

Introduction

GA33-0060-2

3720 3721

Communication Controllers

IBM

**IBM 3720 Models 1, 2, 11, and 12
IBM 3721 Models 1 and 2
Communication Controllers**

Introduction

**System/370, 30xx, 4300,
and 9370 Processors**

**Publication Number
GA33-0060-2**

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The above FCC statement applies only to the IBM 3720 and 3721 Communication Controllers used in the USA and having a label on the back that indicates compliance.

Third Edition (February 1988)

This major revision replaces and obsoletes GA33-0060-1. It reflects new enhancements to the IBM 3720 Communication Controller operation. These enhancements comprise the ability to:

- Add, replace, or purge a control program load module from the controller hard disk, at the request of the host, in a non-disruptive manner
- Save up to two control program load modules on the controller hard disk
- Display and update the controller disk IPL information, at the host or at the controller console.

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Preface

This manual describes the IBM 3720/3721 Communication Controllers with their different models.

3720 Model 1 (channel-attached base model without token-ring attachment)
3720 Model 2 (link-attached base model without token-ring attachment)
3720 Model 11 (channel-attached base model with token-ring attachment)
3720 Model 12 (link-attached base model with token-ring attachment)
3721 Model 1 and 3721 Model 2 (common expansions to all 3720 Models)

This manual is structured as follows:

- *Chapter 1, "Overview of the 3720/3721 Communication Controllers"*
Describes the highlights and major advantages of the 3720/3721.
- *Chapter 2, "3720/3721 Programming Support"*
Describes the programming environment of the IBM 3720/3721 in a data communication network.
- *Chapter 3, "Controller Components"*
Describes the components of the controller and their functions, and the features available.
- *Chapter 4, "Maintenance and Operator Subsystem"*
Describes the facilities provided by the maintenance and operator subsystem (MOSS).
- *Chapter 5, "Network Problem Determination"*
Describes the network problem determination facilities available to the user.
- *Chapter 6, "Controller Problem Determination and Maintenance"*
Describes the controller problem determination and maintenance facilities available to the user, depending on the level of host support and control program provided.
- *Appendix A, "General Bibliography"*
Contains an overview of the publications currently available that are related to IBM System Network Architecture.
- *Appendix B, "Job Descriptions, Tasks, and Manuals"*
Gives examples of the job descriptions and tasks of the various persons who will be responsible for installing and operating the 3720/3721, and titles of the manuals in which the required information can be found.

- *Appendix C, "3720/3721 Library"*
Gives a short description of each manual in the 3720/3721 library.
- *List of Abbreviations, Glossary, and Index.*

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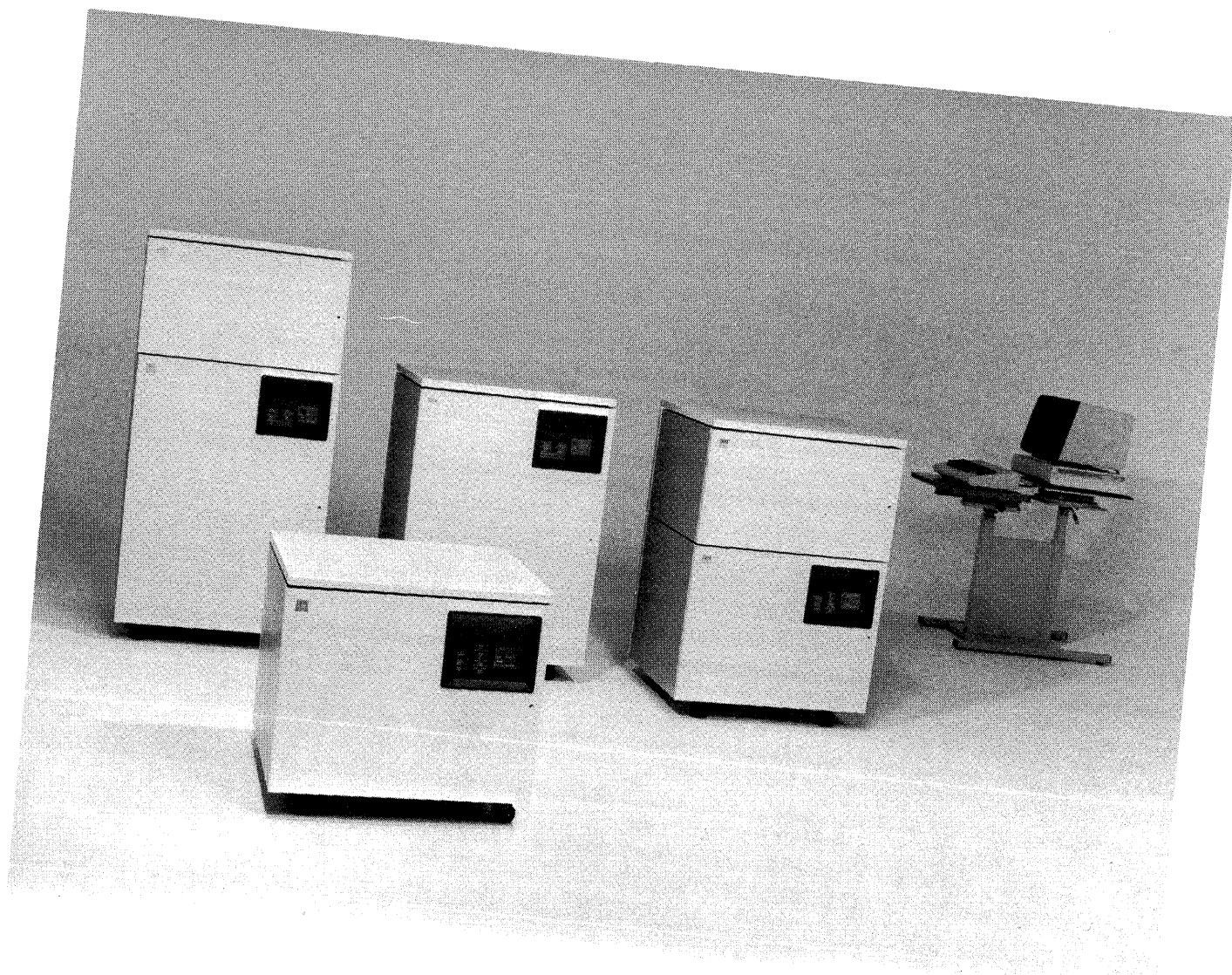
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IBM 3720/3721 Communication Controllers

Note: This illustration shows the design model only.

X IBM 3720/3721 Communication Controllers, Introduction

Chapter 1. Overview of the 3720/3721 Communication Controllers

The IBM 3720/3721 Communication Controllers are designed to control the data flow between terminals and host processors in data communication networks. They communicate with one or more host processors over a channel, or with another communication controller over a link.

A wide range of data terminal equipment using different line speeds, protocols, and interfaces can be connected and operated simultaneously.

Communications software and microcode facilitate problem determination and simplify network expansion and modification.

Extension of the IBM Communication Controller Family

The 3720/3721 controllers belong to the IBM Communication Controller family, and preserve compatibility with the existing IBM 3705 and 3725 Communication Controllers:

- 3720 Models 1 and 2/3721 : up to 60 lines and four host channel attachments
- 3720 Models 11 and 12/3721 : up to 48 lines, two IBM Token-Ring Networks and four host channel attachments
- 3725 Model 2 : up to 80 lines and four host channel attachments.
- 3725 Model 1 : up to 256 lines and eight host channel attachments

IBM communication controllers run the same communication software.

Major Advantages

The 3720/3721 controllers:

- Provide price/performance ratio better than the 3705/3725.
- Are intended for the attachment of up to 60 lines (3720 Models 1 and 2), or up to 48 lines and up to two IBM Token-Ring Networks (3720 Models 11 and 12).
- Can also be used as remote concentrators.

- Simplify the machine structure by using only:
 - Two storage sizes: 1 and 2 megabytes (1024K or 2048K, where K equals 1024)
 - One channel adapter type
 - One scanner type
 - Five line attachment types
 - One token-ring attachment type.
- Allow distribution of the communication scanner load at line level (line weight) instead of line coupler level (LIC weight).
- Allow the on-site conversion of a 3720 Model 1 or 2 into a 3720 Model 11 or 12 respectively.
- Are designed to simplify the addition and installation of features in the field.
 - The channel-attached models (3720 Models 1 and 11) are installed by the IBM service personnel.
 - The link-attached models (3720 Models 2 and 12) and the expansion units (3721 Models 1 and 2) are to be set up by the user. They do not require the assistance of a skilled technical person.

Improved Network Management

The 3720/3721 controllers:

- Simplify operation and maintenance procedures.
- Provide a new supervision function mode: *unattended operation*. They:
 - Can be managed using a *remote console*.
 - Do not require the presence of a skilled operator on site.
 - Can be remotely controlled from the user's network control center.
 - Do not need to be *channel-attached* to a host. They may be *link-attached* to other communication controller(s) and managed via the remote console.
- Provide enhanced control program load module management on the controller hard disk. This new capability:
 - Allows up to two control program load modules to be saved on the controller hard disk. Either of these load modules may then be loaded into the controller via a host request.

- Enables, at host request, the non-disruptive transfer, replacement or purge of a disk-resident load module. The controller continues to run and the current load module is not affected.
- Can also be managed from a *local operator console* directly attached to the 3720.
- Provide a *remote support facility (RSF)* which allows communications between 3720/3721 and the IBM Remote Technical Assistance Information Network (RETAIN) for remote assistance.
- Contain a *maintenance and operator subsystem (MOSS)*, which includes:
 - A *microprocessor* and a *control program* to manage files, diagnostic programs, and other functions
 - Attachments for operator consoles, *disk*, *diskette drive*, operator panel, and remote support facility (RSF).
- Provide other new supervisory functions such as:
 - Logon password to protect the 3720/3721 against intrusion
 - Automatic box event record analysis to make problem determination easier
 - Internal wrap test to identify failures on the 3720/3721 side: modem, cable, line, or token-ring network.

Other Highlights

The 3720/3721 controllers:

- Control data communication between:
 - Modem-attached or direct-attached processors
 - Modem-attached, direct-attached, token-ring attached terminals
 - Up to four host systems (via two channel adapters and two two-processor switches, two hosts only being active at the same time).
- Provide great attachment capabilities by offering:
 - Direct attachment (up to 19 200 bps for start-stop, 245 760 bps for SDLC, and 55 855 bps for BSC protocols)
 - Modem attachment of terminals through CCITT V.24, V.25 and V.35 interfaces
 - Token-ring attachment of terminals (4 million bps)

- High-speed attachment (up to 256 000 bps)
- Duplex lines
- Support for X.21 and X.25 protocols, as well as EIA 232D and RS-366A.
- Provide low cost *network growth* possibilities to satisfy expanding network requirements or for newly installed networks
- Use advanced LSI technology to:
 - Improve *reliability, availability, and serviceability (RAS)*
 - Reduce power consumption
 - Reduce floor space requirements.
- Provide facilities such as:
 - *Host power on/off* to allow a host to power a channel-attached controller on or off
 - *Host power off* to allow a host operator to power off a link-attached controller by a command sent from a host
 - *Auto restart* to reapply power automatically to the controller after a power failure.
- Trigger the controller initialization using the disk-resident control program load module designated as active by the network operator:
 - Automatic control program load at power-on or at IPL request from the 3720 console or control panel
 - Automatic control program dump and reload of the control program in case of CCU failure. The dump can be transferred to the host.

Programming Support

For details, see Chapter 2, “3720/3721 Programming Support.”

The 3720/3721 controllers:

- Operate in Systems Network Architecture (SNA) and/or in non-SNA environment
- Operate under the control of:
 - *Network Control Program (NCP) Version 4 or 5.*

The 3720 Models 1, 2, 11 and 12 without the 3721 can also operate with NCP Version 4 subset.

- *Emulation Program (EP)*. EP supports only the 3720 Model 1.
- *Partitioned emulation programming (PEP) extension* supports the 3720 Models 1 and 11.
- Facilitate system management by providing the *NetView™* program^{*}, which integrates several network management functions.

^{*} NetView is a trademark of International Business Machines Corporation.

Machine Units and 3720/3721 Configurations

The 3720/3721 are modular, programmable communication controllers.

The 3720 Models 1 and 2 /3721 allow the attachment of up to 60 lines. The 3720 Models 11 and 12 /3721 allow the attachment of up to 48 lines and up to two IBM token-ring networks.

The direct-attached and modem-attached lines can be either half-duplex or duplex. The total number of lines that may be attached depends on line speeds and protocols, message lengths, and similar factors. For line speeds, see "Transmission Subsystem: Line Attachment through LICs" on page 3-9.

The line interface couplers provide great flexibility. One type of line interface coupler (LIC1) can handle SDLC or BSC protocols, as well as asynchronous protocols, at speeds up to 19 200 bps.

Token-ring attachment operates at 4 million bps. Each attachment can be connected to one token-ring network, and two attachments can be attached to the same token-ring network. This is a backup provision in case of failure of the active attachment. Token-ring attachment uses token-ring protocol.

The 3720/3721 consists of the following units:

Base Units

There are four models:

- The 3720 Model 1 is a *channel-attached* communication controller, directly attached to the host channel(s). It can be configured to provide:
 - Main storage of 1 or 2 megabytes (1024K or 2048K)
 - One or two channel adapters
 - Up to two two-processor switches (TPSs)
 - One communication scanner (CS) to control from one to seven line interface couplers (LICs)¹:
 - For up to 28 teleprocessing (TP) lines at 9600 bps
 - For up to 4 TP lines at 64 000 bps
 - For up to 1 TP line at 256 000 bps.
- The 3720 Model 2 is a *link-attached* communication controller, connected to the host(s) via telecommunication links, and through another 3720/3721 (3720 Model 1 or 2) or a 3705, or a 3725 communication controller. The 3720 Model 2

¹ For more details of the number of lines and line speeds depending on the duplex or half duplex mode and on the protocol, refer to the *3720/3721 Communication Controllers, Configuration Guide*, GA33-0063.

can also be attached to an IBM 4331/4361 Processor with the integrated communication adapter (ICA). It provides:

- Main storage of 1 or 2 megabytes (1024K or 2048K)
 - One communication scanner (CS) to control from one to seven line interface couplers (LICs)¹:
 - For up to 28 TP lines at 9600 bps
 - For up to 4 TP lines at 64 000 bps
 - For up to 1 TP line at 256 000 bps
- The 3720 Model 11 is a *channel-attached* communication controller, directly attached to the host channel(s). It can be configured to provide:
 - Main storage of 1 or 2 megabytes (1024K or 2048K)
 - One or two channel adapters
 - Up to two two-processor switches (TPSs)
 - One communication scanner (CS) to control from one to four line interface couplers (LICs)¹:
 - For up to 16 TP lines at 9600 bps
 - For up to 4 TP lines at 64 000 bps
 - For up to 1 TP line at 256 000 bps.
 - One token-ring multiplexer (TRM) to control one or two token-ring interface couplers (TICs), working at 4 million bps.
- The 3720 Model 12 is a *link-attached* communication controller, connected to host(s) via telecommunication links, and through another 3720/3721 (3720 Model 1, 11 or 2) or a 3705, or a 3725 communication controller. The 3720 Model 12 can also be attached to an IBM 4331/4361 Processor with the integrated communication adapter (ICA). It provides:
 - Main storage of 1 or 2 megabytes (1024K or 2048K)
 - One communication scanner (CS) to control from one to seven line interface couplers (LICs)¹:
 - For up to 16 TP lines at 9600 bps
 - For up to 4 TP lines at 64 000 bps
 - For up to 1 TP line at 256 000 bps
 - One token-ring multiplexer (TRM) to control one or two token-ring interface couplers (TICs), working at 4 million bps.

