key or Combined Keyboard/Display	5B
X'12'	Keyboard, Alphanumeric	5A
X'13'	Keyboard, Alphanumeric	5B
X'16'	Keyboard, Matrix	5A
X'17'	Keyboard, Matrix	5B
X'1A'	Keyboard, ANPOS	5A
X'1B'	Keyboard, ANPOS	5B
X'20'	Display, Alphanumeric	4A
X'21'	Display, Alphanumeric	4B
X'22'	Display, Operator or Combined Keyboard/Display	4A (5A if Combined Keyboard/Display)
X'23'	Display, Operator or Combined Keyboard/Display	4B (5B if Combined Keyboard/Display)
X'26'	Display, Shopper	4A
X'27'	Display, Shopper	4B
X'28'	Display, Video	81 on the Feature Adapter in location 2A
X'29'	Display, Video	81 on the Feature Adapter in location 2B
X'30'	Printer Model 1 or 2	7
X'34'	Printer Model 3	7
X'36'	Printer Model 2A Fiscal	7
X'38'	Printer Model 3A Fiscal	7
X'40'	MSR (Single-Track)	6 on the keyboard attached to Socket 5A
X'41'	MSR (Single-Track)	6 on the keyboard attached to Socket 5B
X'44'	1520 Hand-Held Scanner Model A01	21 on the Feature Adapter in location 2A
	Optical Character Reader (OCR)	21 on the Feature Adapter in location 2A
X'45'	1520 Hand-Held Scanner Model A01	21 on the Feature Adapter in location 2B
	Optical Character Reader (OCR)	21 on the Feature Adapter in location 2B
X'46'	MSR (Dual-Track) ANPOS or Combined Keyboard/Display (Low-Profile)	5A
X'47'	MSR (Dual-Track)	5B
X'4A'	Point-of-Sale Scanner	17
X'4B'	1520 Hand-Held Scanner Model A02	5B
	Hand-Held Bar Code Reader	9B
X'4C'	Magnetic Wand	26 on the Feature

		Adapter in location 2A
X'4D'	Magnetic Wand	26 on the Feature Adapter in location 2B
X'50'	Totals Retention	Internal to the base unit
X'54'	Cash Drawer	3A
X'54'	Cash Drawer	3B
X'60'	Coin Dispenser	29 on the Feature Adapter in location 2A
X'61'	Coin Dispenser	29 on the Feature Adapter in location 2B
X'64'	RS232 Device	25 on the Feature Adapter in location 2A
X'65'	RS232 Device	25 on the Feature Adapter in location 2B
X'68'	RS232 Device	23 on the Feature Adapter in location 2A
X'69'	RS232 Device	23 on the Feature Adapter in location 2B
X'6A'	Scale (Feature Expansion B or C only)	21 on the Feature Adapter in location 2A
X'6B'	Scale (Feature Expansion B or C only)	21 on the Feature Adapter in location 2B
X'6E'	Scale	17

5.6.8.2 Device IDs by Device Type

Table 42. Device IDs by Device Type

Device	Socket Number	ID
Cash Drawer	3A	X'54'
	3B	X'54'
Coin Dispenser	29 on the Feature Adapter in location 2A	X'60'
	29 on the Feature Adapter in location 2B	X'61'
Display, Alphanumeric	4A	X'20'
	4B	X'21'
Display, Operator or Combined Keyboard/Display	4A (5A if Combined Keyboard/Display)	X'22'
	4B (5B if Combined Keyboard/Display)	X'23'
Display, Shopper	4A	X'26'
	4B	X'27'
Display, Video	81 on the Feature Adapter in location 2A	X'28'
	81 on the Feature Adapter in location 2B	X'29'
Hand-Held Bar Code Reader	9B	X'4B'
Keyboard, 50-key or Combined Keyboard/Display	5A	X'10'
	5B	X'11'
Keyboard, Alphanumeric	5A	X'12'
	5B	X'13'
Keyboard, ANPOS	5A	X'1A'
	5B	X'1B'
Keyboard, Matrix	5A	X'16'
	5B	X'17'
MSR (Single-Track)	6 on the keyboard attached to Socket 5A	X'40'
	6 on the keyboard attached to Socket 5B	X'41'
MSR (Dual-Track)	5A (ANPOS or Combined Keyboard/Display)	X'46'
	5B	X'47'
Magnetic Wand	26 on the Feature Adapter in location 2A	X'4C'
	26 on the Feature Adapter in location 2B	X'4D'
Optical Character Reader (OCR)	21 on the Feature Adapter in location 2A	X'44'
	21 on the Feature Adapter in location 2B	X'45'
Point-of-Sale Scanner	17	X'4A'
Printer Model 1 or 2	7	X'30'
Printer Model 3	7	X'34'

Printer Model 2A Fiscal	7	X'36'
Printer Model 3A Fiscal	7	X'38'
RS-232 Device	25 on the Feature Adapter in location 2A	X'64'
	25 on the Feature Adapter in location 2B	X'65'
	23 on the Feature Adapter in location 2A	X'68'
	23 on the Feature Adapter in location 2B	X'69'
Scale	21 on the Feature Adapter in location 2A	X'6A'
	21 on the Feature Adapter in location 2B	X'6B'
	17 (Shares Socket with Point-of-Sale Scanner)	X'6E'
Totals Retention	Internal to the base unit.	X'50'
1520 Hand-Held Scanner Model A01	21 on the Feature Adapter in location 2A	X'44'
	21 on the Feature Adapter in location 2B	X'45'
1520 Hand-Held Scanner Model A02	5B	X'4B'

5.6.9 Displaying POS Terminal Configuration Using Set Terminal Characteristics

For a 4683-*xx*2, see "Displaying 4683-xx2 Configuration" in topic 5.6.9.2.

Subtopics

5.6.9.1 Displaying 4683-xx1 Configuration
5.6.9.2 Displaying 4683-xx2 Configuration

5.6.9.1 Displaying 4683-xx1 Configuration

1. Press and hold the dump switch on the 4683-*xx*1.

2. Switch **POWER OFF** and then release the dump switch.

3. Wait 5 seconds, and switch power ON.

4. Wait for message U005 to display.

5. Press and release the dump switch.

   This causes the point-of-sale terminal to ignore its current terminal number and prompt for a new terminal number by displaying message Z001.

6. Wait for message Z001 to display.

   If you have more than one display attached to the point-of-sale terminal, the Z*xxx* messages are displayed on the system display. See "Entering Terminal Numbers" in the *IBM 4680 Store System: User's Guide* for a description of the default system display.

7. Enter the current terminal number (1*xxx* where *xxx* = a number from 001 to 999) and then press **S2**. **Do not enter a new terminal number.**

   Note: On the ANPOS keyboard (during some procedures) and on the enhanced alphanumeric keyboard, **Esc** = S1 and **Enter** = S2.

8. When message Z010 displays, press **S2**.

   Messages in the range of Z014 through Z024 are displayed. The text associated with these messages indicates the socket number and whether a device is configured or attached to that socket. For a list of point-of-sale terminal device IDs, see "Device IDs for the Point-of-Sale Terminal" in topic 5.6.8.

9. Press **S2** after each message is displayed.

   - If a socket has no device configured or attached, its message is not displayed.

   - An error message may be displayed when you IPL the point-of-sale terminal if a socket has a device configured but not attached.

10. When message Z025 displays, press **S2**.

11. When message Z012 displays, this indicates the operation is complete.

    If an error was discovered:

    - The configuration must be corrected at the store controller. See the *IBM 4680 Store System: User's Guide* to correct the configuration.
      -- or --
    - The correct device must be connected to the correct socket at the point-of-sale terminal.

12. Press **S2**.

13. If customer setup (CSU) has **never** been run, it is automatically loaded and started.

14. If CSU has been run, the initial point-of-sale terminal application program is loaded.

5.6.9.2 Displaying 4683-xx2 Configuration

Note: This procedure assumes that the 4683-*xx*2 is up and running at the time the request is made. When "Displaying 4683-xx1 Configuration" in topic 5.6.9.1 is performed, the 4683-*xx*2 displays message Z001.

1. Press **S1**, type **71**, and press **S2**.

   Note: On the ANPOS keyboard (during some procedures) and on the enhanced alphanumeric keyboard, **Esc** = S1 and **Enter** = S2.

2. Wait approximately one minute for message Z002 to display.

   If you have more than one display attached to the point-of-sale terminal, the Z*xxx* messages display on the system display. See "Entering Terminal Numbers" in the *IBM 4680 Store System: User's Guide* for a description of the default system display.

3. Key the current terminal number (1*xxx* where *xxx* = a number from 001 to 999) and then press **S2**. **Do not enter a new terminal number.**

   If the terminal number you entered in does not equal the current 4683-*xx*2 terminal number, message Z004 displays. If this message is displayed, ensure that you are entering the correct terminal number.

4. When message Z010 displays, press **S2**.

   Messages in the range of Z014 through Z024 are displayed. The text associated with these messages indicates the socket number and whether a device is configured or attached to that socket. For a list of point-of-sale terminal device IDs, see "Device IDs for the Point-of-Sale Terminal" in topic 5.6.8.

5. Press **S2** after each message is displayed.

   - If a socket has no device configured or attached, its message is not displayed.

   - An error message may be displayed when you IPL the point-of-sale terminal if a socket has a device configured but not attached.

6. When message Z025 displays, press **S2**.

7. When message Z012 displays, this indicates that the operation is complete.

   If an error was discovered:

   - The configuration must be corrected at the store controller. See the *IBM 4680 Store System: User's Guide* to correct the configuration.
     -- or --
   - The correct device must be connected to the correct socket at the point-of-sale terminal.

8. Press **S2**.

9. If customer setup (CSU) has never been run, it is automatically loaded and started.

10. If CSU has been run, the initial point-of-sale terminal application program is loaded.

5.6.10 Displaying a Point-of-Sale Terminal Message

The lights on the keyboard give you status information about the system. When one of these lights comes on, the system is sending a message to the point-of-sale terminal system display. The types of messages are:

- A wait message. See "Displaying a Wait Message" in topic 5.6.10.1.
- An offline message. See "Displaying an Offline Message" in topic 5.6.10.2.
- A system message. See "Displaying a System Message" in topic 5.6.10.3.

PICTURE 13

Figure 16. 50-key Keyboard Lights

Subtopics
5.6.10.1 Displaying a Wait Message
5.6.10.2 Displaying an Offline Message
5.6.10.3 Displaying a System Message
5.6.10.4 Displaying a System Message (Message Pending Light is Off)
5.6.10.5 Displaying a System Message (Message Pending Light is On)

5.6.10.1 Displaying a Wait Message

When the keyboard Wait light comes on, the application running on the point-of-sale terminal is waiting for some action to be completed (for example, waiting for a program to load). Only system function requests are accepted from the keyboard. A message related to the wait condition can be displayed.

- If you display the message when the Wait light is ON, the message indicates the reason for the current wait condition.

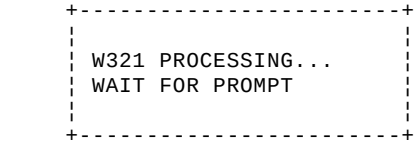
- If you display the message when the Wait light is OFF, the message indicates the reason for a previous wait condition.

1. Press **S1**, type **1**, and press **S2**.

   Note: On the ANPOS keyboard (during some procedures) and on the enhanced alphanumeric keyboard, **Esc** = S1 and **Enter** = S2.

2. The wait message appears on the point-of-sale terminal system display.

   Example of a wait message:

3. Find the message in the *IBM 4680 Store System: Messages Guide*.

4. To clear the message, press **Clear**.

5.6.10.2 Displaying an Offline Message

When the keyboard Offline light comes on, normal system communications have been interrupted and the point-of-sale terminal is offline (not communicating with the store controller). You can display a message related to the offline condition by using a system function request.

- If you display the message when the Offline light is ON, the message indicates the reason for the current offline condition.
- If you display the message when the Offline light is OFF, the message indicates the reason for a previous offline condition.

1. Press **S1**, type **2**, and press **S2**.

   Note: On the ANPOS keyboard (during some procedures) and on the enhanced alphanumeric keyboard, **Esc** = S1 and **Enter** = S2.

2. The offline message appears on the point-of-sale terminal system display.

   Example of an offline message:

   ```
   +------------------------+
   ¦                        ¦
   ¦ W004 CONTROLLER DOES   ¦
   ¦ NOT RESPOND            ¦
   ¦                        ¦
   +------------------------+
   ```

3. Find the message in the *IBM 4680 Store System: Messages Guide*.

4. To clear the message, press **Clear**.

5.6.10.3 Displaying a System Message

The point-of-sale terminal receives numerous messages from the system such as:

- Prompting messages
- Information messages
- Status messages

The point-of-sale terminal keeps the last five system messages it received. When you display the system messages, the most current message displays first and the least current message displays last. The least current message is deleted if a new message increases the number of messages beyond five. You can display these messages when:

- The Message Pending light is OFF. See "Displaying a System Message (Message Pending Light is Off)" in topic 5.6.10.4.

- The Message Pending light is ON. See "Displaying a System Message (Message Pending Light is On)" in topic 5.6.10.5.

5.6.10.4 Displaying a System Message (Message Pending Light is Off)

If the Message Pending light is OFF when you display a message, the message you see is the last message queued. You can continue displaying the messages by repeating the keying sequence until message W204 is displayed. W204 indicates that you have seen all the queued messages.

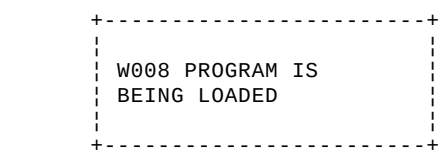
If you continue displaying messages beyond this point, the display sequence starts over. The most current message is displayed again, and then the remainder of the queued messages are displayed again.

1. Press **S1**, type **3**, and press **S2**.

   Note: On the ANPOS keyboard (during some procedures) and on the enhanced alphanumeric keyboard, **Esc** = S1 and **Enter** = S2.

2. The system message appears on the point-of-sale terminal system display.

   Example of a system message:

3. Find the message in the *IBM 4680 Store System: Messages Guide*.

4. To clear the message, press **Clear**.

5.6.10.5 Displaying a System Message (Message Pending Light is On)

When the Message Pending light comes ON, the point-of-sale terminal has received a message that you have not seen. The light stays ON until you display the message.

If you display the message when the light is ON, you see the message that caused the Message Pending light to come ON. This is the most current message. More messages can be waiting to be displayed. You can display these messages by repeating the keying sequence until message W204 is displayed. This indicates that you have seen all the queued messages.

If you continue displaying messages beyond this point the display sequence starts over. The most current message is displayed again, and then the remainder of the queued messages are displayed again.

1. Press **S1**, type **3**, and press **S2**.

   Note: On the ANPOS keyboard (during some procedures) and on the enhanced alphanumeric keyboard, **Esc** = S1 and **Enter** = S2.

2. The system message appears on the point-of-sale terminal system display.

   Example of a system message:

   ```
   +-------------------------+
   ¦                         ¦
   ¦ W008 PROGRAM IS         ¦
   ¦ BEING LOADED            ¦
   ¦                         ¦
   +-------------------------+
   ```

3. Find the message in the *IBM 4680 Store System: Messages Guide*.

4. To clear the message, press **Clear**.

5.6.11 Displaying the Terminal Number

The first time a point-of-sale terminal is powered-ON, a terminal number is not stored in its totals retention.

The initial point-of-sale terminal application program load uses a default terminal number. During set terminal characteristics (STC), the terminal number is entered by the operator and stored in totals retention storage. This terminal number is permanently assigned unless it is reset or changed by STC.

To display the terminal number:

1. Press **S1**, type **7**, and press **S2**.

   Note: On the ANPOS keyboard (during some procedures) and on the enhanced alphanumeric keyboard, **Esc** = S1 and **Enter** = S2.

2. Message W012 (containing the terminal number) appears on the system display.

   To exit:
   - If you are in test mode, press **S2**.
   - If you are **not** in test mode, press **Clear**.

5.6.12 Changing the Terminal Number

After the terminal number has been entered, you may want to change it.

Note: You can display the current terminal number by pressing **S1**, typing **7**, and pressing **S2**. Message W012 (containing the terminal number) appears on the system display. Press **Clear** to exit.

1. Press **S1**, type **71**, and press **S2**.

   Note: On the ANPOS keyboard (during some procedures) and on the enhanced alphanumeric keyboard, **Esc** = S1 and **Enter** = S2.

2. Wait approximately one minute for message Z002 to display.

   The Z*xxx* messages appear on the system display. For a description of the default system display, see "Entering Terminal Numbers" in the *IBM 4680 Store System: User's Guide*.

3. Enter the new terminal number (1*xxx* where *xxx* = a number from 001 to 999) and then press **S2**.

4. If this is a 4683-*xx*1 or 4684, continue at step 5.

   If this is a 4683-*xx*2, message Z004 displays. Switch **POWER OFF** and continue at "Entering the Terminal Number" in topic 5.6.13.

5. When message Z010 displays, press **S2**.

6. Watch the display for a series of messages.

7. Press **S2** to view each message. When message Z012 displays, the operation is complete

8. Press **S2**. The terminal operating system loads if this is a 4683-*xx*1 or 4684.

9. If customer setup (CSU) has **never** been run, it is automatically loaded and started.

10. If CSU has been run, the initial point-of-sale terminal application program is loaded.

5.6.13 Entering the Terminal Number

The terminal number must be entered before the point-of-sale terminal can operate on the store loop. If the number has never been entered, message Z001 displays after the power-on self test is complete.

This procedure is used when the terminal number has never been entered.

1. Switch power ON.

2. Wait for message Z001 to display.

   The Z*xxx* messages appear on the system display. For a description of the default system display, see "Entering Terminal Numbers" in the *IBM 4680 Store System: User's Guide*.

3. Enter the terminal number (1*xxx* where *xxx* = a number from 001 to 999) and then press **S2**.

   Note: On the ANPOS keyboard (during some procedures) and on the enhanced alphanumeric keyboard, **Esc** = S1 and **Enter** = S2.

   If this is a 4683-*xx*2, the terminal number must be specified in the configuration record of the partner 4683-*xx*1 or 4684.

4. When message Z010 displays, press **S2**.

5. Watch the display for a series of messages.

6. Press **S2** to view each message. When message Z012 displays, the operation is complete

7. Press **S2**. The terminal operating system is loaded if this is a 4683-*xx*1 or 4684.

8. If customer setup (CSU) has **never** been run, it is automatically loaded and started.

9. If CSU has been run, the initial point-of-sale terminal application program is loaded.

5.6.14 Resetting the Terminal Number

1. Press **S1**, type **71**, and press **S2**.

   Note: On the ANPOS keyboard (during some procedures) and on the enhanced alphanumeric keyboard, **Esc** = S1 and **Enter** = S2.

2. Wait approximately one minute for message Z002 to display.

3. Type **1000** and then press **S2**.

4. If this is a 4683-*xx*1 or 4684, continue at step 5.

   If this is a 4683-*xx*2, the terminal number is reset to 000 and message Z004 displays. Switch **POWER OFF**.

5. The terminal number is reset to 000, the display clears, the point-of-sale terminal starts the load process, and messages U001 through U007 are displayed.

   - If the point-of-sale terminal is to be removed from the store loop, switch **POWER OFF** at the base unit. The terminal number remains reset to 000 until a new number is entered.

   - If another terminal number is to be entered, continue at "Entering the Terminal Number" in topic 5.6.13.

5.6.15 Initial Program Load (IPL)

Subtopics
5.6.15.1 Description of an IPL
5.6.15.2 Source of an IPL

5.6.15.1 Description of an IPL

An IPL is a group of program and data components that are loaded into the point-of-sale terminal read/write random access storage (RAM).

An IPL contains three major components:

- System Code
- Input/output (I/O) driver code
- Application code

These components are selected by the user to make the hardware perform the tasks needed by the point-of-sale terminal operator.

The system code is loaded at power-on time by code that resides in the read-only storage (ROS). The system code defines and controls the tasks requested by the application program.

The I/O driver code controls the I/O devices that are attached to the point-of-sale terminal. This code is selected by the user. A permanent record of which I/O code to load is kept in the system area of the nonvolatile RAM. This code is loaded by the system code.

The application code establishes the procedures that the operator uses to do a job. The application program components do this by assigning tasks to the hardware and to the operator in an ordered structure. These components also supervise the interaction and information exchange between the operator tasks and the hardware tasks. This code is also loaded by the system code.

The point-of-sale terminal needs the system, I/O driver, and application code immediately after the power-on self test has completed successfully. If storage retention was enabled (4683-*xx*1 only), the storage contents are saved when the power is switched off. Therefore, RAM is kept active by either the battery or the wall power and no IPL is needed. If storage retention was not enabled, the point-of-sale terminal needs an IPL when the power is switched on.

5.6.15.2 Source of an IPL

All system, I/O driver, and application components reside in the store controller. When the point-of-sale terminal needs an IPL, it requests one through the store loop to the store controller. The store controller then transmits the system code to the point-of-sale terminal.

In a 4680 Store System, the 4683-*xx*2 gets its IPL from its partner 4683-*xx*1 or 4684. For other applications, the 4683-*xx*2 gets its IPL from its controlling device.

5.6.16 Power-On Self Test for the Point of Sale Terminal

The point-of-sale terminals have tests that run automatically each time power is switched ON at the base unit.

Note: When power is switched **OFF** at the 4683-*xx*1 or 4684, operation is halted at an attached 4683-*xx*2.

These tests are located in the point-of-sale terminal read-only-storage (ROS) and they test the following:

- Cash drawer attachment logic
- Device channel
- Display logic
- Keyboard logic
- Processor logic (4683-*xx*1 or 4684 only)
- Read-only storage (4683-*xx*1 or 4684 only)
- Storage (4683-*xx*1 or 4684 only)
- Store loop channel (4683-*xx*1 or 4684 only)
- Timer (4683-*xx*1 or 4684 only)
- Totals storage

5.7 Remote IPL (RIPL) for Token-Ring and Baseband LAN

RIPL Support for token-ring and baseband LAN on a 4684 Model 1*xx*/200/300

RIPL support can be enabled by following the procedures outlined here.

Note: 4684 configurations without a VGA-attached video display and PS/2 Enhanced Keyboard cannot support the RIPL function without additional installation and maintenance considerations.

Subtopics
5.7.1 Installation and Maintenance
5.7.2 Hardware
5.7.3 Configuration
5.7.4 Installation Instructions
5.7.5 Operating Instructions
5.7.6 Theory of Operation

5.7.1 Installation and Maintenance

RIPL can be installed and used on a 4684-1*xx*/200/300 if maintenance limitations are taken into consideration:

- Diskette drive required for 4684 reference diskette functions:
  - Configuration
  - Diagnostic tests
- PS/2 VGA/video display and PS/2 Enhanced Keyboard required for:
  - Token Ring RIPL progress indicators on video
  - RIPL failure problem determination via video/keyboard.

5.7.2 Hardware

Hardware RIPL support for the 4684 differs depending on the 4684 model, the type of network adapter used, and the style of adapter used.

4684-1*xx*

- The 4684-1*x*0 models do **not** have baseband LAN integrated on the system planar board.

- The 4684-1*x*1 models have baseband LAN (including RIPL ROM) integrated on the system planar board.

- The 4684-1*x*0 and 4684-1*x*1 models **cannot** have a baseband LAN adapter installed in an option adapter slot.

- The 4684-1*x*0 and 4684-1*x*1 models can have one or two token-ring adapters installed in the option adapter slots.

  If two token-ring adapters are installed, only one of the adapters can have RIPL ROM.

4684-200

- The 4684-200 model is featured, at time of order, with or without baseband LAN (including RIPL ROM) integrated on the system planar board.

- The 4684-200 model **cannot** have a baseband LAN adapter installed in an option adapter slot.

- The 4684-200 model can have one or two token-ring adapters installed in the option adapter slots.

  If two token-ring adapters are installed, only one of the adapters can have RIPL ROM.

4684-300

- 4684-300 model is featured, at time of order, with or without either one of the following optional system planar **side card** options:

  - Baseband LAN (including RIPL ROM) side card
  - Token-ring (including RIPL ROM) side card

- The 4684-300 model that does not have a baseband LAN side card can have one baseband LAN adapter (including RIPL ROM) installed in an option adapter slot.

- The 4684-300 model can have one or two token-ring adapters installed in the option adapter slots.

  If two token-ring adapters are installed, only one of the adapters can have RIPL ROM.

The 4684 supports only one baseband LAN adapter:

1. Integrated on the system planar board.
2. Installed in an option adapter slot (model 300 only).
3. Installed with a system planar **side card** (Model 300 only).

The 4684 supports up to two token-ring adapters:

1. Installed in option adapter slots.
2. Installed with a system planar **side card** (Model 300 only).
3. If two token-ring adapters are installed, only one of the adapters can have RIPL ROM.

5.7.3 Configuration

Use the following procedure to support RIPL on the 4684 Models 1*xx*/200/300 using version 3.00 of the 4684 reference diskette. version 3.00 supersedes all prior versions of the reference diskette for all models of the 4684.

1. Follow the installation and operation instructions listed below to personalize the CONFIG.SYS file on a backup copy of the version 3.00 reference diskette (any language).

   For baseband LAN configurations only, you can optionally personalize the @EFEF.ADF file on a backup copy of the version 3.00 reference diskette (any language).

2. Enable the RIPL function for 4684 token-ring or baseband LAN by using the updated backup copy of the version 3.00 reference diskette to configure the 4684.

5.7.4 Installation Instructions

RIPL Configuration Driver Installation Instructions for the 4684 Model 1*xx*/200/300 Reference Diskette Version 3.00

- For 4684 systems configured with token-ring or baseband LAN:

  For each language you wish to support, edit the CONFIG.SYS file on a backup copy of the 4684 version 3.00 reference diskette (root directory) and enable RIPL support by changing the RIPLDRVR.SYS entry from /N to /Y, as in the following example.

```
  SUB-DIRECTORY: A:\                            (diskette root directory)
           FILE: CONFIG.SYS                     (DOS configuration file)

          ENTRY: DEVICE=\4684\RIPLDRVR.SYS /Y   (enables RIPL)
           NOTE: ......................> /N    (disables RIPL)
```

- For 4684 systems configured with a baseband LAN (Only):

  For each language you wish to support, edit the @EFEF.ADF file on a backup copy of the 4684 version 3.00 reference diskette (root directory) and allow auto configuration to select Baseband RIPL as the default configuration choice, per the following example.

```
  SUB-DIRECTORY: A:\                        (diskette root directory)
           FILE: @EFEF.ADF                  (baseband configuration file)
```

  NOTE: Use an editor to relocate the desired default RIPL 'choice' from the 'choice' list to the first 'choice' position within the file.

```
        EXAMPLE: NamedItem
                 Prompt "Type, Memory Location, Interrupt Level"

                 choice "RPL, Mem 2, Int 2"
                             pos[0] = 1X10001Xb
                             io 0620h - 0627h
                             int 2
                             mem 0D0000h - 0D7FFFh
                             .
                             .
                             .
```

5.7.5 Operating Instructions

When installing a 4684 Model 1*xx*/200/300 use the updated backup copy of the version 3.00 reference diskette to configure the 4684.

1. IPL the 4684 using the updated backup copy of the version 3.00 reference diskette.

2. Follow the menus to configure the 4684.

   This automatically ENABLEs the 4684 RIPL option.

3. Activate the new configuration when requested to do so.

   The 4684 restarts (re-IPLs) to activate the new configuration.

5.7.6 Theory of Operation

Update a backup copy of the 4684 reference diskette, (version 3.00 or higher, any language), by editing the CONFIG.SYS file (token-ring and baseband LAN) and @EFEF.ADF file (baseband LAN ONLY) as noted earlier.

Each time the 4684 is configured using the updated backup copy of the version 3.00 reference diskette, the RIPL configuration option is enabled or disabled according to the parameters specified in the CONFIG.SYS file. The RIPL option remains in effect until the next time the 4684 is reconfigured.

5.8 4684 Device Channel Adapter Failure Status Bytes

The device channel adapter failure status bytes appear on the screen when the advanced diagnostics detect a failure.

XX represents a FAILURE STATUS BYTE. It may be any number depending on the type of adapter failure that occurred.

The device channel adapter failure status bytes are numbered as follows:

XX	0	*XX*	6
XX	1	*XX*	7
XX	2	*XX*	8
XX	3	*XX*	9
XX	4		
XX	5		

The tables on the following pages define the meaning of the device channel adapter failure status bytes. These bytes are displayed only when a failure is detected by the device channel adapter tests.

Use Table 43 to find information on the device channel adapter failure status bytes.

Table 43. Failure Status Byte Information

For	**Go to**
Byte 0	"Error Code - Failure Status Byte 0" in topic 5.8.1.
Byte 1	"Microprocessor Status Codes - Failure Status Byte 1" in topic 5.8.2.
Byte 2 and Byte 3	"Shared Buffer Latch Error Codes and Extended Data - Failure Status Bytes 2 and 3" in topic 5.8.3.
Byte 4 and Byte 5	"Shared Buffer Error Codes and Test Patterns - Failure Status Bytes 4 and 5" in topic 5.8.4.
Byte 6	"CMOS Error Codes - Failure Status Byte 6" in topic 5.8.5.
Byte 7	"Dump Error Codes - Failure Status Byte 7" in topic 5.8.6.
Byte 8	Contains the EC level of the device channel adapter microprocessor.
Byte 9	Contains the EC level of the device channel adapter power-on self test microcode in ROS.

Subtopics

5.8.1 Error Code - Failure Status Byte 0
5.8.2 Microprocessor Status Codes - Failure Status Byte 1
5.8.3 Shared Buffer Latch Error Codes and Extended Data - Failure Status Bytes 2 and 3
5.8.4 Shared Buffer Error Codes and Test Patterns - Failure Status Bytes 4 and 5
5.8.5 CMOS Error Codes - Failure Status Byte 6
5.8.6 Dump Error Codes - Failure Status Byte 7
5.8.7 Device Channel Adapter System Status Byte
5.8.8 Shared Buffer Request Byte
5.8.9 Shared Buffer Status Byte
5.8.10 Device Channel Adapter Interrupt Flag Byte
5.8.11 POST Test Device Channel Adapter Errors
5.8.12 4684 Memory Map

5.8.1 Error Code - Failure Status Byte 0

The following table defines the meaning of each bit of failure status byte 0 of the device channel adapter.

Bit	Error	Values
7	Dump switch	0 = Good 1 = Bad
6	Reserved	0 = Good 1 = Bad
5	ROS scan error	0 = Good 1 = Bad
4	Device channel adapter microprocessor status	0 = Good 1 = Bad
3	Shared buffer latch test error code	0 = Good 1 = Bad
2	Shared buffer test error code	0 = Good 1 = Bad
1	CMOS test error code	0 = Good 1 = Bad
0	Dump switch test error code	0 = Good 1 = Bad

5.8.2 Microprocessor Status Codes - Failure Status Byte 1

The following table defines the meaning of failure status byte 1 of the device channel adapter.

Table 44. Device Channel Adapter Microprocessor Status Codes

Byte 1 Status Code	**Definition**
00	No errors occurred
10 through 16	Device channel adapter operational error
15 through 17	Not valid
20 through 23	Operational error
24 through 70	Not valid
71 through 76	Self test error
77 through 80	Not valid
81 through 84	Self test error
86 through 8F	Not valid
90	External wrap error
91 through FF	Not valid

5.8.3 Shared Buffer Latch Error Codes and Extended Data - Failure Status Bytes 2 and 3

The following table defines the meaning of failure status bytes 2 and 3 of the device channel adapter.

Table 45. Shared Buffer Latch Error Codes and Extended Data

Byte 2 Error Code	**Byte 3 Extended Data**	**Definition**
00	00	No errors detected
01	Device channel adapter system status byte See topic 5.8.7.	The device channel adapter microprocessor was not at a "Ready and Not Enabled" condition after initial POR was complete.
02	Device channel adapter interrupt flag byte See topic 5.8.10.	A level 7 software interrupt was not received when expected.
03	Device channel adapter system status byte See topic 5.8.7.	A level 7 hardware interrupt was not received when expected.
04	Shared buffer request byte See topic 5.8.8.	The system unit microprocessor was unable to find the Shared Buffer after initial POR was complete.
05	Device channel adapter system status byte See topic 5.8.7.	The device channel adapter microprocessor was not at a "Ready and Not Enabled" condition after initial POR was complete.
06	Shared buffer request byte See topic 5.8.8.	The system unit microprocessor was unable to return the shared buffer to the device channel adapter microprocessor after initial POR was complete.
07	Device channel adapter system status byte See topic 5.8.7.	The system unit microprocessor was unable to acquire the shared buffer for a software POR request.
08	Shared buffer request byte See topic 5.8.8.	The system unit microprocessor was unable to find the shared buffer after acquiring it for a software POR request.
09	Device channel adapter system status byte See topic 5.8.7.	A level 7 hardware interrupt was not received from a software POR request.
0A	Device channel adapter system status byte See topic 5.8.7.	The device channel adapter microprocessor internal diagnostic test failed to complete during the software POR.
0B	Shared buffer error codes See topic 5.8.4.	The alternate shared buffer failed.
0C	Shared buffer error codes See topic 5.8.4.	The primary shared buffer failed.
10	Device channel adapter system status byte See topic 5.8.7.	The system unit microprocessor was unable to acquire the shared buffer for a software POR request.
11	Device channel adapter system status byte See topic 5.8.7.	The software POR request failed.
12	Device channel adapter system status byte See topic 5.8.7.	The system unit microprocessor was unable to acquire the shared buffer for a Read EC Level request.
13	Device channel adapter system status byte See topic 5.8.7.	The read EC level request failed.
20	Device channel adapter system status byte See topic 5.8.7.	Timeout while waiting for a level 7 hardware interrupt.
30	Device channel adapter system status byte. See topic 5.8.7.	Timeout while waiting for a response from a request to acquire the shared buffer for a software POR request.