Expansion Units

Each expansion unit can be connected to any model of the basic unit. Only one expansion unit can be connected to the same basic unit. An expansion unit is physically installed on top of the corresponding basic unit.

There are two models:

- The 3721 Model 1 provides one communication scanner (CS) to control from one to eight additional line interface couplers (LICs)¹:
 - For up to 32 additional TP lines at 9600 bps
 - For up to 4 additional TP lines at 64 000 bps
 - For up to 1 additional TP line at 256 000 bps.
- The 3721 Model 2 provides two communication scanners (CSs) to control from one to eight additional line interface couplers (LICs). Each CS controls up to four LICs¹:
 - For up to 32 additional TP lines at 9600 bps
 - For up to 8 additional TP lines at 64 000 bps
 - For up to 2 additional TP lines at 256 000 bps.

For more details of machine units, see Chapter 3, “Controller Components” on page 3-1.

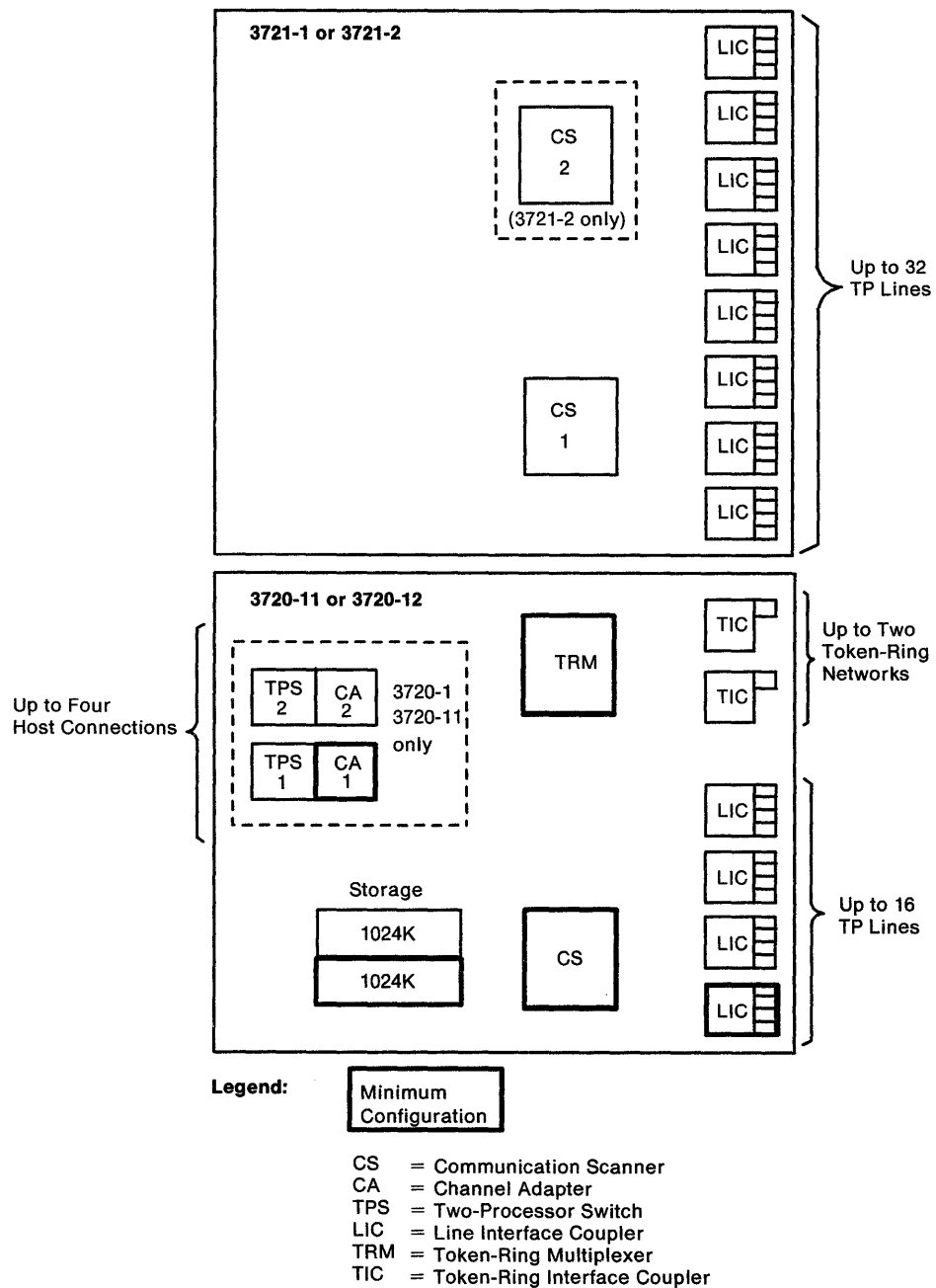


Figure 1-1. Unit Configurations

Number of Lines

The maximum number of lines attached through the transmission subsystem in a 3720/3721 depends on:

- The line speed and protocol
- The control program installed
- The application work load
- The model installed.

See Figure 1-2 on page 1-11.

For the 3720 Models 11 and 12, the maximum number of lines attached through the token-ring depends on the token-ring network.

For more details refer to *3720/3721 Communication Controllers, Configuration Guide*.

3720 Model 1 or Model 2 (No Token-Ring Network)

Speed in bps	Maximum number of LICs Lines	
9 600	7	28
64 000	4	4
256 000	1	1

3720 Model 11 or Model 12 (With Token-Ring Network)

Speed in bps	Maximum number of LICs Lines	
9 600	4	16
64 000	4	4
256 000	1	1

3721 Model 1

Speed in bps	Maximum number of LICs Lines	
9 600	8	32
64 000	4	4
256 000	1	1

3721 Model 2

Speed in bps	Maximum number of LICs Lines	
9 600	8	32
64 000	8	8
256 000	2	2

Figure 1-2. Maximum Number of Lines

Operator Console

An operator console is to be provided by the user. Several types of consoles can be used. See "Console Type" on page 4-6.

A console can be attached to the 3720 Models 1, 2, 11 and 12 in two ways:

- Locally, being directly attached to the controller without modem or data circuit-terminating equipment (DCE).
- Remotely, being connected over a switched telephone line through a duplex modem equipped with the auto-answer feature.

The advantages of the remote console are:

- There is no need for a 3720/3721 operator at each 3720/3721 site.
- The main console may be installed where supervisory tools and trained personnel are available.
- One console may be used to manage multiple 3720/3721 controllers.

Local and remote consoles can coexist for one 3720, but only one console is required. A local console is required when the IBM remote support facility (RSF) is not available. This is the case in countries where RSF is not available, or when the user does not provide the RSF modem and access to the switched network.

When two consoles are attached to a 3720/3721, only one of them can operate at a given time.

Access to the 3720/3721 via remote and local consoles is protected by a password.

For more details about the consoles see "Operator Console" on page 4-6.

3720/3721 in a Network

This section briefly describes host-controller connections and a simple network configuration.

For additional information on user application networks, refer to *IBM Systems Network Architecture, Concepts and Products*, GC30-3072.

Host-Controller Connections in an NCP Environment

The 3720 can be channel-attached to one host and link-attached to another host. In this manual, the two terms are always used with respect to a particular host. A maximum of four hosts can be attached to the same 3720 using two channel adapters and two two-processor switches (TPSs).

See Figure 1-3.

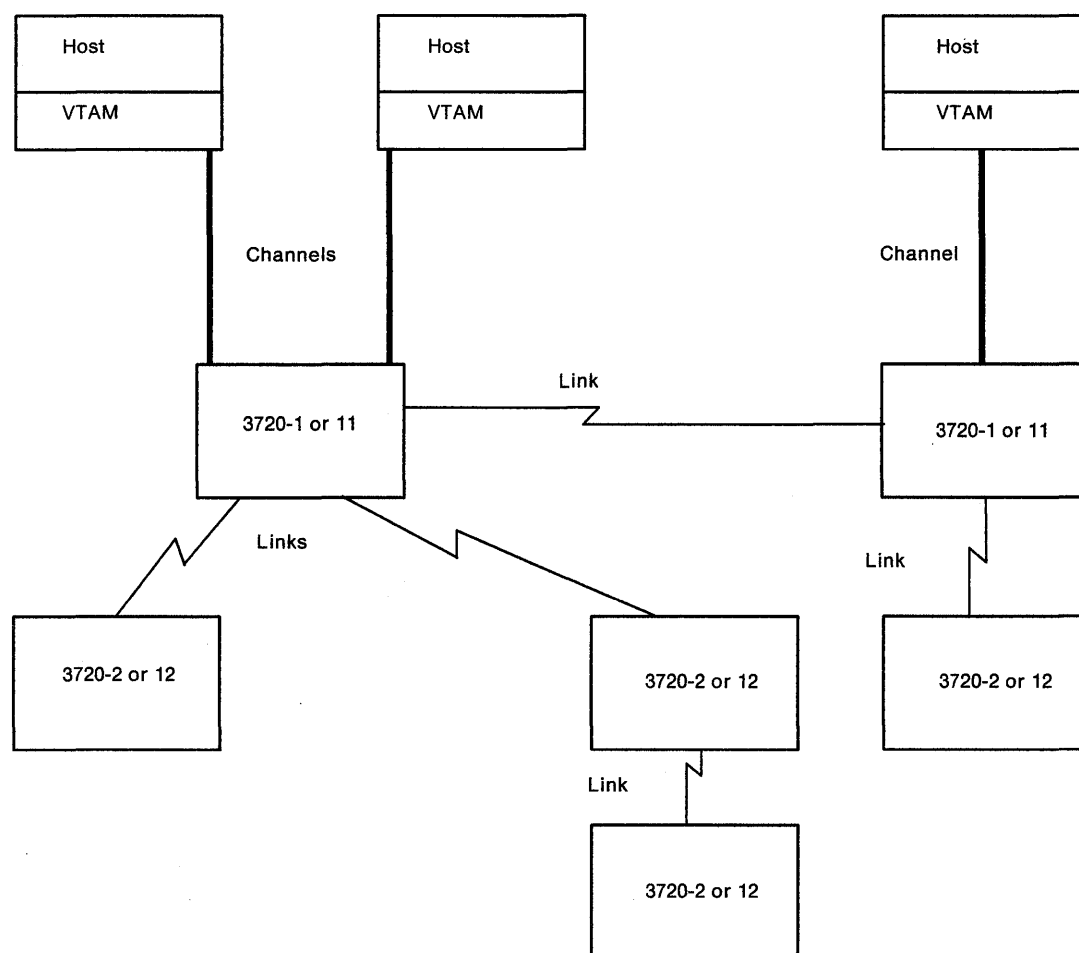


Figure 1-3. Link-Attached and Channel-Attached Controllers

Different Uses of the 3720/3721 in Networks

The 3720 may be included in different ways in various types of data networks.

Example 1: Channel-Attached 3720 Models 1 and 11 in a Small Network.

The 3720 allows a growth path for the 4331/4361 processor equipped with the integrated communication adapter (ICA) by providing:

- More connected teleprocessing lines
- Improved throughput
- Off-loading at 4331/4361 level.

See Figure 1-4.

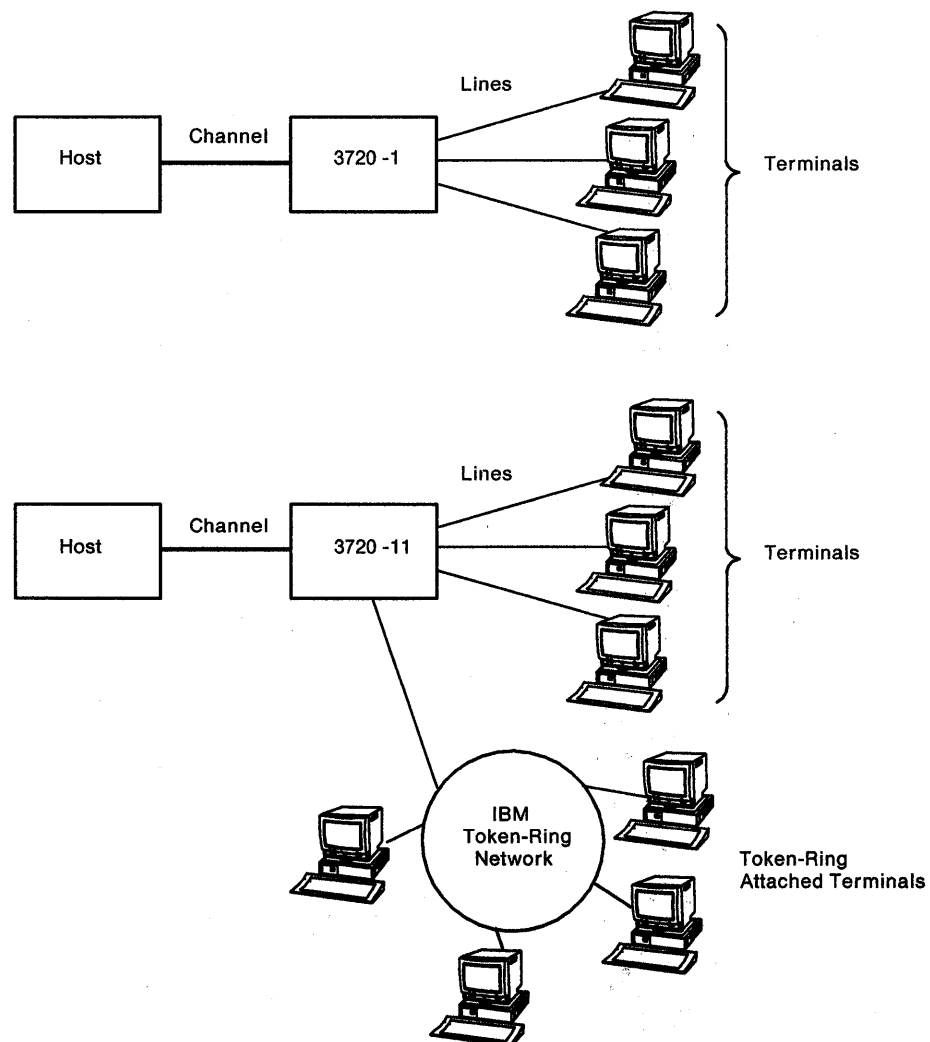


Figure 1-4. 3720/3721 in a Network - Example 1

Example 2: Link-Attached 3720 Models 2 and 12 as Concentrators in a Large Network.

The 3720 is link-attached (via modems) and it can:

- Be connected to more than one host and to other concentrators in a meshed network
- Support transmission groups (parallel links) that improve the reliability.

See Figure 1-5.