31	Device channel adapter system status byte See topic 5.8.7.	Timeout while waiting for a response from a software POR request.
32	Device channel adapter system status byte See topic 5.8.7.	Timeout while waiting for a response from a request to acquire the shared buffer for a read EC level request.
33	Device channel adapter system status byte See topic 5.8.7.	Timeout while waiting for a response from a read EC level request.
40	Device channel adapter interrupt flag byte See topic 5.8.10.	A level 7 interrupt was received with unexpected status.
80	Device channel adapter interrupt flag byte See topic 5.8.10.	A level 7 interrupt was received when not expected.
90	Device channel adapter interrupt flag byte See topic 5.8.10.	A level 7 interrupt was received when not expected.

5.8.4 Shared Buffer Error Codes and Test Patterns - Failure Status Bytes 4 and 5

The following table defines the meaning of failure status bytes 4 and 5 of the device channel adapter.

Table 46. Shared Buffer Error Codes and Test Patterns

Byte 4 Error Code	**Byte 5 Test Pattern**	**Definition**
00	00	No errors detected
01	01	Data test pattern failed
02	02	Data test pattern failed
03	04	Data test pattern failed
04	08	Data test pattern failed
05	10	Data test pattern failed
06	20	Data test pattern failed
07	40	Data test pattern failed
08	80	Data test pattern failed
09	FE	Data test pattern failed
0A	FD	Data test pattern failed
0B	FB	Data test pattern failed
0C	F7	Data test pattern failed
0D	EF	Data test pattern failed
0E	DF	Data test pattern failed
0F	BF	Data test pattern failed
10	7F	Data test pattern failed
11	F1	Buffer address 0400 failed
12	02	Buffer address 0200 failed
13	F3	Buffer address 0100 failed
14	04	Buffer address 0080 failed
15	F5	Buffer address 0040 failed
16	06	Buffer address 0020 failed
17	F7	Buffer address 0010 failed
18	08	Buffer address 0008 failed
19	F9	Buffer address 0004 failed
1A	0A	Buffer address 0002 failed
1B	FB	Buffer address 0001 failed
1C	0C	Buffer address 0000 failed
1D	0E	Buffer address 0400 failed
1E	FD	Buffer address 0200 failed
1F	0C	Buffer address 0100 failed
20	FB	Buffer address 0080 failed
21	0A	Buffer address 0040 failed
22	F9	Buffer address 0020 failed
23	08	Buffer address 0010 failed
24	F7	Buffer address 0008 failed

25	06	Buffer address 0004 failed
26	F5	Buffer address 0002 failed
27	04	Buffer address 0001 failed
28	F3	Buffer address 0000 failed

5.8.5 CMOS Error Codes - Failure Status Byte 6

The following table defines the meaning of failure status byte 6 of the device channel adapter.

Table 47. CMOS Error Codes

Byte 6 Error Code	**Definition**
00	No errors detected
01	Battery failure
02	Storage failure
04	Addressing failure
10	Restore "Save Area" failure
20	Save "Save Area" failure

5.8.6 Dump Error Codes - Failure Status Byte 7

The following table defines the meaning of failure status byte 7 of the device channel adapter.

Table 48. Dump Error Codes

Byte 7 Error Code	**Definition**
00	No errors detected
01	Software-invoked dump request error
02	Dump switch-invoked dump request error
04	Hardware "Dump Request Bit" error

5.8.7 Device Channel Adapter System Status Byte

The following table describes the bits of the device channel adapter system status byte (SSB). The values in the SSB represent the current state of the store loop adapter hardware.

Table 49. Device Channel Adapter System Status Byte

Bit	**Definition**
Bit 7 (Read Only)	Reserved
Bit 6 (Read/Write)	1 = Generated a device channel adapter soft POR. 0 = Reset the POR mechanism.
Bit 5 (Read/Write)	1 = Requested a dump. 0 = Reset the dump mechanism.
Bit 4 (Read Only)	Reserved
Bit 3 (Read/Write)	1 = Enable the interrupt mechanism. 0 = Disable the interrupt mechanism.
Bit 2 (Read Only)	1 = Level 7 interrupt is active. 0 = Level 7 interrupt is inactive.
Bit 1 (Read/Write)	1 = Shared buffer access is complete. 0 = Shared buffer return is complete.
Bit 0 (Read/Write)	1 = Requested shared buffer access. 0 = Shared buffer return is complete.

5.8.8 Shared Buffer Request Byte

The following table describes the bits of the Shared Buffer Request Bytes. This byte is updated by the system unit microprocessor after each access of the message buffer.

Table 50. Shared Buffer Request Byte

Bit	**Definition**
Bit 7	1 = Diagnostic self test request.
Bit 6	1 = Read and process the "Timer Function" bytes.
Bit 5	1 = Read the device channel function command byte.
Bit 4	1 = Process the "Transmit Message(s)" held in the shared buffer.
Bit 3	1 = New poll list.
Bit 2	1 = Device channel internal storage dump request.
Bit 1	1 = Read EC Level Request.
Bit 0	1 = Reserved

5.8.9 Shared Buffer Status Byte

The following table describes the bits of the shared buffer status byte. This byte is updated by the device channel adapter microprocessor before it interrupts the system unit microprocessor.

Table 51. Shared Buffer Status Byte

Bit	**Definition**
Bit 7	1 = The diagnostic self test is complete.
Bit 6	1 = Stress test is active.
Bit 5	Reserved
Bit 4	1 = Device channel received.
Bit 3	1 = An error message is present.
Bit 2	1 = A device channel internal storage dump is present.
Bit 1	1 = An EC level message is present.
Bit 0	Reserved

5.8.10 Device Channel Adapter Interrupt Flag Byte

The following table describes the bits of the device channel adapter interrupt flag byte. This byte is updated by the software interrupt service routine when a level 7 hardware interrupt occurs.

Table 52. Device Channel Adapter Interrupt Flag Byte

Bit	**Definition**
Bit 7	1 = The level 7 interrupt is not from the device channel adapter.
Bit 6	1 = An interrupt occurred when not expected (bit 0 = 0).
Bit 5	1 = More than one interrupt occurred when only one was expected (bit 0 = 1).
Bit 4	Not used, always zero (0).
Bit 3	Not used, always zero (0).
Bit 2	Not used, always zero (0).
Bit 1	**1 =** A device channel adapter level 7 hardware interrupt has occurred.
Bit 0	**1 =** A device channel adapter level 7 hardware interrupt is expected.

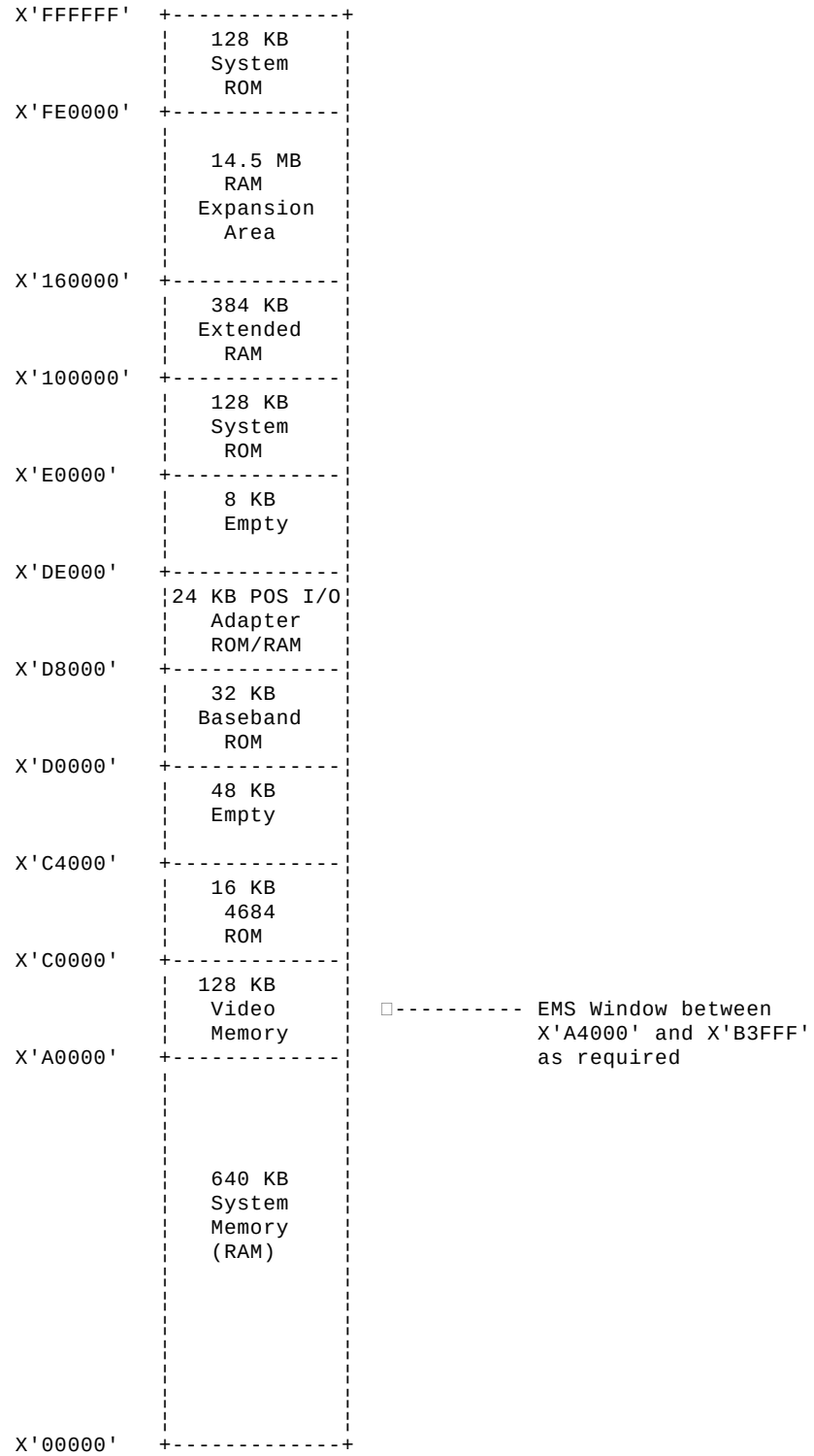
5.8.11 POST Test Device Channel Adapter Errors

Press **F1** and continue with the test.

Table 53. POST Device Channel Errors

Symptom	**Cause**
14517	Multiple errors
14527	8051 POR errors
14537	Latch test errors
14547	Shared buffer errors
14557	CMOS test errors
14567	Dump latch errors

5.8.12 4684 Memory Map



Note: The 64 KB window at X'A4000' for EMS, if used, restricts applications to video modes 0 through 6.

Figure 17. 4684 Memory Map

5.9 4684 Communication Adapters Port Assignments

Subtopics
5.9.1 4684 Asynchronous Adapter (System Board)
5.9.2 IBM Dual Asynchronous Adapter
5.9.3 IBM Multiprotocol Communication Adapter

5.9.1 4684 Asynchronous Adapter (System Board)

Default: This port is assigned as a serial port.

Serial_1

5.9.2 IBM Dual Asynchronous Adapter

The connectors on the IBM dual asynchronous adapter are automatically assigned by the automatic configuration program.

One card installed

"Connector 1"

Default: This connector is assigned to the following serial port if one dual asynchronous adapter is present.

Serial_2 (connector # 1 on the dual asynchronous adapter)

"Connector 2"

Default: This connector is assigned to the following serial port if one dual asynchronous adapter is present.

Serial_3 (connector # 2 on the dual asynchronous adapter)
Two cards installed

"Connector 1"

Default: This connector is assigned to the following serial ports if two dual asynchronous adapters are present.

Serial_2 (connector # 1 on 1st dual asynchronous adapter)
Serial_4 (connector # 1 on 2nd dual asynchronous adapter)

"Connector 2"

Default: This connector is assigned to the following serial ports if two dual asynchronous adapters are present.

Serial_3 (connector # 2 on 1st dual asynchronous adapter)
Serial_5 (connector # 2 on 2nd dual asynchronous adapter)

5.9.3 IBM Multiprotocol Communication Adapter

If this adapter is defined as asynchronous, it is always assigned serial 7 port. If a second adapter is present and defined as asynchronous, it is always assigned serial 8 port.

Default: This adapter is assigned to the following serial port:

```
          SDLC_1     (1st adapter - primary)
          SDLC_2     (2nd adapter - alternate)
  OPTIONS:
          Bisync_1   (1st adapter - primary)
          Bisync_2   (2nd adapter - alternate)

          Serial_7   (1st adapter - primary)
          Serial_8   (2nd adapter - alternate)
```

NOTE: The MPCA adapter installed in slot #1 is always the primary adapter if two MPCA adapters are present in the 4684.

5.10 4683 Serial Input/Output Channel (Device Channel)

The device channel is a communication channel that ties the associated input/output devices on a 4683 point-of-sale terminal (all models) to the microprocessor in the 4683-*xx*1. The microprocessor, with a shared RAM-attached microprocessor, controls the data flow on the device channel. The rules for sending and receiving data over the device channel are a subset of the synchronous data link control (SDLC) rules and the store loop rules.

Subtopics

5.10.1 Device Channel Configuration
5.10.2 Device Channel Interface
5.10.3 Device Channel Byte Format
5.10.4 Device Channel Message Format
5.10.5 Device Channel Message Checking
5.10.6 Device Channel Power-On Initialization

5.10.1 Device Channel Configuration

The communication link connecting devices to the 4683 (all models) consists of land patterns on the base card in the base unit and device cables connecting the devices to the base unit rear panel.

The device channel connecting the 4683-002 to the 4683-*xx*1 can consist of either a single IBM-supplied cable connecting the two units or an IBM-supplied cable for each unit, terminated with an IBM data connector that plugs into the wall. The cable in the wall is provided by the customer and is limited to a length of 150 m (490 ft). This cable must be IBM Cabling System cable or comparable.

5.10.2 Device Channel Interface

The transmit and receive circuits that connect to the device channel are transceivers. The driver is switched to transmit or set to a high impedance condition when the unit is not transmitting. The receiver is always enabled, passing to the unit its own transmitted data and any received data.

5.10.3 Device Channel Byte Format

The device channel message frames are made up of twelve-bit characters. The meaning of these bits is as follows:

Bit 1	Start bit (zero)
Bits 2 to 9	Data bits 0 to 7
Bit 10	Address bit one = framing byte
	Address bit zero = non-framing byte
Bits 11 and 12	Stop bits (one)

5.10.4 Device Channel Message Format

The message format for device channel frames are defined as follows:

- Frames transmitted to the devices

  Message Frame |Address|Control| Data |CRC|CRC|Flag|
  Response Frame |Address|Control|CRC|CRC|Flag|
  Poll Frame |24 one bits|Address|24 one bits|Address|

- Frames transmitted from the devices

  Message Frame |Address|Control| Data |CRC|CRC|Flag|
  Response Frame |Address|Control|CRC|CRC|Flag|
  Poll Response (no data or status to transmit) |EOP|

The flag character acts as the ending delimiter for message and response frames. The address character sends the frame to the correct device or identifies the device from which a frame is received. The address byte, in other than a poll, has the high-order bit (bit 9) set to zero. The control character gives a method of defining the type of frame being transmitted or received (data, response, or control). The terminal and the devices each have a frame check sequence (FCS); that is, two cyclic redundancy check (CRC) characters at the end of each frame to check the validity of the frame. A check is also made to ensure that no characters between the starting delimiter and the ending delimiter have the address bit (bit 10) set to 1 (one).

Subtopics
5.10.4.1 Addressing
5.10.4.2 Polling

5.10.4.1 Addressing

Messages transmitted by I/O devices always flow from the device to the 4683-*xx*1. The address character in these messages identifies which device originated the message. Messages originating at the 4683-*xx*1 are sent to a specific device by using that device address as the leading delimiter in the frame. The following types of addresses are placed in a message only by the 4683-*xx*1:

A **broadcast** address sends a message to all devices, regardless of device type, that are connected to the device channel, rather than to a specific device. A message can be broadcast to all the devices attached to a 4683-*xx*1 or to all the devices attached to a 4683-002, but not to both groups at the same time.

A **port** address is used by the operating system in the 4683-*xx*1 to send traffic to devices on the 4683-*xx*1 or to send traffic to devices on the 4683-002. The group address X'11' selects 4683-*xx*1 devices; X'22' selects 4683-002 devices. This address is not transmitted on the channel, but is only used by the master microprocessor to select the correct channel.

A **poll** address requests messages from the specific device addressed. This address always has the high-order data bit set to 1 (one).

Each device is capable of detecting its poll address, its receive address, and a broadcast address.

5.10.4.2 Polling

The operating system manages message flow on the device channel by transmitting a poll frame that lets the device with that address transmit. A device cannot start to transmit unless it is polled by the master microprocessor in the 4683-*xx*1. The master microprocessor continuously polls, using a poll list given to it by the operating system. Any device on the channel that needs to send a message can send it after its specific poll has been detected. If a device does not have any data, response, or status to transmit when it detects its poll, the device must respond with an end of poll (EOP) character.

5.10.5 Device Channel Message Checking

The terminal uses a frame check sequence (FCS) to check the validity of each message it receives. An invalid message is discarded. When either the operating system or the device sends an information message, an acknowledgment is expected from the receiving end. If an acknowledgment is not received in a specific time-out period, the message is retransmitted. If all units connected to the channel are operating normally, there should be very few CRC errors on the channel.

5.10.6 Device Channel Power-On Initialization

During each terminal power-on sequence, diagnostics run automatically. While diagnostics are running, no devices on the channel are polled. When the ROS code in the terminal takes control, a check is made to determine if the diagnostics have uncovered any faults that would prevent the terminal from operating. If the ROS code determines that it can activate the terminal, polling is started by the master microprocessor when the ROS code passes a polling list to it and initializes operation.

6.0 Topic 6. Store System Description

This topic contains a description of the store system, including typical store loops and their operation. Store loop theory and operation is the same for 4693, 4684, and 4683 point-of-sale terminals.

The following discussion of the store loop can be used as reference for store loops consisting of either 4693, 4684, or 4683 point-of-sale terminals.

When reading this topic, the various models of terminals may be interchanged according to the following chart:

    4684-**xxx** may also be 4693-541
    4683-**xx**1 may also be 4693-421 or 4693-321
    4683-**x**02 may also be 4693-202

Subtopics
6.1 Typical Store System
6.2 Store Loop Description

6.1 Typical Store System

The 4680 Store System includes a store controller and point-of-sale terminals. The 4683-*xx*1 terminals are connected to the store controller through the store loop. The 4683-*xx*2 terminals are directly connected to a 4683-*xx*1 or 4684.

PICTURE 14

Figure 18. Typical 4693/4680 Store System. In this figure, the 4683-P can also be a 4683-001 or 4683-A01. The 4683-002 can also be a 4683-A02.

6.2 Store Loop Description

Use this section to find additional information about the store loop.

The following information is provided to assist you in understanding normal store loop functions. You can use it as an aid in developing store loop recovery and problem determination procedures unique to your store loop configuration.

The store loop is a cable over which data is transmitted between the store controller and the point-of-sale terminals of a 4680 Store System.

The store controller manages the data flow on the store loop. The rules for sending and receiving data over the loop are a subset of the synchronous data link control (SDLC) rules.

Subtopics
6.2.1 Configuration
6.2.2 Store Loop Hardware
6.2.3 Store Loop Wiring Concentrator
6.2.4 Polls
6.2.5 End-of-Poll Timeouts
6.2.6 Beacons
6.2.7 Cyclical Redundancy Check (CRC) / Message Retransmit
6.2.8 Store Loop Error Conditions and Error Messages
6.2.9 Store Loop Error Recovery Procedures

6.2.1 Configuration

The physical loop, which starts and ends at the store controller, connects the 4683s in a serial or radial arrangement. The store loop wiring is a shielded, twisted-pair cable that is installed by the user. This cable must meet the electrical and physical specifications outlined in *IBM 4680 Store System: Preparing Your Site*. The store loop can also be installed using the IBM Cabling System.

Several types of loop configurations are possible, depending on the type of cable used. Two of these configurations are described here.

- A radial store loop uses a twisted-pair cable that runs from each 4683 and the store controller to a centrally located loop wiring concentrator (LWC). See Figure 19 in topic 6.2.3.

- A serial store loop uses a twisted-pair cable that connects the store controller's loop transmitter to the first 4683's loop receiver. Then, a twisted-pair cable connects the loop transmitter in each successive 4683 to the loop receiver in the next 4683. Finally, a twisted-pair cable returns from the last 4683's loop transmitter to the store controller's receiver to complete the loop. See Figure 20 in topic 6.2.3.

Up to sixty-four 4683s can be connected to one store loop.

Note: System performance can be affected based on transaction rate.

Systems using a single store controller are limited to a single loop. Loops generally use two twisted pairs in a single jacket with a connection similar to the one shown in Figure 21 in topic 6.2.3.

No remote loops are supplied with this system.

6.2.2 Store Loop Hardware

The 4680 Store System store loop is made up of the following hardware:

- A store controller with one or two store loop adapters
- A store controller store loop attachment cables
- A store loop adapter in each point-of-sale terminal
- A store loop attachment cable for each point-of-sale terminal
- A shorting plug (1B) for each store loop attachment cable
- Store loop wiring including the receptacles for plugging into the store loop

A store loop in a 4680 Store System is configured with a store controller managing a communications line to which terminals are connected. Point-of-sale terminals are connected in series to form a loop with the store controller. The store loop is totally contained within a store.

The distance between powered-ON point-of-sale terminals on the store loop should not exceed 1220 m (4000 ft.).

A point-of-sale terminal is attached to the store loop with store loop attachment cable 1. A 4683-*xx*1 attaches directly to the store loop. A 4683-*xx*2 attaches to a partner 4683-*xx*1 or 4684. It is not attached to the store loop. A 4683-*xx*2 displays the store loop status of its partner 4683-*xx*1 or 4684.

The store loop receptacles and the connectors that attach to the receptacles are self-shorting. This means that when a store loop attachment cable is disconnected from a receptacle, the transmit and receive contacts in the **receptacle** automatically connect together to maintain the continuity of the store loop.

The same contacts in the store loop attachment **cable connector** connect together when the connector is disconnected from a receptacle. The transmit and receive contacts connecting together causes the point-of-sale terminal transmit data to be wrapped back so the terminal receives the same data that it transmits.

Shorting plug (1B) is attached to the point-of-sale terminal store loop attachment cable 1. It is designed to be used at the **terminal end** of its store loop attachment cable 1. This allows store loop continuity to be maintained when the store loop attachment cable is disconnected from socket 1 on the point-of-sale terminal base unit.

6.2.3 Store Loop Wiring Concentrator

Figure 19 is a diagram of 4683s and a store controller connected by radial store loop cables to a loop wiring concentrator.

PICTURE 15

Figure 19. Example of Store Loop (Radial). The 4683-P can also be a 4683-001 or 4683-A01. The 4683-002 can also be a 4683-A02.

PICTURE 16

Figure 20. Example of Store Loop (Serial). The 4683-P can also be a 4683-001 or 4683-A01. The 4683-002 can also be a 4683-A02.

PICTURE 17

Figure 21. Radial Store Loop Wiring Connected to a Loop Wiring Concentrator. The 4683-P can also be a 4683-001 or 4683-A01.

PICTURE 18

NOTES:

- This illustration represents a typical store loop, using the IBM Loop Wiring Concentrator. Your stor may not be wired like this, but the position of your 4683s on the loop and their relationship to the controller is similar.
- 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 receive the data and passes it to the next 4683 down-loop. This continues with each 4683 receiving data from the 4683 immediately up-loop from its position, and passing it on to the next 4683 down-loop. The last 4683 down-loop passes the data back to the store controller.

Figure 22. Store Loop Using Wiring Concentrators

PICTURE 19

NOTES:

- This illustration represents a typical store loop, using the IBM Loop Wiring Concentrator. Your stor may not be wired like this, but the position of your 4683s on the loop and their relationship to the controller is similar.
- 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 receive the data and passes it to the next 4683 down-loop. This continues with each 4683 receiving data from the 4683 immediately up-loop from its position, and passing it on to the next 4683 down-loop. The last 4683 down-loop passes the data back to the store controller.

Figure 23. Store Loop with LAN

6.2.4 Polls

The store controller transmits unique poll messages to invite 4683s on the store loop to transmit. The poll messages are propagated around the store loop as each 4683 receives and then retransmits all messages. The position of a 4683 on the store loop determines the sequence in which it receives its unique poll.

A 4683 must be polled before it can respond to a message that it received from the store controller. If a 4683 is waiting with a message or a response to a message, it transmits its terminal number followed by the message or response when it is polled. It then resumes passing received data to the next 4683 on the store loop. If a 4683 has neither a message nor a response to a message, it does not respond to the poll.

When the store controller transmits a message to a 4683, an acknowledgment of that message is required. The acknowledgment is not transmitted until the 4683 receives a poll. If the store controller does not receive an acknowledgment within a certain period of time, the message is retransmitted to the 4683.

6.2.5 End-of-Poll Timeouts

An end-of-poll (EOP) character is transmitted with every poll. The store controller expects to receive the EOP character that is transmitted with each poll. If the EOP is not received, the store controller retries. If an EOP character is received, the store controller resumes normal operation. If retries fail, the store controller then runs a wrap test on its own store loop adapter.

If the store controller store loop adapter wrap test fails, the store controller loop relay drops. When the loop relay drops, store loop continuity is maintained and the store controller is removed from the store loop. When the store controller is removed from the store loop, the 4683s detect the absence of polls and they start to beacon. When a 4683 receives its own beacon, this is confirmation that the store loop is intact and the 4683 transmits a backup request. The 4683 continues to transmit the backup request until it receives a poll from a store controller. When the **enabled** backup store controller recognizes the backup request, it takes control of the store loop and begins transmitting polls. See "Backup Store Controller" in topic 8.2.1.

If no failure is detected during the store controller store loop adapter wrap test, the store controller continues to poll and monitor the receive side of the store loop. Any beacon received at the store controller contains the number of the beaconing 4683. The location of the beaconing 4683 on the store loop indicates the approximate location of the store loop problem.

If no beacons are received, the store controller indicates an EOP timeout. The EOP timeout also indicates the approximate location of the store loop problem. In this case the problem is in the store controller, the last 4683 on the store loop, or the store loop segment between the last 4683 on the store loop and the store controller.

6.2.6 Beacons

A beacon is a message that a 4683 transmits to indicate it is not receiving polls from the store controller. A 4683 expects to continuously receive polls. When a 4683 does not receive polls for a specified period of time, a poll timeout occurs. When a poll timeout occurs, the 4683 automatically runs a wrap test of its store loop adapter.

If a failure is detected during the wrap test, the 4683 drops its loop relay. The 4683 is removed from the store loop and store loop continuity is maintained. Also, when a 4683 is powered-OFF, the loop relay drops and this has the same effect.

If no failure is detected during the adapter wrap test, the 4683 stays on the store loop and continuously transmits a beacon message containing its terminal number. While the beacon is being transmitted, the 4683 monitors the receive side of the store loop looking for polls.

- If a beacon is received from another 4683 on the store loop, the 4683 stops transmitting its own beacon and passes on the received beacon. The store controller receives the beacon message containing the beaconing terminal number. The location of the beaconing 4683 indicates the approximate location of the store loop problem. The problem can exist in:

  - The beaconing 4683
  - The 4683 just prior to the beaconing 4683 on the store loop
  - The store loop segment between these two 4683s

  If the beaconing 4683 is the first 4683 in the store loop, the problem can exist in:

  - The beaconing 4683
  - The store controller
  - The store loop segment between the store controller and the 4683

- If a 4683 receives its own beacon, this means that the store controller is down. The 4683:

  1. Stops beaconing

  2. Transmits a backup request message notifying all 4683s on the store loop that the store controller is down.

     Note: The 4683 continues to transmit the backup request until it receives a poll from a store controller. When a poll is received, this indicates system recovery has occurred and normal operation is resumed.

6.2.7 Cyclical Redundancy Check (CRC) / Message Retransmit

The data format and error recovery method used for store loop traffic is designed to assure the data integrity of all messages received and transmitted by the store controller and each of the 4683s. Each message transmitted to the store loop by the store controller or a 4683 contains a CRC code based on the transmitted data.

The receiving 4683 or store controller calculates the CRC code using the received data. If the CRC code matches the CRC code in the received data, the message is acknowledged to the sender as good. If the CRC code **does not** match, no acknowledgement is sent. This results in the message being retransmitted by the originator.

- The store controller records an entry in the system log when the number of messages received from a 4683 with CRC data errors (CRC mismatch), exceeds 1% of the total number of messages received from the 4683.

  The system log entry "System message W000, B4/S008(or S009)/E017", indicates that 1% of the messages received from 4683 *xxx* contained CRC data errors (CRC mismatch).

- The store controller records an entry in the system log when the number of messages requiring retransmission to a 4683 exceeds 1% of the total number of messages transmitted to the 4683.

  The system log entry "System message W000, B4/S008(or S009)/E018", indicates that 1% of the messages transmitted to 4683 *xxx* were not acknowledged and were retransmitted.

6.2.8 Store Loop Error Conditions and Error Messages

It is important to understand the terms down-loop and up-loop when dealing with store loop failures. These terms are defined as the position of a 4683 or store controller relative to the direction of data flow on the store loop.

1. The store controller transmits data to the first 4683 down-loop on the store loop.

2. This 4683 receives the loop data, accepts or adds data, and passes the data on to the next 4683 down-loop from its own position on the store loop.

3. This continues with each 4683 receiving data from the 4683 immediately up-loop from its position on the store loop and passing the data to the next 4683 down-loop.

4. The last 4683 down-loop passes the data back to the store controller.

A 4683 is offline from the store controller.

A 4683 is offline when it is not receiving store loop polls or responses to messages. Many conditions can cause a 4683 to be offline. These conditions can exist in the 4683, in the store controller, or in the store loop wiring. When a 4683 is offline, the 4683 keyboard Offline light comes ON. When the Offline light is ON, the operator should press **S1**, type **2**, and press **S2** at the 4683 keyboard to display the message and further define the reason for the offline condition.

Note: On the ANPOS keyboard (during some procedures) and on the enhanced alphanumeric keyboard, **Esc** = S1 and **Enter** = S2.

SYSTEM MESSAGE AVAILABLE is displayed at the store controller.

A system message is waiting to be displayed. Press **System Request** and then type **M** at the store controller keyboard to display the message.

Note: Point-of-sale terminals that have not yet been loaded with the terminal operating system are not able to provide the operator support necessary to display the message that defines the offline condition. A 4683 that is in the process of receiving an IPL across the store loop displays progress messages U001 thru U008.

U003 A 4683 that is displaying message U003 is not receiving store loop polls from the store controller. When a 4683 is not receiving store loop polls, it transmits a beacon message containing its terminal number. If a 4683 has not been configured with a terminal number, it cannot beacon.

A 4683 displays message U003 whether it has or has **not** been configured with a terminal number. The external indications at the 4683 are the same for either situation until the 4683 has completed the IPL. If the 4683 is beaconing, the 4683s down-loop and the store controller indicates this in the normal manner.

U003 can be caused by a failure in the store controller or an open store loop up-loop from the 4683 displaying U003.

U004 A 4683 that is displaying message U004 has received store loop polls and has sent a load request message to the store controller, but has not yet received a response to the load request.

U004 can be caused by no response from the store controller or an open store loop down-loop from the 4683 displaying U004.

U005 A 4683 that is displaying message U005 has received a response from the store controller and is in the process of receiving a program load.

Note: The position of a 4683 on the store loop determines which offline condition exists at that 4683. The location of the loop problem in the store loop determines which error messages are displayed at the store controller.

If a failure is detected when a 4683 runs its store loop adapter wrap test:

- The 4683 removes itself from the store loop and goes offline.
- The keyboard Message Pending light comes ON.
- Message W002 is placed in the message queue.

If a failure is detected when the store controller runs its store loop adapter wrap test:

- The store controller removes itself from the store loop.
- Message W763 is logged in the system message log.
- The 4683s go offline and issue a backup request.

Note: A 4683 is considered active if it is attached to the store loop, has its power ON, and is configured with a terminal number entered in its totals retention.

If the 4683s are offline because of an open store loop:

Down-loop from the open store loop condition:

- The first active 4683 down-loop beacons.
- Message W005 is placed in the message queue of the beaconing 4683.
- The active 4683s down-loop from the beaconing 4683 indicate that a 4683 up-loop is beaconing and they pass the beacon on to the next 4683.
- Message W007 is placed in the message queue of each active 4683 down-loop from the beaconing 4683.
- The store controller receives the beacon from the beaconing 4683 and log message W760 in the system message log.

Up-loop from the open store loop condition:

- The 4683s do not beacon because they receive store loop polls.
- They do not see the beacon from the beaconing 4683.
- If a 4683 responds to a poll with a message, the message does not reach the store controller.
- Eventually the 4683 goes offline because the store controller failed to respond to the message.
- Message W004 is placed in the message queue of each active 4683 up-loop from an open store loop condition.

If no *active* 4683s are *down-loop* from an open store loop condition:

- The store controller does not receive the expected end-of-poll.
- The store controller does not receive a beacon.
- An end-of-poll timeout occurs at the store controller.
- Message W764 is logged in the system message log at the store controller.

If a 4683 detects an open store loop condition and the 4683 has *not* been configured with a terminal number:

- The 4683 cannot beacon because it does not have a terminal number.
- Message W001 is placed in the 4683 message queue.
- The active 4683s down-loop from this 4683, if any, beacon. If there are no active 4683s down-loop from this 4683:
  - An end-of-poll timeout occurs at the store controller.
  - Message W764 is logged in the system message log at the store controller.

If a 4683 beacons, and then receives its own beacon:

- The 4683 stops beaconing and transmit a backup request message to notify all active 4683s on the store loop that the store loop is intact but that the store controller is down.
- Message W003 is placed in the message queue of all active 4683s on the store loop.

If an open store loop is detected at the store controller:

- Message W760 or message W764 is logged at the store controller.
- After the open store loop is resolved, message W761 is logged at the store controller.

If a 4683 fails to respond to a message from the store controller after a retry attempt, the store controller logs message W762 in the System Message Log.

6.2.9 Store Loop Error Recovery Procedures

The following is intended to provide a better general understanding of the store loop for personnel responsible for resolving store loop problems.

Each store must maintain a "Terminal Identification Chart" or a store loop layout chart. The chart must indicate:

- The physical location of the 4683s on the loop
- The terminal number of each 4683 on the loop
- The physical order of the terminal numbers on the loop
- The direction of loop data flow on the loop

The chart can be a picture of the store loop showing the store controller at the top of a circle and each 4683 placed around the circle. The loop must be closed with the last 4683 down-loop connected to the store controller.

Use an arrow to show the direction of data flow from the store controller, through each 4683, and back to the store controller. Starting at the store controller, list the terminal number of the first point-of-sale terminal down-loop from the store controller. Continue until you complete the list with the last 4683 down-loop from the store controller (the 4683 with its down-loop segment going directly back to the store controller).

The first step in isolating any store loop failure is to verify that the distance between active 4683s on the store loop does not exceed the maximum of 1220 m (4000 ft.). If too many 4683s are powered-**OFF** the distance can exceed the maximum. Exceeding 1220 m (4000 ft.) can result in permanent or intermittent store loop failures. If the distance does not exceed 1220 m (4000 ft.), proceed with the following problem determination procedures.

Subtopics
6.2.9.1 When the Beaconing 4683 is the First 4683 on the Store Loop
6.2.9.2 When the Beaconing 4683 is Not the First 4683 on the Store Loop
6.2.9.3 When the Store Controller Receives End-of-Poll Timeouts

6.2.9.1 When the Beaconing 4683 is the First 4683 on the Store Loop

Note: This information is for reference only. To resolve the problem described here, see message W005 or message W760.

1. Message W005 is displayed at the 4683 and message W760 is displayed at the store controller.

2. Disconnect the first 4683 from the store loop. If normal operation resumes, leave this 4683 off the store loop and have it repaired.

3. If removing the first 4683 from the store loop does not result in the resumption of normal operation, reconnect the 4683 to the store loop.

4. Disconnect the store controller from the store loop. If the result of this action is an Offline message W003 at the 4683, the failure is in the store controller. Normal operation cannot be re-established unless a backup store controller takes over the store loop or the primary store controller is repaired.

5. If removing the store controller does not result in the condition described in the previous step, reconnect the store controller to the store loop. The problem is in the store loop wiring segment between the store controller and the first 4683 on the store loop. This wiring must be bypassed or repaired to resume normal operation.

6.2.9.2 When the Beaconing 4683 is Not the First 4683 on the Store Loop

Note: This information is for reference only. To resolve the problem described here, see message W005 or message W760.

1. Message W005 is displayed at the 4683 and W760 is displayed at the store controller.

2. Disconnect the beaconing 4683 from the store loop. If this action results in normal store loop operation, the beaconing 4683 is failing. It should be left off the store loop until it is repaired.

3. If removing the beaconing 4683 does not resolve the store loop problem, reconnect this 4683 to the store loop and disconnect the first active 4683 up-loop from the beaconing 4683 from the store loop. If normal store loop operation resumes with the 4683 removed, the 4683 is failing. It should be left off the store loop until it is repaired.

4. If removal of the 4683 up-loop from the beaconing 4683 does not resolve the problem, the failure is in the store loop wiring segment between these two 4683s. Normal operation cannot resume until this segment is bypassed or repaired.

6.2.9.3 When the Store Controller Receives End-of-Poll Timeouts

Note: This information is for reference only. To resolve the problem described here, see message W764.

1. Message W764 is displayed at the store controller.

2. Disconnect the last 4683 from the store loop. If normal operation resumes, leave this failing 4683 off the store loop until it is repaired.

3. If removing the last 4683 does not resolve the situation, reconnect this 4683 to the store loop and disconnect the store controller. If the result of this step is an offline message W003 at the 4683s, the store controller is failing. Normal operation cannot be re-established unless a backup store controller takes over the store loop.

4. If the previous step does not show that the store controller is failing, reconnect the store controller to the store loop. The problem is in the store loop wiring segment between the store controller and the last 4683 on the store loop. Normal operation cannot resume until this segment is bypassed or repaired.

7.0 Topic 7. Store Loop Maintenance Analysis Procedures

Subtopics

7.1 Store Loop MAPs
7.2 MAP 0100: W001 Message
7.3 MAP 0110: W003 Message
7.4 MAP 0120: W004 Message
7.5 MAP 0130: W005 Message
7.6 MAP 0140: W762 Message
7.7 MAP 0150: W764 Message
7.8 MAP 0160: W772 Message

7.1 Store Loop MAPs

The following store loop maintenance analysis procedures (MAPs) were written for the 4680 store system. Since store loop operation is the same for 4693, 4684, and 4683 terminals, they can be applied to either.

When reviewing these MAPs, the various models of terminals may be interchanged according to the following chart:

4684-XXX may also be 4693-541
4683-XX1 may also be 4693-421 or 4693-321
4683-X02 may also be 4693-202

This section contains information that can be used to learn more about the store loop and its failure modes.

- The following full-page figures represent a typical store loop, using the IBM loop wiring concentrator.
- Each figure represents the same store loop, each with the following conditions:

  Store loop with an open condition in the top loop wiring concentrator.

  Store loop with the primary store controller offline.

  Store loop with an open condition in the bottom loop wiring concentrator.

  Store loop with a failing point-of-sale terminal.
- Your store loop may not be wired like this, but the position of your 4683s on the loop and the relationship to the store controller is similar.
- The 4683-P can also be a 4683-001 or 4683-A01. The 4683-002 can also be a 4683-A02.
- The terminal numbers are shown in numeric order, but they can be put in any order on your store loop.
- 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 up-loop from its position, and passing it on to the next 4683 down-loop. The last 4683 down-loop passes the data back to the store controller.

PICTURE 20

Figure 24. Store Loop with an Open Condition

PICTURE 21

Figure 25. Store Loop with the Primary Store Controller Offline

PICTURE 22

Figure 26. Store Loop with an Open Condition

PICTURE 23

Figure 27. Store Loop with a Failing Point-of-Sale Terminal

PICTURE 24

Figure 28. Typical Store Loop Receptacles

PICTURE 25

Figure 29. 4683-xx1 Store Loop Cable 1 and Shorting Plug 1B

PICTURE 26

Figure 30. Store Controller Store Loop Adapter and Store Loop Receptacle

7.2 MAP 0100: W001 Message

Symptom Explanation	**Conditions That Could Cause This Symptom**
The 4683 is not receiving store loop communications. The 4683 is not beaconing because it does not have a terminal number. The 4683 keyboard OFFLINE light is ON.	□ The store loop is open up-loop from the 4683 displaying message W001. □ A 4683-*xx*1 is failing up-loop. □ The 4683-*xx*1 store loop cable is failing. □ The 4683 base unit is failing. □ The primary store controller is failing. □ The backup store controller is failing. □ The distance exceeds 4000 feet (1220 meters) between powered-ON 4683-*xx*1s on the store loop.

001

To display the terminal number, press **S1**, type **7**, and press **S2**.
To display messages at a point-of-sale terminal (when the keyboard OFFLINE light is ON), press **S1**, type **2**, and press **S2**.

Note: On the ANPOS Keyboard (during some procedures) and on the Enhanced Alphanumeric Keyboard, **Esc** = S1 and **Enter** = S2.
To display a system message at the store controller, sign on at the store controller, press **System Request** and then press the **M** key.

Warning: Switching **POWER OFF** at a 4684 affects operations at all point-of-sale terminals attached to it.

- Before starting store loop problem determination, obtain the filled-in "Terminal Identification Chart" from the book *IBM 4680 Store System: Preparing Your Site*.

  -- or --

  Obtain a store loop layout chart containing:

  □ The physical location of store controller(s) and point-of-sale terminals

  □ The order of store controller(s) and point-of-sale terminals on the store loop

  □ The terminal numbers.

- Ensure the store loop cable is plugged into socket 1 on the 4683-*xx*1 displaying message W001 and that the other end of the cable is plugged into the store loop receptacle. See Figure 30 in topic 7.1 and Figure 29 in topic 7.1.

Is there a backup store controller connected to this store loop?
Yes **No**

002
- Continue at Step 011.

003
- At the backup store controller, display the Backup Store Loop status.

Is the Backup Store Loop status "Providing Backup"?
Yes **No**

004
- Continue at Step 008.

005
- At the primary store controller, display the Store Loop Control status.

The primary store controller is the controller that has been designated to control the store loop. It is supported by the backup store controller.
Is the Store Loop Control status "Controlling Loop"?
Yes **No**

```
 ¦    ¦
 ¦   +---+
 ¦   ¦006¦
 ¦   +---+
 ¦   - Disconnect the primary store controller from the store loop by
 ¦     unplugging its store loop cable from the store loop receptacle.
 ¦     See Figure 30 in topic 7.1.
 ¦   Do not reconnect this store controller until the problem has been
 ¦   resolved.
 ¦   - Continue at Step 011.
 ¦
 ¦
+---+
¦007¦
+---+
```

Both store controllers are trying to control the store loop. This condition is caused by attaching an active store controller to the store loop when another active store controller is on the store loop.

- Disable the backup store controller.
- Wait 15 seconds and enable the backup store controller.

Return to normal store operation.

```
+---+
¦008¦
+---+
```

(From step 004)

- Disconnect the backup store controller from the store loop by unplugging its store loop cable from the store loop receptacle. See Figure 30 in topic 7.1.

Do not reconnect this store controller until the problem has been resolved.

- Wait 15 seconds and observe the keyboard lights on the 4683 displaying message W001.

Did the OFFLINE light go OFF?

Yes **No**

```
 ¦    ¦
 ¦   +---+
 ¦   ¦009¦
 ¦   +---+
 ¦   - Continue at Step 011.
 ¦
 ¦
+---+
¦010¦
+---+
```

- Record keywords CONTROLLER and INCORROUT.

At the backup store controller, go to the *Hardware Service Manual* for your store controller and check for power-on self test error messages.

```
+---+
¦011¦
+---+
```

(From steps 002, 006, and 009)

- Display the system message at the active store controller by pressing **System Request** and then pressing the **M** key.

A store controller is active when it is:

The only store controller on the store loop
-- or --
The primary store controller and its status is "Controlling Loop"
-- or --
The backup store controller and its status is "Providing Backup".

Did the active store controller display message W760 or W764?

Yes **No**

```
 ¦    ¦
 ¦   +---+
 ¦   ¦012¦
 ¦   +---+
 ¦   - Continue at Step 018.
 ¦
 ¦
+---+
¦013¦
+---+
```

- Note the information in the message and return to the 4683 displaying message W001.
- If it is a 4683-*xx*2, go to its partner 4683-*xx*1. A 4683-*xx*2 displays the status of its partner 4683-*xx*1. See the store loop layout chart.

The store controller transmits data down-loop to the first 4683-*xx*1 and to all the following 4683s on the store loop. Each 4683 receives its data from the 4683 or store controller up-loop from its position on the store

loop.
Is this the first powered-ON 4683-*xx*1 down-loop from the active store controller?
Yes **No**

014
- Continue at Step 023.

015
- Disconnect this 4683-*xx*1 from the store loop by unplugging its store loop cable from the store loop receptacle. See Figure 30 in topic 7.1.
- Return to the active store controller and display the system message by pressing **System Request** and then pressing the **M** key.

Did message W761 display?
Yes **No**

016
- Reconnect the 4683-*xx*1 to the store loop and continue at Step 051.

017
- Continue at Step 035.

018
(From step 012)
Is the store loop cable plugged into the store loop adapter on the active store controller? See Figure 30 in topic 7.1.
Yes **No**

019
Correct the problem by plugging the cable into the store loop adapter.

020
- Return to the 4683-*xx*1 displaying message W001.

On this 4683, is the store loop cable plugged into socket 1 and into the store loop receptacle?
Yes **No**

021
Correct the problem by plugging the cable into socket 1 and into the store loop receptacle.

022
- Record keywords CONTROLLER and INCORROUT.

At the active store controller, go to the *Hardware Service Manual* for your store controller and check for power-on self test error messages.

023
(From step 014)
- Look for 4683-*xx*1s up-loop from this 4683 with message W001 displayed. See the store loop layout chart.

Are there any 4683-*xx*1s up-loop from this 4683 with message W001 displayed?
Yes **No**

024

```
  ¦   - Continue at Step 030.
  ¦
  ¦
  ¦
+---+
¦025¦
+---+
- Return to the active store controller and check each 4683-xx1 down-loop
  until you find one displaying message W001.
Is this the first powered-ON 4683-xx1 down-loop from the active store
controller?
Yes  No
  ¦    ¦
  ¦   +---+
  ¦   ¦026¦
  ¦   +---+
  ¦   - Continue at Step 030.
  ¦
  ¦
  ¦
+---+
¦027¦
+---+
- Disconnect this 4683-xx1 from the store loop by unplugging its store
  loop cable from the store loop receptacle.  See Figure 30 in topic 7.1.
- Return to the active store controller and display the system message by
  pressing System Request and then pressing the M key.
Did message W761 display?
Yes  No
  ¦    ¦
  ¦   +---+
  ¦   ¦028¦
  ¦   +---+
  ¦   - Reconnect the 4683-xx1 to the store loop and continue at Step 051.
  ¦
  ¦
  ¦
+---+
¦029¦
+---+
- Continue at Step 035.
--------------------------------------------------------------------------------

+---+
¦030¦
+---+
(From steps 024 and 026)
- Disconnect this 4683-xx1 from the store loop by unplugging its store
  loop cable from the store loop receptacle.  See Figure 30 in topic 7.1.
- Return to the active store controller and display the system message by
  pressing System Request and then pressing the M key.
Did message W761 display?
Yes  No
  ¦    ¦
  ¦   +---+
  ¦   ¦031¦
  ¦   +---+
  ¦   - Reconnect the 4683-xx1 to the store loop and continue at Step 033.
  ¦
  ¦
  ¦
+---+
¦032¦
+---+
- Continue at Step 035.
--------------------------------------------------------------------------------

+---+
¦033¦
+---+
(From step 031)
- Go to the next powered-ON 4683-xx1 up-loop from this 4683.  See the
  store loop layout chart.
- Disconnect this 4683 from the store loop by unplugging its store loop
  cable from the store loop receptacle.
- Return to the active store controller and display the system message by
  pressing System Request and then pressing the M key.
Did message W761 display?
Yes  No
  ¦    ¦
  ¦   +---+
  ¦   ¦034¦
  ¦   +---+
  ¦   - Reconnect the 4683-xx1 to the store loop and continue at Step 042.
  ¦
  ¦
  ¦
+---+
¦035¦
```

(From steps 017, 029, and 032)
Is the store loop cable plugged into socket 1 on this 4683-*xx*1 base unit?
Yes **No**

036
Correct the problem by plugging the cable into socket 1.

037
- Unplug the store loop cable from socket 1 on this 4683-*xx*1 base unit.
- Attach shorting plug 1B to the 4683-end of the cable. See Figure 29 in topic 7.1.
- Plug the other end of the cable into the store loop receptacle.
- Return to the active store controller and display the system message by pressing **System Request** and then pressing the **M** key.

Did the active store controller display message W760 or W764?
Yes **No**

038
- Return to the 4683-*xx*1 and switch **POWER OFF**.

Service the 4683 base unit.

039
- Return to the 4683-*xx*1 and examine its store loop receptacle for damage.

Is the store loop receptacle OK?
Yes **No**

040
Report the problem to the person responsible for repairing store loop wiring.

041
Correct the problem by exchanging the store loop cable attached to the 4683.

042
(From step 034)
The problem is in the store loop segment between the two powered-ON 4683-*xx*1s.
Are there any powered-OFF 4683-*xx*1s connected to the store loop segment between the two powered-ON 4683s?
Yes **No**

043
The problem is in the store loop wiring **or** the store loop receptacles for the 4683-*xx*1s.
Report the problem to the person responsible for repairing store loop wiring.

044
- One at a time, disconnect each powered-OFF 4683-*xx*1 from the store loop segment by unplugging its store loop cable from the store loop receptacle.
- After each 4683 is disconnected, return to the active store controller and display the system message by pressing **System Request** and then pressing the **M** key.

Did message W761 display?
Yes **No**

045

```
  ¦   +---+
  ¦   If all powered-OFF 4683s have not been disconnected, continue
  ¦   disconnecting them and displaying the system message at the active
  ¦   store controller.
  ¦   - or -
  ¦   If all powered-OFF 4683s have been disconnected, the problem is in
  ¦   the store loop wiring or the store loop receptacles for the
  ¦   4683-xx1s.
  ¦   - Reconnect all 4683s and report the problem to the person
  ¦     responsible for repairing store loop wiring.
  ¦
  ¦
+---+
¦046¦
+---+
- Unplug the store loop cable from socket 1 on the 4683-xx1 that you just
  disconnected from the store loop.
- Attach shorting plug 1B to the 4683-end of the cable.  See Figure 29 in
  topic 7.1.
- Plug the other end of the cable into the store loop receptacle.
- Return to the active store controller and display the system message by
  pressing System Request and then pressing the M key.
Did the active store controller display message W760 or W764?
Yes  No
  ¦    ¦
  ¦   +---+
  ¦   ¦047¦
  ¦   +---+
  ¦   - Return to the 4683-xx1 and switch POWER OFF.
  ¦   Service the 4683 base unit.
  ¦
  ¦
+---+
¦048¦
+---+
- Return to the 4683-xx1 and examine its store loop receptacle for damage.
Is the store loop receptacle OK?
Yes  No
  ¦    ¦
  ¦   +---+
  ¦   ¦049¦
  ¦   +---+
  ¦   Report the problem to the person responsible for repairing store loop
  ¦   wiring.
  ¦
  ¦
+---+
¦050¦
+---+
Correct the problem by exchanging the store loop cable attached to the
4683.
--------------------------------------------------------------------------

+---+
¦051¦
+---+
(From steps 016 and 028)
Is the store loop cable plugged into the store loop adapter on the active
store controller?  See Figure 30 in topic 7.1.
Yes  No
  ¦    ¦
  ¦   +---+
  ¦   ¦052¦
  ¦   +---+
  ¦   Correct the problem by plugging the cable into the store loop
  ¦   adapter.
  ¦
  ¦
+---+
¦053¦
+---+
- Disconnect the active store controller from the store loop by unplugging
  its store loop cable from the store loop receptacle.
- Display the system message at the active store controller by pressing
  System Request and then pressing the M key.
Did message W761 display?
Yes  No
  ¦    ¦
  ¦   +---+
  ¦   ¦054¦
  ¦   +---+
  ¦   The problem is in the active store controller, the store loop
  ¦   adapter, or the store loop adapter cable.
  ¦   - Record keywords CONTROLLER and INCORROUT.
```

At the active store controller, go to the *Hardware Service Manual* for your store controller and check for power-on self test error messages.

055

- Reconnect the active store controller to the store loop.

Are there any powered-OFF 4683-*xx*1s connected to the store loop segment between the 4683 displaying message W001 and the active store controller?

Yes **No**

056

The problem is in the store loop wiring between the active store controller and the 4683-*xx*1 **or** in the store loop receptacle for the store controller or 4683-*xx*1.
Report the problem to the person responsible for repairing store loop wiring.

057

- One at a time, disconnect each powered-OFF 4683-*xx*1 from the store loop segment by unplugging its store loop cable from the store loop receptacle.
- After each 4683 is disconnected, return to the active store controller and display the system message by pressing **System Request** and then pressing the **M** key.

Did message W761 display?

Yes **No**

058

If all powered-OFF 4683s have **not** been disconnected, continue disconnecting them and displaying the system message at the active store controller.
- or -
If all powered-OFF 4683s have been disconnected, the problem is in the store loop wiring between the active store controller and the 4683-*xx*1 **or** in the store loop receptacle for the store controller or 4683-*xx*1.
- Reconnect all 4683s and report the problem to the person responsible for repairing store loop wiring.

059

- Unplug the store loop cable from socket 1 on the 4683-*xx*1 that you just disconnected from the store loop.
- Attach shorting plug 1B to the 4683-end of the cable. See Figure 29 in topic 7.1.
- Plug the other end of the cable into the store loop receptacle.
- Return to the active store controller and display the system message by pressing **System Request** and then pressing the **M** key.

Did the active store controller display message W760 or W764?

Yes **No**

060

- Return to the 4683-*xx*1 and switch **POWER OFF**.
Service the 4683 base unit.

061

- Return to the 4683-*xx*1 and examine its store loop receptacle for damage.

Is the store loop receptacle OK?

Yes **No**

062

Report the problem to the person responsible for repairing store loop wiring.

```
+---+
¦063¦
+---+
Correct the problem by exchanging the store loop cable attached to the
4683.
```

7.3 MAP 0110: W003 Message

Symptom Explanation	**Conditions That Could Cause This Symptom**
The 4683-*xx*1 is not receiving store loop communications. It beaconed and then received its own beacon. Its store loop adapter test was run automatically and it detected no problems. Its keyboard OFFLINE light is ON. The 4683-*xx*1s are now signaling that the store controller is not communicating on the loop (message W003). The store loop appears to be OK.	□ The store controller is powered-OFF. □ The store controller is disconnected from the store loop. □ The store controller store loop cable is failing. □ The store controller is failing. □ The 4683-*xx*1 is disconnected from the store loop. □ The 4683-*xx*1 store loop cable is failing. □ The 4683-*xx*1 base unit is failing.

001

To display the terminal number, press **S1**, type **7**, and press **S2**.
To display messages at a point-of-sale terminal (when the keyboard OFFLINE light is ON), press **S1**, type **2**, and press **S2**.

Note: On the ANPOS Keyboard (during some procedures) and on the Enhanced Alphanumeric Keyboard, **Esc** = S1 and **Enter** = S2.
To display a system message at the store controller, sign on at the store controller, press **System Request** and then press the **M** key.

Warning: Switching **POWER OFF** at a 4684 affects operations at all point-of-sale terminals attached to it.

- Before starting store loop problem determination, obtain the filled-in "Terminal Identification Chart" from the book *IBM 4680 Store System: Preparing Your Site*.

  -- or --

  Obtain a store loop layout chart containing:

  □ The physical location of store controller(s) and point-of-sale terminals

  □ The order of store controller(s) and point-of-sale terminals on the store loop

  □ The terminal numbers.

- If the 4683 displaying message W003 is a 4683-*xx*2, go to its partner 4683-*xx*1.
- Ensure the store loop cable is plugged into socket 1 on the 4683-*xx*1 displaying message W003 and that the other end of the cable is plugged into the store loop receptacle. See Figure 30 in topic 7.1 and Figure 29 in topic 7.1.

On this 4683, is the store loop cable plugged into socket 1 and into the store loop receptacle?

Yes **No**

002

Correct the problem by plugging the cable into socket 1 and the store loop receptacle.

003

Is this the only powered-ON 4683-*xx*1 connected to the store loop?

Yes **No**

```
  ¦   +---+
  ¦   ¦004¦
  ¦   +---+
  ¦   - Continue at Step 008.
  ¦
  ¦
+---+
¦005¦
+---+
- Unplug the store loop cable from socket 1 on this 4683-xx1 base unit.
- Attach shorting plug 1B to the 4683-end of the cable.  See Figure 29 in
  topic 7.1.
- At the 4683, press S1, type 2, and press S2 to display the OFFLINE
  message.

  Note:  On the ANPOS Keyboard (during some procedures) and on the
  Enhanced Alphanumeric Keyboard, Esc = S1 and Enter = S2.
Did message W003 change to message W005?
Yes  No
  ¦    ¦
  ¦   +---+
  ¦   ¦006¦
  ¦   +---+
  ¦   - Switch POWER OFF at the 4683-xx1.
  ¦   Service the 4683 base unit.
  ¦
  ¦
+---+
¦007¦
+---+
- Remove shorting plug 1B from the end of the cable.
- Plug the store loop cable back into socket 1.
- Continue at Step 012.
--------------------------------------------------------------------------

+---+
¦008¦
+---+
(From step 004)
Is the keyboard OFFLINE light ON at any other 4683-xx1?
Yes  No
  ¦    ¦
  ¦   +---+
  ¦   ¦009¦
  ¦   +---+
  ¦   The 4683 displaying message W003 is failing.
  ¦   - Switch POWER OFF at the 4683.
  ¦   Service the 4683 base unit.
  ¦
  ¦
+---+
¦010¦
+---+
- At the other 4683(s), press S1, type 2, and press S2 to display the
  OFFLINE message(s).

  Note:  On the ANPOS Keyboard (during some procedures) and on the
  Enhanced Alphanumeric Keyboard, Esc = S1 and Enter = S2.
Did message W003 display?
Yes  No
  ¦    ¦
  ¦   +---+
  ¦   ¦011¦
  ¦   +---+
  ¦   The 4683 displaying message W003 is failing.
  ¦   - Switch POWER OFF at the 4683.
  ¦   Service the 4683 base unit.
  ¦
  ¦
+---+
¦012¦
+---+
(From step 007)
Is there a backup store controller connected to this store loop?
Yes  No
  ¦    ¦
  ¦   +---+
  ¦   ¦013¦
  ¦   +---+
  ¦   - Continue at Step 025.
  ¦
  ¦
+---+
¦014¦
```

- At the backup store controller, display the Backup Store Loop status.

Is the Backup Store Loop status "Providing Backup"?

Yes **No**

015

- Continue at Step 019.

016

- At the primary store controller, display the Store Loop Control status.

The primary store controller is the controller that has been designated to control the store loop. It is supported by the backup store controller.

Is the Store Loop Control status "Controlling Loop"?

Yes **No**

017

- Disconnect the primary store controller from the store loop by unplugging its store loop cable from the store loop receptacle.
- ***Do not reconnect this store controller until the problem has been resolved.***
- Continue at Step 025.

018

Both store controllers are trying to control the store loop. This condition is caused by attaching an active store controller to the store loop when another active store controller is on the store loop.

- Disable the backup store controller.
- Wait 15 seconds and enable the backup store controller.

Return to normal store operation.

019

(From step 015)

- Display the system message at the backup store controller by pressing **System Request** and then pressing the **M** key.

Did message W771 display?

Yes **No**

020

- Continue at Step 022.

021

- Follow the *User Response* in message W771 in the *Messages Guide* for your system.

022

(From step 020)

Is the store loop cable on the backup store controller plugged into the store loop receptacle?

Yes **No**

023

Correct the problem by plugging the cable into the store loop receptacle.

024

- Record keywords CONTROLLER and INCORROUT.

At the backup store controller, go to the *Hardware Service Manual* for your store controller and check for power-on self test error messages.

025
(From steps 013 and 017)
A store controller is active when it is:

The only store controller on the store loop
-- or --
The primary store controller and its status is "Controlling Loop"
-- or --
The backup store controller and its status is "Providing Backup".

Is the store loop cable plugged into the store loop adapter on the active store controller? See Figure 30 in topic 7.1.

Yes **No**

026
Correct the problem by plugging the cable into the store loop adapter.

027
Is the active store controller powered-ON and loaded with the store controller program?

Yes **No**

028
- Continue at Step 030.

029
- Continue at Step 032.

030
(From step 028)
- Switch **POWER OFF** at the active store controller.
- Switch power ON and load the store controller program.

Did the active store controller load the store controller program successfully?

Yes **No**

031
The failure symptom has changed.
Follow the *User Response* for the message in the *IBM 4680 Store System: Messages Guide*.
- or -
Follow the *Repair Action* for the symptom.

032
(From step 029)
- Record keywords CONTROLLER and INCORROUT.

At the active store controller, go to the *Hardware Service Manual* for your store controller and check for power-on self test error messages.

7.4 MAP 0120: W004 Message

Symptom Explanation	Conditions That Could Cause This Symptom
The 4683 is receiving store loop communications from the store controller, but no responses are being received for messages that the 4683 has sent to the store controller. The 4683 keyboard OFFLINE light is ON. The store controller can be communicating with other 4683s on the store loop.	□ The store loop is open down-loop from the 4683 displaying message W004. □ A 4683-*xx*1 is failing down-loop. □ The 4683-*xx*1 store loop cable is failing. □ The 4683 base unit is failing. □ The primary store controller is failing. □ The backup store controller is failing. □ The distance exceeds 4000 feet (1220 meters) between powered-ON 4683-*xx*1s on the store loop.

001

To display the terminal number, press **S1**, type **7**, and press **S2**.
To display messages at a point-of-sale terminal (when the keyboard OFFLINE light is ON), press **S1**, type **2**, and press **S2**.

Note: On the ANPOS Keyboard (during some procedures) and on the Enhanced Alphanumeric Keyboard, **Esc** = S1 and **Enter** = S2.
To display a system message at the store controller, sign on at the store controller, press **System Request** and then press the **M** key.

Warning: Switching **POWER OFF** at a 4684 affects operations at all point-of-sale terminals attached to it.

- Before starting store loop problem determination, obtain the filled-in "Terminal Identification Chart" from the book *IBM 4680 Store System: Preparing Your Site*.

  -- or --

  Obtain a store loop layout chart containing:

  □ The physical location of store controller(s) and point-of-sale terminals

  □ The order of store controller(s) and point-of-sale terminals on the store loop

  □ The terminal numbers.

Is there a backup store controller connected to this store loop?
Yes **No**

002

- Continue at Step 011.

003

- At the backup store controller, display the Backup Store Loop status.

Is the Backup Store Loop status "Providing Backup"?
Yes **No**

004

- Continue at Step 008.

005

- At the primary store controller, display the Store Loop Control status.
The primary store controller is the controller that has been designated to control the store loop. It is supported by the backup store controller.

Is the Store Loop Control status "Controlling Loop"?
Yes **No**

```
 ¦    ¦
 ¦   +---+
 ¦   ¦006¦
 ¦   +---+
 ¦   - Disconnect the primary store controller from the store loop by
 ¦     unplugging its store loop cable from the store loop receptacle.
 ¦     See Figure 30 in topic 7.1.
 ¦   Do not reconnect this store controller until the problem has been
 ¦   resolved.
 ¦   - Continue at Step 011.
 ¦
 ¦
+---+
¦007¦
+---+
Both store controllers are trying to control the store loop.  This
condition is caused by attaching an active store controller to the store
loop when another active store controller is on the store loop.
- Disable the backup store controller.
- Wait 15 seconds and enable the backup store controller.
Return to normal store operation.
--------------------------------------------------------------------------

+---+
¦008¦
+---+
(From step 004)
- Disconnect the backup store controller from the store loop by unplugging
  its store loop cable from the store loop receptacle.  See Figure 30 in
  topic 7.1.
Do not reconnect this store controller until the problem has been
resolved.
- Wait 15 seconds and observe the keyboard lights on the 4683 displaying
  message W004.
Did the OFFLINE light go OFF?
Yes  No
 ¦    ¦
 ¦   +---+
 ¦   ¦009¦
 ¦   +---+
 ¦   - Continue at Step 011.
 ¦
 ¦
+---+
¦010¦
+---+
- Record keywords CONTROLLER and INCORROUT.
At the backup store controller, go to the Hardware Service Manual for your
store controller and check for power-on self test error messages.
--------------------------------------------------------------------------

+---+
¦011¦
+---+
(From steps 002, 006, and 009)
- Display the system message at the active store controller by pressing
  System Request and then pressing the M key.
A store controller is active when it is:

    The only store controller on the store loop
    -- or --
    The primary store controller and its status is "Controlling Loop"
    -- or --
    The backup store controller and its status is "Providing Backup".

Did the active store controller display message W760 or W764?
Yes  No
 ¦    ¦
 ¦   +---+
 ¦   ¦012¦
 ¦   +---+
 ¦   - Continue at Step 041.
 ¦
 ¦
+---+
¦013¦
+---+
Did message W760 display?
Yes  No
 ¦    ¦
 ¦   +---+
 ¦   ¦014¦
 ¦   +---+
 ¦   - Continue at Step 016.
```

015

Go to the *Hardware Service Manual* for your store controller and follow the procedures for Store Loop Problems.