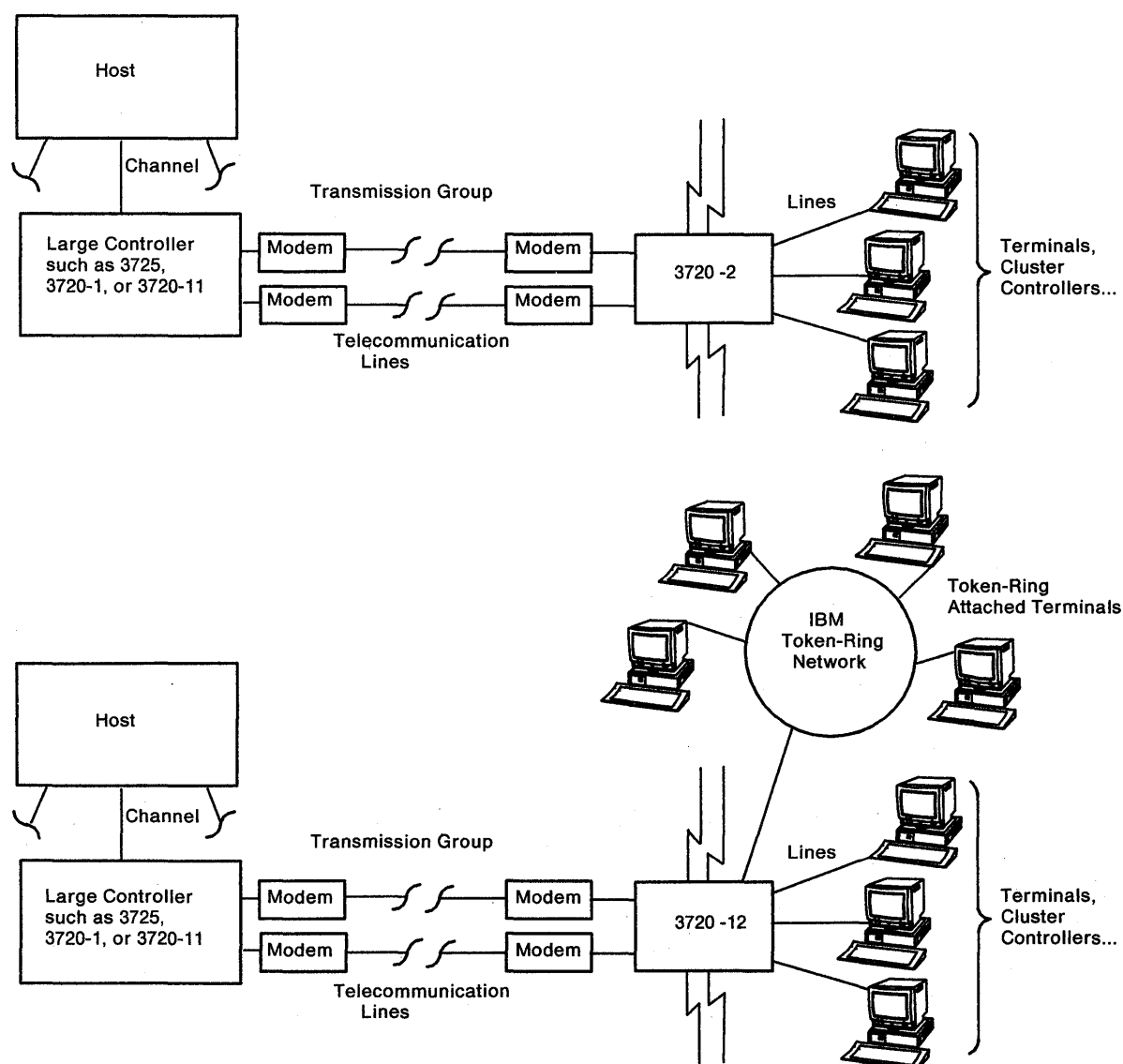


Figure 1-5. 3720/3721 in a Network - Example 2

Example 3: 3720 Models 1 and 11 in Distributed Data Processing (DDP) Network.

The 3720 is:

- Channel-attached to the DDP host
- Link-attached to one or more main hosts.

As in Example 2, the 3720 can:

- Be connected to more than one main host, one or several DDP hosts, and to other communication controllers
- Support transmission groups.

See Figure 1-6.

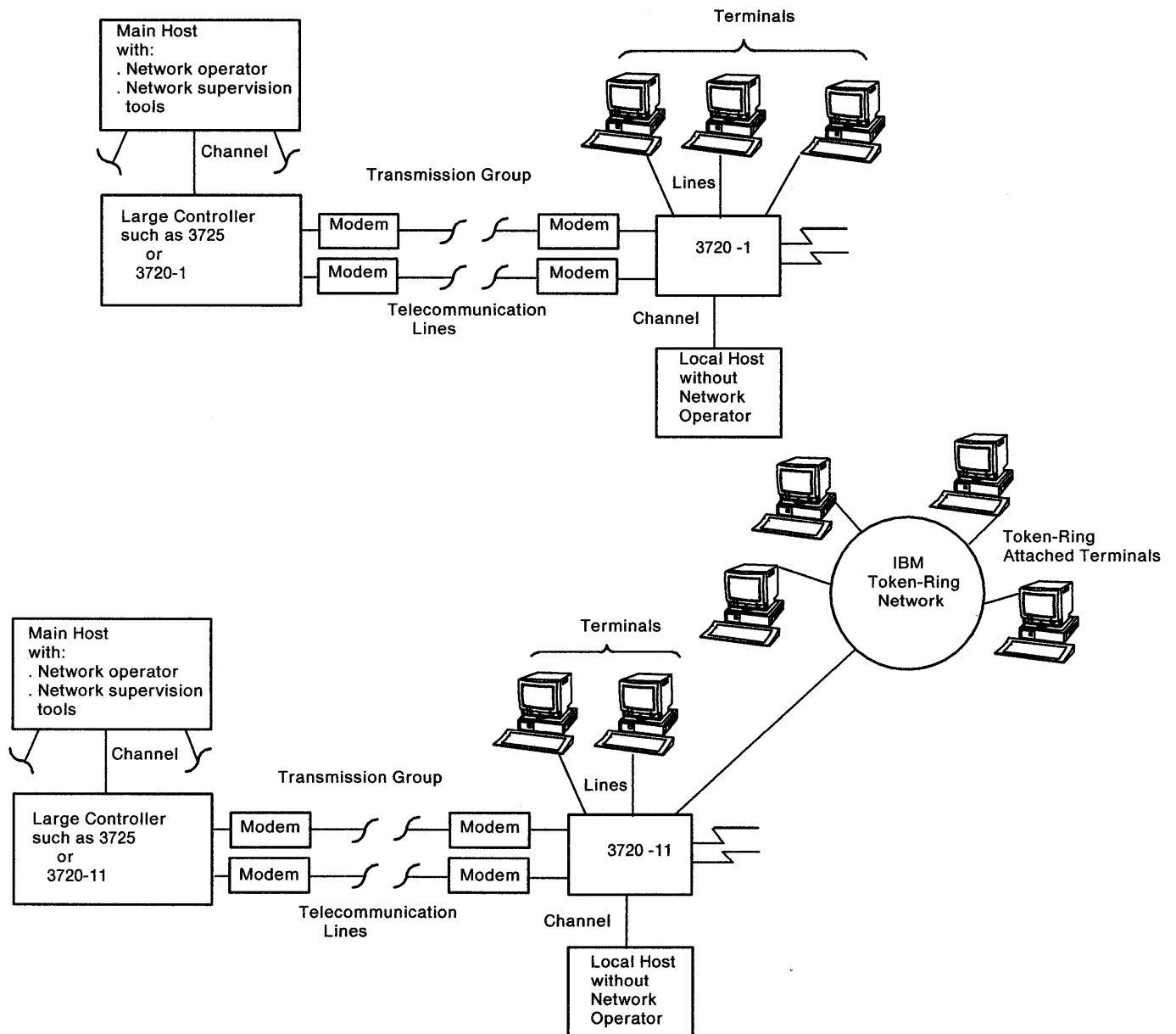


Figure 1-6. 3720/3721 in a Network - Example 3

Types of Attachment to Controllers

The modularity of 3720/3721 hardware and control programs provides a high degree of flexibility in configuring and reconfiguring networks.

See Figure 1-7.

Host The host contains the user's application programs and an IBM access method (VTAM).: For example, the host may be one of the following processors:

- IBM 43XX
- IBM 308X
- IBM 3090.

Data Channel The data channel can be:

- Byte multiplexer
- Block multiplexer
- Selector.

Two-Processor Switch For an example of a 3720 with TPS see Figure 3-2.

Control Program The control program used can be either an NCP, an EP, or PEP.

- NCP can work with all 3720/3721 models.
- PEP can work only with the 3720 Models 1 and 11.
- EP can work only with the 3720 Model 1.

NCP can be used to control start-stop (through NTO program control), BSC, and SDLC terminals. EP can control only start-stop and BSC terminals.

A locally-attached 3720 Model 1 or 11 with NCP can be connected to a host through any type of the above channels. A locally-attached 3720 Model 1 using EP connects only to a byte multiplexer channel.

Operator Console Several types of console can be used. See "Console Type" on page 4-6.: In this example, each 3720 has an optional local console and all 3720s share the same remote console through the switched telephone network.

Remote Support Facility RSF is not illustrated in this figure. See Figure 6-5.

Attachment of Terminals Terminals can be:

- *Modem-attached*, using telecommunication lines and data circuit-terminating equipment (DCE).
- *Direct-attached*, using data terminal equipment (DTE) up to a maximum distance of 600 m (1968 ft).

- *Token-ring attached.* Physical attachment depends upon the type of IBM cabling system. The type of terminals attached to the ring are defined by the IBM Token-Ring Network requirements.

For more details on the IBM Token-Ring Network, refer to the *IBM Token-Ring Network Introduction and Planning Guide, GA27-3177*.

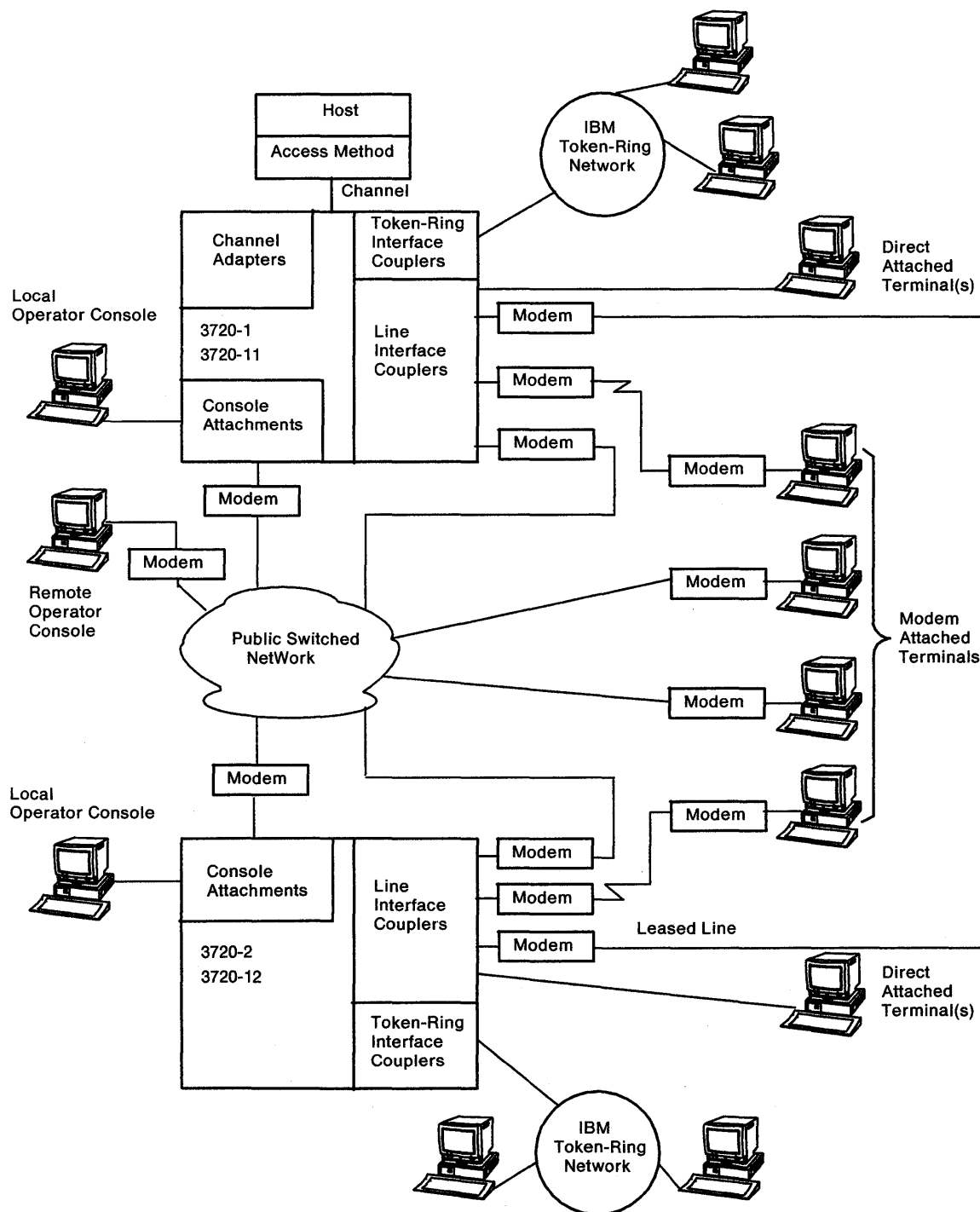


Figure 1-7. Simple Network Configuration

Controller Reliability, Availability, and Serviceability

Together, the controller hardware, the control program, and the microcode provide a high degree of reliability, availability, and serviceability (RAS). In addition to the devices and functions listed at the beginning of this chapter, the following contribute to improving RAS:

- Advanced LSI technology.
- Storage protection mechanisms, error detection, and correction of code on storage.
- Extensive hardware fault-checking logic.
- Continued operation and controlled shutdown in various failure situations. The 3720/3721's functional building block design isolates most failures within a single building block. This allows continued operation despite unrecoverable failures, such as microcode failure, channel adapter failure, communication scanner failure, or MOSS failure.
- *Retries*: On detection of an adapter failure, the failure environment is recorded and a recovery attempt is made.
- *Recovery*: If a software failure occurs, the control program is automatically reloaded (re-IPL) from the controller hard disk.

If a scanner failure occurs, the microcode is automatically reloaded (automatic IML).

- *Error Recovery Procedures*: NCP/PEP provides error recovery procedures (ERPs) that allow the controller to recover from intermittent hardware and transmission failures.
- *Availability*: The transfer of the control program load modules to the controller hard disk during normal operation increases the availability of link-attached controllers. These may be initialized from the disk instead of the link.
- Problem bypass facilities available in the host: CCU IPL, dynamic reconfiguration, backup resources, network resource reactivation.
- Problem bypass facilities available in the 3720/3721: Controller/MOSS IML, selective scanner IML, line port swapping.

Controller and Network Errors

There are two types of error that are handled separately by the 3720/3721:

- *Controller error*: In a component of a 3720/3721.
- *Network error*: In any other part of the network, for example in a line, modem, station, token-ring network or, host.

Error Handling Procedures and Responsibilities

The 3720/3721 prepares error messages that give the details necessary for the operators to determine the nature, area, and probable cause of the failure, and to call the appropriate service organization (communication common carrier, PTT, IBM, or non-IBM).

It is the user's responsibility to oversee a failure through to its resolution by the appropriate organization. The isolation and repair of the failure is a maintenance responsibility.

Problem procedures for the operator are explained in the *3720/3721 Communication Controllers, Problem Determination Guide*, GA33-0086. For token-ring related problems, the *IBM Token-Ring Network Problem Determination Guide*, SY27-0280 should be used in conjunction with *3720/3721 Communication Controllers, Extended Services*, GA33-0066.

Controller Error Detection Level

Controller errors can be detected at two levels:

- At *controller* level: The problem is handled on site, using the local console or RSF, and the 3720/3721 hardware, and associated microcode capabilities that allow host-independent problem determination and isolation for most hardware failures.
- At *network* level: The problem can be solved without local intervention. It can be solved remotely using the remote console and all the powerful tools available at the user's control center (host programs and personnel competence).

Controller Error Detection and Notification

Controller errors are detected by the control program or by MOSS.

When an error is detected in a component of the controller, MOSS builds a box event record (BER)² and stores it on the controller hard disk.

Each BER is analyzed by the AUTOBER program to produce a reference code which gives more details about the problem, related components, and possible causes of the failure.

MOSS uses the BER to build an alarm/alert message containing the reference code. This code is used to isolate the controller error and to assist the IBM service personnel in solving the problem.