016

(From step 014)
- Return to the 4683 displaying message W004. If it is a 4683-*xx*2, go to its partner 4683-*xx*1. A 4683-*xx*2 displays the status of its partner 4683-*xx*1. See the store loop layout chart.

A 4683 is considered active if it has a terminal number, is powered-ON, and attached to the store loop.

Is this the last active 4683-*xx*1 on the store loop?

Yes **No**

017

- Go to the last active 4683-*xx*1 on the store loop. See the store loop layout chart.
- Continue at Step 018.

018

(From step 017)
- Disconnect this 4683-*xx*1 from the store loop by unplugging its store loop cable from the store loop receptacle.
- Return to the active store controller and display the system message by pressing **System Request** and then pressing the **M** key.

Did message W761 display?

Yes **No**

019

- Reconnect the 4683-*xx*1 to the store loop and continue at Step 027.

020

Is the store loop cable plugged into socket 1 on this 4683-*xx*1 base unit?
See Figure 29 in topic 7.1.

Yes **No**

021

Correct the problem by plugging the cable into socket 1.

022

- Unplug the store loop cable from socket 1 on this 4683-*xx*1 base unit.
- Attach shorting plug 1B to the 4683-end of the cable. See Figure 29 in topic 7.1.
- Plug the other end of the cable into the store loop receptacle.
- Return to the active store controller and display the system message by pressing **System Request** and then pressing the **M** key.

Did the active store controller display message W760 or W764?

Yes **No**

023

- Return to the 4683-*xx*1 and switch **POWER OFF**.

Service the 4683 base unit.

024

- Return to the 4683-*xx*1 and examine its store loop receptacle for damage.

Is the store loop receptacle OK?

Yes **No**

025
Report the problem to the person responsible for repairing store loop wiring.

026
Correct the problem by exchanging the store loop cable attached to the 4683.

027
(From step 019)
Are there any powered-OFF 4683-*xx*1s connected to the store loop segment between the 4683 that you just reconnected and the active store controller?
Yes **No**

028
- Continue at Step 036.

029
- One at a time, disconnect each powered-OFF 4683-*xx*1 from the store loop segment by unplugging its store loop cable from the store loop receptacle.
- After each 4683 is disconnected, return to the active store controller and display the system message by pressing **System Request** and then pressing the **M** key.

Did message W761 display?
Yes **No**

030
If all powered-OFF 4683s have **not** been disconnected, continue disconnecting them and displaying the system message at the active store controller.
- or -
If all powered-OFF 4683s have been disconnected, reconnect all of them and continue at Step 036.

031
- Unplug the store loop cable from socket 1 on the 4683-*xx*1 that you just disconnected from the store loop.
- Attach shorting plug 1B to the 4683-end of the cable. See Figure 29 in topic 7.1.
- Plug the other end of the cable into the store loop receptacle.
- Return to the active store controller and display the system message by pressing **System Request** and then pressing the **M** key.

Did the active store controller display message W760 or W764?
Yes **No**

032
- Return to the 4683-*xx*1 and switch **POWER OFF**.
Service the 4683 base unit.

033
- Return to the 4683-*xx*1 and examine its store loop receptacle for damage.

Is the store loop receptacle OK?
Yes **No**

034
Report the problem to the person responsible for repairing store loop

```
  ¦   wiring.
  ¦
  ¦
+---+
¦035¦
+---+
```
Correct the problem by exchanging the store loop cable attached to the 4683.

```
+---+
¦036¦
+---+
```
(From steps 028 and 030)
Is the store loop cable plugged into the store loop adapter on the active store controller? See Figure 30 in topic 7.1**.**
Yes **No**
```
  ¦    ¦
  ¦   +---+
  ¦   ¦037¦
  ¦   +---+
  ¦   Correct the problem by plugging the cable into the store loop
  ¦   adapter.
  ¦
  ¦
+---+
¦038¦
+---+
```
- Disconnect the active store controller from the store loop by unplugging its store loop cable from the store loop receptacle.
- Display the system message at the active store controller by pressing **System Request** and then pressing the **M** key.

Did message W761 display?
Yes **No**
```
  ¦    ¦
  ¦   +---+
  ¦   ¦039¦
  ¦   +---+
  ¦   The problem is in the active store controller, the store loop
  ¦   adapter, or the store loop adapter cable.
  ¦   - Record keywords CONTROLLER and INCORROUT.
  ¦   At the active store controller, go to the Hardware Service Manual for
  ¦   your store controller and check for power-on self test error
  ¦   messages.
  ¦
  ¦
+---+
¦040¦
+---+
```
- Reconnect the active store controller to the store loop.

The problem is in the store loop wiring between the active store controller and the last active 4683-*xx*1 **or** in the store loop receptacle for the store controller or 4683-*xx*1.
Report the problem to the person responsible for repairing store loop wiring.

```
+---+
¦041¦
+---+
```
(From step 012)
- Return to the 4683 displaying message W004. If it is a 4683-*xx*2, go to its partner 4683-*xx*1. A 4683-*xx*2 displays the status of its partner 4683-*xx*1. See the store loop layout chart.
- Switch **POWER OFF** at the 4683-*xx*1.
- Wait five seconds and switch power ON again.
- Wait at least two minutes for the 4683 to become operational.

Is the keyboard OFFLINE light still ON?
Yes **No**
```
  ¦    ¦
  ¦   +---+
  ¦   ¦042¦
  ¦   +---+
  ¦   The 4683 is operating correctly now.
  ¦   - If the problem returns, record keywords CONTROLLER and INCORROUT.
  ¦   At the active store controller, go to the Hardware Service Manual for
  ¦   your store controller and check for power-on self test error
  ¦   messages.
  ¦
  ¦
+---+
¦043¦
+---+
```
- At the 4683, press **S1**, type **2**, and press **S2** to display the OFFLINE

message.

Note: On the ANPOS Keyboard (during some procedures) and on the Enhanced Alphanumeric Keyboard, **Esc** = S1 and **Enter** = S2.

Is message W004 still displayed?

Yes **No**

044

The failure symptom has changed.
Follow the *User Response* for the message in the *IBM 4680 Store System: Messages Guide*.
- or -
Follow the *Repair Action* for the symptom.

045

- Record keywords CONTROLLER and INCORROUT.

At the active store controller, go to the *Hardware Service Manual* for your store controller and check for power-on self test error messages.

7.5 MAP 0130: W005 Message

Symptom Explanation	**Conditions That Could Cause This Symptom**
The 4683-*xx*1 is not receiving store loop communications. The 4683-*xx*1 store loop adapter test was run automatically and it detected no problems. It is sending beacons but not receiving beacons. The 4683 keyboard OFFLINE light is ON.	□ The store loop is open up-loop from the 4683 displaying message W005. □ A 4683-*xx*1 is failing up-loop. □ The 4683-*xx*1 store loop cable is failing. □ The 4683 base unit is failing. □ The primary store controller is failing. □ The backup store controller is failing. □ The distance exceeds 4000 feet (1220 meters) between powered-ON 4683-*xx*1s on the store loop.

001

To display the terminal number, press **S1**, type **7**, and press **S2**.
To display messages at a point-of-sale terminal (when the keyboard OFFLINE light is ON), press **S1**, type **2**, and press **S2**.

Note: On the ANPOS Keyboard (during some procedures) and on the Enhanced Alphanumeric Keyboard, **Esc** = S1 and **Enter** = S2.
To display a system message at the store controller, sign on at the store controller, press **System Request** and then press the **M** key.

Warning: Switching **POWER OFF** at a 4684 affects operations at all point-of-sale terminals attached to it.

- Before starting store loop problem determination, obtain the filled-in "Terminal Identification Chart" from the book *IBM 4680 Store System: Preparing Your Site*.

  -- or --

  Obtain a store loop layout chart containing:

  □ The physical location of store controller(s) and point-of-sale terminals

  □ The order of store controller(s) and point-of-sale terminals on the store loop

  □ The terminal numbers.

- Ensure the store loop cable is plugged into socket 1 on the 4683-*xx*1 displaying message W005 and that the other end of the cable is plugged into the store loop receptacle. See Figure 30 in topic 7.1 and Figure 29 in topic 7.1.

Is there a backup store controller connected to this store loop?
Yes **No**

002

- Continue at Step 011.

003

- At the backup store controller, display the Backup Store Loop status.

Is the Backup Store Loop status "Providing Backup"?
Yes **No**

004

- Continue at Step 008.

005

- At the primary store controller, display the Store Loop Control status.
The primary store controller is the controller that has been designated to

control the store loop. It is supported by the backup store controller.

Is the Store Loop Control status "Controlling Loop"?

Yes **No**

006

- Disconnect the primary store controller from the store loop by unplugging its store loop cable from the store loop receptacle.

Do not reconnect this store controller until the problem has been resolved.

- Continue at Step 011.

007

Both store controllers are trying to control the store loop. This condition is caused by attaching an active store controller to the store loop when another active store controller is on the store loop.

- Disable the backup store controller.
- Wait 15 seconds and enable the backup store controller.

Return to normal store operation.

008

(From step 004)

- Disconnect the backup store controller from the store loop by unplugging its store loop cable from the store loop receptacle. See Figure 30 in topic 7.1.

Do not reconnect this store controller until the problem has been resolved.

- Wait 15 seconds and observe the keyboard lights on the 4683 that was displaying message W005.

Did the OFFLINE light go OFF?

Yes **No**

009

- Continue at Step 011.

010

- Record keywords CONTROLLER and INCORROUT.

At the backup store controller, go to the *Hardware Service Manual* for your store controller and check for power-on self test error messages.

011

(From steps 002, 006, and 009)

- Display the system message at the active store controller by pressing **System Request** and then pressing the **M** key.

A store controller is active when it is:

The only store controller on the store loop
-- or --
The primary store controller and its status is "Controlling Loop"
-- or --
The backup store controller and its status is "Providing Backup".

Did the active store controller display message W760 or W764?

Yes **No**

012

- Continue at Step 018.

013

- Note the information in the message and return to the 4683 displaying message W005.
- If it is a 4683-*xx*2, go to its partner 4683-*xx*1. A 4683-*xx*2 displays the status of its partner 4683-*xx*1. See the store loop layout chart.

The store controller transmits data down-loop to the first 4683-*xx*1 and to

all the following 4683s on the store loop. Each 4683 receives its data from the 4683 or store controller up-loop from its position on the store loop.

Is this the first powered-ON 4683-*xx*1 down-loop from the active store controller?

Yes **No**

014

- Continue at Step 023.

015

- Disconnect this 4683-*xx*1 from the store loop by unplugging its store loop cable from the store loop receptacle. See Figure 30 in topic 7.1.
- Return to the active store controller and display the system message by pressing **System Request** and then pressing the **M** key.

Did message W761 display?

Yes **No**

016

- Reconnect the 4683-*xx*1 to the store loop and continue at Step 052.

017

- Continue at Step 036.

018

(From step 012)

Is the store loop cable plugged into the store loop adapter on the active store controller? See Figure 30 in topic 7.1.

Yes **No**

019

Correct the problem by plugging the cable into the store loop adapter.

020

- Return to the 4683-*xx*1 displaying message W005.

On this 4683, is the store loop cable plugged into socket 1 and into the store loop receptacle?

Yes **No**

021

Correct the problem by plugging the cable into socket 1 and the store loop receptacle.

022

- Record keywords CONTROLLER and INCORROUT.

At the active store controller, go to the *Hardware Service Manual* for your store controller and check for power-on self test error messages.

023

(From steps 014, 025, and 030)

- Go to the next powered-ON 4683-*xx*1 up-loop from this 4683. See the store loop layout chart.

Is U003 displayed?

Yes **No**

024

```
  ¦   +---+
  ¦   - Continue at Step 026.
  ¦
  ¦
+---+
¦025¦
+---+
```
Return to Step 023 and continue up-loop from this 4683.

```
+---+
¦026¦
+---+
```
(From step 024)
Is the keyboard OFFLINE light ON?
Yes **No**

```
  ¦    ¦
  ¦   +---+
  ¦   ¦027¦
  ¦   +---+
  ¦   - Continue at Step 031.
  ¦
  ¦
+---+
¦028¦
+---+
```
- At the 4683, press **S1**, type **2**, and press **S2** to display the OFFLINE message.

  Note: On the ANPOS Keyboard (during some procedures) and on the Enhanced Alphanumeric Keyboard, **Esc** = S1 and **Enter** = S2.

Did message W001 display?
Yes **No**

```
  ¦    ¦
  ¦   +---+
  ¦   ¦029¦
  ¦   +---+
  ¦   - Continue at Step 031.
  ¦
  ¦
+---+
¦030¦
+---+
```
Return to Step 023 and continue up-loop from this 4683.

```
+---+
¦031¦
+---+
```
(From steps 027 and 029)
- Disconnect this 4683-*xx*1 from the store loop by unplugging its store loop cable from the store loop receptacle.
- Return to the active store controller and display the system message by pressing **System Request** and then pressing the **M** key.

Did message W761 display?
Yes **No**

```
  ¦    ¦
  ¦   +---+
  ¦   ¦032¦
  ¦   +---+
  ¦   - Reconnect the 4683-xx1 to the store loop and continue at Step 034.
  ¦
  ¦
+---+
¦033¦
+---+
```
- Continue at Step 036.

```
+---+
¦034¦
+---+
```
(From step 032)
- Go to the next powered-ON 4683-*xx*1 down-loop from this 4683. See the store loop layout chart.
- Disconnect this 4683-*xx*1 from the store loop by unplugging its store loop cable from the store loop receptacle.
- Return to the active store controller and display the system message by pressing **System Request** and then pressing the **M** key.

Did message W761 display?
Yes **No**

```
  ¦    ¦
  ¦   +---+
  ¦   ¦035¦
```

```
  ¦   +---+
  ¦   - Reconnect the 4683-xx1 to the store loop and continue at Step 043.
  ¦
  ¦
+---+
¦036¦
+---+
```

(From steps 017 and 033)
Is the store loop cable plugged into socket 1 on this 4683-*xx*1 base unit?
Yes **No**

```
  ¦    ¦
  ¦   +---+
  ¦   ¦037¦
  ¦   +---+
  ¦   Correct the problem by plugging the cable into socket 1.
  ¦
  ¦
+---+
¦038¦
+---+
```

- Unplug the store loop cable from socket 1 on this 4683-*xx*1 base unit.
- Attach shorting plug 1B to the 4683-end of the cable. See Figure 29 in topic 7.1.
- Plug the other end of the cable into the store loop receptacle.
- Return to the active store controller and display the system message by pressing **System Request** and then pressing the **M** key.

Did the active store controller display message W760 or W764?
Yes **No**

```
  ¦    ¦
  ¦   +---+
  ¦   ¦039¦
  ¦   +---+
  ¦   - Return to the 4683 and switch POWER OFF.
  ¦   Service the 4683 base unit.
  ¦
  ¦
+---+
¦040¦
+---+
```

- Return to the 4683-*xx*1 and examine its store loop receptacle for damage.

Is the store loop receptacle OK?
Yes **No**

```
  ¦    ¦
  ¦   +---+
  ¦   ¦041¦
  ¦   +---+
  ¦   Report the problem to the person responsible for repairing store loop
  ¦   wiring.
  ¦
  ¦
+---+
¦042¦
+---+
```

Correct the problem by exchanging the store loop cable attached to the 4683.

```
+---+
¦043¦
+---+
```

(From step 035)
Are there any powered-OFF 4683s connected to the store loop segment between the two powered-ON 4683s?
Yes **No**

```
  ¦    ¦
  ¦   +---+
  ¦   ¦044¦
  ¦   +---+
  ¦   The problem is in the store loop wiring or the store loop receptacles
  ¦   for the 4683-xx1s.
  ¦   Report the problem to the person responsible for repairing store loop
  ¦   wiring.
  ¦
  ¦
+---+
¦045¦
+---+
```

- One at a time, disconnect each powered-OFF 4683-*xx*1 from the store loop segment by unplugging its store loop cable from the store loop receptacle.
- After each 4683 is disconnected, return to the active store controller and display the system message by pressing **System Request** and then pressing the **M** key.

Did message W761 display?

Yes **No**

046

If all powered-OFF 4683s have **not** been disconnected, continue disconnecting them and displaying the system message at the active store controller.
- or -
If all powered-OFF 4683s have been disconnected, the problem is in the store loop wiring **or** the store loop receptacles for the 4683-*xx*1s.
- Reconnect all 4683s and report the problem to the person responsible for repairing store loop wiring.

047

- Unplug the store loop cable from socket 1 on the 4683-*xx*1 that you just disconnected from the store loop.
- Attach shorting plug 1B to the 4683-end of the cable. See Figure 29 in topic 7.1.
- Plug the other end of the cable into the store loop receptacle.
- Return to the active store controller and display the system message by pressing **System Request** and then pressing the **M** key.

Did the active store controller display message W760 or W764?

Yes **No**

048

- Return to the 4683-*xx*1 and switch **POWER OFF**.
Service the 4683 base unit.

049

- Return to the 4683-*xx*1 and examine its store loop receptacle for damage.

Is the store loop receptacle OK?

Yes **No**

050

Report the problem to the person responsible for repairing store loop wiring.

051

Correct the problem by exchanging the store loop cable attached to the 4683.

052

(From step 016)
Is the store loop cable plugged into the store loop adapter on the active store controller? See Figure 30 in topic 7.1**.**

Yes **No**

053

Correct the problem by plugging the cable into the store loop adapter.

054

- Disconnect the active store controller from the store loop by unplugging its store loop cable from the store loop receptacle.
- Display the system message at the active store controller by pressing **System Request** and then pressing the **M** key.

Did message W761 display?

Yes **No**

055

```
  ¦   +---+
  ¦   The problem is in the active store controller, the store loop
  ¦   adapter, or the store loop adapter cable.
  ¦   - Record keywords CONTROLLER and INCORROUT.
  ¦   At the active store controller, go to the Hardware Service Manual for
  ¦   your store controller and check for power-on self test error
  ¦   messages.
  ¦
  ¦
+---+
¦056¦
+---+
- Reconnect the active store controller to the store loop.
Are there any powered-OFF 4683-xx1s connected to the store loop segment
between the 4683 displaying message W005 and the active store controller?
Yes  No
  ¦    ¦
  ¦   +---+
  ¦   ¦057¦
  ¦   +---+
  ¦   - The problem is in the store loop wiring between the active store
  ¦     controller and the 4683-xx1 or in the store loop receptacle for the
  ¦     store controller or 4683-xx1.
  ¦   Report the problem to the person responsible for repairing store loop
  ¦   wiring.
  ¦
  ¦
+---+
¦058¦
+---+
- One at a time, disconnect each powered-OFF 4683-xx1 from the store loop
  segment by unplugging its store loop cable from the store loop
  receptacle.
- After each 4683 is disconnected, return to the active store controller
  and display the system message by pressing System Request and then
  pressing the M key.
Did message W761 display?
Yes  No
  ¦    ¦
  ¦   +---+
  ¦   ¦059¦
  ¦   +---+
  ¦   If all powered-OFF 4683s have not been disconnected, continue
  ¦   disconnecting them and displaying the system message at the active
  ¦   store controller.
  ¦   - or -
  ¦   If all powered-OFF 4683s have been disconnected, the problem is in
  ¦   the store loop wiring between the active store controller and the
  ¦   4683-xx1 or in the store loop receptacle for the store controller or
  ¦   4683-xx1.
  ¦   - Reconnect all 4683s and report the problem to the person
  ¦     responsible for repairing store loop wiring.
  ¦
  ¦
+---+
¦060¦
+---+
- Unplug the store loop cable from socket 1 on the 4683-xx1-xx1 that you
  just disconnected from the store loop.
- Attach shorting plug 1B to the 4683-end of the cable.  See Figure 29 in
  topic 7.1.
- Plug the other end of the cable into the store loop receptacle.
- Return to the active store controller and display the system message by
  pressing System Request and then pressing the M key.
Did the active store controller display message W760 or W764?
Yes  No
  ¦    ¦
  ¦   +---+
  ¦   ¦061¦
  ¦   +---+
  ¦   - Return to the 4683-xx1 and switch POWER OFF.
  ¦   Service the 4683 base unit.
  ¦
  ¦
+---+
¦062¦
+---+
- Return to the 4683-xx1 and examine its store loop receptacle for damage.
Is the store loop receptacle OK?
Yes  No
  ¦    ¦
  ¦   +---+
  ¦   ¦063¦
  ¦   +---+
```

```
  ¦   Report the problem to the person responsible for repairing store loop
  ¦   wiring.
  ¦
  ¦
+---+
¦064¦
+---+
```

Correct the problem by exchanging the store loop cable attached to the 4683.

7.6 MAP 0140: W762 Message

Symptom Explanation	**Conditions That Could Cause This Symptom**
The terminal number in this W762 message does not respond to messages sent to it by the store controller. The active store controller is receiving end-of-polls. The active store controller is **not** receiving beacons. The store loop appears to be OK.	□ The 4683 may be powered-OFF (terminal number displayed in message W762). □ The 4683 may be offline (terminal number displayed in message W762). □ The 4683 is failing (terminal number displayed in message W762). □ The primary store controller is failing. □ The backup store controller is failing. □ The distance exceeds 4000 feet (1220 meters) between powered-ON 4683-*xx*1s on the store loop.

001

To display the terminal number, press **S1**, type **7**, and press **S2**.
To display messages at a point-of-sale terminal (when the keyboard OFFLINE light is ON), press **S1**, type **2**, and press **S2**.

Note: On the ANPOS Keyboard (during some procedures) and on the Enhanced Alphanumeric Keyboard, **Esc** = S1 and **Enter** = S2.
To display a system message at the store controller, sign on at the store controller, press **System Request** and then press the **M** key.

Warning: Switching **POWER OFF** at a 4684 affects operations at all point-of-sale terminals attached to it.

- Before starting store loop problem determination, obtain the filled-in "Terminal Identification Chart" from the book *IBM 4680 Store System: Preparing Your Site*.

  -- or --

  Obtain a store loop layout chart containing:

  □ The physical location of store controller(s) and point-of-sale terminals

  □ The order of store controller(s) and point-of-sale terminals on the store loop

  □ The terminal numbers.

Is there a backup store controller connected to this store loop?
Yes **No**

002

- Continue at Step 011.

003

- At the backup store controller, display the Backup Store Loop status.

Is the Backup Store Loop status "Providing Backup"?
Yes **No**

004

- Continue at Step 008.

005

- At the primary store controller, display the Store Loop Control status.
The primary store controller is the controller that has been designated to control the store loop. It is supported by the backup store controller.

Is the Store Loop Control status "Controlling Loop"?
Yes **No**

```
 ¦    ¦
 ¦   +---+
 ¦   ¦006¦
 ¦   +---+
 ¦   - Disconnect the primary store controller from the store loop by
 ¦     unplugging its store loop cable from the store loop receptacle.
 ¦     See Figure 28 in topic 7.1.
 ¦   Do not reconnect this store controller until the problem has been
 ¦   resolved.
 ¦   - Continue at Step 011.
 ¦
 ¦
+---+
¦007¦
+---+
```

Both store controllers are trying to control the store loop. This condition is caused by attaching an active store controller to the store loop when another active store controller is on the store loop.

- Disable the backup store controller.
- Wait 15 seconds and enable the backup store controller.

Return to normal store operation.

```
+---+
¦008¦
+---+
```

(From step 004)

- Disconnect the backup store controller from the store loop by unplugging its store loop cable from the store loop receptacle. See Figure 28 in topic 7.1.

Do not reconnect this store controller until the problem has been resolved.

- Wait 15 seconds and observe the keyboard lights on the 4683 that was displaying message W762.

Did the OFFLINE light go OFF?

Yes **No**

```
 ¦    ¦
 ¦   +---+
 ¦   ¦009¦
 ¦   +---+
 ¦   - Continue at Step 011.
 ¦
 ¦
+---+
¦010¦
+---+
```

- Record keywords CONTROLLER and INCORROUT.

At the backup store controller, go to the *Hardware Service Manual* for your store controller and check for power-on self test error messages.

```
+---+
¦011¦
+---+
```

(From steps 002, 006, and 009)

- Display the system message at the active store controller by pressing **System Request** and then pressing the **M** key.

A store controller is active when it is:

The only store controller on the store loop
-- or --
The primary store controller and its status is "Controlling Loop"
-- or --
The backup store controller and its status is "Providing Backup".

Did the active store controller display message W760 or W764?

Yes **No**

```
 ¦    ¦
 ¦   +---+
 ¦   ¦012¦
 ¦   +---+
 ¦   - Continue at Step 015.
 ¦
 ¦
+---+
¦013¦
+---+
```

Did message W761 display also?

Yes **No**

```
 ¦    ¦
 ¦   +---+
 ¦   ¦014¦
 ¦   +---+
 ¦   For message W760, go to the Hardware Service Manual for your store
```

controller and follow the procedures for Store Loop Problems.
- or -
For message W764, follow "MAP 0150: W764 Message" in topic 7.7.

015

(From step 012)
- Go to the 4683 that has the terminal number displayed in message W762. If it is a 4683-*xx*2, go to its partner 4683-*xx*1. A 4683-*xx*2 displays the status of its partner 4683-*xx*1. See the store loop layout chart.
- Switch **POWER OFF** at the 4683-*xx*1.
- Wait five seconds and switch power ON again.

Did the 4683 IPL correctly?

Yes **No**

016

The failure symptom has changed.
Follow the *User Response* for the message in the *IBM 4680 Store System: Messages Guide*.
- or -
Follow the *Repair Action* for the symptom.

017

- Wait at least two minutes for the 4683 to become operational.
- Return to the active store controller and display the system message by pressing **System Request** and then pressing the **M** key.

Did the active store controller display message W762 again?

Yes **No**

018

The 4683 is operating correctly now.
- If the problem returns, record keywords CONTROLLER and INCORROUT.
At the active store controller, go to the *Hardware Service Manual* for your store controller and check for power-on self test error messages.

019

- Record keywords CONTROLLER and INCORROUT.

At the active store controller, go to the *Hardware Service Manual* for your store controller and check for power-on self test error messages.

7.7 MAP 0150: W764 Message

Symptom Explanation	Conditions That Could Cause This Symptom
The active store controller is transmitting store loop polls but it is not receiving end-of-polls or beacons.	□ The store loop is open down-loop from the last active 4683-*xx*1. □ An inactive 4683-*xx*1 is failing down-loop from the last active 4683-*xx*1. □ The store loop cable is failing on the last active 4683-*xx*1. □ The base unit is failing on the last active 4683-*xx*1. □ The store loop cable is failing on the active store controller. □ The active store controller is failing. □ The distance exceeds 4000 feet (1220 meters) between the last active 4683-*xx*1 and the active store controller.

001

To display the terminal number, press **S1**, type **7**, and press **S2**.
To display messages at a point-of-sale terminal (when the keyboard OFFLINE light is ON), press **S1**, type **2**, and press **S2**.

Note: On the ANPOS Keyboard (during some procedures) and on the Enhanced Alphanumeric Keyboard, **Esc** = S1 and **Enter** = S2.
To display a system message at the store controller, sign on at the store controller, press **System Request** and then press the **M** key.

Warning: Switching **POWER OFF** at a 4684 affects operations at all point-of-sale terminals attached to it.

- Before starting store loop problem determination, obtain the filled-in "Terminal Identification Chart" from the book *IBM 4680 Store System: Preparing Your Site*.

  -- or --

  Obtain a store loop layout chart containing:

  □ The physical location of store controller(s) and point-of-sale terminals

  □ The order of store controller(s) and point-of-sale terminals on the store loop

  □ The terminal numbers.

Is there a backup store controller connected to this store loop?
Yes **No**

002

- Continue at Step 011.

003

- At the backup store controller, display the Backup Store Loop status.

Is the Backup Store Loop status "Providing Backup"?
Yes **No**

004

- Continue at Step 008.

005

- At the primary store controller, display the Store Loop Control status.
The primary store controller is the controller that has been designated to control the store loop. It is supported by the backup store controller.

Is the Store Loop Control status "Controlling Loop"?
Yes **No**

```
  ¦    ¦
  ¦   +---+
  ¦   ¦006¦
  ¦   +---+
  ¦   - Disconnect the primary store controller from the store loop by
  ¦     unplugging its store loop cable from the store loop receptacle.
  ¦     See Figure 30 in topic 7.1.
  ¦   Do not reconnect this store controller until the problem has been
  ¦   resolved.
  ¦   - Continue at Step 011.
  ¦
  ¦
+---+
¦007¦
+---+
Both store controllers are trying to control the store loop.  This
condition is caused by attaching an active store controller to the store
loop when another active store controller is on the store loop.
- Disable the backup store controller.
- Wait 15 seconds and enable the backup store controller.
Return to normal store operation.
--------------------------------------------------------------------------

+---+
¦008¦
+---+
(From step 004)
- Disconnect the backup store controller from the store loop by unplugging
  its store loop cable from the store loop receptacle.  See Figure 30 in
  topic 7.1.
Do not reconnect this store controller until the problem has been
resolved.
- Wait 15 seconds and display the system message at the primary store
  controller by pressing System Request and then pressing the M key.
Did message W761 display?
Yes  No
  ¦    ¦
  ¦   +---+
  ¦   ¦009¦
  ¦   +---+
  ¦   - Continue at Step 011.
  ¦
  ¦
+---+
¦010¦
+---+
- Record keywords CONTROLLER and INCORROUT.
At the backup store controller, go to the Hardware Service Manual for your
store controller and check for power-on self test error messages.
--------------------------------------------------------------------------

+---+
¦011¦
+---+
(From steps 002, 006, and 009)
Are there any 4683-xx1s connected to the store loop?
Yes  No
  ¦    ¦
  ¦   +---+
  ¦   ¦012¦
  ¦   +---+
  ¦   - Continue at Step 035.
  ¦
  ¦
+---+
¦013¦
+---+
- Go to the last active 4683-xx1 on the store loop.  See the store loop
  layout chart.
A 4683 is considered active if it has a terminal number, is powered-ON,
and attached to the store loop.
- Disconnect this 4683 from the store loop by unplugging its store loop
  cable from the store loop receptacle.  See Figure 30 in topic 7.1.
- Return to the active store controller and display the system message by
  pressing System Request and then pressing the M key.
Did message W761 display?
Yes  No
  ¦    ¦
  ¦    ¦
  ¦   +---+
  ¦   ¦014¦
  ¦   +---+
  ¦   (From steps 026 and 029)
  ¦   - Reconnect the 4683-xx1 to the store loop and continue at Step 022.
```

015

Is the store loop cable plugged into socket 1 on this 4683-*xx*1 base unit?

Yes — **No**

016

Correct the problem by plugging the cable into socket 1.

017

- Unplug the store loop cable from socket 1 on this 4683-*xx*1 base unit.
- Attach shorting plug 1B to the 4683-end of the cable. See Figure 29 in topic 7.1.
- Plug the other end of the cable into the store loop receptacle.
- Return to the active store controller and display the system message by pressing **System Request** and then pressing the **M** key.

Did the active store controller display message W760 or W764?

Yes — **No**

018

- Return to the 4683-*xx*1 and switch **POWER OFF**.

Service the 4683 base unit.

019

- Return to the 4683-*xx*1 and examine its store loop receptacle for damage.

Is the store loop receptacle OK?

Yes — **No**

020

Report the problem to the person responsible for repairing store loop wiring.

021

Correct the problem by exchanging the store loop cable attached to the 4683.

022

(From step 014)

Is the store loop cable plugged into the store loop adapter on the active store controller? See Figure 30 in topic 7.1.

Yes — **No**

023

Correct the problem by plugging the cable into the store loop adapter.

024

- Disconnect the active store controller from the store loop by unplugging its store loop cable from the store loop receptacle.
- Display the system message at the active store controller by pressing **System Request** and then pressing the **M** key.

Did message W761 display?

Yes — **No**

025

The problem is in the active store controller, the store loop adapter, or the store loop adapter cable.

- Record keywords CONTROLLER and INCORROUT.
  At the active store controller, go to the *Hardware Service Manual* for your store controller and check for power-on self test error messages.

026

- Reconnect the active store controller to the store loop.

Are there any powered-OFF 4683-*xx*1s connected to the store loop segment between the 4683 that you reconnected in Step 014 **and the active store controller?**

Yes **No**

027

The problem is in the store loop wiring between the active store controller and the last active 4683-*xx*1 **or** in the store loop receptacle for the store controller or 4683-*xx*1.
Report the problem to the person responsible for repairing store loop wiring.

028

- One at a time, disconnect each powered-OFF 4683-*xx*1 from the store loop segment by unplugging its store loop cable from the store loop receptacle.
- After each 4683 is disconnected, return to the active store controller and display the system message by pressing **System Request** and then pressing the **M** key.

Did message W761 display?