An alert/alarm message provides:

² The word *box* is used instead of *controller* to contrast with the network in which this controller is only a component.

- A first level of problem determination and failure isolation
- A notification of failure:
 - An *alert* is sent:
 - By the controller with NCP/PEP (no alert message is sent by EP)
 - To the host with VTAM or with NCCF/NPDA or the NetView program
 - To the host with VTAM and the NetView program for token-ring configurations (alert message without reference code).
 - An *alarm* is sent to the 3720/3721 console.

A host with NCCF/NPDA or the NetView program and a controller with NCP/PEP is the combination that offers the maximum efficiency in network problem determination and controller failure isolation. For a configuration with token-ring attachment, error handling is managed by a host with the NetView program and VTAM.

NPDA or the NetView program decodes the alert messages, stores them by failing resource category, and prepares screens for the host operator. This allows the host operator to go rapidly to the source of the problem and take the required action, or to call the appropriate maintenance organization. The host operator can then route around the failure, reschedule jobs, or activate backup facilities.

Alert messages can be read at the host console. Alarm messages can be read at the 3720/3721 console.

Controller Maintenance

Controller maintenance is independent of the host, except for dumps, traces, channel adapter OLTs, and the operating system log file (LOGREC).

Diagnostic programs, stored on the controller hard disk, are used to detect and isolate hardware failures in the controller, and also to verify the controller.

There are be three levels of maintenance, depending on the severity of the problem:

1. The local service personnel solves the problem on-site from the control panel by following the action plan given by the IBM Hardware Central Service (HCS) after the reference code study.
2. Remote support facility (RSF) assistance is requested.
3. If the problem is still unsolved, the IBM Hardware Central Service (HCS) may send an IBM specialist to solve the problem on-site. If required, the IBM

specialist may use a service terminal (IBM Portable PC or convertible PC or PT-2)³ to assist in resolving the problem.

The remote support facility (RSF) allows communications between the MOSS and an IBM RETAIN system to provide remote assistance. A communication is established through the public switched telephone network whenever remote assistance is needed. This session is used to transfer data files from MOSS to RETAIN, or from RETAIN to MOSS, or to allow a RETAIN terminal to be used as remote 3720/3721 console.

RSF is a good way to solve a certain number of problems:

- Without on-site intervention, or
- With on-site intervention, faster and with greater efficiency.

Network Error Handling in the 3720/3721

Network errors (for example, lines, modems, stations or token-ring networks) are recognized by the NCP/PEP or EP, which reports them to the host access method in different ways:

- As an INOP message to the host operator.
- As a *record maintenance statistic* (RECMS), which is recorded at the host in LOGREC for further analysis by maintenance personnel.
- As a *Network Management Vector Transport* (NMVT), which is sent to the host with VTAM and the NetView program. This is used for errors in token-ring networks.

Installation

The installation of the 3720/3721 has three steps:

1. *Planning:* The definition of the configuration and the site preparation may be done by the user's personnel with the assistance of IBM. The necessary information is contained in the *3720/3721 Configuration Guide*, and the *3720/3721 Planning and Site Preparation Guide*, GA33-0061.
2. *Installation or Setup:*
 - *Installation:* The installation of the 3720 Models 1 and 11 is performed by the IBM service personnel.
 - *Setup:* The 3720 Models 2 and 12, and the 3721 Models 1 and 2 have been designed for setup by the user.

³ The PT-2 is an IBM Portable Terminal Type 2. This equipment is used by IBM maintenance personnel when handling an error on-site.

The physical setup can be done by user's personnel without the assistance of IBM service personnel. The information necessary for a setup is contained in the 3720/3721 *Setup Instructions* listed in Appendix C, "3720/3721 Library."

You may ask for IBM assistance or select an installation option by IBM service personnel. This assistance is chargeable. The setup time depends on the type of installation. For example,

- For the first installation of a 3720 Model 2 or 12 only or with a 3721 Model 1 or 2
 - Or for the addition of a 3721 to an installed 3720 Model 1, 11, 2 or 12.
3. *System integration*: This step requires a skilled data processing/teleprocessing operator at the local or remote console. The operator:
- Enters customized parameters such as IPL ports, direct-attached line speeds, and passwords.
 - Generates a control program (NCP, PEP, EP).
 - Initializes the 3720/3721 files.
 - IPLs the 3720/3721 unit with the appropriate control program (NCP, EP, or PEP). See 3720/3721 *Communication Controllers, System Integration*, GA33-0067.

Upgrading the 3720/3721

Growth in storage or line capacity is accomplished by additions to the existing machine.

Additional line interface couplers (LIC), or different LIC types can be installed on site by the user. The Token-Ring Interface Couplers (TIC) can also be installed on site by the user. The information necessary for installing LIC or TIC is contained in the *Feature Addition* or *Setup Instructions* manuals listed in Appendix C, "3720/3721 Library."

This reduces the cost of unit replacement.

However, IBM service personnel is required for:

- The installation of other features such as additional storage, channel adapters, or two-processor switches
- The conversion of a 3720 Model 1 or 2 into respectively a 3720 Model 11 or 12.

Chapter 2. 3720/3721 Programming Support

The 3720/3721 operates under the control of IBM licensed programs:

- Controller-resident programs, and
- Host-resident programs.

For details of these programs, refer to the publications listed in Appendix A, "General Bibliography."

Controller-Resident Programs

The 3720/3721 operates under the control of one of the following controller-resident programs:

- Advanced Communications Function for Network Control Program (ACF/NCP, referred to as NCP in this publication).

NCP Version 4 Release 1 supports:

- MVS operating system for the 3720 Models 1 and 2
- VSE operating system for the 3720 Models 1 and 2.

NCP Version 4 Release 2 and above supports:

- MVS operating system for the 3720 Models 1, 2, 11 and 12
- VM operating system for the 3720 Models 1, 2, 11 and 12.

In addition, the 3720 Models 1, 2, 11 and 12 (without 3721) can operate with the NCP Version 4 subset. Compared to the full-function NCP Version 4 on which it is based, this subset:

- Has the same functional characteristics, except some limitations such as the number of lines (up to 28 lines)
- Has a significantly lower price.

NCP Version 4 subset supports:

- MVS, VM, and VSE operating systems for the 3720 Models 1 and 2
- MVS and VM operating systems for the 3720 Models 11 and 12.

It is based on:

- NCP Version 4 Release 1 for VSE (3720 Models 1 and 2)
- NCP Version 4 Release 2 for MVS and VM (3720 Models 1, 2, 11, and 12).

NCP Version 5 Release 1 supports MVS for the 3720 Models 1, 2, 11 and 12.

NCP Version 5 Release 2 supports MVS, VM and VSE for the 3720 Models 1, 2, 11 and 12.

NCP communicates with an SNA access method located in one or more host processors (for example, IBM System/370, or IBM 308X, 3090, or 43XX Processors).

- The partitioned emulation programming (PEP) extension is supported in the 3720 Models 1 and 11.
- Emulation Program (EP) Version 3 and 4 are supported in the 3720 Model 1 only.

The following programs can also reside in the 3720/3721 together with NCP Version 4, Version 4 subset and Version 5, unless otherwise specified.

- Network Terminal Option (NTO), which provides an SNA protocol environment for the start-stop data stream for NCP-attached ASCII devices.
- X.25 NCP Packet Switching Interface (NPSI) for connections over X.25 NCP packet-switched networks.
- Non-SNA Interconnection (NSI), which allows IBM BSC RJE terminals to access non-SNA applications (such as JES2, JES3) via an SNA network. NSI coexists with the full-function NCP Version 4 only.
- Network Routing Facility (NRF), which provides a path between terminals attached to the 3720/3721 without going through the host. NRF cannot coexist with the NCP Version 4 Subset.
- X.25 SNA Interconnection (XI), which provides an X.25 DCE interface at the 3720/3721 that is part of the SNA network. The SNA network can be used as a transport network for data exchange between two X.25-compatible DTEs attached to a 3720/3721 node operating with the X.21 SNA Interconnection (XI).

Network Control Program

NCP provides major capabilities for networks based on systems network architecture (SNA). It provides the controller with the flexibility to meet the demands of an ever-expanding network. It works with the host access method to control networks, from the simplest single-domain network with a single controller, to complex multiple-domain networks using advanced communications function networking, in accordance with the concepts of SNA.

The NCP load module can be loaded in the controller main storage:

- From the host, or
- From the controller hard disk when it has been saved to the disk.

In the last case, IPL and dump can be performed automatically from the load module on the hard disk.

The extended recovery facility (XRF) function is supported. It improves the system availability for an IMS/VS online system by reducing its restart time.

The token-ring interconnection, integrated in NCP, allows attachment to an IBM Token-Ring Network.

Emulation Program

EP emulates most of the functions of the IBM 2701, 2702, and 2703 (270X) to support non-SNA applications. Host programs, written for operation with the 270Xs or for the emulation of these machines on a 3705 and 3725, run with the 3720/3721.

EP provides the support for a large variety of start-stop and BSC terminals.

EP supports only the 3720 Model 1.

Partitioned Emulation Programming Extension

Partitioned emulation programming (PEP) extension lets the NCP operate certain lines in network control mode while operating others under EP control (EP is a corequisite for NCP/PEP). PEP communicates with the SNA and non-SNA access methods.

With PEP extension, the NCP can operate the same non-SNA telecommunication line alternately under NCP or EP control. The change from one to the other may be made dynamically during program execution, by commands sent from the access method. This method of operation requires that the terminal connected to the line be supported by both NCP and EP. The fact that the lines can work in either mode must be specified at program generation time. For PEP:

- EP Release 3 (MVS, VSE) is required with NCP V4 R1
- EP Release 3 (VSE) is required with NCP V4 subset

- EP Release 4 (MVS, VM) is required with NCP V4 R2
- EP Release 4 (MVS, VM) is required with NCP V4 Subset
- EP Release 5 is required with NCP V5 R1
- EP Release 6 is required with NCP V5 R2.

Host-Resident Programs

Operating Systems

NCP and EP can run under the following virtual operating systems:

- Multiple Virtual Storage/370 (MVS/370)
- MVS Extended Architecture (MVS/XA)
- VM System Product (VM/SP)
- Virtual Storage Extended/System Product (VSE/SP)
- VSE/Advanced Function (VSE/AF).

Communication Function Programs

The host-resident programs that support the control program in the 3720/3721 are:

- Access methods located in one or more host processors:
 - The ACF/NCP Version 4 works with the ACF/Virtual Telecommunications Access Method (ACF/VTAM):
 - ACF/VTAM Version 2 Release 1 and Release 2
 - ACF/VTAM Version 3 Release 1, and Release 1.1
 - ACF/Telecommunications Access Method Version 2 Release 4 (ACF/TCAM).
 - The ACF/NCP Version 5 works with the ACF/Virtual Telecommunications Access Method (ACF/VTAM):
 - ACF/VTAM Version 3 Release 1, and Release 1.1 plus the appropriate Program Temporary Fixes (PTFs)
 - ACF/VTAM Version 3 Release 2.

- The Emulation Program (EP) works with the following access methods:
 - Basic Telecommunication Access Method (BTAM-ES)
 - BTAM System Product (BTAM/SP)
 - Remote Terminal Access Method (RTAM)
 - ACF/Telecommunications Access Method (TCAM).
- The ACF/System Support Programs (ACF/SSP), which supports the generation, load, and dump function of the control program.
 - ACF/SSP Version 3 Release 2 with ACF/NCP Version 4 and Version 4 subset
 - ACF/SSP Version 3 Release 3 with ACF/NCP Version 5 Release 1
 - ACF/SSP Version 3 Release 4 with ACF/NCP Version 5 Release 2.
- The NetView program

The IBM 3720/3721 takes full advantage of enhanced network management support with the NetView program.

- NetView program Release 1 with ACF/NCP Version 4, Version 4 subset, and Version 5 Release 1
- NetView program Release 2 with ACF/NCP Version 5 Release 1 and 2.

The NetView program is an IBM licensed program used to monitor a network, manage it, and diagnose its problems. It integrates functions of several network management products and VTAM functions, for example:

- A command facility, which lets the user control, record and automate various operator tasks. It can be used as an operator's interface to VTAM in a data communication network.
- A session monitor, which enables the user to examine, from a central control point, information related to the SNA network and to identify network problems.
- A hardware monitor which helps the user to get problem determination information generated at resources that are either link-attached or channel-attached to the host system.

As a cohesive set of SNA host network management services, the NetView program offers:

- Consistency and usability in its support for network management
- Easy installation procedure

- Navigation between components and functions
- Device support
- Operator usability.

For more details on these programs, refer to Appendix A, "General Bibliography."

Generating the Control Program

ACF/SSP is used in the host to generate control program load modules and load them into controller storage, or to dump the controller storage to the host.

The control program for the controller is generated from the library of NCP and/or EP program modules. To generate the control program, the requirements of the installation are described using language statements that characterize the data communication subsystem. Some characteristics are defined automatically, depending on the options specified.

When the network configuration is changed, the new hardware must be installed, and the control program must be regenerated. Provisions can be made when generating the control program to allow for the future attachment of lines, avoiding the need to regenerate the control program when the lines are actually attached.

It is possible to generate several network control program modules and to keep them in the host secondary storage. To run a particular application in the network, its corresponding control program is loaded and initialized. This is particularly useful if different network configurations are required at different times of day and night.

Loading and Transferring the Control Program

The host operator can transfer and save up to two control program load modules on the controller hard disk. Either load module can be used at controller initialization.

The transfer, replacement or purge of control program load modules from/to disk can be performed during normal operation of the controller. The currently running load module is not disrupted or affected.

This multiple load module capability with non-disruptive load module management requires ACF/NCP Version 5 Release 2, ACF/VTAM Version 3 Release 2 and ACF/SSP Version 3 Release 4.

When the NCP load module has been saved to the controller hard disk and the automatic IPL option has been set, any IPL requested by the network operator from the console or the MOSS panel uses the required control program load module from the controller hard disk. This enables controller IPL to be performed automatically from the controller hard disk after a power-on or a controller failure.

This reduces the time the controller is inoperative when initializing a link-attached controller.

With two load modules saved on the hard disk, the load module used at IPL is:

- The load module last loaded in the CCU if it was saved to the disk, or
- The load module last loaded from the disk during IPL.

This load module will be specified as the *active* load module at the controller console.

NCP/SNA Facilities

3720/3721 and NCP together with the SNA host access methods provide:

- Continuous growth potential from small to large single-domain networks, and from single-domain to multiple-domain networks
- Compatibility with existing host application programs using VTAM
- Increased access to information and host processing
- Extended sharing of resources across domains or independent networks
- Elimination of redundant host application programs in two or more domains
- Application program transparency of the location of a terminal involved in cross-domain communication
- Continuation of cross-domain operations despite certain host processor, controller, or network failures
- Possible decrease in telecommunication line costs by utilizing cross-domain resources, that is, *link-attached* controllers.

The 3720/3721 allows the NCP to test IBM 3865 Model 1 Modems (data multiplexing subchannel link), as well as IBM 3863 and 3864 Modems (tailed modems). See *IBM 3863, 3864, and 3865 Modems, Introduction and Site Preparation Guide*, GA27-3200.

Software Migration

The 3720/3721 offers a path for conversion from existing systems and for continuing growth. A system designed around a 3705 and 3725 may be transferred to the 3720/3721 after regeneration of the control program. The control program generation input that was used in the 3705 and 3725 program generation can be used with some modifications to generate the control program for the 3720/3721 (assuming that the controller has the same line configuration and that the storage capacity installed is adequate).

This migration may require a change in the licensed programs used (for example, NCP, NTO) to a level prerequisite for the 3720/3721.

4-10

Chapter 3. Controller Components

For the first definition of the four 3720/3721 machine units, as well as for 3720/3721 configurations, refer to “Machine Units and 3720/3721 Configurations” on page 1-6.

Controller Organization

The 3720/3721 contains three logical functional areas (see Figure 3-1) depending on the type of line unit:

1. The 3720 Model 1 (channel-attached base unit) contains:
 - The *control subsystem* (CSS), which consists of:
 - The central control unit (CCU)
 - The main storage: 1 or 2 megabytes
 - One or two channel adapters (CAs) with or without two-processor switches (TPSs).
 - The *transmission subsystem* (TSS), which consists of:
 - One communication scanner (CS) to control from one to seven line interface couplers (LICs) and line attachment hardware¹:
 - For up to 28 teleprocessing (TP) lines at 9600 bps
 - For up to 4 TP lines at 64 000 bps
 - For up to 1 TP line at 256 000 bps.
 - One internal clock control (ICC) for modems that do not provide their own clocking, and for direct attachment. (The 3720/3721 ICCs are standard.)
 - The *maintenance and operator subsystem* (MOSS), which consists of:
 - The processor and storage

¹ For more details of the number of lines and line speeds depending on the duplex or half duplex mode and on the protocol, refer to the *3720/3721 Configuration Guide*.

- The hard disk and diskette drive
- The control panel
- The communication adapter for the local and remote consoles and for the remote support facility.

MOSS has its own microcode and operates independently of the rest of the controller. One of its functions is to detect and isolate failures within the controller, even if the controller is down. MOSS also diagnoses itself. For more details about MOSS, refer to Chapter 4, "Maintenance and Operator Subsystem."

2. The 3720 Model 2 (link-attached base unit) contains the same components as in the 3720 Model 1 except that it has no channel adapter and no TPS.
3. The 3720 Model 11 (channel-attached base unit) has the same logical structure as in the 3720 Model 1 but provides an additional token-ring subsystem (TRSS). It contains:
 - The same *control subsystem* (CSS) as in the 3720 Model 1.
 - The *transmission subsystem* (TSS), which consists of:
 - One communication scanner (CS) to control from one to four line interface couplers (LICs), and line attachment hardware:
 - For up to 16 teleprocessing (TP) lines at 9600 bps
 - For up to 4 TP lines at 64 000 bps
 - For up to 1 additional TP line at 256 000 bps.
 - One internal clock control, (ICC) for modems that do not provide their own clocking and for direct attachment. (The 3720/3721 ICCs are standard.)
 - The *token-ring subsystem* (TRSS), which consists of:
 - One token-ring multiplexer to control one or two token-ring interface couplers (TICs).
 - One TIC can be attached to one IBM token-ring network.
 - Two TICs can be attached to the same IBM token-ring network.
 - The same *maintenance and operator subsystem* (MOSS) as in the 3720 Model 1.
4. The 3720 Model 12 (link-attached base unit) contains the same components as in the 3720 Model 11 except that it has no channel adapter and no TPS.
5. The 3721 Model 1 (expansion unit with one scanner) contains:
 - The *transmission subsystem* (TSS), which consists of:

- One communication scanner (CS) to control one to eight additional line interface couplers (LICs)¹:
 - For up to 32 additional TP lines at 9600 bps
 - For up to 4 additional TP lines at 64 000 bps
 - For up to 1 additional TP line at 256 000 bps.
- One internal clock control (ICC).

6. The 3721 Model 2 (expansion unit with two scanners) contains:

- The *transmission subsystem* (TSS), which consists of:
 - Two communication scanners (CSs) to control from one to eight additional line interface couplers (LICs). Each CS controls up to four LICs¹:
 - For up to 32 additional TP lines at 9600 bps
 - For up to 8 additional TP lines at 64 000 bps
 - For up to 2 additional TP lines at 256 000 bps.
 - One internal clock control (ICC).

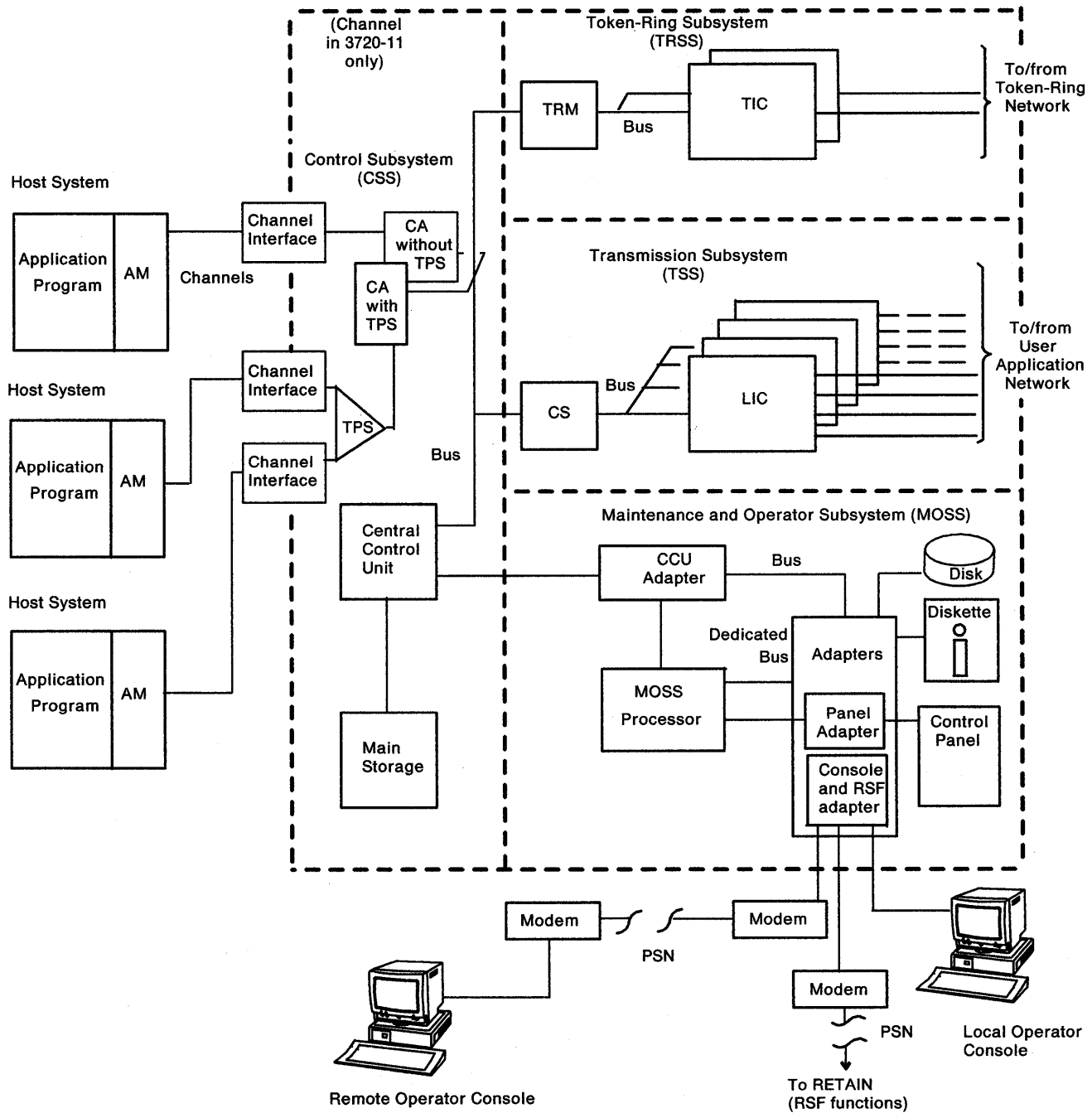


Figure 3-1. 3720 Subsystems

Control Subsystem

The control subsystem consists of the central control unit (CCU), with up to 2048K bytes of storage. When locally attached, it can contain up to two channel adapters, which can be equipped with one two-processor switch each.

Central Control Unit

The CCU, driven by the NCP and/or EP control program in main storage, controls all the attached lines and all the channel connections to the host(s). For link-attached controllers, one or more high-speed lines are used to connect to a channel-attached controller or to other remote controllers.

For details, see *IBM 3725 and 3720/3721 Communication Controllers, Principles of Operation*, GA33-0013.

Storage

Main storage is available in two sizes, 1024K bytes or 2048K bytes. The storage size required depends on the type of control program and the number, speed, and protocols of the attached lines.

An *error checking and correction* (ECC) procedure is used during the read cycles for main storage. It *corrects* all single-bit errors and *detects* double-bit errors.

Channel Adapter

The 3720/3721 uses a single type of channel adapter. The function of the channel adapter is to attach the CCU to the host data channels (byte-multiplexer, block-multiplexer, or selector channels).

Regardless of the channel type used, the NCP requires only one channel address (called native subchannel or NSC) to attach to a host for all data transmission. EP requires one subchannel per line (called emulated subchannel or ESC). EP must use byte-multiplexer channels to communicate with a host.

The channel adapter issues an IPL control signal to the CCU on the native subchannel. This signal allows the host to initialize the controllers in the network.

Manual switches are provided on the control panel to activate and deactivate the interfaces of the data channels. This can also be done from the remote console. See "Panel and Console Functions" on page 4-7.

A 3720 Model 1 or Model 11 contains one or two channel adapters. The 3720 Model 2, 3720 Model 12, 3721 Model 1, and 3721 Model 2 do not contain any channel adapter.

The normal channel provided by the channel adapter is called *interface A*. The channel adapters can connect to the same or to different hosts.

Two-Processor Switches

A two-processor switch (TPS) provides an additional channel interface, called *interface B*, to a channel adapter. The two interfaces can lead to the same or to different hosts. Manual switches on the 3720/3721 control panel allow the user to select:

- Interface A only, or interface B only. This is used to connect the channel adapter to one host channel or the other.
- Both interfaces A and B. This is used to connect both interfaces of the channel adapter to two-channel interfaces on the same host *multiprocessor*, only one connection being active at a given time.
- Neither interface A nor interface B. This is used to disable a channel adapter for test or diagnostic purposes.

If both interfaces A and B are enabled by the 3720/3721 control panel switches, the attached host must activate either interface as required. Either interface can be active alternately, but both interfaces cannot be active simultaneously. (The attached host is responsible for ensuring that both host interfaces are not active at the same time.) This maximizes the availability of the host connections.

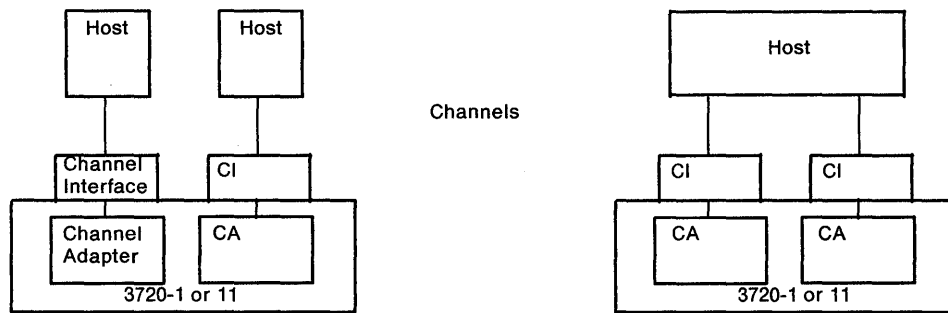
If only one interface is enabled at a time by the 3720/3721 control panel switches, the attached host activates the channel as required for the application. To change to the other interface, either a manual intervention on a switch, or an action from the remote console is required (see Figure 3-2).

For the emulator subchannel, the two-processor switch is not supported in automatic host control. The emulator subchannel interfaces must be switched between processors manually by enabling only the desired interface switch on the 3720 control panel. Emulator subchannels are not available when both channel adapter interfaces are enabled.

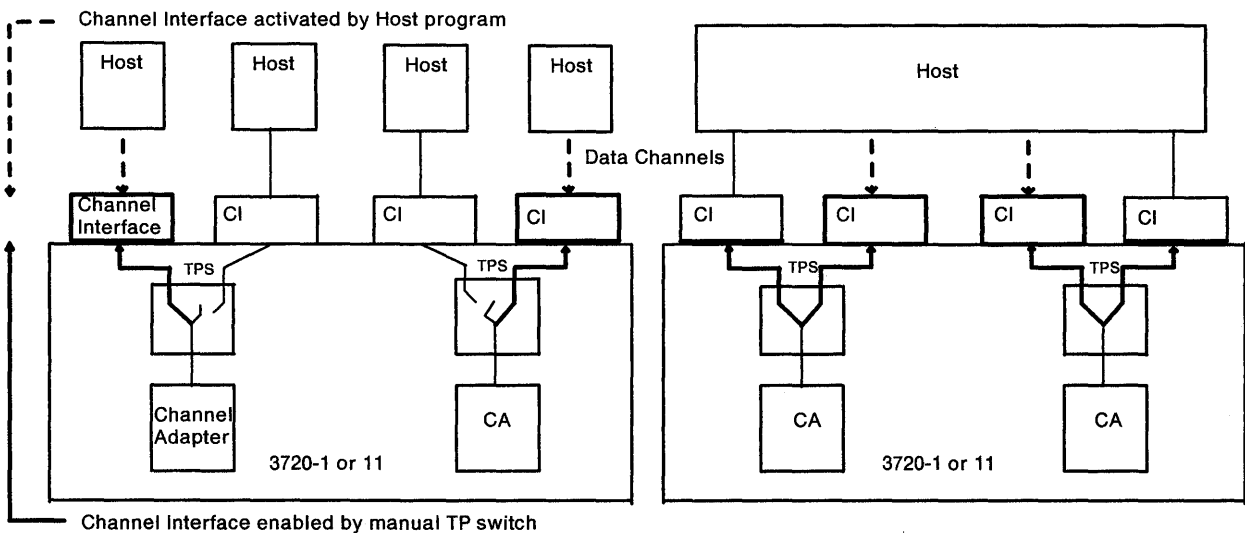
The 3720/3721 can be upgraded (by IBM service personnel) with two-processor switch features, one per channel adapter.

Remember that only two channel interfaces can be active simultaneously.

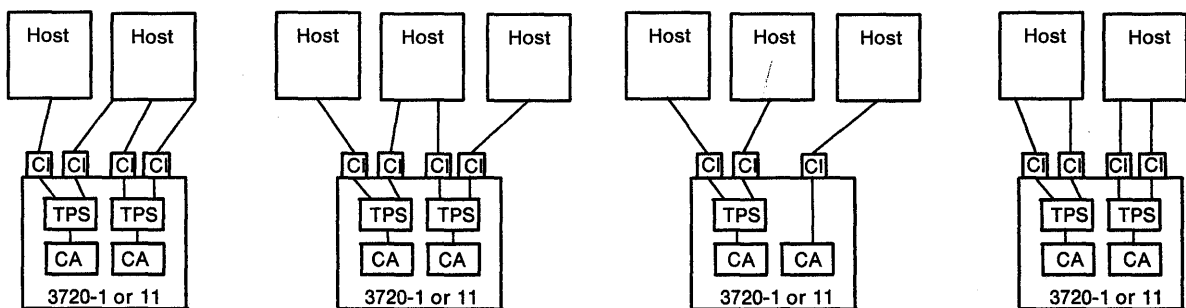
1. Without TPS: Up to two host/CA configurations



2. With TPS: Up to four host/CA configurations (two simultaneously active)



3. Examples of configurations with TPS



Note: Only two channel interfaces can be simultaneously active.

Figure 3-2. Channel Adapter and Two-Processor Switch

Transmission Subsystem: General Description

The transmission subsystem (TSS) consists of *communication scanners* (CSs), *line interface couplers* (LICs) and an *internal clock control* (ICC).