Yes **No**

029

If all powered-OFF 4683s have **not** been disconnected, continue disconnecting them and displaying the system message at the active store controller.
- or -
If all powered-OFF 4683s have been disconnected, the problem is in the store loop wiring between the active store controller and the 4683-*xx*1 that you reconnected in Step 014 **or** in the store loop receptacle for the store controller or 4683-*xx*1.
- Reconnect all 4683s and report the problem to the person responsible for repairing store loop wiring.

030

- Unplug the store loop cable from socket 1 on the 4683-*xx*1 that you just disconnected from the store loop.
- Attach shorting plug 1B to the 4683-end of the cable. See Figure 29 in topic 7.1.
- Plug the other end of the cable into the store loop receptacle.
- Return to the active store controller and display the system message by pressing **System Request** and then pressing the **M** key.

Did the active store controller display message W760 or W764?

Yes **No**

031

- Return to the 4683-*xx*1 and switch **POWER OFF**.
  Service the 4683 base unit.

032

- Return to the 4683-*xx*1 and examine its store loop receptacle for damage.

Is the store loop receptacle OK?

Yes **No**

033

Report the problem to the person responsible for repairing store loop wiring.

```
  ¦
  ¦
+---+
¦034¦
+---+
```
Correct the problem by exchanging the store loop cable attached to the 4683.

```
+---+
¦035¦
+---+
```
(From step 012)
Is the store loop cable plugged into the store loop adapter on the active store controller? See Figure 30 in topic 7.1.

Yes **No**

```
  ¦    ¦
  ¦   +---+
  ¦   ¦036¦
  ¦   +---+
```
Correct the problem by plugging the store loop cable into the store loop adapter.

```
  ¦
  ¦
+---+
¦037¦
+---+
```
- Disconnect the active store controller from the store loop by unplugging its store loop cable from the store loop receptacle.
- Display the system message at the active store controller by pressing **System Request** and then pressing the **M** key.

Did message W761 display?

Yes **No**

```
  ¦    ¦
  ¦   +---+
  ¦   ¦038¦
  ¦   +---+
```
The problem is in the active store controller, the store loop adapter, or the store loop adapter cable.
- Record keywords CONTROLLER and INCORROUT.

At the active store controller, go to the *Hardware Service Manual* for your store controller and check for power-on self test error messages.

```
  ¦
  ¦
+---+
¦039¦
+---+
```
- Reconnect the active store controller to the store loop.

The problem is in the store loop wiring **or** the store loop receptacles for the 4683-*xx*1s.
Report the problem to the person responsible for repairing store loop wiring.

7.8 MAP 0160: W772 Message

Symptom Explanation	**Conditions That Could Cause This Symptom**
The backup store controller is not receiving store loop communications. The backup store controller is sending beacons but it is not receiving beacons.	□ The store loop is open up-loop from the store controller. □ A 4683-*xx*1 is failing up-loop. □ The backup store controller is failing. □ The primary store controller is failing. □ The distance exceeds 4000 feet (1220 meters) between powered-ON 4683-*xx*1s on the store loop.

001

To display the terminal number, press **S1**, type **7**, and press **S2**.
To display messages at a point-of-sale terminal (when the keyboard OFFLINE light is ON), press **S1**, type **2**, and press **S2**.

Note: On the ANPOS Keyboard (during some procedures) and on the Enhanced Alphanumeric Keyboard, **Esc** = S1 and **Enter** = S2.
To display a system message at the store controller, sign on at the store controller, press **System Request** and then press the **M** key.

Warning: Switching **POWER OFF** at a 4684 affects operations at all point-of-sale terminals attached to it.

- Before starting store loop problem determination, obtain the filled-in "Terminal Identification Chart" from the book *IBM 4680 Store System: Preparing Your Site*.

  -- or --

  Obtain a store loop layout chart containing:

  □ The physical location of store controller(s) and point-of-sale terminals

  □ The order of store controller(s) and point-of-sale terminals on the store loop

  □ The terminal numbers.

- Display the system message at the primary store controller by pressing **System Request** and then pressing the **M** key.

The primary store controller is the controller that has been designated to control the store loop. It is supported by the backup store controller.
Did any current message display?
Yes **No**

002

- Continue at Step 010.

003

Did message W760 display?
Yes **No**

004

The failure symptom has changed.
Follow the *User Response* for the message in the *IBM 4680 Store System: Messages Guide*.
- or -
Follow the *Repair Action* for the symptom.

005

Is the terminal number 000 in the W760 message?
Yes **No**

006

```
  ¦   +---+
  ¦   Go to the Hardware Service Manual for your store controller and
  ¦   follow the procedures for Store Loop Problems.
  ¦
  ¦
+---+
¦007¦
+---+
- Disconnect the backup store controller from the store loop by unplugging
  its store loop cable from the store loop receptacle.  See Figure 28 in
  topic 7.1.
- Display the system message at the primary store controller by pressing
  System Request and then pressing the M key.
Did message W761 display?
Yes  No
  ¦    ¦
  ¦   +---+
  ¦   ¦008¦
  ¦   +---+
  ¦   For message W760, go to the Hardware Service Manual for your store
  ¦   controller and follow the procedures for Store Loop Problems.
  ¦   - or -
  ¦   For message W764, follow "MAP 0150:  W764 Message" in topic 7.7.
  ¦
  ¦
+---+
¦009¦
+---+
The backup store controller is failing.
- Record keywords CONTROLLER and INCORROUT.
At the backup store controller, go to the Hardware Service Manual for your
store controller and check for power-on self test error messages.
--------------------------------------------------------------------------

+---+
¦010¦
+---+
(From step 002)
- Disconnect the backup store controller from the store loop by unplugging
  its store loop cable from the store loop receptacle.  See Figure 28 in
  topic 7.1.
- Display the system message at the backup store controller by pressing
  System Request and then pressing the M key.
Did message W774 display?
Yes  No
  ¦    ¦
  ¦   +---+
  ¦   ¦011¦
  ¦   +---+
  ¦   The backup store controller is failing.
  ¦   - Record keywords CONTROLLER and INCORROUT.
  ¦   At the backup store controller, go to the Hardware Service Manual for
  ¦   your store controller and check for power-on self test error
  ¦   messages.
  ¦
  ¦
+---+
¦012¦
+---+
The primary store controller is failing.
- Record keywords CONTROLLER and INCORROUT.
At the primary store controller, go to the Hardware Service Manual for
your store controller and check for power-on self test error messages.
--------------------------------------------------------------------------
```

8.0 Topic 8. Store Controller Reference Information

Store controller operation is a function the operating system. The discussions in this topic can be used as reference for store systems consisting of 4693, 4684, or 4683 point-of-sale terminals.

When reading this topic, the various models of terminals may be interchanged according to the following chart:

4684-**xxx** may also be 4693-541
4683-**xx**1 may also be 4693-421 or 4693-321
4683-**x**02 may also be 4693-202

This topic contains reference information about the local area network (LAN) and backup. It may be applied to 4693 point-of-sale terminals, as well as 4680 point-of-sale terminals.

Subtopics
8.1 Local Area Network (LAN)
8.2 Store Controller

8.1 Local Area Network (LAN)

The LAN includes:

- The IBM PC network
- The IBM multiple controller feature
- The IBM PC network adapter in the store controller
  -- or --
  The IBM token-ring adapter in the store controller.

Subtopics
8.1.1 File Server Store Controller on the LAN
8.1.2 Master Store Controller on the LAN

8.1.1 File Server Store Controller on the LAN

If the file server becomes permanently disabled, there is a possibility that data can be lost. Examples of the data that can be lost are:

- Any information in the spool file of the failing file server that has not been copied to the alternate file server.
- Any information in the I/O buffers of the failing file server.

When the configured file server is brought back up after being down, the following steps should be taken:

Note: If one store controller is both the master and the file server, steps 1 and 2 of "Master Store Controller on the LAN" in topic 8.1.2 should be done before starting here. If this is the case, you may not have to be concerned with stopping and starting background applications.

1. If the alternate file server has been activated as acting file server:

   a. Stop any background applications that should be running **only** on the file server.

   b. Deactivate the alternate (acting) file server.

2. Activate the configured file server as acting file server.

   Between the deactivation and activation of the file server there is a time when there is no file server. During this time no updates can be made to application mirrored files.

3. Start any necessary background applications on the Acting file server.

   Note: If "Auto Resume" was selected during configuration, the following step is not needed. Store loop control resumes automatically after IPL.

4. Resume store loop control at the file server if the file server has primary store loop responsibilities.

   When the file server resumes control of the store loop, for a short period of time the 4683s on the store loop are offline to the primary and backup store controllers. During this time file reads from the 4683s (such as price lookup) cannot be performed.

8.1.2 Master Store Controller on the LAN

If the master store controller becomes permanently disabled, there is a possibility that data can be lost. Examples of the data that can be lost are:

- Any information in the spool file of the failing master store controller that has not been copied to the alternate master store controller.
- Any information in the I/O buffers of the failing master store controller.

When the configured master store controller is brought back up after being down, the following steps should be taken:

1. If the alternate master store controller has been activated as acting master, deactivate the alternate (acting) master.

2. Activate the configured master as acting master store controller.

   Between the deactivation and activation of the master store controller there is a time when there is no master. During this time no updates can be made to compound files or system mirrored files.

   Note: If "Auto Resume" was selected during configuration, the following step is not needed. Store loop control resumes automatically after IPL.

3. Resume store loop control at the master store controller if the master has primary store loop responsibilities.

   When the master store controller resumes control of the store loop, for a short period of time the 4683s on the store loop is offline to the primary and backup store controllers. During this time file-reads from the 4683s (such as price lookup) cannot be performed.

8.2 Store Controller

Use this section to find additional information about the store controller.

Subtopics

8.2.1 Backup Store Controller
8.2.2 Backup Configurations
8.2.3 Using the Supplemental Diskette to Recover from a PLD
8.2.4 Displaying a Store Controller Message
8.2.5 Message Description
8.2.6 Message General Format

8.2.1 Backup Store Controller

The 4680 Store System provides the capability for a backup store controller to take control of the store loop if the assigned primary store controller cannot function or is not available. The backup store controller monitors the activity on the store loop while performing its other assigned duties.

The backup store controller has two modes of operation that can be set from the keyboard:

1. **Allowed**: The backup store controller takes over the store loop if a backup request is received from a 4683.

2. **Prevented**: The backup store controller does NOT take over the store loop if a backup request is received from a 4683.

While the backup store controller is controlling the store loop, it can display any of the store loop messages that you would normally see at the primary store controller, such as W760, W761, W762, W763, and W764.

The following are messages that can be displayed ONLY at the backup store controller:

Message W770 A backup request was received from a 4683 on the store loop because the primary store controller is not functioning. The backup store controller status was **allowed**. Therefore, it is now in control of the store loop.

Message W771 A backup request was received from a 4683 on the store loop because the primary store controller is not functioning. The backup store controller status was **prevented**. Therefore, it did not take control of the store loop.

Message W772 The backup store controller, while monitoring the activity on the store loop, is not receiving end-of-poll characters or beacons from 4683s on the store loop. It is sending beacons down-loop to the primary store controller.

Message W773 The backup store controller was in control of the store loop and the primary store controller requested control of the store loop. The backup store controller always honors this request.

Message W774 The backup store controller, while monitoring the activity on the store loop, is not receiving polls or beacons from 4683s up-loop. It is beaconing and receiving its own beacon. This means there is no active primary store controller and there are no 4683s on the store loop.

Figure 31 is a diagram of 4683s and two store controllers connected to a store loop to provide store controller backup.

PICTURE 27

NOTES:

- This illustration represents a typical store loop, using the IBM Loop Wiring Concentrator. Your stor may not be wired like this, but the position of your 4683s on the loop and their relationship to the controller is similar.

- 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 receive the data and passes it to the next 4683 down-loop. This continues with each 4683 receiving data from the 4683 immediately up-loop from its position, and passing it on to the next 4683 down-loop. The last 4683 down-loop passes the data back to the store controller.

Figure 31. Store Loop with Backup Store Controller

PICTURE 28

Figure 32. Examples of Configurations for Store Controller Backup

8.2.2 Backup Configurations

There are several options in connecting the store controllers and the store loops, depending on requirements. Figure 32 in topic 8.2.1 shows four possible configurations. The four examples are:

- Two store controllers, with one having primary responsibility for a store loop and one serving in a backup capacity.

- Two store controllers, each one operating its own store loop and giving backup support for the other.

- Three store controllers, one has no primary responsibility for a store loop, but it gives backup support for the other two store controllers.

- Three or more store controllers, arranged so that each one controls its own store loop and gives backup support for one other.

8.2.3 Using the Supplemental Diskette to Recover from a PLD

A loss of electrical power is referred to as a power line disturbance (PLD). Although the 4680 Operating System can recover from most PLDs, PLDs can occur when the operating system is performing certain fixed disk functions that are not recoverable. For example, the store controller cannot recover when a PLD occurs while the 4680 Operating System is writing to:

- The disk files
- The subdirectories
- The file allocation table (FAT) sectors that are mandatory for IPL.

When the store controller fails to recover from a PLD, use the following procedure:

1. Switch **POWER OFF** at the store controller.

2. While you are waiting (about 20 seconds), insert the supplemental diskette into diskette drive A.

3. Switch power ON at the store controller.

4. Wait for the supplemental diskette to complete loading. Loading is complete when the SYSTEM MAIN MENU displays.

5. At this point, the fixed disk has been corrected for sectors that were not complete as a result of the PLD. Remove the supplemental diskette and IPL from the fixed disk.

6. The store controller should now load as it did prior to the PLD. If the store controller does not IPL, it may be necessary to recover the 4680 Operating System from the previously prepared backup diskettes or tape (from streaming tape drive). If any messages or codes are displayed as a result of the IPL failure, find the message in the *IBM 4680 Store System: Messages Guide*.

7. After fixing the problem, return the supplemental diskette to its secure storage location.

8.2.4 Displaying a Store Controller Message

When SYSTEM MESSAGE AVAILABLE appears in the lower right of the store controller display screen, there is a message available that has not been displayed.

You can use the following procedure at any time to see the ten most recent messages in the system message file. You can view all of the messages in the file by using the function keys described on the screen.

To display a system message at the store controller:

1. Sign on to the store controller using the store procedures.

2. Press **System Request**, then type **M**.

3. The system messages are displayed on the screen. If a new message is received while you are looking at this screen, the new message is not displayed until you press one of the function keys.

4. Press **QUIT** to return to the screen that was displayed when you pressed **System Request**.

5. Find the message in the *IBM 4680 Store System: Messages Guide*.

8.2.5 Message Description

Subtopics
8.2.5.1 4680 BASIC Language Messages
8.2.5.2 4680 Operating System Messages (Command Mode)

8.2.5.1 4680 BASIC Language Messages

The 4680 BASIC language can issue error messages while it is compiling and link-editing. The following kinds of messages can be displayed:

- Compiler error messages
- Link86 error messages
- Runtime error messages
- Lib86 error messages
- Stack error messages

See the *IBM 4680 BASIC: Language Reference* for these messages.

8.2.5.2 4680 Operating System Messages (Command Mode)

The 4680 Operating System has functions other than those that support the sales environment. Access to these additional functions is through the command mode. You can select command mode from the SYSTEM MAIN MENU. While in this mode it is possible to receive error messages. These error messages are also called SHELL messages.

The HELPLVL parameter for the DEFINE command lets you specify how much online information is displayed with the error message. If you are a beginning user, you can set the help level so the message contains detailed information to resolve the condition. If you are a more experienced user, you can set the help level to provide a briefer message.

Examples of the levels of help for a message are:

Help Level	**Description Level**
1	Displays the command mode function, the error source module, and the return code.
2	Identifies the command and type of error in one sentence. An example of a level 2 error message is: "COPY: Write error"
3	Expands on the level 2 message and includes more specific information. An example of a level 3 error message is: "COPY: An error occurred writing report.txt on A."
4	Expands on the level 3 message and often suggests a possible solution. An example of a level 3 error message is: "COPY: An error occurred writing report.txt on A. Disk A is full. You can erase unnecessary files to free up space".

See the *IBM 4680 Store System: User's Guide* for selecting the level of help for error messages that occur in command mode.

8.2.6 Message General Format

This is the general format for messages displayed at the store controller.

```
mm/dd hh:mm cc ttt s annn xxxxxxxx...xxxxxxxx
                     Bx/Sxxx/Exxx xxxx...xxxx
```

Description:

mm/dd Month and Day the Message Was Logged

hh:mm Time of Day that the Message Was Logged

cc The Store Controller Identifier (ID) Capital alphabetic, in the range of CC to ZZ, assigned by the controller load definition screen at configuration.

ttt Terminal Number In decimal, from 000 to 999, if applicable.

s Message Severity Indicator In decimal, from 1 to 5.

Severity	Impact	Type of Error or Event
1	System	Affects multiple point-of-sale terminals or the entire system.
2	Unit	Affects a single physical unit such as a point-of-sale terminal or an input/output device.
3	Function	Affects the normal operation of a programming function.
4	Statistical	Indicates a statistical event/ error has been detected or a sub-part of a programming function was affected.
5	Events	Indicates an expected occurrence such as an initial program load (IPL).

annn The Message Identifier

```
Annn   - IBM 4680 General Sales Application
Bnnn   - IBM 4680 Supermarket Application
Cnnn   - IBM 4680 Chain Drug Sales Application
Hnnn   - IBM 4680 Store Management Application
Tnnnn  - Hardware Tests
Unnn   - IPL
Wnnn   - IBM 4680 Operating System
Xnnn   - Debug
Ynnn   - System Utilities
Znnn   - Set Terminal Characteristics
```

xxx... Message Text

Bx System Log Section Indicator

```
B1 - Store controller hardware errors
B2 - Point-of-sale terminal hardware errors
B3 - Point-of-sale terminal events
B4 - Store controller events
B5 - System events
B6 - Application events
```

Sxxx The Source Code of the Originator of the Message

```
S002 - IPL Command Processor
S004 - File Services
S006 - X.25 Driver
S008 - Store Controller First Store Loop Adapter
S009 - Store Controller Second Store Loop Adapter
S010 - Host ASYNC Driver
S011 - Host BSC Driver
S012 - Common Communications
S013 - Communications & Systems Management
S014 - Host Command Processor (HCP)
S015 - SDLC Driver
S016 - SNA Driver
S017 - Shared I/O Access Method
S020 - DDA
S021 - Token-Ring / PC Network
```

S022 - LAN (Local Area Network)
S022 - PC Network Transporter
S024 - System Menu Initialization
S026 - SSRT Terminal
S027 - SSRT Utilities
S030 - Store Controller IPL
S031 - Store Controller Partial Dump
S032 - Dump Formatter
S033 - Trace Formatter
S034 - System Log Scan
S035 - Performance Report
S036 - Start Trace/Performance
S037 - Problem Analysis Diskette
S038 - Report Module Level
S039 - Apply Software Maintenance
S040 - Input Sequence Table Utility
S041 - System Configuration Utility
S042 - Print Configuration Utility
S043 - Keyed File Utility
S044 - Display Alter Utility
S045 - Control File Build Utility
S046 - File Distribution Utility
S047 - Store Controller RAM Disk
S048 - Remote Command Processor (RCP)
S049 - Audible Alarm
S050 - Host BSC - IBM ARTIC Adapter
S051 - Host Async - IBM ARTIC Adapter
S052 - Communications Driver - IBM ARTIC Adapter
S053 - Remote Change Management Server (RCMS)
S054 - Print Spooler
S055 - Streaming Tape Drive
S056 - Streaming Tape Drive Utility
S057 - File Compression/Decompression
S058 - 3270 Emulation in the Store Controller
S059 - Remote System Function
S064 - Application Loader
S068 - Debug
S069 - 3270 Emulation in the Point-of-Sale Terminal
S070 - I/O Processor
S072 - Point-of-Sale Terminal File Services
S074 - Point-of-Sale Terminal Services
S076 - Point-of-Sale Terminal Timer
S078 - Remote I/O Access Method
S080 - Point-of-Sale Terminal Store Loop
S082 - Point-of-Sale Terminal Device Channel Adapter
S084 - Point-of-Sale Terminal IPL
S085 - Point-of-Sale Terminal Partial Dump
S086 - Set Terminal Characteristics
S090 - Point-of-Sale Terminal Printer
S091 - Point-of-Sale Terminal Matrix Keyboard
S092 - Point-of-Sale Terminal 50-Key Keyboard
S093 - Point-of-Sale Terminal Alphanumeric or ANPOS Keyboard
S094 - Cash Drawer Adapter
S095 - Operator Display
S096 - Alphanumeric Display
S097 - Shopper Display
S098 - Point-of-Sale Terminal Video Display Adapter
S100 - Managers Keylock
S102 - Optical Character Reader (OCR) Adapter
S104 - Point-of-Sale Scanner
S108 - Single-Track Magnetic Stripe Reader
S109 - Dual-Track Magnetic Stripe Reader
S110 - Scale Adapter
S112 - Coin Dispenser Adapter
S114 - Totals Retention
S116 - Point-of-Sale Terminal Keyboard Tone
S118 - Serial Port Adapter
S120 - Magnetic Wand Adapter
S122 - 1520 Hand-Held Scanner Model A02
S124 - Hand-Held Bar Code Reader
S125 - Point-of-Sale Terminal RAM Disk
S126 - SSRT Store Controller

Exxx Event Code (See the "IBM 4680 Store System: Messages Guide".)

9.0 Topic 9. Collecting Information About a Problem

This topic can be used to help gather information about a store system problem.

When a store system consists of 4693 point-of-sale terminals, the operating system in use determines most of the information gathering procedures. Refer to the Operating System manual for your system.

This topic includes the 4680 Store System procedures for collecting and reporting system hardware information. The store system is an 4680 Store System when the 4680 Operating System is running in the store controller. This information can then be used to analyze problems.

Subtopics

9.1 Requesting a Store Controller Storage Dump
9.2 Requesting a 4683 Storage Dump
9.3 Requesting a Storage Dump Report
9.4 Requesting a System Log Report
9.5 Creating a 4680 Problem Analysis Diskette
9.6 Requesting Store Controller Status
9.7 Problem Data Collection Form

9.1 Requesting a Store Controller Storage Dump

Subtopics
9.1.1 IBM Personal Computer AT or PS/2 Storage Dump
9.1.2 4684 Point of Sale Terminal Storage Dump

9.1.1 IBM Personal Computer AT or PS/2 Storage Dump

Warning: This procedure stops store operations. The storage dump occurs and the store controller IPLs.

1. Press a dump switch on the Personal Computer AT or PS/2. See Figure 33.

   Message W507 displays.

   If two store loop adapters are installed, you can press either dump switch. They both do the same thing.

2. Wait for the dump to finish (approximately two minutes).

   Message W507 disappears and the store controller IPLs.

3. When the dump is complete, notify the store programmer.

Note: Figure 33 **shows the store loop adapters installed in the Personal Computer AT. The dump switch is in the same location on the store loop adapters in the PS/2. The store loop adapters can be installed in any expansion slot in the Personal Computer AT or PS/2. This figure shows them installed in slots 1 and 2**.

PICTURE 29

Figure 33. Location of Store Controller Dump Switch

9.1.2 4684 Point of Sale Terminal Storage Dump

Warning: This procedure stops store operations. The storage dump occurs and the 4684 IPLs.

1. Press the dump switch shown in Figure 34.

   Message W507 displays.

   Figure 33 in topic 9.1.1 shows the store loop adapters installed in the Personal Computer AT. The dump switch is in the same location on the store loop adapters in the 4684 point-of-sale terminal.

2. Wait for the dump to finish (approximately two minutes).

   Message W507 disappears and the 4684 IPLs.

3. When the dump is complete, notify the store programmer.

Note: On a 4684 using the 4680 Operating System, both the point-of-sale terminal dump and the store controller dump occur at the same time. Also, both dumps are entered in the store controller dump file.

PICTURE 30

Figure 34. Location of 4684 Dump Switch

9.2 Requesting a 4683 Storage Dump

1. Press the dump switch on the 4683-*xx*1. See Figure 35.

   If this is a 4683-*xx*2, you must press the dump switch on its partner 4683-*xx*1 or 4684.

2. Wait for the dump to complete (approximately 10 minutes).

   While the dump is in progress, U008 displays.
   When the dump is complete, U008 disappears and the 4683 IPLs.

3. When the dump is complete, notify the store programmer.

   Note: Message W052 is placed in the message queue at the store controller.

PICTURE 31

Figure 35. Location of 4683 Dump Switch

9.3 Requesting a Storage Dump Report

1. Press **System Request** on the store controller keyboard.

2. The SYSTEM KEYS screen displays.

3. On the SYSTEM KEYS screen, enter **s** (Start New Application).

```
+------------------------------------------------------------------------+
|                                                                        |
|                              SYSTEM KEYS                               |
|                                                                        |
|         Type one of the following letters or a function key.           |
|                                                                        |
|         m   Access the System Messages Display screen.                 |
|         c   Access the Store Control Functions screen.                 |
|         b   Access the Background Application Control screen.          |
|         s   Start New Application.  (Displays System Main Menu)        |
|         w   Access the Window Control screen.                          |
|         n   Pass control to the next higher numbered window            |
|             owned by this operator (Next).                             |
|         p   Pass control to the next lower numbered window             |
|             owned by this user (Preceding).                            |
|         a   Access the Auxiliary Console Control screen.               |
|                                                                        |
|                                                                        |
|     (Message line)                                                     |
|     F1   F2   F3QUIT F4   F5   F6   F7   F8   F9Disconnct             |
|     (Status line)                                                      |
|                                                                        |
+------------------------------------------------------------------------+
```

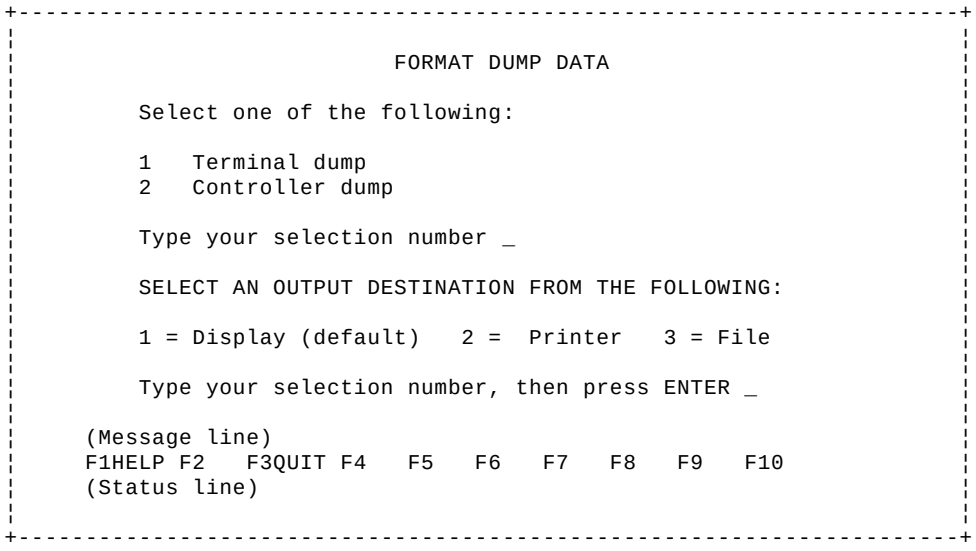
4. On the SYSTEM MAIN MENU, enter **6** (Problem Analysis Reports).

```
+------------------------------------------------------------------------+
|                                                                        |
|                            SYSTEM MAIN MENU                            |
|                                                                        |
|         Select one of the following:                                   |
|                                                                        |
|         1   (User-defined text appears here)                           |
|         2   (User-defined text appears here)                           |
|         3   File Utilities                                             |
|         4   Installation and Update Aids                               |
|         5   Problem Analysis Data Collection                           |
|         6   Problem Analysis Reports                                   |
|         7   Command Mode                                               |
|                                                                        |
|         Type your selection number, then press ENTER _                 |
|                                                                        |
|                                                                        |
|     (Message line)                                                     |
|     F1HELP F2   F3     F4   F5   F6   F7   F8   F9SIGNOFF              |
|     (Status line)                                                      |
|                                                                        |
+------------------------------------------------------------------------+
```

5. On the PROBLEM ANALYSIS REPORT screen, enter **4** (Format Dump Data).

```
+------------------------------------------------------------------------+
|                                                                        |
|                         PROBLEM ANALYSIS REPORT                        |
|                                                                        |
|         Select one of the following:                                   |
|                                                                        |
|         1   Scan System Log Data                                       |
|         2   Format System Trace Data                                   |
|         3   Format Performance Data                                    |
|         4   Format Dump Data                                           |
|         5   Create Problem Analysis Diskette                           |
|                                                                        |
|         Type your selection number, then press ENTER _                 |
|                                                                        |
|                                                                        |
|     (Message line)                                                     |
|     F1HELP F2   F3QUIT F4   F5   F6   F7   F8   F9   F10              |
|     (Status line)                                                      |
|                                                                        |
```

6. On the FORMAT DUMP DATA screen, enter **1** or **2** for the dump you want to format
and then enter **1** (display) as the output destination.
Note: To prepare the dump report to copy to a problem analysis diskette, enter **3** File for destination.



7. Examine the terminal number (if applicable), date, time, and reason for the dump to determine if the dump file contains the dump you requested. If the dump file does not contain the dump you requested, try to recreate the problem and request the storage dump again.

8. Press **Esc** to return to the PROBLEM ANALYSIS REPORT screen.
Note: You can return to the SYSTEM MAIN MENU by pressing **F3** after pressing **Esc**.

9. If you plan to create a problem analysis diskette, continue at step 5 of "Requesting a System Log Report" in topic 9.4. On the SYSTEM LOG REPORT screen, enter **7** (All of the Above Reports).

9.4 Requesting a System Log Report

1. Press **System Request** on the store controller keyboard.

2. The SYSTEM KEYS screen displays.

3. On the SYSTEM KEYS screen, enter **s** (Start New Application).

```
+------------------------------------------------------------------------+
|                                                                        |
|                              SYSTEM KEYS                               |
|                                                                        |
|         Type one of the following letters or a function key.           |
|                                                                        |
|         m   Access the System Messages Display screen.                 |
|         c   Access the Store Control Functions screen.                 |
|         b   Access the Background Application Control screen.          |
|         s   Start New Application.  (Displays System Main Menu)        |
|         w   Access the Window Control screen.                          |
|         n   Pass control to the next higher numbered window            |
|             owned by this operator (Next).                             |
|         p   Pass control to the next lower numbered window             |
|             owned by this user (Preceding).                            |
|         a   Access the Auxiliary Console Control screen.               |
|                                                                        |
|                                                                        |
|     (Message line)                                                     |
|     F1   F2   F3QUIT F4   F5   F6   F7   F8   F9Disconnct             |
|     (Status line)                                                      |
|                                                                        |
+------------------------------------------------------------------------+
```

4. On the SYSTEM MAIN MENU, enter **6** (Problem Analysis Reports).

```
+------------------------------------------------------------------------+
|                                                                        |
|                            SYSTEM MAIN MENU                            |
|                                                                        |
|         Select one of the following:                                   |
|                                                                        |
|         1   (User-defined text appears here)                           |
|         2   (User-defined text appears here)                           |
|         3   File Utilities                                             |
|         4   Installation and Update Aids                               |
|         5   Problem Analysis Data Collection                           |
|         6   Problem Analysis Reports                                   |
|         7   Command Mode                                               |
|                                                                        |
|         Type your selection number, then press ENTER _                 |
|                                                                        |
|                                                                        |
|     (Message line)                                                     |
|     F1HELP F2   F3     F4   F5   F6   F7   F8   F9SIGNOFF              |
|     (Status line)                                                      |
|                                                                        |
+------------------------------------------------------------------------+
```

5. On the PROBLEM ANALYSIS REPORT screen, enter **1** (Scan System Log Data).

```
+------------------------------------------------------------------------+
|                                                                        |
|                          PROBLEM ANALYSIS REPORT                       |
|                                                                        |
|         Select one of the following:                                   |
|                                                                        |
|         1   Scan System Log Data                                       |
|         2   Format System Trace Data                                   |
|         3   Format Performance Data                                    |
|         4   Format Dump Data                                           |
|         5   Create Problem Analysis Diskette                           |
|                                                                        |
|         Type your selection number, then press ENTER _                 |
|                                                                        |
|                                                                        |
|                                                                        |
|     (Message line)                                                     |
|     F1HELP F2   F3QUIT F4   F5   F6   F7   F8   F9   F10               |
|     (Status line)                                                      |
```

```
+------------------------------------------------------------------------+
```

6. On the SYSTEM LOG REPORT screen, enter the number corresponding to the System Log section you want. For example, **1** is section B1, **2** is B2, and so forth.

```
+------------------------------------------------------------------------+
|                                                                        |
|                            SYSTEM LOG REPORT                           |
|                                                                        |
|         Select one of the following:                                   |
|                                                                        |
|         1   Controller Hardware Errors                                 |
|         2   Terminal Hardware Errors                                   |
|         3   Terminal Events                                            |
|         4   Controller Events                                          |
|         5   System Events                                              |
|         6   Application Events                                         |
|         7   All of the above reports                                   |
|                                                                        |
|         Type your selection number, then press ENTER _                 |
|                                                                        |
|                                                                        |
|                                                                        |
|     (Message line)                                                     |
|     F1HELP F2   F3QUIT F4   F5   F6   F7   F8   F9   F10               |
|     (Status line)                                                      |
|                                                                        |
+------------------------------------------------------------------------+
```

7. As the next screens appear, make selections to do the tasks you want. To get the System Log Report ready to copy to a 4680 Problem Analysis Diskette, enter **3** (File).

```
+------------------------------------------------------------------------+
|                                                                        |
|                        SYSTEM LOG REPORT                               |
|                        XXXXXXXXXXXXX LOG                               |
|         Type the necessary information.                                |
|                                                                        |
|          START SCAN                                                    |
|           Date  (mm/dd/yy)     01/01/86                                |
|           Time  (hh:mm)        00:00                                   |
|                                                                        |
|          STOP SCAN                                                     |
|           Date  (mm/dd/yy)     12/31/99                                |
|           Time  (hh:mm)        23:59                                   |
|                                                                        |
|          CONTROLLER ID     *                                           |
|          TERMINAL NUMBER   *                                           |
|          SOURCE NUMBER     *                                           |
|                                                                        |
|          DESTINATION       1   1 = Display   2 = Printer  3 = File    |
|          FORMAT MODE       1   1 = Long      2 = Short    3 = Both    |
|                                                                        |
|      When complete, press ENTER.                                       |
|                                                                        |
|     (Message line)                                                     |
|     F1HELP F2   F3QUIT F4   F5   F6   F7   F8   F9   F10               |
|     (Status line)                                                      |
|                                                                        |
+------------------------------------------------------------------------+
```

Note: XXXXXXXXXXXXX LOG indicates the log being displayed.

8. When the display indicates that report creation is complete, press **Esc** to return to the PROBLEM ANALYSIS REPORT screen.

   Note: You can return to the SYSTEM MAIN MENU by pressing F3 after pressing **Esc**.

9. If you plan to create a problem analysis diskette, continue at step 5 of "Creating a 4680 Problem Analysis Diskette" in topic 9.5. When the CREATE PROBLEM ANALYSIS DISKETTE screen appears, select *System Log Report* and *Terminal Dump* or *Controller Dump*.

9.5 Creating a 4680 Problem Analysis Diskette

1. Press **System Request** on the store controller keyboard.

2. The SYSTEM KEYS screen displays.

3. On the SYSTEM KEYS screen, enter **s** (Start New Application).

```
+--------------------------------------------------------------------+
|                                                                    |
|                            SYSTEM KEYS                             |
|                                                                    |
|         Type one of the following letters or a function key.       |
|                                                                    |
|         m   Access the System Messages Display screen.             |
|         c   Access the Store Control Functions screen.             |
|         b   Access the Background Application Control screen.      |
|         s   Start New Application.  (Displays System Main Menu)    |
|         w   Access the Window Control screen.                      |
|         n   Pass control to the next higher numbered window        |
|             owned by this operator (Next).                         |
|         p   Pass control to the next lower numbered window         |
|             owned by this user (Preceding).                        |
|         a   Access the Auxiliary Console Control screen.           |
|                                                                    |
|                                                                    |
|                                                                    |
|     (Message line)                                                 |
|     F1   F2   F3QUIT F4   F5   F6   F7   F8   F9Disconnct         |
|     (Status line)                                                  |
|                                                                    |
+--------------------------------------------------------------------+
```

4. On the SYSTEM MAIN MENU, enter **6** (Problem Analysis Reports).

```
+--------------------------------------------------------------------+
|                                                                    |
|                          SYSTEM MAIN MENU                          |
|                                                                    |
|         Select one of the following:                               |
|                                                                    |
|         1   (User-defined text appears here)                       |
|         2   (User-defined text appears here)                       |
|         3   File Utilities                                         |
|         4   Installation and Update Aids                           |
|         5   Problem Analysis Data Collection                       |
|         6   Problem Analysis Reports                               |
|         7   Command Mode                                           |
|                                                                    |
|         Type your selection number, then press ENTER _             |
|                                                                    |
|                                                                    |
|                                                                    |
|     (Message line)                                                 |
|     F1HELP F2   F3     F4   F5   F6   F7   F8   F9SIGNOFF          |
|     (Status line)                                                  |
|                                                                    |
+--------------------------------------------------------------------+
```

5. On the PROBLEM ANALYSIS REPORTS screen, enter **5** (Create Problem Analysis Diskette).

```
+--------------------------------------------------------------------+
|                                                                    |
|                        PROBLEM ANALYSIS REPORTS                    |
|                                                                    |
|         Select one of the following:                               |
|                                                                    |
|         1   Scan System Log Data                                   |
|         2   Format System Trace Data                               |
|         3   Format Performance Data                                |
|         4   Format Dump Data                                       |
|         5   Create Problem Analysis Diskette                       |
|                                                                    |
|         Type your selection number, then press ENTER _             |
|                                                                    |
|     (Message line)                                                 |
|     F1HELP F2   F3QUIT F4   F5   F6   F7   F8   F9   F10           |
|     (Status line)                                                  |
|                                                                    |
+--------------------------------------------------------------------+
```

6. Obtain a formatted diskette and insert it into the appropriate drive (A or B).

7. On the CREATE PROBLEM ANALYSIS DISKETTE screen, select the reports to be copied to the diskette. If you are going to copy a system log report to the problem analysis diskette, you must first write the system log report to a file. See step 7 of "Requesting a System Log Report" in topic 9.4. **This is necessary for any of the REPORTs listed on the screen**.

```
+-------------------------------------------------------------------------+
|                                                                         |
|                     CREATE PROBLEM ANALYSIS DISKETTE                    |
|                                                                         |
|       Type an X by the item(s) you wish to be copied......              |
|                                                                         |
|                               MODIFICATION   STATUS                     |
|                                   DATE                                  |
|           SYSTEM LOG REPORT                                             |
|           TERMINAL DUMP                                                 |
|           CONTROLLER DUMP                                               |
|           SYSTEM TRACE REPORT                                           |
|           PERFORMANCE REPORT                                            |
|           MODULE LEVEL REPORT                                           |
|                                                                         |
|       Type the desired diskette selection:                              |
|                                                                         |
|           DESTINATION   1   1 = DISKETTE DRIVE A                        |
|                             2 = DISKETTE DRIVE B                        |
|                                                                         |
|       Insert a formatted diskette into the selected drive.              |
|       To continue, press ENTER.                                         |
|                                                                         |
|     (Message line)                                                      |
|     F1HELP F2   F3QUIT F4   F5   F6   F7   F8   F9   F10               |
|     (Status line)                                                       |
|                                                                         |
+-------------------------------------------------------------------------+
```

8. When the display indicates that diskette creation is complete, press **F3** twice to return to the SYSTEM MAIN MENU.

9. Remove the diskette from the drive, label it, and give it to the person responsible for problem analysis diskettes (help desk personnel, store programmer, or the IBM Support Center for Software Assistance).

9.6 Requesting Store Controller Status

1. Press **System Request** on the store controller keyboard.

2. The SYSTEM KEYS screen displays.

3. On the SYSTEM KEYS screen, enter **c** (Access Store Control Functions).

```
+------------------------------------------------------------------------+
|                                                                        |
|                              SYSTEM KEYS                               |
|                                                                        |
|         Type one of the following letters or a function key.           |
|                                                                        |
|         m   Access the System Messages Display screen.                 |
|         c   Access the Store Control Functions screen.                 |
|         b   Access the Background Application Control screen.          |
|         s   Start New Application.  (Displays System Main Menu)        |
|         w   Access the Window Control screen.                          |
|         n   Pass control to the next higher numbered window            |
|             owned by this operator (Next).                             |
|         p   Pass control to the next lower numbered window             |
|             owned by this user (Preceding).                            |
|         a   Access the Auxiliary Console Control screen.               |
|                                                                        |
|                                                                        |
|                                                                        |
| (Message line)                                                         |
|     F1   F2   F3QUIT F4   F5   F6   F7   F8   F9Disconnct              |
| (Status line)                                                          |
+------------------------------------------------------------------------+
```

Note: If the STORE CONTROL FUNCTIONS screen does not display after you enter **c**, press **Esc**.

4. On the STORE CONTROL FUNCTIONS screen, enter **2** (Controller Functions).

```
+------------------------------------------------------------------------+
|                                                                        |
|                         STORE CONTROL FUNCTIONS                        |
|                                                                        |
|         Select one of the following:                                   |
|                                                                        |
|         1   Terminal Functions                                         |
|         2   Controller Functions                                       |
|         3   System Functions                                           |
|         4   LAN Control Functions                                      |
|         5   System Functions                                           |
|                                                                        |
|         Type your selection number, then press Enter. _                |
|                                                                        |
|                                                                        |
|                                                                        |
|     (Message line)                                                     |
|     F1HELP F2   F3QUIT F4   F5   F6   F7   F8   F9   F10               |
|     (Status line)                                                      |
+------------------------------------------------------------------------+
```

5. On the CONTROLLER FUNCTIONS screen, enter **1** (Display Controller Status).

```
+------------------------------------------------------------------------+
|                                                                        |
|                           CONTROLLER FUNCTIONS                         |
|                                                                        |
|         Select one of the following:                                   |
|                                                                        |
|         1   Display Controller Status                                  |
|         2   Enable Controller RAM Disk                                 |
|         3   Disable Controller RAM Disk                                |
|         4   Load Controller Storage                                    |
|         5   Dump Controller Storage                                    |
|                                                                        |
|         Type your selection number, then press Enter. _                |
|                                                                        |
|                                                                        |
|                                                                        |
|     (Message line)                                                     |
|     F1HELP F2   F3QUIT F4   F5   F6   F7   F8   F9   F10               |
|     (Status line)                                                      |
```

This list describes the items on CONTROLLER STATUS Page 1 of 3.

ITEM ON PAGE 1 of 3	INDICATES
xx	ID of the store controller
Type - Configured or Acting	Master File server Alternate master Alternate file server
Loop 1 or 2 - Configured	Store loop control Backup store loop
Loop 1 or 2 - Status	Controlling loop Backup allowed Backup prevented Providing backup Receiving backup
System Trace -	Active Inactive
Performance Monitor -	Active Inactive
Controller RAM disk -	Active Inactive
Automatic Resume -	Active Inactive

6. Press **PgDn** to view page 2.

This is an example of CONTROLLER STATUS Page 1. Examples of CONTROLLER STATUS Page 2 and CONTROLLER STATUS Page 3 follow this one.

```
                  CONTROLLER STATUS                Page 1 of 3
                        ID - xx
                      Time - 00:00

        Type     - Configured: Master
                               File Server
                         Acting: Master
                               File Server

        Loop 1   - Configured: Store Loop Control
                         Status: Controlling Loop

        Loop 2   - Configured: Backup Store Loop
                         Status: Standby

        System Trace -         Inactive
        Performance Monitor -  Inactive
        Controller RAM Disk -  Inactive
        Automatic Resume -     Active

        Press PgDn for additional controller status.
        To refresh the status, press F9.

    (Message line)
    F1     F2   F3QUIT F4   F5   F6   F7   F8   F9Refresh   F10
    (Status line)
```

7. Press **PgDn** to view page 3.

This is an example of CONTROLLER STATUS Page 2.

```
                  CONTROLLER STATUS                Page 2 of 3
                        ID - xx
                      Time - 00:00
```

```
        Master                  xx            xx
        File Server             xx            xx
        Alternate Master        xx            xx
        Alternate File Server   xx            xx

        Active Controller Connections:
            xx  xx

        Inactive Controller Connections:
            xx  xx  xx  xx  xx

        Press PgUp to see the previous page of controller status.
        Press PgDn for additional Controller status.
        To refresh the status, press F9.

    (Message line)
    F1     F2   F3QUIT F4   F5   F6   F7   F8   F9Refresh
    (Status line)
```

8. Press **PgUp** to view the previous pages.

   This is an example of CONTROLLER STATUS Page 3.

```
                  CONTROLLER STATUS (Loop Status)   Page 3 of 3
                        ID - xx
                      Time - 00:00

       -------- Loop 1 --------     -------- Loop 2 --------  Auto-
  Node  Configured  Acting:          Configured:   Acting:     Resume

  xx    Control     Controlling      Backup        Standby      Y
  xx    Control     Controlling      Backup        Standby      N
  xx    Backup      Prevented        Backup        Standby



    Note:  Only active controllers (Nodes) are listed.

           Press PgUp to see the previous page of controller status.
           To refresh the status, press f9.

    (Message line)
    F1     F2   F3QUIT F4   F5   F6   F7   F8   F9Refresh
    (Status line)
```

9.7 Problem Data Collection Form

Date_____ Time_____

Store Number_____ Controller Number_____ Terminal Number_____

Message (that you received)_____

Symptom (that you observed)_____

_____

_____

Describe the Problem_____

_____

_____

_____

_____

What were you trying to do?_____

_____

_____

_____

_____

Can you make the problem happen again?(Y=Yes, N=No)

What else was happening in the store?

_____

_____

_____

Choose keywords from the list on the other side of this form.

Primary keywords:_____

Additional keywords:_____

Component ID =_____

MAKE COPIES OF THIS FORM FOR FUTURE USE

Primary Keywords	**Description**
AB	ABEND
ADRS	Address, Displacement, Offset
DEVS	Device Type and Model
FLDS	Fields, Label, Name
LVLS	Levels
MSG	Message
OPCS	OP Codes, I/O Command Codes, T/P OP Codes, Request Codes
OVS	Overlaid Core
PCSS	Statements, Commands, JCL, Options, Parameters, Keys, Process Names, Environments, Special Characters, Diagnose Command, Responses, Physical Unit, Logical Unit
PIDS	Component
PUBS	Pub ID, Chapter, Page, Section, Appendix, TNL

PRCS	Return Code, Status Code, Condition, Feedback
PTFS	PTF, APAR, Service Level
REGS	Registers
RIDS	Module, Macro, Csect, Exec, Access Method, Subroutine, Panel
SIG	Signal
VALUE	Value
WS	Wait State

Additional Keywords	**Description**
ADCS	Advanced Data Communications for Stores
ALERT	Diagnostic information generated by a system that indicates potential system problems.
APPLPGM	Store Application Program
ANDISP	Alphanumeric Display
ANKBRD	Alphanumeric Keyboard
ASM	Apply Software Maintenance
BALDUE	Balance Due
B*x*/S*xxx*/E*xxx*	The information in a message that indicates the System Log section, the Source of the problem, and the Event that occurred.
CASHDRAWER	The cash drawer on the point-of-sale terminal.
COMPILER	A program that decodes instructions and produces a machine language program which can be executed later.
CONFIG	Configuration is the process of creating Operating System records that are used later by the system to ensure that software support exits for the hardware.
CONSOLE	The store controller keyboard and display.
CONTROLLER	The store controller that supports the store loop.
D/C/S	Department/Class/Stock
DEBUG	The process of correcting software errors.
DISK	The resident fixed disk drive in the store controller.
DISKETTE	The resident fixed diskette drive in the store controller.
DISPLAY	The monitor on the store controller.
DRIVES	The software component that controls a device.
DSX	Distributed Systems Executive
DUMP	The contents of the memory in the point-of-sale terminal or store controller.
EAN	European Article Number
EOT	End of Transmission
HANG	Describes a problem where an attached device does not accept input **or** the point-of-sale terminal or store controller cannot continue to operate. For example, the keyboard does not accept input.
HOST	The system at the central-site.
INCORROUT	Describes a problem that is indicated by incorrect output.

IPL	Initial Program Load
KEYBOARD	50-Key Keyboard
LAN	Local Area Network
MATRIXKBD	Matrix Keyboard
OCR	Optical Character Reader
OPDISP	Operator Display
PERFM	Describes a problem that is performance related.
PLD	Power Line Disturbance
PIPE	An in-memory buffer used by programs to exchange messages.
PROCESS	A task created by the operating system each time an application begins execution. The process is defined to the system by the existence of a process descriptor record.
RAMDISK	In-memory disk files (point-of-sale terminal or store controller)
RC*xxxxxxxx*	Return Code
READ	To acquire or interpret data from a storage device.
SCANNER	A device that reads and interprets bar codes, and generates signals corresponding to the bar code characters.
SESSION*xx*	The identification of a session where *xx* equals a value from 1 to 64. The session is established by the Operating System upon request to support communication between the store controller and one or more point-of-sale terminals.
SHOPDISP	Shopper Display
SVC	Supervisor Call
SYSFUNC	The function requested by pressing specially programmed keys the point-of-sale terminal or store controller keyboard.
TAPE	Streaming Tape Drive
TERMINALS	Any combination of 4683s or 4684s.
TRACE	collection of data exchanged between two points for a specified period of time.
UPC	Universal Product Code
USEREXIT	A call to user-written code from the main application.
VIDEODISP	Video Display
1520-A01	1520 Hand-Held Scanner Model A01
1520-A02	1520 Hand-Held Scanner Model A02
3687-2	3687 Checkout Scanner Model 2
4683-P	Model Px1
4683-1	Model 001
4683-2	Model 002
4683-A01	Model A01
4683-A02	Model A02

10.0 Topic 10. Cables and Wiring Diagrams

CAUTION:
For your safety, connect equipment requiring electrical power to a properly wired and grounded outlet.

DANGER

During periods of lightning activity, do not connect or disconnect any cables, or perform installation, maintenance, or reconfiguration.

Subtopics

10.1 Wiring Diagrams for 4693, 4684, and 4683 Cables
10.2 Wiring Diagrams for the 4683 Base Unit Power Supply Connectors
10.3 Wiring Diagrams for the Model 1 or 2 Printer Card Connectors
10.4 Wiring Diagrams for the Model 3 or 4 Printer Card Connectors

10.1 Wiring Diagrams for 4693, 4684, and 4683 Cables

Subtopics

10.1.1 Cash Drawer A Connector and Cable
10.1.2 Cash Drawer B Connector and Cable
10.1.3 Coin Dispenser Connector and Cable
10.1.4 Display A (Alphanumeric, Operator, or Shopper) Connector and Cable
10.1.5 Display B (Alphanumeric, Operator, or Shopper) Connector and Cable
10.1.6 Optical Character Reader (OCR) Connector and Cable
10.1.7 Point-of-Sale Keyboard A and B Connector and Long Cable
10.1.8 Point-of-Sale Keyboard A and B Connector and Short Cable
10.1.9 Enhanced A/N Keyboard Connector and Cable (4684, 4693)
10.1.10 RS-232C Device Connector and Cable
10.1.11 RS-232C or Current Loop Device Connector and Cable
10.1.12 RS-232C Asynchronous/Communications Port
10.1.13 RS-232C (Current Loop) Wrap Plug
10.1.14 RS-232C (EIA) Wrap Plug
10.1.15 Scale Connector and Cable
10.1.16 Special Attachment Cable (Remote Alarm and Non-IBM Cash Drawer)
10.1.17 Special Attachment "Y" Cable (1520 Model A02 and Dual-Track MSR)
10.1.18 System Unit Printer (Parallel Port) - 4684 and 4693
10.1.19 Serial I/O (Asynchronous) Port - 4693
10.1.20 4693 Serial I/O (Asynchronous) Wrap Plug
10.1.21 3687 Point of Sale Scanner Model 002 Adapter Connector and Cable
10.1.22 4696/4697 Point-of-Sale Scanner Connector and Cable
10.1.23 Point-of-Sale Printer Model 1, 2, 3, or 4 Connector and Cable
10.1.24 4680/4690 Store Loop Connector and Cable
10.1.25 4683 Video Display (5-inch / Distributed) Connector and Cable
10.1.26 4683 Video Display (Except 5-Inch) Connector and Cable
10.1.27 4684/4693 9-Inch Video Display Connector and Cable
10.1.28 Point-of-Sale Terminal Connector and Cable
10.1.29 Baseband Network Cable Adapter
10.1.30 Baseband Network Cable and Connectors
10.1.31 Baseband Network Cable and Data Connector
10.1.32 PS/2 Cable to Data Connector
10.1.33 PS/2 Baseband to 4684 Baseband Connector
10.1.34 4684 Baseband Network Wrap Plug
10.1.35 4684 Baseband Network Terminator Plug
10.1.36 X.25 Interface Co-Processor/2 Cable Wiring

10.1.1 Cash Drawer A Connector and Cable

Connector (4683, 4684, 4693)	Line Description	Cash Drawer A Connector
3A-1	Switch	Pin 4
3A-2	Switch	Pin 3
3A-3	Signal	Pin 2
3A-4	+36 V dc	Pin 1

10.1.2 Cash Drawer B Connector and Cable

Connector (4683, 4684, 4693)	**Line Description**	**Cash Drawer B Connector**
3B-1	Switch	Pin 4
3B-2	Switch	Pin 3
3B-3	Signal	Pin 2
3B-4	+36 V dc	Pin 1

PICTURE 32

Figure 36. Cash Drawer Cable Wiring

10.1.3 Coin Dispenser Connector and Cable

Connector (4683 only)	Line Description	Coin Dispenser Connector
29-1	Coin data	Pin 1
29-2	Coin clock	Pin 2
29-3	Coin dispenser enable	Pin 3
29-4	+5 V dc return	Pin 4
	Not used	Pin 6
	Not used	Pin 7
	Not used	Pin 8
	Not used	Pin 9

PICTURE 33

Figure 37. Coin Dispenser Cable Wiring

10.1.4 Display A (Alphanumeric, Operator, or Shopper) Connector and Cable

Connector (4683, 4684, 4693)	**Line Description**	**Display A Connector**
4A-1	+12 V dc return	Pin 4
4A-2	Serial I/O B	Pin 3
4A-3	Serial I/O A	Pin 2
4A-4	+12 V dc	Pin 1

10.1.5 Display B (Alphanumeric, Operator, or Shopper) Connector and Cable

Connector (4683, 4684, 4693)	Line Description	Display B Connector
4B-1	+12 V dc return	Pin 4
4B-2	Serial I/O A	Pin 3
4B-3	Serial I/O B	Pin 2
4B-4	+12 V dc	Pin 1

PICTURE 34

Figure 38. Display Cable Wiring

10.1.6 Optical Character Reader (OCR) Connector and Cable

Connector (4683 only)	Line Description	OCR Wand Connector	Connector (4683 only)	Line Description	OCR Wand Connector
21-1	Reserved	Pin 16	21-9	OCR EOT	Pin 8
21-2	OCR data 1	Pin 1	21-10	OCR data ready	Pin 9
21-3	OCR data 2	Pin 2	21-11	Reserved	Pin 18
21-4	OCR data 3	Pin 3	21-12	+5 V dc return	Pin 22
21-5	OCR data 4	Pin 4	21-13	OCR user ready	Pin 10
21-6	OCR data 5	Pin 5	21-14	Reserved	Pin 23
21-7	OCR data 6	Pin 6	21-15	Reserved	Pin 24
21-8	OCR edit check	Pin 7	21-16	Reserved	Pin 25

PICTURE 35

Figure 39. OCR Wand Cable Wiring

10.1.7 Point-of-Sale Keyboard A and B Connector and Long Cable

Connector (4683, 4684, 4693)	Line Description	Keyboard A Connector	Connector (4683, 4684, 4693)	Line Description	Keyboard B Connector
5A-1	Reserved	Pin 8	5B-1	Reserved	Pin 8
5A-2	+5 V dc	Pin 7	5B-2	+5 V dc	Pin 7
5A-3	+5 V dc return	Pin 6	5B-3	+5 V dc return	Pin 6
5A-4	Serial I/O B	Pin 5	5B-4	Serial I/O B	Pin 5
5A-5	Serial I/O A	Pin 4	5B-5	Serial I/O A	Pin 4
5A-6	+5 V dc	Pin 3	5B-6	+5 V dc	Pin 3
5A-7	+5 V dc return	Pin 2	5B-7	+5 V dc return	Pin 2
5A-8	Reserved	Pin 1	5B-8	Reserved	Pin 1

PICTURE 36

Figure 40. Long Keyboard Cable Wiring

10.1.8 Point-of-Sale Keyboard A and B Connector and Short Cable

Connector (4683, 4684, 4693)	Line Description	Keyboard A Connector	Connector (4683, 4684, 4693)	Line Description	Keyboard B Connector
5A-1	Reserved	Pin 8	5B-1	Reserved	Pin 8
5A-2	Reserved	Pin 7	5B-2	Reserved	Pin 7
5A-3	+5 V dc return	Pin 6	5B-3	+5 V dc return	Pin 6
5A-4	Serial I/O B	Pin 5	5B-4	Serial I/O A	Pin 5
5A-5	Serial I/O A	Pin 4	5B-5	Serial I/O B	Pin 4
5A-6	+5 V dc	Pin 3	5B-6	+5 V dc	Pin 3
5A-7	Reserved	Pin 2	5B-7	Reserved	Pin 2
5A-8	Reserved	Pin 1	5B-8	Reserved	Pin 1

PICTURE 37

Figure 41. Short Keyboard Cable Wiring

10.1.9 Enhanced A/N Keyboard Connector and Cable (4684, 4693)

PICTURE 38

Figure 42. Enhanced A/N Keyboard Cable Continuity Check

PICTURE 39

Figure 43. Enhanced A/N Keyboard Cable Pin Voltages

10.1.10 RS-232C Device Connector and Cable

Connector (4683 only)	**Line Description**	**RS-232C Connector**	**Connector (4683 only)**	**Line Description**	**RS-232C Connector**
23-1	Transmit Data	Pin 2	23-5	Ground	Pin 7
23-2	Reserved	Reserved	23-6	Clear to Send	Pin 5
23-3	Receive Data	Pin 3	23-7	Data Set Ready	Pin 6 & 8
23-4	Request to Send	Pin 4	23-8	Data Terminal Ready	Pin 20

PICTURE 40

Figure 44. RS-232C Cable Wiring

10.1.11 RS-232C or Current Loop Device Connector and Cable

Connector (4683 only)	**Line Description**	**RS-232C or Current Loop Device Connector**
25-1	Reserved	Not connected
25-2	Transmit Data	Pin 2
25-3	Reserved	Not connected
25-4	Receive Data	Pin 3
25-5	Reserved	Not connected
25-6	Request to Send	Pin 4
25-7	Reserved	Not connected
25-8	Clear to Send	Pin 5
25-9	+ Transmit Data (current loop)	Pin 18
25-10	Data Set Ready	Pin 6
25-11	Signal Ground	Pin 7
25-12	Data Terminal Ready	Pin 20
25-13	Data Carrier Detect	Pin 8
25-14	+ Receive Data (current loop)	Pin 9
25-15	- Receive Return (current loop)	Pin 11
25-16	- Transmit Return (current loop)	Pin 25

PICTURE 41

Figure 45. RS-232C or Current Loop Device Cable Wiring

10.1.12 RS-232C Asynchronous/Communications Port

Pin Number	Signal Name	Pin Number	Signal Name
1	Not connected	14	Not connected
2	Transmit data	15	Not connected
3	Receive data	16	Not connected
4	Request to send	17	Not connected
5	Clear to send	18	Not connected
6	Data set ready	19	Not connected
7	Signal ground	20	Data terminal ready
8	Data carrier detect	21	Not connected
9	Not connected	22	Ring indicate
10	Not connected	23	Not connected
11	Not connected	24	Not connected
12	Not connected	25	Not connected
13	Not connected	-	-

PICTURE 42

Figure 46. RS-232C Asynchronous/Communications Connector Wiring

10.1.13 RS-232C (Current Loop) Wrap Plug

Pin 9 (+ Receive Data) is connected to pin 18 (+ Transmit Data).

Pin 11 (- Receive Return) is connected to pin 25 (- Transmit Return).

10.1.14 RS-232C (EIA) Wrap Plug

Pin 2 (Transmit Data) is connected to pin 3 (Receive Data).

Pin 4 (Request to Send) is connected to pin 5 (Clear to Send).

Pin 6 (Data Set Ready) is connected to pin 20 (Data Terminal Ready).

PICTURE 43

Figure 47. Wrap Plug Wiring

10.1.15 Scale Connector and Cable

Connector (4683 only)	Line Description	Scale Connector
21-1	Scale Inhibit	Pin 19
21-2	Scale Data 1	Pin 1
21-3	Scale Data 2	Pin 2
21-4	Scale Data 4	Pin 3
21-5	Scale Data 8	Pin 4
21-6	Reserved	Pin 22, 23, 24
21-7	Reserved	Pin 22, 23, 24
21-8	Reserved	Pin 22, 23, 24
21-9	Reserved	Pin 22, 23, 24
21-10	Reserved	Pin 22, 23, 24
21-11	Reserved	Pin 22, 23, 24
21-12	Signal Ground	Pin 22, 23, 24
21-13	Scale clock	Pin 11
21-14	Reserved	Pin 22, 23, 24
21-15	Reserved	Pin 22, 23, 24
21-16	Reserved	Pin 22, 23, 24

PICTURE 44

Figure 48. Scale Cable Wiring

10.1.16 Special Attachment Cable (Remote Alarm and Non-IBM Cash Drawer)

Connector (4683, 4684, 4693)	**Line Description**	**Special Attachment Connector**
-	not used	Pin 1
-	not used	Pin 2
-	not used	Pin 3
-	not used	Pin 4
-	not used	Pin 5
3-1	DC ground	Pin 6
3-2	sensor	Pin 7
3-3	coil	Pin 8
3-4	36 V dc	Pin 9

PICTURE 45

Figure 49. Special Attachment Cable Wiring. Remote Alarm and Non-IBM Cash Drawer

10.1.17 Special Attachment "Y" Cable (1520 Model A02 and Dual-Track MSR)

Connector (4683, 4684, 4693)	**Line Description**	**Special Attachment Connector**
A-1	Reserved	B1-1 and B2-1
A-2	+5 V dc	B1-2 and B2-2
A-3	+5 V dc return	B1-3 and B2-3
A-4	Serial I/O A	B1-4 and B2-4
A-5	Serial I/O B	B1-5 and B2-5
A-6	+5 V dc	B1-6 and B2-6
A-7	+5 V dc return	B1-7 and B2-7
A-8	Reserved	B1-8 and B2-8

PICTURE 46

Figure 50. Special Attachment Cable Wiring. This cable allows the Dual-Track MSR and the 1520 Model A02 to be attached to socket 5B at the same time.

10.1.18 System Unit Printer (Parallel Port) - 4684 and 4693

Pin Number	Signal Name	Pin Number	Signal Name
1	-STROBE	14	-AUTO FEED
2	+Data Bit 0	15	-ERROR
3	+Data Bit 1	16	-Initialize Printer
4	+Data Bit 2	17	-Select Input
5	+Data Bit 3	18	Ground
6	+Data Bit 4	19	Ground
7	+Data Bit 5	20	Ground
8	+Data Bit 6	21	Ground
9	+Data Bit 7	22	Ground
10	-Acknowledge	23	Ground
11	+BUSY	24	Ground
12	+P End (out of paper)	25	Ground
13	+Select	-	-

PICTURE 47

Figure 51. System Unit Printer (Parallel Port) - 4684 and 4693

10.1.19 Serial I/O (Asynchronous) Port - 4693

Table 54. 4693 Serial Port Pinout Assignments

Pin	Signal Name	Signal Direction
1	Data carrier detect	In (to DTE)
2	Receive data	In
3	Transmit data	Out (to DCE)
4	Data terminal ready	Out
5	Signal ground	Common
6	Data set ready	In
7	Request to send	Out
8	Clear to send	In
9	Ring indicator (reserved in 4693 Model 202)	In

PICTURE 48

Figure 52. 4693 Serial I/O (Asynchronous) Port Connector

10.1.20 4693 Serial I/O (Asynchronous) Wrap Plug

PICTURE 49

Figure 53. 4693 Serial I/O (Asynchronous) Wrap Plug

10.1.21 3687 Point of Sale Scanner Model 002 Adapter Connector and Cable

Connector (4683 or 4684)	Line Description	Scanner Connector	Connector (4683 or 4684)	Line Description	Scanner Connector
17-1	+5 V dc	17-16	17-9	Ground	17-8
17-2	+5 V dc return	17-15	17-10	+ 12 V	17-7
17-3	+5 V dc	17-14	17-11	Ground	17-6
17-4	+5 V dc return	17-13	17-12	+ 12 V	17-5
17-5	+5 V dc	17-12	17-13	Ground	17-4
17-6	+5 V dc return	17-11	17-14	+ 12 V	17-3
17-7	Serial I/O A	17-10	17-15	Ground	17-2
17-8	Serial I/O B	17-9	17-16	+ 12 V	17-1

PICTURE 50

Figure 54. 3687 Point-of-Sale Scanner Model 002 Cable Wiring

10.1.22 4696/4697 Point-of-Sale Scanner Connector and Cable

Connector (4683, 4684, 4693)	**Line Description**	**Scanner**
1	+ 12 V dc return	8
2	Serial I/O A	10
3	Serial I/O B	9
4	+ 12 V dc	7

PICTURE 51

Figure 55. 4696/4697 Point-of-Sale Scanner Cable Wiring

10.1.23 Point-of-Sale Printer Model 1, 2, 3, or 4 Connector and Cable

Connector (4683, 4684, 4693)	Line Description	IBM Printer Connector	Connector (4683, 4684, 4693)	Line Description	IBM Printer Connector
7-1	+38 V dc	Pin 16	7-9	Serial I/O A	Pin 8
7-2	+38 V dc return	Pin 15	7-10	Serial I/O B	Pin 7
7-3	+38 V dc	Pin 14	7-11	+5 V dc return	Pin 6
7-4	+38 V dc return	Pin 13	7-12	+5 V dc	Pin 5
7-5	+38 V dc	Pin 12	7-13	+5 V dc return	Pin 4
7-6	+38 V dc return	Pin 11	7-14	+5 V dc	Pin 3
7-7	+38 V dc	Pin 10	7-15	+5 V dc return	Pin 2
7-8	+38 V dc return	Pin 9	7-16	+5 V dc	Pin 1

PICTURE 52

Figure 56. Point-of-Sale Printer Model 1, 2, 3, or 4 Connector and Cable

10.1.24 4680/4690 Store Loop Connector and Cable

Connector (4683 or 4693)	**Line Description**	**Store Loop Connector**
1-1	Receive signal A (black dot)	Pin 4
1-2	Receive signal B (orange dot)	Pin 3
1-3	Transmit signal A (green dot)	Pin 2
1-4	Transmit signal B (red dot)	Pin 1

PICTURE 53

Note: Both connectors autowrap (pin 1 to 3 and pin 2 to 4) when disconnected.