The TSS can attach and control:

- Up to 28 lines for a 3720 Model 1
- Up to 28 lines for a 3720 Model 2
- Up to 16 lines for a 3720 Model 11
- Up to 16 lines for a 3720 Model 12
- Up to 32 lines for a 3721 Model 1
- Up to 32 lines for a 3721 Model 2.

For details of LIC types, see "Transmission Subsystem: Line Attachment through LICs."

Communication Scanners

The 3720/3721 uses a single type of microprocessor-based communication scanner. It serializes and deserializes the characters, supports various line protocols, and provides character buffering and cycle steal transfer into 3720/3721 main storage.

The scanners support asynchronous protocols with 5 to 8 data bits and 1 to 2 stop bits, BSC (EBCDIC, ASCII) and SDLC. They also support procedures for automatic calling units and X.21 native, X.21 bis, and X.20 bis. They handle a variable number of lines, depending on the protocols and the transmission speeds.

The communication scanners are initialized during initial program load (IPL). In the event of an error in the microcode of a scanner, that scanner can be selectively reinitialized.

Internal Clocking

A clock provides clocking at speeds from 50 to 245 760 bps.

This internal clock control (ICC) is used when terminals are direct-attached or when the DCEs do not provide clocking.

Transmission Subsystem: Line Attachment through LICs

Telecommunication lines, usually terminated by a modem, are connected via cables to line interface couplers (LICs) in the 3720/3721.

The LICs provide the functions necessary to interface the communication scanner with the various external facilities such as DCEs and other communication common carrier or PTT interfaces.

A LIC receives the data coming from the attached lines, transfers it to the communication scanner, and conversely distributes the data coming from the communication scanner to the attached lines.

A single line interface coupler type can attach lines using different protocols, with either internal or external clocking. For example, a LIC type 1 (LIC1) can handle start-stop protocols as well as SDLC or BSC protocols at line speeds up to 19200 bps. The protocol selection is made by control program generation parameters, or automatically by MOSS and IPL action based on customized MOSS files. Different coupler types can be plugged into the same unit. These characteristics give considerable flexibility in the number and type of lines that can be attached to the controller. This is particularly advantageous when an installation requires several different types of lines.

Five types of LIC are available for connecting most of the widely-used line interfaces.

3720/3721 LICs are functionally equivalent to 3725 LICs.

Line Interface Coupler Type 1

Type 1 characteristics are:

- *Type of interface* (the four interfaces attached to a given LIC1 can be of the same type, or different, and are configured individually by cabling or by the scanner microcode):
 - EIA 232D/CCITT V.24 interface
 - Autocall interfaces corresponding to EIA RS366/CCITT V.25, and X.21 bis leased or switched interfaces.
- *Number of lines*: From one to four lines
- *Protocols*: It supports devices using:
 - Asynchronous (start-stop) protocols
 - Synchronous (SDLC, BSC) protocols.
- *Data speed*: Up to 19 200 bps
- *Type of attachment*:
 - Modem attachment
 - Direct-attachment at distances up to 150 m (492 ft).

Line Interface Coupler Type 2

Type 2 characteristics are:

- *Type of interface:* Interface used to connect wideband data stations; Bell 303 interface
- *Number of lines:* One
- *Protocols:* Synchronous (SDLC, BSC)
- *Data speed:* From 19 200 through 256 000 bps (analog lines)
- *Type of attachment:* Modem attachment.

Line Interface Coupler Type 3

Type 3 characteristics are:

- *Type of interface:* CCITT V.35
- *Number of lines:* One
- *Protocols:* Synchronous (SDLC, BSC)
- *Data speed:* Up to 256 000 bps
- *Type of attachment:*
 - Modem attachment
 - Direct attachment (up to 245 760 bps) at distances up to 150 m (492 ft).

Line Interface Coupler Type 4A

Type 4A characteristics are:

- *Type of interface:* Leased or switched X.21 interface
- *Number of lines:* From one to four
- *Protocols:* Synchronous (SDLC)
- *Data speed:* Up to 9600 bps
- *Type of attachment:*
 - Modem attachment
 - Direct attachment at distances up to 600 m (1968 ft).

Line Interface Coupler Type 4B

Type 4B characteristics are:

- *Type of interface:* Leased or switched X.21 interface
- *Number of lines:* One
- *Protocols:* Synchronous (SDLC)
- *Data speed:* Up to 256 000 bps
- *Type of attachment:*
 - Modem attachment, or
 - Direct attachment at distances up to 600 m (1968 ft) for speeds up to 19 200 bps, and distances up to 300 m (984 ft) for speeds up to 245 760 bps.

Token-Ring Subsystem

The token-ring subsystem (TRSS) consists of a *token-ring adapter* (TRA).

The components of a TRA are:

- One token-ring multiplexer (TRM)
- One or two token-ring interface couplers (TIC).

An IBM token-ring network can be connected to one of the two TICs available in a 3720 Model 11 or Model 12. The same token-ring network can be connected to two TICs. Only one attachment can be active at a time. This is a backup provision in case the one active TIC fails. Interconnection to the token-ring network is provided by the IBM Cabling System. This common wiring system accommodates the receive and transmit path requirements for ring transmission. For details, see *IBM Token-Ring Network and Planning Guide*, GA27-3677.

Token-Ring Multiplexer

The token-ring multiplexer (TRM) adapts the TICs to the bus of the CCU.

Token-Ring Interface Coupler

A token-ring interface coupler provides one attachment to one IBM token-ring network. A maximum of two TICs can be installed in a 3720 Model 11 or 12. The TIC is field installable by the user.

Its main characteristics are to:

- Monitor the ring activity
- Support ring protocols
- Operate at 4 million bps.

The TIC can communicate with IBM Personal Computers through the token-ring, and with the IBM 3174 Control Unit.

Maintenance and Operator Subsystem

The maintenance and operator subsystem (MOSS) is a 3720/3721 subsystem.
MOSS is described in Chapter 4.

Chapter 4. Maintenance and Operator Subsystem

The maintenance and operator subsystem (MOSS) provides the following functions:

- Controller initialization, IML and IPL control
- Automatic IPL after a failure
- Dump before automatic IPL and dump transfer from the hard disk to the host
- Controller supervision
- Problem determination
- Failure isolation
- Controller maintenance.

The main components of the MOSS are:

- The microprocessor and storage
- The disk/diskette drive and adapter
- The control panel
- The console communication and the remote support facility (RSF) adapter.

The consoles to be attached to the 3720/3721 are separately orderable. A console can be local or remote, see "Operator Console" on page 4-6.

The structure of the MOSS and its relationship to the control subsystem, transmission subsystem, token-ring subsystem, and host system are illustrated in Figure 3-1.

MOSS Processor and Storage

The MOSS microprocessor operates independently of the other 3720/3721 subsystems. Its microcode is loaded directly from the hard disk into the MOSS storage during IML at power on time.

MOSS Disk/Diskette Drive and Adapter

Two drives are connected to the MOSS bus via a common adapter:

- A diskette drive with removable diskettes. Each diskette provides 1228K bytes. Two sets of two diskettes are shipped with each 3720/3721 unit and contain the MOSS microcode and the diagnostic programs. One diskette is shipped with each 3721 unit and contains the configuration information for the unit.
- A disk drive with one fixed disk which provides 10650K bytes. At installation time, the diskettes are copied onto the hard disk which then becomes the only disk used by MOSS. After installation the diskettes are used only for backup.

The fixed disk contains:

- Communication scanner microcode
- MOSS microcode
- Optionally, up to two control program load modules
- One control program dump
- Support for:
 - Logon password
 - Automatic BER analysis
 - Wrap test
 - Remote support facility.
- Diagnostic programs
- BER file
- Line description file (LDF)
- Line interface display (LID)
- Configuration data file (CDF)
- Token-ring interconnection (TRI)
- Machine level table (MLT)
- Disk IPL information (DII)
- IPL port table
- Dump buffer areas
- Microcode fix (MCF) program
- Port swapping status.

Line Description File

The line description file (LDF) contains the characteristics of all attached lines (for example, line control protocol, nominal speed, symbolic name). It also provides the status of the attached token-ring links.

The LDF is created, updated, and displayed by the operator from either a local or remote console.

Line Interface Display

The line interface display file (LID) contains various line parameters (control program, line type, protocol, interface standard, speed, clock, transmission, cable identification). It displays data set leads, transmit and receive commands, and command status.

The operator can use this function for error and fault detection.

Configuration Data File

The configuration data file (CDF) stores information about the CCU main storage size, channel adapters and two-processor switches, communication scanners, token-ring adapter, line interface couplers, token-ring interface couplers, cables, and clock feature.

It is created at the manufacturing site and is then checked automatically against the current controller configuration at installation time. It is displayed and updated for each change in the 3720/3721 configuration. This file is used by MOSS during the initialization process, and by the diagnostic programs.

Token-Ring Interconnection

The token-ring interconnection function allows the user or IBM service personnel to display the status and activity of the token-ring attachment. It is used to isolate and determine a problem in the token-ring adapter (TRA).

Machine Level Table

The machine level table (MLT) contains information such as the microcode level of the machine, the type and version of the control program (NCP, NCP/PEP, EP) and, also, the name of the load module which are used. This table provides information required by the maintenance personnel.

The MLT can be displayed from the operator console. This file may be transferred to NPDA or NetView program on request (NCP only). Also the MLT can be printed at the host whenever a microcode dump is requested.

Disk IPL Information

The disk IPL information (DII) function displays the status of the control program load modules, the control program dump, and the setting of the automatic dump/load option. The user can also purge the dump file and change the automatic IPL/dump option setting.

IPL Port Table

An IPL port is any channel or telecommunication line used to transfer the control program from the host to the controller. The IPL port table contains either the channel link address, or the communication link addresses used to IPL the controller.

The IPL port table is maintained on the hard disk, and contains the parameters of each IPL port. The link addresses in the IPL port table are initialized at installation time by the user via the operator console, and must be updated if the IPL link addresses are changed.

Communication Adapter for Consoles and RSF

See Figure 3-1, which shows how the adapter is situated in the MOSS.

The MOSS contains a common communication adapter for operator consoles and for the remote support facility (RSF):

- *Local console*: Direct attachment (no modem) using start-stop protocol
- *Remote console*: Switched connection (modem) using start-stop protocol
- *Remote support facility*: Switched connection (modem) using BSC protocol.

Only one console, or the RSF, can be active at a time.

See: "Remote Support Facility" on page 6-13 for a description of RSF functions.

Types of Modems

Different modems are required for remote console and for remote support facility.

- *Remote console*: Modem with auto-answer and compatible with:
 - IBM 5841 or equivalent (compatible with Bell 212-A) or IBM 5842 at 1200 bps or equivalent (CCITT V.22 bis) in the USA and Canada
 - CCITT V.22 alternate B or V.22 bis (1200 bps) in other countries.
- *Remote support facility*: Modem with auto-answer and compatible with:

- IBM 5841 or equivalent (compatible with Bell 212-A) or IBM 5842 at 1200 bps or equivalent (compatible with ATT 2224) in the USA and Canada
- CCITT V.23 in other countries.

Control Panel

The control panel located on the 3720 contains switches and indicators that allow the operator to:

- Control the power system
- Communicate with MOSS
- Enable the channel interfaces
- Control the local and/or remote consoles.

Most switch and indicator names are self-explanatory. The three-digit hexadecimal display is used to display:

- Progress of IPL
- Errors during initialization
- Progress of the diagnostic programs for the maintenance personnel.

Some functions do not require a console to run, for example, CSU status during setup.

Power On or Off in 3720 Models 1 or 11 (Channel-Attached)

A power control function switch on the control panel can be set to *local*, *network*, or *host*:

- If the power control function switch is set to *local*, the 3720/3721 can be powered on and off manually by the local operator.
- If the power control function switch is set to *network*, the 3720/3721 can be:
 - Re-powered on automatically by the auto-restart 3720/3721 function after a main ac power outage
 - Powered on from the control panel
 - Powered off by a host command.
- If the power control function switch is set to *host*, the 3720/3721 can be:
 - Powered on automatically by the 3720/3721 auto-restart function
 - Powered on and off automatically by a channel-attached host.

Power On or Off in 3720 Models 2 or 12 (Link-Attached)

The 3720/3721 can be:

- Powered on and off manually by the local operator
- Re-powered on automatically by the auto-restart 3720/3721 function after a main ac power outage
- Powered off by a host command sent through the network if the Remote Power Off switch on the control panel is set on Enable.

Operator Console

An operator console must be provided by the user. The console is attached to each 3720 Model 1, 2, 11, or 12 to provide operator access to 3720/3721 via MOSS, for maintenance and problem determination. Various 3720/3721 tasks can be performed from the operator console(s) and/or the 3720 control panel. For more details see "Panel and Console Functions."

See also:

IBM 3101 Display Terminal Description, GA18-2033

IBM 3161/3163 Display Station Description, GA18-2310 (this manual also describes the IBM 3164 Display Station).

Console Type

The operator console can be:

- An IBM 3161 Model 11 or Model 12, in 3101 emulation mode
- An IBM 3163 Model 11 or Model 12, in 3101 emulation mode
- An IBM 3164 Model 11 or Model 12, in 3101 emulation mode
- An IBM PC 5150, 5160 or 5550, using 3101 emulation program (Program number: 6024-042)
- Or equivalent to the IBM 3101 model 23.

Console Attachment and Functions

A console can be attached to a controller as a:

- *Local console:* Directly attached to the controller without a modem (also called DCE). It may be a maximum of 150 m (492 ft) from the 3720/3721. The data speed is 2400 bps.

And/or

- *Remote console*: Connected to the controller over a switched telephone line through a duplex modem equipped with the auto-answer feature. The maximum data speed is 1200 bps.

Only one console is required per controller. A remote console may be used by several 3720/3721 controllers.

However, if the RSF is not installed, a local console is required.

When a local and a remote console are connected to the same controller, only one console can be active at a time. The local console can take control at any time, but a manual switch mounted on the control panel gives control to the local console when needed. In installations where only a remote console is installed, the IBM service personnel can use the local console port to connect a service terminal (IBM Portable PC or PT-2).

The operator console is used only when installing the 3720/3721, updating the configuration, or for problem determination.

The operator console is connected to MOSS via a common communication adapter (CCA) (CCITT V.24 interface).

Access to MOSS is protected by a password.

The operator supervises the controller by choosing functions from menu areas of the screen.

Panel and Console Functions

The 3720/3721 functions are controlled from the operator console(s) and the control panel, as follows:

- From a *local* console:
 - Problem determination (see Chapter 5, "Network Problem Determination" and Chapter 6, "Controller Problem Determination and Maintenance")
 - Maintenance facilities (see Chapter 6)
 - Supervisory functions using disk files (see "MOSS Disk/Diskette Drive and Adapter" on page 4-2).
- From the panel (see "Control Panel" on page 4-5):
 - Power system control
 - Function selection and initiation
 - Channel interface enable/disable
 - Control of console(s) (see the following).

When the console is *remote*, some panel functions are also available from that console:

- Display messages corresponding to panel lamps and hexadecimal display
- Interface channel enable/disable switches
- IPL and IML.

A switch on the control panel allows a controller operator to transfer these functions, either to the panel or to the remote console.

MOSS Functions

Most of the initialization, supervision, controller problem isolation, and maintenance functions of the 3720/3721 are performed using MOSS, and most of them are available to the user.