Figure 57. Store Loop Cable Wiring

10.1.25 4683 Video Display (5-inch / Distributed) Connector and Cable

Connector (4683 only)	Line Description	IBM Video Display Connector	Connector (4683 only)	Line Description	IBM Video Display Connector
81-1	Horizontal return	Pin 1	81-14	Horizontal drive	Pin 14
81-2	Vertical return	Pin 2	81-15	Vertical drive	Pin 15
81-3	Dual intensity return	Pin 3	81-16	Dual intensity	Pin 16
81-4	Video return	Pin 4	81-17	Video	Pin 17
81-5	+12 V dc return	Pin 5	81-18	+12 V dc	Pin 18
81-6	+12 V dc return	Pin 6	81-19	+12 V dc	Pin 19
81-7	Sense	Pin 7	81-20	Reserved	Pin 20
81-8	Reserved	Pin 8	81-21	Reserved	Pin 21
81-9	Reserved	Pin 9	81-22	Reserved	Pin 22
81-10	Reserved	Pin 10	81-23	Reserved	Pin 23
81-11	Reserved	Pin 11	81-24	Reserved	Pin 24
81-12	Reserved	Pin 12	81-25	Reserved	Pin 25
81-13	Reserved	Pin 13	-	-	-

PICTURE 54

Figure 58. 5-Inch Video Distributed Display Cable Wiring

10.1.26 4683 Video Display (Except 5-Inch) Connector and Cable

Connector (4683 only)	Line Description	IBM Video Display Connector	Connector (4683 only)	Line Description	IBM Video Display Connector
81-1	Ground	Pin 5	81-14	Horizontal Sync	Pin 13
81-2	Ground	Pin 10	81-15	Vertical Sync	Pin 14
81-3	N/A	N/A	81-16	N/A	N/A
81-4	N/A	N/A	81-17	N/A	N/A
81-5	N/A	N/A	81-18	N/A	N/A
81-6	N/A	N/A	81-19	N/A	N/A
81-7	N/A	N/A	81-20	N/A	N/A
81-8	N/A	N/A	81-21	Red Video	Pin 1
81-9	Red Return	Pin 6	81-22	Blue Video	Pin 3
81-10	Blue Return	Pin 8	81-23	Green Video	Pin 2
81-11	Green Return	Pin 7	81-24	N/A	N/A
81-12	N/A	N/A	81-25	N/A	N/A
81-13	Sense 2	Pin 12	N/A	Sense 1	Pin 11

PICTURE 55

Figure 59. Other Video Display Cable Wiring

10.1.27 4684/4693 9-Inch Video Display Connector and Cable

Connector (4684 or 4693) Position Number	**Video Connector Position Number**	**Signal Name**
1	1	Red Video
6	6	Red Return
3	3	Blue Video
8	8	Blue Return
2	2	Green Video
7	7	Green Return
13	13	Horizontal Sync
14	14	Vertical Sync
11	--	Sense 1
12	12	Sense 2
5	5	Ground
10	10	Ground

PICTURE 56

Figure 60. 4684 9-Inch Video Display Connector and Cable

10.1.28 Point-of-Sale Terminal Connector and Cable

Table 55. Data Cable from 4683 Model 001 to 4683 Model 002 -or- from 4693-202 to 4693-541, 421, or 321		
4683-*xx*1	**Line Description**	**4683-*xx*2**
11-1	Serial I/O A	11-1
11-2	Serial I/O B	11-2
11-3	Serial I/O A	11-3
11-4	Serial I/O B	11-4

The top cable in Figure 61 connects:

- 4683-*xx*1 to 4683-*xx*2
- 4684 to 4683-*xx*2
- 4693-*xx*1 to 4693-*xx*1

The bottom cable in Figure 61 connects:

- 4683, 4684, or 4693 to the loop wiring concentrator
- 4683, 4684, or 4693 to the store loop receptacle.

PICTURE 57

Figure 61. Point-of-Sale Terminal Cable Wiring (4683 and 4693)

10.1.29 Baseband Network Cable Adapter

PICTURE 58

Figure 62. Baseband Network Cable Adapter

10.1.30 Baseband Network Cable and Connectors

Connector A Position	Connector B Position	Signal Name
1	1	- TX
6	6	+TX
9	9	+RX
5	5	- RX

PICTURE 59

Figure 63. Baseband Network Cable and Connectors

10.1.31 Baseband Network Cable and Data Connector

4684 Connector Position	**Data Connector Position**	**Signal Name**
1	Red	- TX
6	Green	+TX
9	Orange	+RX
5	Black	- RX

PICTURE 60

Figure 64. Baseband Network Connector and Cable

10.1.32 PS/2 Cable to Data Connector

Wire Number	Wire Color	Connector RJ11 Position	Data Connector Position	Signal Name
1	Orange	4	Green	+TX
T1	Orange/White	3	Red	-TX
2	Blue	5	Orange	+RX
T2	Blue/White	2	Black	-RX
Drain	-	1	Shield	Ground

PICTURE 61

Figure 65. PS/2 Cable to Data Connector

10.1.33 PS/2 Baseband to 4684 Baseband Connector

Wire Number	Wire Color	Connector RJ11 Position	4684 Connector Position	Signal Name
1	Orange	4	6	+TX
T1	Orange/White	3	1	-TX
2	Blue	5	9	+RX
T2	Blue/White	2	5	-RX
Drain	-	1	Shield	Ground

PICTURE 62

Figure 66. PS/2 Baseband to 4684 Baseband Connector

10.1.34 4684 Baseband Network Wrap Plug

PICTURE 63

Figure 67. 4684 Baseband Network Wrap Plug

10.1.35 4684 Baseband Network Terminator Plug

PICTURE 64

Figure 68. 4684 Baseband Network Terminator Plug

10.1.36 X.25 Interface Co-Processor/2 Cable Wiring

PICTURE 65

Figure 69. X.25 Interface Co-Processor/2 Cable Wiring

10.2 Wiring Diagrams for the 4683 Base Unit Power Supply Connectors

Subtopics

10.2.1 4683 Power Supply Connector P11
10.2.2 4683 Power Supply Connector P12
10.2.3 4683 Power Supply Connector P13
10.2.4 4683 Power Supply Connector P14

10.2.1 4683 Power Supply Connector P11

Power Supply Connector	Line Description	Power Supply Connector	Line Description
P11-1	POR 1	P11-J	+5 V dc aux return
P11-A	POR 1	P11-9	+5 V dc internal return
P11-2	PDI	P11-K	+5 V dc internal
P11-B	PDI	P11-10	+5 V dc external return
P11-3	Save	P11-L	+5 V dc external return
P11-C	Save	P11-11	+5 V dc external
P11-4	Not connected	P11-M	+5 V dc external
P11-D	Battery enable	P11-12	+36 V dc printer return
P11-5	Polarization key	P11-N	+36 V dc printer return
P11-E	Polarization key	P11-13	+36 V dc
P11-6	Dump switch	P11-P	+36 V dc
P11-F	Battery disable	P11-14	+12 V dc return
P11-7	+5 V dc Aux	P11-R	+12 V dc return
P11-H	+5 V dc Aux	P11-15	+12 V dc
P11-8	+5 V dc Aux return	P11-S	+12 V dc

PICTURE 66

Figure 70. Power Supply Connector P11 Wiring. Connector pins are numbered the same on P11, P12, P13, and P14.

10.2.2 4683 Power Supply Connector P12

Power Supply Connector	Line Description	Power Supply Connector	Line Description
P12-1	+36 V dc solenoid return	P12-J	+12 V dc
P12-A	+36 V dc solenoid return	P12-9	-12 V dc
P12-2	+36 V dc solenoid	P12-K	-12 V dc
P12-B	+36 V dc solenoid	P12-10	+5 V dc internal
P12-3	+5 V dc external	P12-L	+5 V dc internal return
P12-C	+5 V dc external	P12-11	-12 V dc return
P12-4	+5 V dc external return	P12-M	+12 V dc return
P12-D	+5 V dc external return	P12-12	Jumper 'B'
P12-5	Polarization key	P12-N	Jumper 'A'
P12-E	Polarization key	P12-13	Jumper 'D'
P12-6	+12 V dc	P12-P	Jumper 'C'
P12-F	+12 V dc	P12-14	Jumper 'F'
P12-7	+12 V dc return	P12-R	Jumper 'E'
P12-H	+12 V dc return	P12-15	Jumper 'H'
P12-8	+12 V dc	P12-S	Jumper 'G'

PICTURE 67

Figure 71. Power Supply Connector P12 Wiring. Connector pins are numbered the same on P11, P12, P13, and P14.

10.2.3 4683 Power Supply Connector P13

Power Supply Connector	Line Description	Power Supply Connector	Line Description
P13-1	+5 V dc internal	P13-J	Reserved
P13-A	+5 V dc internal	P13-9	Reserved
P13-2	+5 V dc internal return	P13-K	Reserved
P13-B	+5 V dc internal return	P13-10	Reserved
P13-3	+12 V dc return	P13-L	Reserved
P13-C	+12 V dc return	P13-11	Address sense
P13-4	+12 V dc	P13-M	Reserved
P13-D	+12 V dc	P13-12	Reserved
P13-5	Polarization key	P13-N	Reserved
P13-E	Polarization key	P13-13	Master POR
P13-6	-12 V dc	P13-P	Master POR
P13-F	-12 V dc	P13-14	Jumper 'C'
P13-7	-12 V dc return	P13-R	Jumper 'D'
P13-H	-12 V dc return	P13-15	Jumper 'A'
P13-8	Reserved	P13-S	Jumper 'B'

PICTURE 68

Figure 72. Power Supply Connector P13 Wiring. Connector pins are numbered the same on P11, P12, P13, and P14.

10.2.4 4683 Power Supply Connector P14

Power Supply Connector	Line Description	Power Supply Connector	Line Description
P14-1	+5 V dc	P14-J	Reserved
P14-A	+5 V dc	P14-9	Reserved
P14-2	+5 V dc return	P14-K	Reserved
P14-B	+5 V dc return	P14-10	Reserved
P14-3	+12 V dc return	P14-L	Reserved
P14-C	+12 V dc return	P14-11	Address sense
P14-4	+12 V dc	P14-M	Reserved
P14-D	+12 V dc	P14-12	Reserved
P14-5	Polarization key	P14-N	Reserved
P14-E	Polarization key	P14-13	Master POR
P14-6	-12 V dc	P14-P	Master POR
P14-F	-12 V dc	P14-14	Jumper 'G'
P14-7	-12 V dc return	P14-R	Jumper 'H'
P14-H	-12 V dc return	P14-15	Jumper 'E'
P14-8	Reserved	P14-S	Jumper 'F'

PICTURE 69

Figure 73. Power Supply Connector P14 Wiring. Connector pins are numbered the same on P11, P12, P13, and P14.

10.3 Wiring Diagrams for the Model 1 or 2 Printer Card Connectors

Use the following figure to locate the connectors on the printer card.

PICTURE 70

Figure 74. Printer Card Connector Wiring. The polarization key is counted as a pin.

Subtopics

10.3.1 Model 1 or 2 Printer Card Connector J1 (Print Head)
10.3.2 Model 1 or 2 Printer Card Connector J2 (Operator Keypad)
10.3.3 Model 1 or 2 Printer Card Connector J3 (Cover Interlock Sensor)
10.3.4 Model 1 or 2 Printer Card Connector J4 (Document Insert Paper Sensor)
10.3.5 Model 1 or 2 Printer Card Connector J5 (Home Sensor)
10.3.6 Model 1 or 2 Printer Card Connector J6 (Capacitor)
10.3.7 Model 1 or 2 Printer Card Connector J7 (I/O Interface Cable)
10.3.8 Model 1 or 2 Printer Card Connector J8 (Journal Emitter Sensor)
10.3.9 Model 1 or 2 Printer Card Connector J9 (Customer Receipt/Document Insert Motor)
10.3.10 Model 1 or 2 Printer Card Connector J10 (Transport Motor)
10.3.11 Model 1 or 2 Printer Card Connector J11 (Journal/Ribbon Motor)
10.3.12 Model 1 or 2 Printer Card Connector J12
10.3.13 Model 1 or 2 Printer Card Connector J13

10.3.1 Model 1 or 2 Printer Card Connector J1 (Print Head)

Printer Card Connector	Line Description	Printer Card Connector	Line Description
J1-1	Print wire 5	J1-7	+36 V dc
J1-2	Print wire 7	J1-8	+36 V dc
J1-3	Print wire 9	J1-9	Print wire 4
J1-4	Print wire 8	J1-10	Print wire 2
J1-5	Print wire 6	J1-11	Print wire 1
J1-6	+36 V dc	J1-12	Print wire 3

10.3.2 Model 1 or 2 Printer Card Connector J2 (Operator Keypad)

J2 Printer Card Connector	**J2 Line Description**
J2-1	Customer receipt paper advance
J2-2	Journal paper advance
J2-3	+5 V dc return
J2-4	Document insert open/close
J2-5	Test

10.3.3 Model 1 or 2 Printer Card Connector J3 (Cover Interlock Sensor)

Printer Card Connector	Line Description	Sensor Cable Wire
J3-1	+5 V dc return	Black
J3-2	+5 V dc	Blue
J3-3	Sensor	Green
J3-4	Sensor	White
J3-5	Polarization key	No wire
J3-6	+5 V dc return	Black

10.3.4 Model 1 or 2 Printer Card Connector J4 (Document Insert Paper Sensor)

Printer Card Connector	**Line Description**	**Sensor Cable Wire**
J4-1	+5 V dc return	Black
J4-2	Polarization key	No wire
J4-3	+5 V dc	Blue
J4-4	Sensor	Green
J4-5	Sensor	White
J4-6	+5 V dc return	Black

10.3.5 Model 1 or 2 Printer Card Connector J5 (Home Sensor)

Printer Card Connector	**Line Description**	**Sensor Cable Wire**
J5-1	+5 V dc return	Black
J5-2	+5 V dc	Blue
J5-3	Polarization key	No wire
J5-4	Sensor	Green
J5-5	Sensor	White
J5-6	+5 V dc return	Black

10.3.6 Model 1 or 2 Printer Card Connector J6 (Capacitor)

Printer Card Connector	**Line Description**
J6-1	+36 V dc
J6-2	+36 V dc return
J6-3	Polarization key

10.3.7 Model 1 or 2 Printer Card Connector J7 (I/O Interface Cable)

Printer Card Connector	Line Description	Printer Card Connector	Line Description
J7-1	+5 V dc	J7-9	+36 V dc return
J7-2	+5 V dc return	J7-10	+36 V dc
J7-3	+5 V dc	J7-11	+36 V dc return
J7-4	+5 V dc return	J7-12	+36 V dc
J7-5	+5 V dc	J7-13	+36 V dc return
J7-6	+5 V dc return	J7-14	+36 V dc
J7-7	Serial I/O B	J7-15	+ 36 V dc return
J7-8	Serial I/O A	J7-16	+36 V dc

10.3.8 Model 1 or 2 Printer Card Connector J8 (Journal Emitter Sensor)

Printer Card Connector	**Line Description**	**Sensor Cable Wire**
J8-1	+5 V dc return	Black
J8-2	+5 V dc	Blue
J8-3	Sensor	Green
J8-4	Polarization key	No wire
J8-5	Sensor	White
J8-6	+5 V dc return	Black

10.3.9 Model 1 or 2 Printer Card Connector J9 (Customer Receipt/Document Insert Motor)

Printer Card Connector	**Line Description**	**Motor Cable Wire**
J9-1	+36 V dc	Green
J9-2	+36 V dc	Red
J9-3	Motor	Orange
J9-4	Polarization key	No wire
J9-5	Motor	Brown
J9-6	Motor	Yellow
J9-7	Motor	Black

10.3.10 Model 1 or 2 Printer Card Connector J10 (Transport Motor)

Printer Card Connector	**Line Description**	**Motor Cable Wire**
J10-1	Motor	Black
J10-2	Motor	White
J10-3	Motor	Red
J10-4	Motor	Green
J10-5	Polarization key	No wire
J10-6	Motor	Red/White
J10-7	Motor	Green/White

10.3.11 Model 1 or 2 Printer Card Connector J11 (Journal/Ribbon Motor)

Printer Card Connector	Line Description	Motor Cable Wire	Printer Card Connector	Line Description	Motor Cable Wire
J11-1	+36 V dc	Green	J11-5	Motor	Brown
J11-2	+36 V dc	Red	J11-6	Motor	Yellow
J11-3	Polarization key	No wire	J11-7	Motor	Black
J11-4	Motor	Orange	-	-	-

10.3.12 Model 1 or 2 Printer Card Connector J12

Printer Card Connector	**Line Description**
J12-1	Polarization key
J12-2	+36 V dc
J12-3	Signal

10.3.13 Model 1 or 2 Printer Card Connector J13

Printer Card Connector	**Line Description**	**Cable Wire**
J13-1	+5 V dc return	Black
J13-2	+5 V dc	Blue
J13-3	Sensor	Green
J13-4	Sensor	White
J13-5	+5 V dc return	Black
J13-6	Polarization key	No wire

10.4 Wiring Diagrams for the Model 3 or 4 Printer Card Connectors

Subtopics

10.4.1 Model 3 or 4 Printer Card Connector J1 (I/O Interface Cable)
10.4.2 Model 3 or 4 Printer Card Connector J2 (Signals to Extension Card)
10.4.3 Model 3 or 4 Printer Card Connector J3 (Document Insert Motor)
10.4.4 Model 3 or 4 Printer Card Connector J4 (Print Head Transport Motor)
10.4.5 Model 3 or 4 Printer Card Connector J5 (Print Head)
10.4.6 Model 3 or 4 Printer Card Connector J6 (Print Head Home Sensor)
10.4.7 Model 3 or 4 Printer Card Connector J7 (Cover Interlock Sensor)
10.4.8 Model 3 or 4 Printer Card Connector J8 (Top Buttons)
10.4.9 Model 3 or 4 Printer Card Connector J9 (Front Buttons)
10.4.10 Model 3 or 4 Printer Card Connector J10 (Capacitor)
10.4.11 Model 3 or 4 Printer Extension Card Connector J101 (Paper Cutter Motor)
10.4.12 Model 3 or 4 Printer Extension Card Connector J102 (CR Motor)
10.4.13 Model 3 or 4 Printer Extension Card Connector J103 (Signals to Printer Card)
10.4.14 Model 3 or 4 Printer Extension Card Connector J106 (JNL Motion Sensor)
10.4.15 Model 3 or 4 Printer Extension Card Connector J107 (JNL Motor)
10.4.16 Model 3 or 4 Printer Extension Card Connector J108 (DI Front Sensor)
10.4.17 Model 3 or 4 Card Connector J109 (DI Top Sensor)

10.4.1 Model 3 or 4 Printer Card Connector J1 (I/O Interface Cable)

Printer Card Connector	Line Description	Printer Card Connector	Line Description
J1-1	+5 V dc	J1-9	+36 V dc return
J1-2	+5 V dc return	J1-10	+36 V dc
J1-3	+5 V dc	J1-11	+36 V dc return
J1-4	+5 V dc return	J1-12	+36 V dc
J1-5	+5 V dc	J1-13	+36 V dc return
J1-6	+5 V dc return	J1-14	+36 V dc
J1-7	Serial I/O B	J1-15	+36 V dc return
J1-8	Serial I/O A	J1-16	+36 V dc

PICTURE 71

Figure 75. Printer Card Connector Wiring. The polarization key is counted as a pin.

10.4.2 Model 3 or 4 Printer Card Connector J2 (Signals to Extension Card)

Printer Card Connector	Line Description	Printer Card Connector	Line Description
J2-1	+36 V dc to JNL and CR motor	J2-13	Journal motor signal
J2-2	+36 V dc to cutter motor	J2-14	Journal motor signal
J2-3	Cutter motor signal	J2-15	Polarization key
J2-4	Cutter motor signal	J2-16	unused
J2-5	Cutter motor signal	J2-17	+5 V dc
J2-6	Cutter motor signal	J2-18	+5 V dc return
J2-7	CR motor signal	J2-19	+ CR low sensor
J2-8	CR motor signal	J2-20	Polarization key
J2-9	CR motor signal	J2-21	Journal low sensor
J2-10	CR motor signal	J2-22	Journal motion sensor
J2-11	Journal motor signal	J2-23	DI top sensor
J2-12	Journal motor signal	J2-24	DI front sensor

10.4.3 Model 3 or 4 Printer Card Connector J3 (Document Insert Motor)

Printer Card Connector	**Line Description**	**Motor Cable Wire**
J3-1	+36 V dc	Black
J3-2	+36 V dc	Green
J3-3	Polarization key	No wire
J3-4	Motor	Brown
J3-5	Motor	Red
J3-6	Motor	Orange
J3-7	Motor	Yellow

10.4.4 Model 3 or 4 Printer Card Connector J4 (Print Head Transport Motor)

Printer Card Connector	**Line Description**	**Motor Cable Wire**
J4-1	+36 V dc	Black
J4-2	+36 V dc	White
J4-3	Motor	Red
J4-4	Motor	Green
J4-5	Polarization key	No wire
J4-6	Motor	Red/White
J4-7	Motor	Green/White

10.4.5 Model 3 or 4 Printer Card Connector J5 (Print Head)

Printer Card Connector	Line Description	Printer Card Connector	Line Description
J5-1	Print wire 3	J5-7	+36 V dc
J5-2	Print wire 7	J5-8	Print wire 9
J5-3	Print wire 1	J5-9	Print wire 4
J5-4	Print wire 5	J5-10	Print wire 8
J5-5	+36 V dc	J5-11	Print wire 6
J5-6	+36 V dc	J5-12	Print wire 2

10.4.6 Model 3 or 4 Printer Card Connector J6 (Print Head Home Sensor)

Printer Card Connector	**Line Description**	**Sensor Cable Wire**
J6-1	Left home sensor	Red
J6-2	+5 V dc return	Yellow
J6-3	+5 V dc	Blue
J6-4	Polarization key	No wire
J6-5	Center home sensor	Black

10.4.7 Model 3 or 4 Printer Card Connector J7 (Cover Interlock Sensor)

Printer Card Connector	**Line Description**	**Sensor Cable Wire**
J7-1	+5 V dc return	Black
J7-2	+5 V dc	Blue
J7-3	Sensor to card	Green
J7-4	Polarization key	No wire
J7-5	Sensor from card	White
J7-6	+5 V dc return	Brown

10.4.8 Model 3 or 4 Printer Card Connector J8 (Top Buttons)

J8 Printer Card Connector	**J8 Line Description**
J8-1	Customer receipt paper advance
J8-2	+5 V dc return
J8-3	Journal paper advance

10.4.9 Model 3 or 4 Printer Card Connector J9 (Front Buttons)

J9 Printer Card Connector	**J9 Line Description**
J9-1	Document insert reverse advance
J9-2	Document insert forward advance
J9-3	Document insert ready button
J9-4	+5 V dc return
J9-5	Turn on printer indicator light
J9-6	+5 V dc

10.4.10 Model 3 or 4 Printer Card Connector J10 (Capacitor)

Printer Card Connector	**Line Description**
J10-1	+36 V dc return
J10-2	+36 V dc
J10-3	Polarization key
J10-4	Blank

10.4.11 Model 3 or 4 Printer Extension Card Connector J101 (Paper Cutter Motor)

Printer Card Connector	**Line Description**	**Motor Cable Wire**
J101-1	+36 V dc	Black
J101-2	Polarization key	No wire
J101-3	+36 V dc	Green
J101-4	Motor	Brown
J101-5	Motor	Red
J101-6	Motor	Orange
J101-7	Motor	Yellow

PICTURE 72

Figure 76. Printer Extension Card Connector Wiring. The polarization key is counted as a pin.

Note: Printer extension card connectors J104 and J105 are reserved.

10.4.12 Model 3 or 4 Printer Extension Card Connector J102 (CR Motor)

Printer Card Connector	**Line Description**	**Motor Cable Wire**
J102-1	+36 V dc	Black
J102-2	+36 V dc	Green
J102-3	Polarization key	No wire
J102-4	Motor	Brown
J102-5	Motor	Red
J102-6	Motor	Orange
J102-7	Motor	Yellow

10.4.13 Model 3 or 4 Printer Extension Card Connector J103 (Signals to Printer Card)

Printer Card Connector	Line Description	Printer Card Connector	Line Description
J103-1	+36 V dc to JNL and CR motor	J103-12	Journal motor signal
J103-2	+36 V dc to cutter motor	J103-13	Journal motor signal
J103-3	Cutter motor signal	J103-14	Journal motor signal
J103-4	Cutter motor signal	J103-15	Polarization key
J103-5	Cutter motor signal	J103-16	unused
J103-6	Cutter motor signal	J103-17	+5 V dc
J103-7	CR motor signal	J103-18	+5 V dc return
J103-8	CR motor signal	J103-19	CR low sensor
J103-9	CR motor signal	J103-20	Polarization key
J103-10	CR motor signal	J103-21	Journal low sensor
J103-11	Journal motor signal	J103-22	Journal motion sensor
J103-12	Journal motor signal	J103-23	DI top sensor
J103-13	Journal motor signal	J103-24	DI front sensor

10.4.14 Model 3 or 4 Printer Extension Card Connector J106 (JNL Motion Sensor)

Printer Card Connector	**Line Description**	**Sensor Cable Wire**
J106-1	+5 V dc return	Black
J106-2	+5 V dc	Blue
J106-3	Sensor output	Green
J106-4	Polarization key	No wire
J106-5	Sensor input	White
J106-6	+5 V dc return	Brown

10.4.15 Model 3 or 4 Printer Extension Card Connector J107 (JNL Motor)

Printer Card Connector	**Line Description**	**Motor Cable Wire**
J107-1	+36 V dc	Black
J107-2	+36 V dc	Green
J107-3	Polarization key	No wire
J107-4	Motor	Brown
J107-5	Motor	Red
J107-6	Motor	Orange
J107-7	Motor	Yellow

10.4.16 Model 3 or 4 Printer Extension Card Connector J108 (DI Front Sensor)

Printer Card Connector	**Line Description**
J108-1	+5 V dc return
J108-2	Signal to card
J108-3	Polarization key
J108-4	+5 V dc

10.4.17 Model 3 or 4 Card Connector J109 (DI Top Sensor)

Printer Card Connector	**Line Description**
J109-1	+5 V dc
J107-2	Polarization key
J107-3	Signal to card
J107-4	+5 V dc return

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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¦ **A** ¦
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access method. A software component in a processor for controlling the flow of information through a network.

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.

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.

ADCS. Advanced Data Communications for Stores

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 link. 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.

address space. The complete range of addresses that is available to a programmer.

addressing. (1) The assignment of addresses to the instructions of a program. (2) In data communication, the way in which a station selects the station to which it is to send data.

ADF. adapter description file

administrative operations. Store operations other than direct selling; usually performed by supervisors and managers.

Advanced Data Communications for Stores (ADCS). An IBM-licensed product that functions at the host processor to permit host-to-store communication.

alert. (1) An error message sent to the system services control point (SSCP) at the host system. (2) For IBM LAN management products, a notification indicating a possible security violation, a persistent error condition, or an interruption or potential interruption in the flow of data around the network. See also *network management vector transport*. (3) In SNA, a record sent to a system problem management focal point to communicate the existence of an alert condition. (4) In the NetView program, a high-priority event that warrants immediate attention. This data base record is generated for certain event types that are designed by user-constructed filters.

all points addressable (APA). In computer graphics, pertaining to the ability to address and display or not display each picture element (pel) on a display surface.

alphanumeric. Pertaining to a character set containing letters, digits, and other characters, such as punctuation marks.

alphanumeric point-of-sale (ANPOS) 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.

alternate adapter. In a personal computer that is used on a LAN and that supports installation of two network adapters, the adapter that uses alternate (not standard or default) mapping between adapter-shared RAM, adapter ROM, and designated computer memory segments. The alternate adapter is usually designated as adapter 1 in configuration parameters. Contrast with *primary adapter*.

alternate file server. A store controller that maintains image versions of all non-system mirrored files and that can assume control if the configured file server becomes disabled.

alternate master store controller. The store controller that can take control of the LAN if the configured master store controller becomes disabled. It maintains image versions of both system mirrored and system compound files.

American National Standard Code for Information Interchange (ASCII). The standard code, using a coded character set consisting of 7-bit coded characters (8 bits including parity check), used for information interchange among data processing systems, data communication systems, and associated equipment. The ASCII set consists of control characters and graphics characters.

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. Alphanumeric point-of-sale keyboard.

ANSI. American National Standards Institute.

APA. all points addressable.

APAR. Authorized program analysis report.

API. Application program interface.

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 used to connect and communicate with stations in a network, enabling users to perform application-oriented activities.

application program interface (API). The formally defined programming language interface that is between an IBM system control program or a licensed program and the user of the program.

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)*.

ARTIC adapter. A family of communications coprocessor adapters that, with appropriate electrical interfaces, can support a wide range of communication devices. For the IBM Store System, an ARTIC adapter provides communications support for ASYNC, BSC, SDLC, and X.25 communications.

ASCII. American National Standard Code for Information Interchange.

assembler. Computer program that translates assembly language statements into machine code.

async. asynchronous.

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) Without regular time relationship; unexpected or unpredictable with respect to the execution of program instructions. (3) 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. Compare with *connect*.

attaching device. Any device that is physically connected to a network and can communicate over the network.

authorized program analysis report (APAR). A report of a problem caused by a suspected defect in a current unaltered release of a program.

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background. On a color display, the part of the display screen that surrounds a character.

background application. A non-interactive program that can be selected from the background application screen or can start automatically when the system is IPLed.

backup. Pertaining to a system, device, file, or facility that can be used in the event of a malfunction or the loss of data.

backup copy. A copy, usually of a program or of a library member, that is kept in case the original or the working copy is unintentionally altered or destroyed.

backup diskette. A diskette that contains information copied from another diskette. It is used in case the original information is unintentionally altered or destroyed.

bar code. A code representing characters by sets of parallel bars of varying thickness and separation that are read optically by transverse scanning.

base address. A numeric value that is used as a reference in the calculation of addresses in the execution of a computer program, to or through which, the input/output devices are connected.

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.

baseband LAN. A LAN in which information is encoded, multiplexed, and transmitted without modulation of a carrier.

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.

Basic Input/Output System (BIOS). In IBM Personal Computers with PC I/O channel architecture, microcode that controls basic hardware operations such as interactions with diskette drives, fixed disk drives, and the keyboard.

baud. The rate at which signal conditions are transmitted per second. Contrast with *bits per second (bps)*.

BCD. Binary-coded decimal notation.

beacon. (1) A frame sent by an adapter on a ring network indicating a serious ring problem, such as a broken cable. It contains the addresses of the beaconing station and its nearest active upstream neighbor (NAUN). (2) To send beacon frames continuously. An adapter is *beaconing* if it is sending such a frame.

beaconing. An error-indicating function of token-ring adapters that assists in locating a problem causing a hard error on a token-ring network.

beaconing terminal. A terminal that is not receiving the normal signal from the store loop. Therefore, it transmits a "beacon" message.

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-coded decimal notation (BCD). A binary-coded notation in which each of the decimal digits is represented by a binary numeral. For example, in binary-coded decimal notation that uses the weights 8, 4, 2, 1, the number "twenty three" is represented by 0010 0011. In the pure binary numeration system, its representation is 10111.

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)*.

BIOS. Basic Input/Output System.

bit. Either of the binary digits: a 0 or 1.

bits per second (bps). The rate at which bits are transmitted per second. Contrast with *baud*.

bootstrap. (1) A sequence of instructions whose execution causes additional instructions to be loaded and executed until the complete computer program is in storage. (2) A technique or device designed to bring itself into a desired state by means of its own action. For example, a machine routine whose first few instructions are sufficient to bring the rest of itself into the computer from an input device.

bps. Bits per second.

Bps. Bytes per second.

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*.

broadcast. Simultaneous transmission of data to more than one destination.