MOSS provides:

- Automatic IPL after controller power on or failure.
- Automatic recording of box event records (BERs) in the BER file on the hard disk.
- Generation of alert messages to support the network problem determination application at the host.
- Automatic recording of alarm messages on the hard disk.
- Automatic display of alarms.
- Automatic retry of failing controller hardware or MOSS or scanner microcode, with automatic IML after unrecoverable failures. See "Automatic Scanner Re-IML" on page 6-9 for more details.
- Functions that maintain machine files defining the configuration of the lines and token-ring networks attached to the controller, machine details of the controller, and parameters of the lines, token-ring networks, and channels used in the initialization process.
- Utility programs for the operating personnel and IBM service personnel, which:
 - Dump the MOSS, scanner storages, and TIC storages on the hard disk
 - Transfer the dump taken before an automatic IPL to the host
 - Modify the control code (MCF function)
 - Save vital files from the hard disk and write them onto a new disk after an engineering change or a disk failure

- Help debug user-written programs and troubleshoot the control program (address compare, branch trace)
- Isolate hardware problems in the controller
- Provide tools to help isolate problems on lines and token-ring attachments.
- A reference code which:
 - Is created automatically by the AUTOBER program for each new BER.
 - Is included into alert and alarm messages and displayed with them (in token-ring configurations, only the alarm message contains the reference code).
 - Corresponds to a precise type of error and gives information about:
 - The concerned hardware or software component
 - The possible cause of the failure.
 - Allows the user to:
 - Enter the problem determination procedure, or
 - Call the appropriate service organization.

Initializing the Controller

The controller initialization follows the controller microcode loading. The control program is loaded under either control from the host or from the MOSS when it has been saved to the controller hard disk. Initialization can be invoked under the following conditions:

- Automatically with the automatic IPL capability
- At the request of the host operator or host program via a command from the access method
- At the request of the 3720/3721 operator from the control panel or from the console
- At the request of the control program.

Control program loading can be initiated automatically from the load module saved on the controller hard disk when the automatic IPL from disk option has been chosen:

- At power on or at auto-restart
- After a CCU failure.

When two load modules are saved on the hard disk, the control program load module used for automatic IPL/dump is the load module specified as *active* at the

controller console (see "Loading and Transferring the Control Program" on page 2-6).

For any IPL, the operator is kept informed of the progress of the initialization process by the hexadecimal display on the control panel, and by messages displayed in the machine status area of the operator console display.

Supervising the Controller

Normal operations are supervised by the control program. However, to use special diagnostics, the operator supervises the controller from the operator console. At any time, the screen presents the operator with a menu of functions. The operator proceeds through the screen and is prompted and given assistance by the system.

Automatic IPL and Dump

The automatic IPL capability is obtained when:

- The control program load module has been saved on the controller hard disk, and
- The automatic IPL/dump option has been set during NCP loading.

Automatic IPL from the disk is performed after power on, or after a controller failure.

An IPL request from the network operator, either from the control panel or the controller console, uses the *active* load module on the controller hard disk (see "Initializing the Controller" on page 4-9).

When an automatic IPL occurs after a failure, there is an automatic dump of the controller storage before the control program reloading.

- The dump is saved on the controller disk. The network operator can request the transfer of either a part or all of the saved dump to the host. A total purge of the dump can also be requested.

However, there is no automatic IPL/dump process, while an NCP dump is already stored on the disk. The intervention of the network operator is required to:

- If desired, request the transfer of the 3720 storage dump,
- Request the re-IPL of the 3720 (loading of the NCP load module from the controller disk), then
- Request the retrieval and/or the purge of the dump stored on the controller disk.

The automatic IPL/dump operation then resumes.

User Functions Provided by MOSS

Unattended Operations

From the remote console, if the panel/console switch is set to CONSOLE, the user can:

- Display all the panel settings
- Modify the panel settings through MOSS code control, for example:
 - Channel adapter enable/disable request (3720 Model 1 or 11 only)
 - General IPL
 - IML with reset.

Logon Password

The user defines a password to authorize the access to the MOSS, either locally or via a remote console. This password protects against intrusions.

Programmable Line Speed

This function allows the user to set, display, and/or update the speed of direct-attached lines.

Automatic BER Analysis

Each BER is analyzed by the AUTOBER program to produce the reference code. See “MOSS Functions” on page 4-8.

Port Swapping

If a link to a port is unusable because of a LIC or scanner failure, it is possible to logically and physically switch that link from its original port to a spare one, without generating and/or reloading the control program. It is also possible to display the port swap file to verify the ports.

Internal Wrap Test

This problem determination tool allows the user to see whether the 3720/3721 is working correctly:

- At modem level
- At cable level
- At LIC tailgate level
- At LIC level
- At TIC level.

Note: For more details about wrap tests, see *3720/3721 Extended Services Guide*.

Chapter 5. Network Problem Determination

A hardware, microcode, or software failure may occur in a data network. There are two types of error that are handled separately by the 3720/3721:

- *Network error:* In any part of the network except a controller. For example, in a line, a modem, a station, a token-ring network or in a host. This is the subject of this chapter.
- *Controller error:* In a component of a controller unit. This is the subject of Chapter 6.

Before repairing the faulty element, the problem determination process takes place, at a network level and/or at a controller level, depending on the problem.

For example:

1. *At controller level:* The control program of a given controller detects an anomaly in data transmission. It sends an error message to the host.
2. *At network level:* The host receives the message which is processed by the host software tools (access method and NCCF/NPDA or the NetView program). The problem is to determine the faulty element. For example, one controller may detect a fault in another controller to which it is linked. The network operator analyzes the message and tries to determine the failing controller using the host procedures.
3. *At controller level:* If necessary, the network operator through the remote console, or the local operator through the local console and the control panel, use MOSS tools to determine which element is faulty and to follow the appropriate procedure.

Problem Determination Responsibility

The 3720/3721 generates error messages for a local or remote 3720/3721 operator, and/or a host operator. These messages provide the details necessary (reference code) for the operator to identify the failing component and the probable cause of the failure, and if necessary to call the appropriate service organization (communication common carrier, PTT, IBM, or non-IBM).

It is the user's responsibility to manage a failure through to its resolution by the appropriate organization. The isolation and repair of the failure is a maintenance responsibility.

Network Error Handling in a 3720/3721 with NCP/PEP

Network errors (for example, lines, modems, stations, or token-ring networks) are recognized by the NCP/PEP, which reports them to the host access method in different ways:

- As an "inoperative" (INOP) message to the host operator
- As a *record maintenance statistic* (RECMS), which is recorded at the host in operating system log file (LOGREC) for further analysis by maintenance personnel.
- As a *network management vector transport* (NMVT), which is sent to the host with VTAM and the NetView program. This is used for errors in token-ring networks.

Network Error Handling in a 3720/3721 with EP

The EP detects and collects network and controller errors. The network errors are reported to the host access method.

Network Error Handling in Host

The network error handling is managed by the access method (VTAM). VTAM is independent of NPDA or the NetView program. However, VTAM used in conjunction with NPDA or with the NetView program allows the error handling at the host console. In the latter case, VTAM is used with the NetView program for token-ring configurations. Line, modem, or terminal inoperative (INOP) messages are directed to the host console. The record maintenance statistics are recorded in LOGREC, as for previous controllers. NMVTs are also directed to the host console. See Figure 5-1.

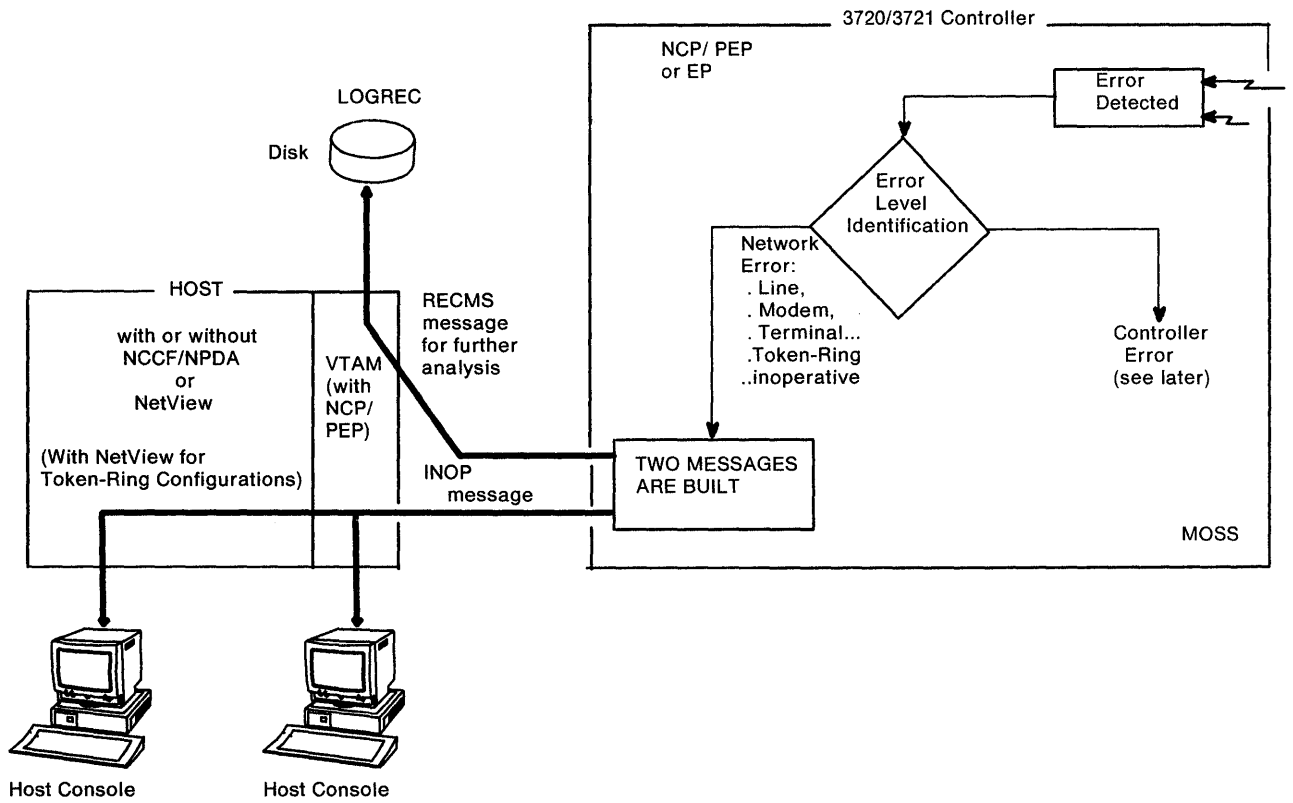


Figure 5-1. Network Problems Determination

Chapter 6. Controller Problem Determination and Maintenance

Three types of installation are described:

1. Controller with NCP/PEP and host with NCCF/NPDA or the NetView program
2. Controller with NCP/PEP and host with access method only
3. Controller with EP and host with access method only.

Controller Error Handling in a 3720/3721 with NCP/PEP

Controller errors are detected by the NCP/PEP or by MOSS.

Box Event Records

When a failure is detected in a component of the controller, NCP/PEP or MOSS builds a box event record (BER) ¹. MOSS adds it to the BER file, which is stored on the hard disk. Each BER contains relevant details about the component at the instant of the detected failure.

The major types of BER are: MOSS, CCU, IOC bus, CA, TSS, TRSS, NCP/PEP.

The BER file contains the most recent BERs. These can be displayed on a 3720/3721 console at any time. The number of BERs stored depends on their length. For example, there may be up to 100 records in BER file. Scrolling facilities are provided to view the entries. In addition, MOSS prepares BER summaries according to the:

- Number of failures per component
- Component failure lists.

In the event of a disk failure, BERs are kept in the MOSS storage. Should MOSS be powered down after a disk failure, those BERs will be lost.

MOSS uses the BER to build an alarm/alert message. See Figure 6-1.

¹ The word *box* is used instead of *controller* to contrast with the *network* in which the controller is only a component.

AUTOBER Program, Reference Code, and BER Threshold

The automatic BER analysis program (AUTOBER) is a facility for failure isolation.

Reference Code

Each BER is analyzed by the AUTOBER program to produce a reference code:

- Which identifies a failing hardware or software component, or the environment of a more complex problem.
- Is included into the alarm and alert messages. For token-ring error handling, the reference code is contained in alarm messages only.

BER Threshold

Let's assume that intermittent failures occur in a communication scanner. These failures could successively affect several lines. The result would be:

- An alarm/alert message is issued by MOSS for each error occurrence.
- Several lines are involved, but it is not obvious that these errors have a common cause.

To optimize the problem determination, a threshold can be defined for certain types of errors. In this case, the alarm/alert message are issued after a certain number of error occurrences. AUTOBER analyzes this information and creates a more enlightening reference code.

The value of this threshold is defined by the user.

Controller Failure Messages - Alerts and Alarms

Programming support has been built into the host and the controller to make problem determination easier, and two mechanisms called the alert and alarm are provided to help accomplish this.

Alerts

The alert provides:

- An automatic first level of:
 - Network problem determination
 - Controller failure isolation.
- A notification of failure to the host
- A recommendation for further problem determination actions to be taken which could include other tests and/or a call to the appropriate service organization.

There are about 32 different alerts, which allow the host operator to distinguish the various failures.

MOSS builds alert messages in a coded form. These are translated by NPDA or the NetView program in the host into a displayable message. The *reference code* is included in the alert message information (except for token-ring related error). This code corresponds to a precise type of error and gives information about the probable cause of the error. It will be transmitted to IBM maintenance by the user to allow the service personnel to prepare the most appropriate action.

The alert message is sent to the host by the NCP/PEP. The NCP/PEP can detect whether the MOSS is down, and send a MOSS down alert message to the host. MOSS can detect whether the CCU is down, and send an alarm to the 3720/3721 console.

Alarms

The alarm provides:

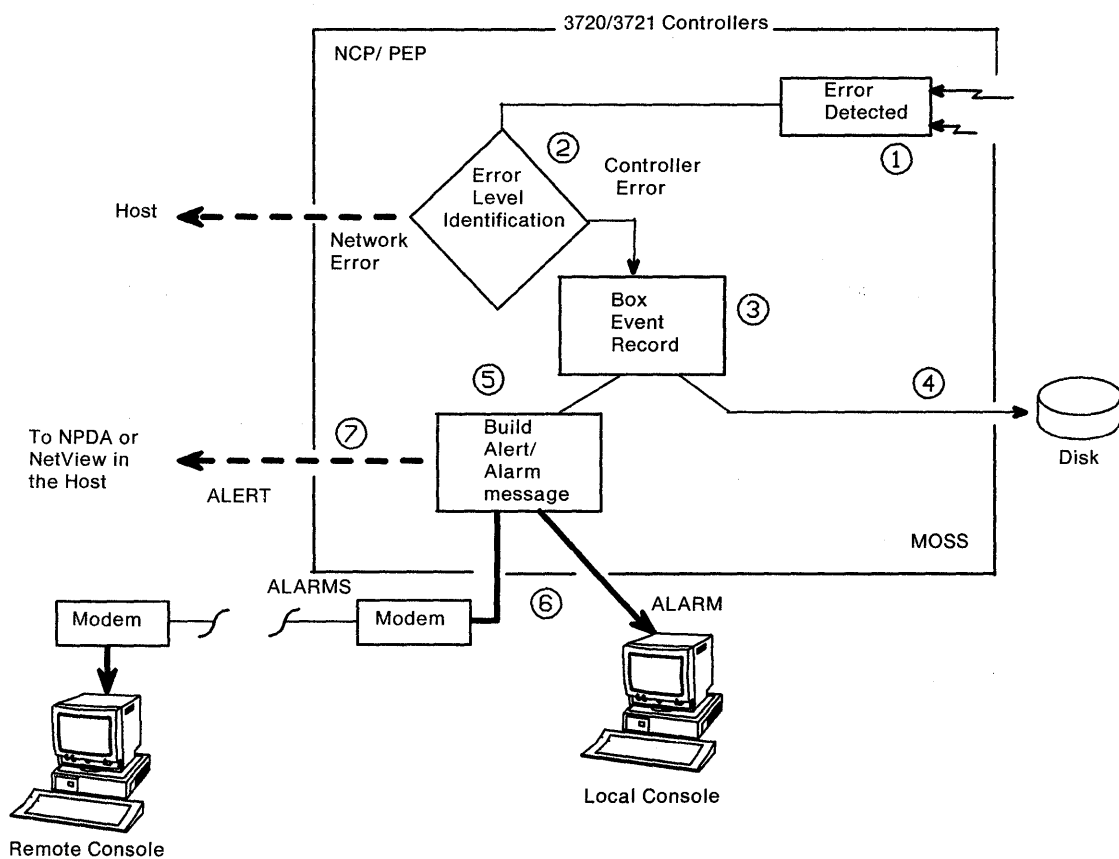
- An automatic first level of:
 - Network problem determination
 - Controller failure isolation.
- A notification of failure to the 3720/3721 console
- An entry point into the maintenance documentation to follow through with the problem determination, repair, and fix.