BSC. Binary synchronous communication.

buffer. (1) A portion of storage used to hold input or output data temporarily. (2) A routine or storage used to compensate for a difference in data rate or time of occurrence of events, when transferring data from one device to another.

bus. (1) In a processor, a physical facility on which data is transferred to all destinations, but from which only addressed destinations may read in accordance with appropriate conventions. (2) A network configuration in which nodes are interconnected through a bidirectional transmission medium. (3) One or more conductors used for transmitting signals or power.

byte. (1) A string that consists of a number of bits, treated as a unit, and representing a character. (2) A binary character operated upon as a unit and usually shorter than a computer word. (3) A string that consists of a particular number of bits, usually 8, that is treated as a unit, and that represents a character. (4) A group of 8 adjacent binary digits that represent one extended binary-coded decimal interchange code (EBCDIC). See *n-bit byte*.

C. A high-level programming language designed to optimize run time, size, and efficiency.

CMOS. Complementary metal-oxide semiconductor.

complementary metal-oxide semiconductor (CMOS). A technology that combines the electrical properties of n-type semiconductors and p-type semiconductors. **Note:** The positive and negative voltage requirements and n-type semiconductors complement each other. A low-power input pulse to a gate of a CMOS device turns one semiconductor on and the other off. There is no current flow except for capacitance charging and discharging and for switching operations. CMOS devices therefore use considerably less power than other types of semiconductor devices. They are ideal for use in microcomputers and battery-powered devices such as calculators and portable computers.

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*.

call. The action of bringing a function or subprogram into effect, usually by specifying the entry conditions and jumping to an entry point.

carrier. A wave or pulse train that may be varied by a signal bearing information to be transmitted over a communication system.

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*.

CD. Corrective diskette.

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.

channel. (1) A functional unit, controlled by a host computer, that handles the transfer of data between processor storage and local peripheral equipment. (2) A path along which signals can be sent. (3) The portion of a storage medium that is accessible to a given reading or writing station.

channel-attached. (1) Pertaining to the connection of devices directly by data channels (I/O channels) to a computer. (2) Pertaining to devices connected to a controlling unit by cables rather than by telecommunication lines.

charge. A sales transaction in which a customer has the partial or total value of purchased merchandise added to an account for later payment.

checkpoint. A point at which information about the status of a job and the system can be recorded so that the job step can be restarted later.

checksum. (1) The sum of a group of data associated with the group and used for checking purposes. (2) On a diskette, data written in a sector for error-detection purposes. A calculated checksum that does not match the checksum of data written in the sector indicates a bad sector. **Note:** The data is either numeric or other character strings regarded as numeric for the purpose of calculating the checksum. See also *module integrity value*.

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.

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).

communication channel. A path for transmitting information from one location to another.

compile. (1) To translate all or part of a program expressed in a high-level language into a computer program expressed in an intermediate language, an assembly language, or a machine language. (2) To prepare a machine language program from a computer program written in another programming language by making use of the overall logic structure of the program, or generating more than one computer instruction for each symbolic statement, or both, as well as performing the function of an assembler. (3) To translate a source program into an executable program (an object program). (4) To translate a program written in a high-level programming language into a machine language program.

compiler. A program that decodes instructions written as pseudo codes and produces a machine language program to be executed at a later time. Contrast with *interpretive routine*. Synonymous with *compiling program*.

compiling program. Synonym for compiler.

component. (1) Any part of a network other than an attaching device, such as an IBM 8228 Multistation Access Unit. (2) Hardware or software that is part of a functional unit.

compound files. Files that are kept on the master store controller, the alternate master store controller, and all other eligible store controllers.

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). See also *access unit* and *wiring concentrator*.

configuration. 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. See also *system configuration*.

configuration file. The collective set of definitions that describes a configuration.

connect. In a LAN, to physically join a cable from a station to an access unit or network connection point. Contrast with *attach*.

contention. In a LAN, a situation in which two or more data stations are allowed by the protocol to start transmitting concurrently and thus risk collision.

control character. A character whose occurrence in a particular context initiates, modifies, or stops a control operation. A control character may be recorded for use in a subsequent action, and it may have a graphic representation in some circumstances.

controller. A unit that controls input/output operations for one or more devices.

conversation partner. One of the two programs involved in a conversation.

conversation state. The condition of a conversation that reflects what the past action on that conversation has been and that determines what the next set of actions may be.

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.

corrective diskette (CD). A set of diskettes that contain modules to replace the modules in the active program subdirectory. The first diskette of the set must contain a product control file that describes which product the modules are to be applied to and a list of all modules that are to be replaced.

coupler. A device that connects a modem to a telephone network. See also *acoustic coupler*.

cps. Characters per second. Used to measure the printing speed of a printer.

CRC. Cyclic redundancy check.

credit authorization. The process of accepting or rejecting a request for credit approval.

cursor. A movable point of light (or a short line) that indicates where the next character is to be entered on the display screen.

customer receipt. An itemized list of merchandise purchased and paid for by the customer.

cyclic redundancy check (CRC). Synonym for *frame check sequence (FCS)*.

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DASD. Direct-access storage device.

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 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 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 integrity. (1) The condition that exists as long as accidental or intentional destruction, alteration, or loss of data does not occur. (2) Preservation of data for its intended use.

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 link. (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 rate. See *data transfer rate, line data rate*.

data set. Logically related records treated as a single unit. See also *file*.

data structure. The syntactic structure of symbolic expressions and their storage allocation characteristics.

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 transfer. (1) The result of the transmission of data signals from any data source to a data receiver. (2) The movement, or copying, of data from one location and the storage of the data at another location.

data transfer rate. The average number of bits, characters, or blocks per unit of time passing between equipment in a data-transmission session. The rate is expressed in bits, characters, or blocks per second, minute, or hour.

DBCS. Double-byte character set.

DCE. Data circuit-terminating equipment.

deactivation. The process of taking any element out of service, rendering it inoperative, or placing it in a state in which it cannot perform the functions for which it was designed.

debug. To detect, diagnose, and eliminate errors in computer programs.

default. Pertaining to an attribute, value, or option that is assumed when none is explicitly specified.

delimiter. (1) A character used to indicate the beginning or end of a character string. (2) A bit pattern that defines the beginning or end of a frame or token on a LAN.

destination. Any point or location, such as a node, station, or particular terminal, to which information is to be sent.

destination address. A field in the medium access control (MAC) frame that identifies the physical location to which information is to be sent. Contrast with *source address*.

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*.

device address. (1) The first subchannel address recognized by a channel-attached device. (2) In data communication, the identification of any device to which data can be sent or from which data can be received.

device channel. In IBM Point-of-Sale terminals, a path along which signals for serial input/output devices can be sent. For these terminals, the device channel controller or adapter is contained on the system board.

diagnostic diskette. A diskette containing diagnostic modules or tests used by computer users and service personnel to diagnose hardware problems.

diagnostics. Modules or tests used by computer users and service personnel to diagnose hardware problems.

digital. (1) Pertaining to data in the form of digits. Contrast with *analog*. (2) Pertaining to data consisting of numerical values or discrete units.

direct-access storage device (DASD). A device in which access time is effectively independent of the location of the data.

direct memory access (DMA). A procedure or method designed to transfer data between main storage and I/O units without intervention of the processing unit.

directory. (1) A table of identifiers and references that correspond to items of data. (2) An index that a control program uses to locate one or more blocks of data that are stored in separate areas of a data set in direct access storage.

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 stores information for processing.

diskette drive. The mechanism used to seek, read, and write data on diskettes.

Disk Operating System (DOS). 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.

DMA. Direct memory access

DOS. Disk Operating System.

double-byte character set (DBCS). A set of characters in which each character is represented by 2 bytes. Languages such as Japanese, Chinese, and Korean, which contain more symbols than can be represented by 256 code points, require double-byte character sets. Because each character requires 2 bytes, the typing, display, and printing of DBCS characters requires hardware and programs that support DBCS. Contrast with single-byte character set.

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*.

driver. Software component that controls a device.

DSX. Distributed Systems Executive.

DTE. Data terminal equipment.

dump. (1) To write at a particular instant the contents of storage, or part of storage, onto another data medium for the purpose of safeguarding or debugging the data. (2) Data that has been dumped.

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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.

element. (1) In a set, an object, entity, or concept having the properties that define a set. (2) A parameter value in a list of parameter values.

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.

enabled. (1) On a LAN, pertaining to an adapter or device that is active, operational, and able to receive frames from the network. (2) Pertaining to a state of a processing unit that allows the occurrence of certain types of interruptions. (3) Pertaining to the state in which a transmission control unit or an audio response unit can accept incoming calls on a line.

end user. The ultimate source or destination of data flowing through an SNA network. An end user can be an application program or a workstation operator.

error condition. The condition that results from an attempt to use instructions or data that are not valid.

error message. A message that is issued because an error has been detected.

Ethernet network. A baseband LAN with a bus topology in which messages are broadcast on a coaxial cable using a carrier sense multiple access/collision detection (CSMA/CD) transmission method.

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.

exception. An abnormal condition such as an I/O error encountered in processing a data set or a file. See also *overflow exception* and *underflow exception*.

execution. The process of carrying out an instruction or instructions of a computer program by a computer.

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 slot. In an IBM Personal Computer, one of several receptacles in the system board of the system unit or expansion unit into which a user can install an expansion board such as a memory expansion option.

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fault. An accidental condition that causes a functional unit to fail to perform its required function.

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 file* and *data set*.

file allocation table (FAT). A table used by the operating system to allocate space on a disk for a file and to locate and chain together parts of the file that may be scattered on different sectors so that the file can be used in a random or sequential manner.

file server. (1) A store controller that maintains prime versions of all non-system mirrored files. (2) A high-capacity disk storage device or a computer that each computer on a network can access to retrieve files that can be shared among the attached computers.

file type. The attribute of a file that specifies to which store controllers it is distributed.

fixed disk (drive). In a personal computer system unit, a disk storage device that reads and writes on rigid magnetic disks. It is faster and has a larger storage capacity than a diskette and is permanently installed.

flag. A character or indicator that signals the occurrence of some condition, such as the setting of a switch, or the end of a word.

formatted diskette. A diskette on which track and sector control information has been written and that can be used by the computer to store data. **Note:** A diskette must be formatted before it can receive data.

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.

frame check sequence (FCS). (1) A system of error checking performed at both the sending and receiving station after a block-check character has been accumulated. (2) A numeric value derived from the bits in a message that checks for any bit errors in transmission. (3) A redundancy check in which the check key is generated by a cyclic algorithm. Synonymous with *cyclic redundancy check (CRC)*.

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.

function key. A key on a terminal, such as an ENTER key, that causes the transmission of a signal not associated with a character that can be printed or displayed. Detection of the signal usually causes the system to perform some predefined action for the operator or determined by the application program.

G

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.

group address. In a LAN, a locally administered address assigned to two or more adapters to allow the adapters to copy the same frame. Contrast *locally administered address* with *universally administered address*.

H

hardware. Physical equipment as opposed to programs, procedures, rules,

and associated documentation.

HCP. Host command processor.

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 command processor (HCP). The SNA logical unit of the programmable Store System store controller.

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) A processor that controls all or part of a user application network. (2) In a network, the processing unit in which resides the access method for the network. (3) In an SNA network, the processing unit that contains a system services control point (SSCP). (4) A processing unit that executes the access method for attached communication controllers. (5) The processing unit required to create and maintain PSS. (6) Synonymous with host computer.

Hz. See *hertz*.

I

IBM Disk Operating System (DOS). A disk operating system based on MS-DOS (*)

identifier. String of characters used to name elements of a program, such as variable names, reserved words, and user-defined function names.

IML. Initial machine load.

IML image. Initial machine load image.

impedance. The combined effect of resistance, inductance, and capacitance on a signal at a particular frequency.

inactive. (1) Not operational. (2) Pertaining to a node or device not connected or not available for connection to another node or device. (3) In the IBM Token-Ring Network, pertaining to a station that is only repeating frames or tokens, or both.

information (I) frame. A frame in I format used for numbered information transfer. See also *supervisory frame, unnumbered frame.*

initialize. In a LAN, to prepare the adapter (and adapter support code, if used) for use by an application program.

initial machine load (IML). (1) A procedure that prepares a device for use. (2) In PSS: (a) an initialization procedure that prepares the store controller or the terminal for operation, (b) a portion of the data representing the operational environment loaded into the active storage of the store controller to control its operations, and (c) the procedure for starting the subsystem store controller with a particular supervisor configuration.

initial program load (IPL). The initialization procedure that causes an operating system to begin operation.

input device. Synonym for *input unit*.

input/output device. See *I/O device*.

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.

input sequence table. Defines all input data that is expected by the application from the keyboard, OCR device, point-of-sale scanner, and wand on the IBM point-of-sale terminal. The table allows the terminal I/O

processor to recognize operator input and organize it into a form the application expects.

input unit. A device in a data processing system by means of which data can be entered into the system. Synonymous with *input device*.

insert. To make an attaching device an active part of a LAN.

instruction. In a programming language, a meaningful expression that specifies one operation and identifies its operands, if any.

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*.

Integrated services digital network (ISDN). A digital end-to-end telecommunications network that supports multiple services including, but not limited to, voice and data.

interaction. A basic unit used to record system activity, consisting of the acceptance of a line of terminal input, processing of the line, and a response, if any.

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.

interpretive routine. A routine that decodes instructions written as pseudocodes and immediately executes the instructions. Contrast with *compile*.

interrupt. (1) A suspension of a process, such as execution of a computer program, caused by an external event and performed in such a way that the process can be resumed. (2) To stop a process in such a way that it can be resumed. (3) In data communication, to take an action at a receiving station that causes the sending station to end a transmission. (4) A means of passing processing control from one software or microcode module or routine to another, or of requesting a particular software, microcode, or hardware function.

interrupt level. The means of identifying the source of an interrupt, the function requested by an interrupt, or the code or feature that provides a function or service.

I/O. Input/output.

I/O device. Equipment for entering and receiving data from the system.

I/O processor. Equipment that receives data from, processes data, and sends data to one or more I/O devices.

IPL. Initial program load.

ISDN. Integrated services digital network.

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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jumper. A connector between two pins on a network adapter that enables or disables an adapter option, feature, or parameter value.

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K. When referring to storage capacity, a symbol that represents two to the tenth power, or 1024.

Kb. Kilobit.

KB. Kilobyte.

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.

keyed file. Type of file composed of keyed records. Each keyed record has two parts: a key and data. A key identifies and accesses each record in the file.

kilobit (Kb). One thousand binary digits.

kilobyte (KB). 1024 bytes for processor and data storage (memory) size; otherwise, 1000 bytes.

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label. Constant, either numeric or literal, that references a statement or function.

LAN. Local area network.

LAN adapter. The circuit card within a communicating device (such as a personal computer) that, together with its associated software, enables the device to be attached to a LAN.

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 by bridges. (2) An entire ring or bus network without bridges. See *cable segment, ring segment*.

latency. The time interval between the instant at which an instruction control unit initiates a call for data and the instant at which the actual transfer of data begins. Synonymous with *waiting time*. See also *ring latency*.

LED. Light-emitting diode.

light-emitting diode (LED). A semiconductor chip that gives off visible or infrared light when activated.

line. On a terminal, one or more characters entered before a return to the first printing or display position.

line data rate. The rate of data transmission over a telecommunications link.

link. (1) In the IBM 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 Store System, the logical link providing two-way communication of data from one network node to one or more other network nodes.

listing. A printout, usually prepared by a language translator, that

lists the source code.

load. In computer programming, to enter data into memory or working registers.

load image. An image, ready for transmission to a communication controller, that contains multiple images; for example, a combination of a configuration image with on or more application program images, or a combination of configuration image with one or more customized images.

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.

locally administered address. An adapter address that the user can assign to override the universally administered address. Contrast with *universally administered address*.

logging. The chronological recording of events occurring in a system or a subsystem for accounting or data collection purposes.

logical unit (LU). (1) In SNA, a port through which an end user accesses the SNA network in order to communicate with another end user and through which the end user accesses the functions provided by system services control points (SSCPs). An LU can support at least two sessions, one with an SSCP and one with another LU, and may be capable of supporting many sessions with other logical units. (2) A type of network addressable unit that enables end users to communicate with each other and gain access to network resources.

logon (n). 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*.

log on (v). (1) To initiate a session. (2) In SNA products, to initiate a session between an application program and a logical unit (LU). Synonymous with *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.

machine language. A language that is used directly by a machine.

macro. An instruction that causes the execution of a predefined sequence of instructions in the same source language.

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.

maintenance analysis procedure (MAP). Deprecated term for *procedure*. See *procedure*.

Manufacturing Automated Protocol (MAP). A broadband LAN with a bus topology that passes tokens from adapter to adapter on a coaxial cable.

MAP. (1) Maintenance analysis procedure. (2) Manufacturing Automated Protocol.

master store controller. The store controller that maintains prime versions of system mirrored files and all compound files.

master terminal. (1) An IBM point-of-sale terminal that controls a

satellite IBM point-of-sale terminal. (2) An IBM point-of-sale terminal that keeps the terminal program load (TPL) so it can load the other terminals on the store loop.

Mb. Megabit.

MB. Megabyte.

media. Plural form of *medium*.

medialess. Not fitted with a direct access storage device, such as a diskette drive or fixed disk drive, as in some models of IBM point-of-sale terminals.

medium. (1) A physical carrier of electrical or optical energy. (2) A physical material in or on which data may be represented.

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.

memory. Program-addressable storage from which instructions and other data can be loaded directly into registers for subsequent execution or processing.

memory mapped I/O (MMIO). In an IBM Personal Computer, a method of accessing an input or output port as if it were a memory location.

message. (1) An arbitrary amount of information whose beginning and end are defined or implied. (2) A group of characters and control bit sequences transferred as an entity. (3) In telecommunication, a combination of characters and symbols transmitted from one point to another. (4) A logical partition of the user device's data stream to and from the adapter. See also *error message, operator message*.

microcode. (1) One or more microinstructions. (2) A code, representing the instructions of an instruction set, that is implemented in a part of storage that is not program-addressable. (3) To design, write, and also test one or more microinstructions.

microprocessor. An integrated circuit that accepts coded instructions for execution. The instructions may be entered, integrated, or stored internally.

mirrored files. Files that are kept on both the master store controller and the alternate master store controller or on both the file server and alternate file server. System mirrored files are kept on the master store controller and alternate store controller and non-system mirrored files are kept on the file server and alternate file server.

mode control switch. In the IBM 4693 point-of-sale terminal, a momentary pushbutton that, when activated, causes the terminal to toggle between its operational and non-operational modes.

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.

module. A program unit that is discrete and identifiable with respect to compiling, combining with other units, and load; for example, the input to, or output from, an assembler, compiler, linkage editor, or executive routine.

module integrity value (checksum). A 3-byte value that is calculated for each module when a product control file is built. The checksum is recalculated when activating the maintenance and is compared against the value in the product control file.

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.

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name. An alphanumeric term that identifies a data set, statement, program, or cataloged procedure.

n-bit byte. A string that consists of n bits.

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 systems interconnect (OSI) architecture*. **Note:** The operating principles of a network include those of services, functions, and protocols.

network management vector transport (NMVT). The portion of an alert transport frame that contains the alert message.

node. (1) Any device, attached to a network, that transmits and/or receives data. (2) An end point of a link, or a junction common to two or more links in a network. Nodes can be processors, controllers, or workstations. Nodes can vary in routing and other functional capabilities. (3) In a network, a point where one or more functional units interconnect transmission lines.

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.

nonvolatile random access memory (NVRAM). Random access memory that retains its contents after electrical power is shut off.

NVRAM. nonvolatile random access memory

OCR. Optical character recognition.

OEM. Original equipment manufacturer.

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 systems interconnect (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 interconnect (OSI) architecture. Network architecture that adheres to a particular set of ISO standards that relates to open systems interconnect (OSI).

open systems interconnect (OSI) reference model. A model that represents

the hierarchical arrangement of the seven layers described by the open systems interconnect (OSI) 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 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.

operator message. A message from the operating system or a program telling the operator to perform a specific function or informing the operator of a specific condition within the system, such as an error condition.

optical character recognition (OCR). The machine identification of printed characters through the use of light-sensitive devices.

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.

option adapter. In IBM point-of-sale terminals, an optional feature or logic card that provides functions in addition to those which are standard.

original equipment manufacturer (OEM). A manufacturer of equipment that may be marketed by another manufacturer.

OS. Operating system.

OS/2. Operating System/2.

OSI. open systems interconnect.

output device. A device in a data processing system by which data can be received from the system. Synonymous with *output unit*.

output unit. Synonym for *output device*.

overflow exception. A condition caused by the result of an arithmetic operation having a magnitude that exceeds the largest possible number. See also *underflow exception*.

owner. In relation to files, an owner is the user that creates the file and therefore has complete access to the file.

packet assembler/disassembler (PAD). A functional unit that enables data terminal equipments (DTEs) not equipped for packet switching to access a packet switched network.

PAD. Packet assembler/disassembler.

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.

parallel port. (1) A port that transmits the bits of a byte in parallel along the lines of the bus, one byte at a time, to an I/O device. (2) On a personal computer, it connects a device that uses a parallel interface, such as a dot matrix printer, to the computer. Contrast with *serial port*.

parameter. (1) A name in a procedure that refers to an argument passed to that procedure. (2) A variable that is given a constant value for a specified application and that may denote the application. (3) An item in a menu or for which the user specifies a value or for which the system provides a value when the menu is interpreted. (4) Data passed between programs or procedures.

parity (even). A condition when the sum of all of the digits in an array of binary digits is even.

parity (odd). A condition when the sum of all of the digits in an array of binary digits is odd.

partner. See *conversation partner*.

password. In computer security, a string of characters known to the computer system and a user, who must specify it to gain full or limited access to a system and to the data stored within it.

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 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.

PC network. A low-cost broadband network that allows attached IBM personal computers to communicate and share resources.

personal computer (PC). A desk-top, free-standing, or portable microcomputer that usually consists of a system unit, a display, 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.

physical unit (PU). In SNA, the component that manages and monitors the resources of a node, such as attached links and adjacent link stations, as requested by a system services control point (SSCP) through an SSCP-SSCP session.

PIO. Programmed I/O.

pipe. A sequential file in a memory buffer that passes messages from one program to another.

PLD. Power line disturbance.

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.

pointer. (1) An identifier that indicates the location of an item of data in memory. (2) A data element that indicates the location of another data element. (3) A physical or symbolic identifier of a unique target.

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 4683/4684 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.

polling. (1) Interrogation of devices for purposes such as to avoid contention, to determine operational status, or to determine readiness to send or receive data. (2) In data communication, the process of inviting data stations to transmit, one at a time. The polling process usually involves the sequential interrogation of several data stations.

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. (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 line disturbance (PLD). Interruption or reduction of electrical power.

Power-On Self Test (POST). A series of diagnostic tests that are run automatically each time the computer's power is switched on.

presentation space (PS). In 3270 emulation, the image of the 3270 screen data that is held in random access memory. This screen appears on the store controller or the terminal display when 3270 emulation is used in operator console mode; it is the virtual screen for applications using the 3270 emulator API. The presentation space is fixed as 24 lines of 80 characters on the display.

primary adapter. In a personal computer that is used on a LAN and that supports installation of two network adapters, the adapter that uses standard (or default) mapping between adapter shared RAM, adapter ROM, and designated computer memory segments. The primary adapter is usually designated as adapter 0 in configuration parameters. Contrast with *alternate adapter*.

primary store controller. The store controller designated to control the store loop under normal conditions.

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 set of related control statements that cause one or more programs to be performed. (2) In a programming language, a block, with or without formal parameters, whose execution is invoked by means of a procedure call. (3) 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.

programmed I/O (PIO). In an IBM Personal Computer, a method of accessing an input or output port with specific instructions.

prompt. A character or word displayed by the operating system to indicate that it is ready to accept input.

protocol. (1) A set of semantic and syntactic rules that determines the behavior of functional units in achieving communication. (2) In SNA, the meanings of and the sequencing rules for requests and responses used for managing the network, transferring data, and synchronizing the states of network components. (3) A specification for the format and relative timing of information exchanged between communicating parties.

PS. Presentation space.

Q

queue. A line or list formed by items in a system waiting for service; for example, tasks to be performed or messages to be transmitted in a message routing system.

R

radio frequency (RF). Any frequency in the range within which radio waves may be transmitted, from about 10 KHz to about 300,000 MHz.

RAM. Random access memory.

random access. An access mode in which specific logical records are obtained from or placed into a mass storage file in a nonsequential manner.

random access memory (RAM). A computer's or adapter's volatile storage area into which data may be entered and retrieved in a nonsequential manner.

RCMS. Remote change management server.

read. To acquire or to interpret data from a storage device, from a data medium, or from another source.

read-only memory (ROM). A computer's or adapter's storage area whose contents cannot be modified by the user except under special circumstances.

real-time. (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 4683/4684 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 Store System, a term that refers to the point-of-sale terminal.

remote change management server (RCMS). The IBM Store System function that interfaces with the host DSX program for file transmission.

remote program load (RPL). A function provided by adapter hardware components and software that enables one computer to load programs and operating systems into the memory of another computer, without requiring the use of a diskette or fixed disk at the receiving computer.

remove. (1) To take an attaching device off a network. (2) To stop an adapter from participating in data passing on a network.

response. The information the network control program sends to the access method, usually in answer to a request received from the access method. (Some responses, however, result from conditions occurring within the network control program, such as accumulation of error statistics.)

retransmit. To repeat the transmission of a message or a segment of a message.

retry. In data communication, sending the current block of data a prescribed number of times or until it is entered correctly and accepted.

return code. (1) A value (usually hexadecimal) provided by an adapter or a program to indicate the result of an action, command, or operation. (2) A code used to influence the execution of succeeding instructions. (3) A value established by the programmer to be used to influence subsequent program action. This value can be printed as output or loaded in a register.

ring latency. In an IBM Token-Ring Network, the time, measured in bit times at the data transmission rate, required for a signal to propagate once around the ring. Ring latency includes the signal propagation delay through the ring medium, including drop cables, plus the sum of propagation delays through each data station connected to the Token-Ring Network.

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*.

RIPL. Remote IPL.

rms. Root mean square.

ROM. Read-only memory.

root directory. Highest or base level directory in a hierarchical file system. Subdirectories branch off of the root directory.

routine. Part of a program, or a sequence of instructions called by a program, that may have some general or frequent use.

RPL. Remote program load.

runtime error. Error occurring during program execution.

S

SAA. Systems Application Architecture.

satellite. (1) A computer that is under the control of another computer and performs subsidiary operations. (2) An offline auxiliary computer.

SBCS. Single-byte character set

scan. To pass an item over or through the scanner so that the encoded information is read. See also *wanding*.

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)*.

SCSI. Small computer system interface.

SDLC. Synchronous Data Link Control.

sector. A 512-byte area of the control unit diskette, the amount of data that is transferred at one time to or from the diskette.

segment. See *cable segment, LAN segment, ring segment*.

serial port. On personal computers, a port used to attach devices such as display devices, letter-quality printers, modems, plotters, and pointing devices such as light pens and mice; it transmits data one bit at a time. Contrast with *parallel port*.

server. (1) A device, program, or code module on a network dedicated to providing a specific service to a network. (2) On a LAN, a data station that provides facilities to other data stations. Examples are a file server, print server, and mail server.

session. (1) A connection between two application programs that allows them to communicate. (2) In SNA, a logical connection between two network addressable units that can be activated, tailored to provide various protocols, and deactivated as requested. (3) The data transport connection resulting from a call or link between two devices. (4) The period of time during which a user of a node can communicate with an interactive system, usually the elapsed time between log on and log off. (5) In network architecture, an association of facilities necessary for establishing, maintaining, and releasing connections for communication between stations.

shared RAM. Random access memory on an adapter that is shared by the computer in which the adapter is installed.

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.

sign-on. (1) A procedure to be followed at a terminal or workstation to establish a link to a computer. (2) To begin a session at a workstation.

single-byte character set (SBCS). A character set in which each character

is represented by a one-byte code. Contrast with *double-byte character set.*

small computer system interface (SCSI). An input and output bus that provides a standard interface between the OS/2 multimedia system and peripheral devices.

SNA. Systems Network Architecture.

socket. Synonym for *port (2)*.

source. The origin of any data involved in a data transfer.

source address. A field in the medium access control (MAC) frame that identifies the location from which information is sent. Contrast with *destination address*.

stack. Data structure to which values are added and from which values are removed at only one end. That is, the last value placed onto the stack must be the first value removed from the stack. The stack passes variables from one routine to another and stores all local variables for each iteration of a recursive procedure.

start-stop tape drive. A magnetic tape unit that stops at each inter-block gap when reading or writing data. Contrast with *streaming tape drive.*

state. See *conversation state*.

state transition. The act of moving from one conversation state to another.

store controller. A programmable unit in a network used to collect data, to direct inquiries, and to control communication within a point-of-sale system.

store loop. In the IBM 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.

streamer. Synonym for streaming tape drive.

streaming tape drive. A magnetic tape unit especially designed to make a nonstop dump or restore of magnetic disks without stopping at inter-block gaps. Synonymous with *streamer.* Contrast with *start-stop tape drive.*

subroutine. Section of code that performs a specific task and is logically separate from the rest of the program.

subsystem. A secondary or subordinate system, or programming support, usually capable of operating independently of or asynchronously with a controlling system.

supervisory (S) frame. A frame in supervisory format used to transfer supervisory control functions. See also *information frame, unnumbered frame.*

SVC. Switched virtual circuit.

switch. On an adapter, a mechanism used to select a value for, enable, or disable a configurable option or feature.

switched virtual circuit (SVC). A virtual circuit that is requested by a virtual call. It is released when the virtual circuit is cleared.

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 board. In a system unit, the main circuit board that supports a variety of basic system devices, such as a keyboard or a mouse, and provides other basic system functions.

system configuration. A process that specifies the devices and programs that form a particular data processing system.

system partition. A protected portion of a fixed disk on an IML system unit that contains power-on self test (POST) and Basic Input/Output System (BIOS) code. The system partition also contains system programs.

system programs. Testing and utility programs that reside in the system partition of a fixed disk that are used to maintain the system. Typically these programs are the same as those provided on the reference and diagnostic diskettes.

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 4683/4684 terminal, the part of the terminal that contains the processing unit, ROM, RAM, disk and diskette drives, and the I/O channel.

tailgate. The area of a computer or control unit where I/O cables are connected.

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.

terminator. A 75-ohm, resistive connector used on the end of a cable or an unused tap to minimize cable reflections.

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.

time out. (1) A time interval allotted for certain events to occur (such as a response to polling) before corrective error recovery action is taken. (2) A parameter related to an enforced event designed to occur at the conclusion of a predetermined elapsed time. A time-out condition can be canceled by the receipt of an appropriate time-out cancellation signal. (3) A time interval allotted for certain operations to occur; for example, response to polling or addressing before system operation is interrupted and must be restarted.

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.

TP. Transaction program.

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.

transaction program (TP). A program that processes transactions in or through a logical unit (LU) type 6.2 in an SNA network. Application transaction programs are end users in an SNA network; they process transactions for service transaction programs and for other end users. Service transaction programs are IBM-supplied programs that typically provide utility services to application transaction programs.

transfer rate. See *transfer data rate*.

transition. See *state transition*.

transmission. The sending of data from one place for reception elsewhere.

transmit. To send information from one place for reception elsewhere.

transmitter. (1) A circuit used in data communication applications to send information from one place for reception elsewhere. (2) The device in which the transmission circuits are housed.

twisted pair. A transmission medium that consists of two insulated conductors twisted together to reduce noise.

underflow exception. A condition caused by the result of an arithmetic operation having a magnitude less than the smallest possible nonzero number. See also *overflow exception*.

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.

universally administered address. The address permanently encoded in an adapter at the time of manufacture. All universally administered addresses are unique. Contrast with *locally administered address*.

universal product code (UPC). An encoded number that can be assigned to and printed on or attached to an article of merchandise for scanning.

unnumbered (U) frame. A frame in unnumbered format, used to transfer unnumbered control functions. See also *information frame, supervisory frame.*

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 supply.

usability. The quality of a system, program, or device that enables it to be easily understood and conveniently employed by a user.

user. (1) Category of identification defined for file access protection. (2) A person using a program or system.

utility program. (1) A computer program in general support of the processes of a computer; for instance, a diagnostic program, a trace program, a sort program. (2) A program designed to perform an everyday task such as copying data from one storage device to another.

V

vector. One or more related fields of data, in a specified format. A quantity usually characterized by an ordered set of numbers.

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.

VPD. Vital product data.

W

waiting time. Synonym for *latency*.

wand. A commercially available device used to read information encoded on merchandise tickets, credit cards, and employee badges.

wanding. Passing the tip of the wand reader over information encoded on a merchandise ticket, credit card, or employee badge.

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.

X

X.25. A CCITT Recommendation that defines the physical level (physical layer), link level (data link layer), and packet level (network layer), of the OSI Reference Model. An X.25 network is an interface between data terminal equipment (DTE) and data circuit-terminating equipment (DCE) operating in the packet mode, and connected to public data networks by dedicated circuits. X.25 networks use the connection-mode network

service.

(*) MS-DOS is a trademark of the Microsoft Corporation.

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