MOSS records all the alarms onto the controller hard disk. The console display shows the five most recent alarm messages.

Problem determination for the 3720/3721 is designed so that the information in the alert/alarm, in conjunction with additional tests indicated by the alert/alarm message, identifies the failing controller component. The maintenance personnel can isolate the failure at the controller level using the reference code.

In addition, the message text and the reference code identify an entry point into the maintenance documentation for the procedures and diagnostics to isolate and repair the failure.

See Figure 6-1 on page 6-4.



- ① Error detected
- ② Controller error identified
- ③ BER built by NCP/PEP or MOSS
- ④ BER recorded on disk
- ⑤ Alert/Alarm message built
- ⑥ Alarm sent to 3720 console(s)
- ⑦ Alert sent to host (NPDA or NetView)

Figure 6-1. Controller Errors in NCP/PEP Environment

Controller with NCP/PEP and Host with NCCF/NPDA or the NetView Program

The Network Communication Control Facility (NCCF) is an IBM program product designed for use with various levels of VTAM in a complex user application network.

NCCF provides a program base on which the user may build other IBM-supplied or user-supplied programs to provide communication network management (CNM) functions. These programs are called CNM programs. NCCF provides these programs with an environment that isolates them from the operating system and access method uniqueness, as well as common application functions required to execute individual programs.

NPDA runs as a communication network management programs under NCCF, and is invoked from an NCCF-authorized terminal. NPDA or the NetView program decodes the alert messages and prepares screens for the host operator.

For ACF/VTAM, NPDA or the NetView program builds requests to collect error statistics from a device in the user application network.

NPDA also ensures proper routing and recording of error statistics to the EP data base, and routes error records from devices supported by VTAM.

A VTAM host using NCCF/NPDA or the NetView program and a 3720/3721 using NCP/PEP offer the maximum effectiveness for (see Figure 6-2):

- Network problem determination
- Controller failure isolation.

All detected network and controller failures are reported to the host operator. NPDA or the NetView program stores alerts by failing resource categories. This allows the host operator to go rapidly to the source of the problem and take the necessary action to resolve it, such as: reloading the communication controller, activating backup facilities, or calling the appropriate maintenance organization.

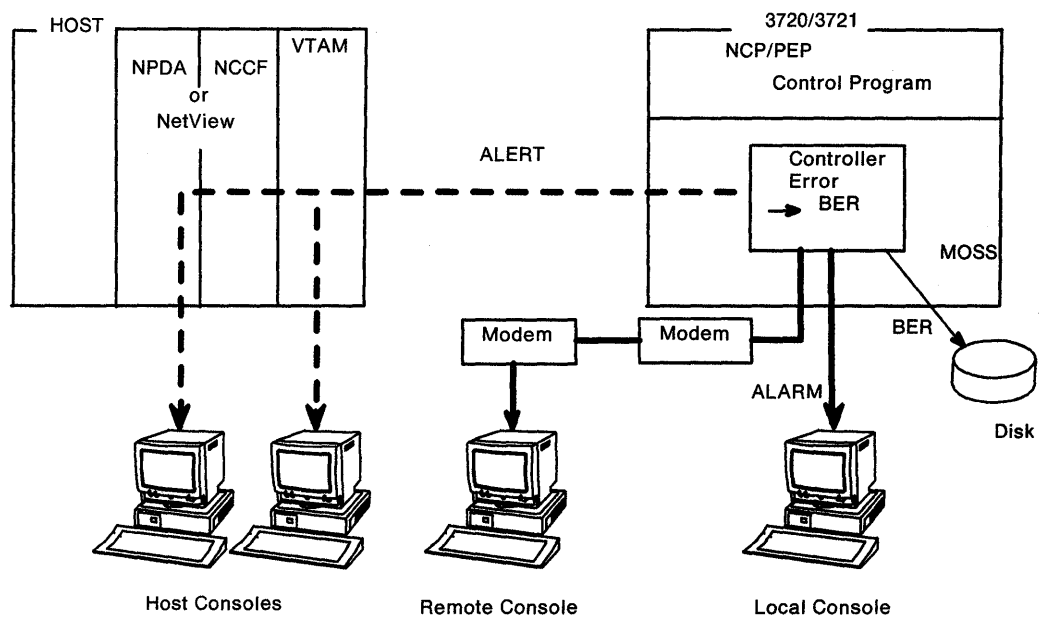


Figure 6-2. NPDA or the NetView program and NCP/PEP Support for Controller Problem Determination

Controller with NCP/PEP and Host with Access Method Only

In a host that does not use NPDA or the NetView program, VTAM displays alerts on the host system console. For token-ring configurations, alert display is possible only when the host uses the NetView program with VTAM. Alarms are also reported to the 3720/3721 console as already described.

The remote 3720/3721 console may be used if necessary to interrogate the controller, read the alarm message, and perform further problem diagnosis.

All MOSS functions are provided. See Figure 6-3.

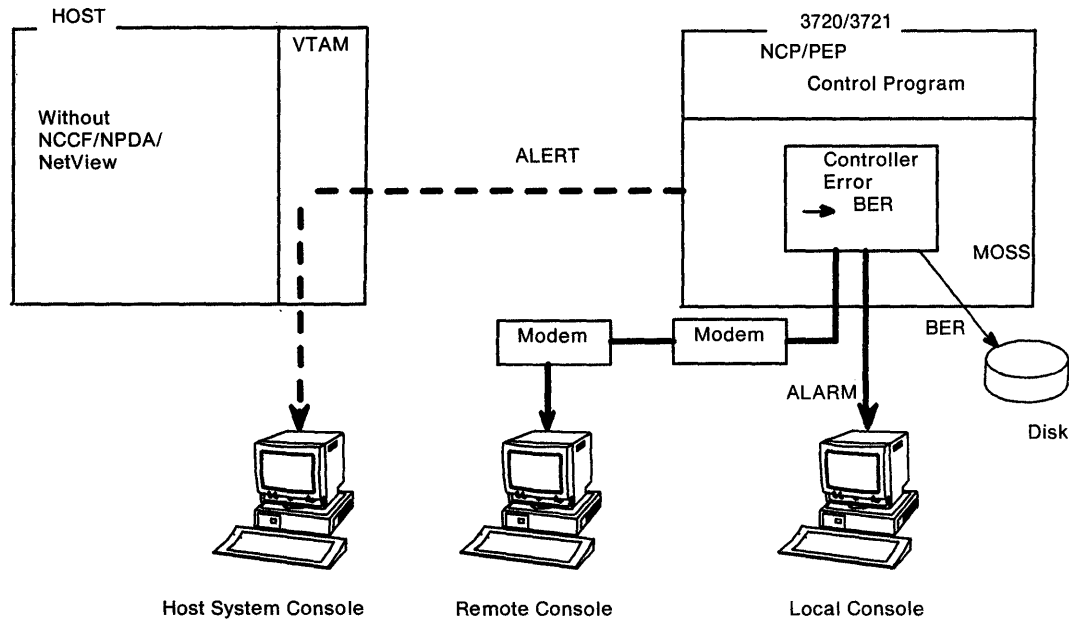


Figure 6-3. VTAM and NCP/PEP Support for Controller Problem Determination

Controller Error Handling in a 3720/3721 with EP

Controller with EP and Host with Access Method Only

With EP standalone, it is not possible to have NCCF/NPDA and the NetView program in the host. No alerts are transmitted to the host. However, alarms are reported to the 3720/3721 console. Therefore, either a local or remote 3720/3721 console would have to be used to read the alarm message, retrieve the reference code, and perform further problem diagnosis.

See Figure 6-4.

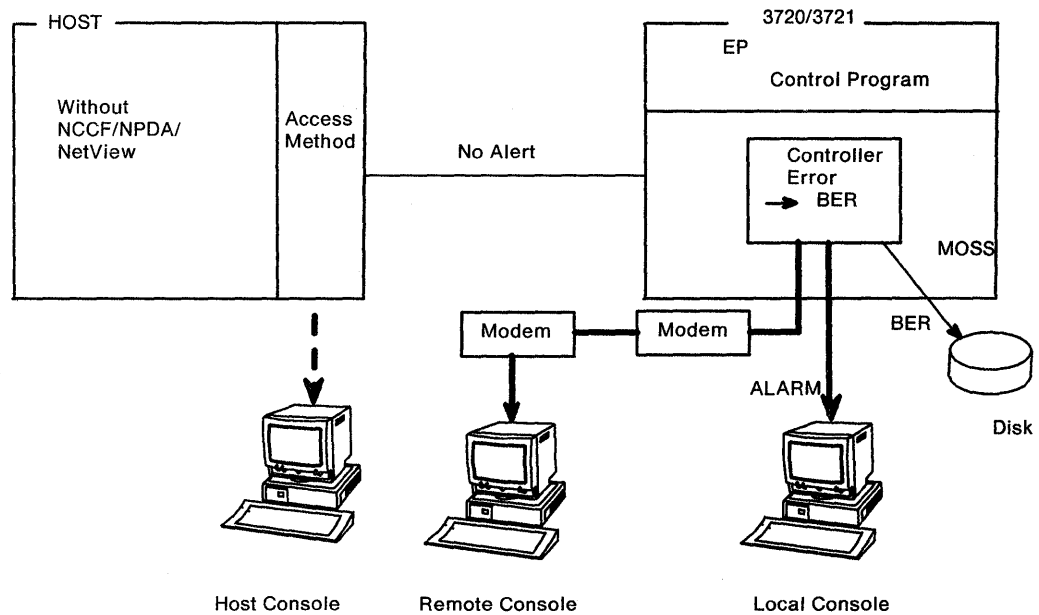


Figure 6-4. Configuration without Alert Messages

Retries and Recovery

Extensive error detection logic is incorporated into the 3720/3721 hardware.

Retries

On detection of a channel adapter failure, the failure environment is recorded as a BER and a recovery attempt is made. If recovery is impossible, or if the adapter fails repeatedly within a short period of time, an attempt is made to disable it. When an adapter is disabled, an alert message is sent to the host (NCP/PEP only) and an alarm message is sent to the 3720/3721 console.

Controller Recovery

If MOSS is operational, and a failure occurs in the CCU or its storage, or if there is a control program abend, MOSS saves 20K bytes of main storage on hard disk, and loads the control program loader in its place.

- When the control program load module is loaded from the host in the controller storage, the host is responsible for requesting a dump of main storage and/or reloading the control program. MOSS can also perform an automatic IML. For example, in the case of a scanner fault, the microcode is automatically reloaded.
- When the control program is loaded from the hard disk in the controller storage:
 - A dump is automatically saved on the hard disk. Dump transfer to the host can be requested.
 - An automatic IPL is performed.

If MOSS is disabled and remains disabled, all communication functions of the 3720/3721 continue, but no maintenance functions can be run nor can the 3720/3721 control program be reloaded.

If a channel adapter is disabled, that path to a host is down. The channel adapter remains down until the 3720/3721 control program is reloaded into main storage.

Automatic Scanner Re-IML:

If a communication scanner fails, and is disabled, the MOSS:

1. Takes a scanner microcode dump
2. Performs a re-IML of this scanner
3. Notifies the host of the outcome of this operation:
 - If it was successful, the lines of this scanner may be reactivated from the host.

- If it was not, and if spare LICs are available, the port swapping function can be used to move the disabled lines to another scanner.

Network Error Recovery Procedures

The NCP/PEP provides *error recovery procedures* (ERPs) that allow the controller to recover from intermittent hardware and transmission failures. In most cases, the controller remains available to the rest of the network while ERPs are executed.

EP provides recovery from intermittent hardware failures, but not from network failures.

User's Facilities for Controller Error Handling

The following is given for information only. For more details see 3720/3721 *Extended Services*.

Problem Bypass Facilities Summary

Facilities Available In Host	Facilities Available In Controller
CCU IPL	Retry/recovery
Dynamic reconfiguration	Controller IPL/MOSS IML
Backup resources	Automatic or selective scanner IML
Network resource reactivation	Line port swapping

Notification Summary

The way in which malfunctions are notified depends on whether NCP/PEP or EP is installed, and on whether NCCF/NPDA or the NetView program is installed in the host.

Control Program	Notification (Host with NCCF/NPDA or NetView Program)	Notification (Host without NCCF/NPDA or NetView Program)
NCP/PEP	Host operator alert via NPDA or NetView program Alarm at 3720/3721 console	Host operator alert via VTAM Alarm at 3720/3721 console
EP	No alert to host Alarm at 3720/3721 console	No alert to host Alarm at 3720/3721 console

Note: For token-ring configurations, the NetView program must be used with VTAM to have alarms and alerts built and displayed.

Problem Determination Facilities Summary

Facilities Available In Host	Facilities Available In Controller
Alert content (NPDA or NetView program) Error summaries (NPDA or NetView program) Host-initiated traces Tests such as OLTs, LPDA, and intensive mode recording Dumps NPDA or NetView facilities Host-initiated link tests	Control panel Alarm content Machine status area Tests such as: Wrap test Stand-alone link test (between two controllers) Control program procedures CCU and line functions Line interface display

Problem Isolation Facilities Summary

Facilities Available In Host	Facilities Available In Controller
Trace Dumps and printouts Channel adapter OLTs	Control panel Display of: All files Machine level table Machine status area BER file and AUTOBER program Diagnostics All controller functions

Problem Correction Facilities Summary

Facilities Available In Host	Facilities Available In Controller
None	Unit replacement CCU, TSS, and TRSS functions Utilities (for example, MCF)

Controller Maintenance

Maintenance Facilities

Controller maintenance is independent of the host, except for dumps, traces, channel adapter OLTs, and the operating system log file (LOGREC).

The maintenance personnel performs the maintenance procedures from the control panel to test the controller. Maintenance of the hard disk can be online, but all other maintenance is offline. Diagnostic programs, stored on the hard disk, are used to detect and isolate hardware failures in the controller, and also to verify the controller after repairs and engineering changes, or controller configuration changes.

The following is an example of a maintenance scenario:

1. Local or remote problem detection: An error is detected by alarm/alert message.
2. Problem determination by local personnel using the reference code. If the cause of the problem is found, the local IBM service personnel:
 - Replaces the suspected components
 - Runs diagnostic programs from the control panel.
3. If the problem is still unsolved, the IBM Hardware Central Service (HCS) may:
 - Use remote support facility (RSF) assistance, or
 - Send an IBM specialist to solve the problem on-site, using the IBM portable PC or PT-2 as a local 3720/3721 console.

Remote Support Facility

Remote support facility (RSF) allows communication between the MOSS and an IBM RETAIN system to provide remote assistance. Communication is established through the public switched network whenever remote assistance is needed. This session is used to transfer data files from MOSS to RETAIN, or from RETAIN to MOSS, or to allow a RETAIN terminal to be used as a remote 3720/3721 console.

RSF is a mechanism to solve problems:

- Without on-site intervention, or
- With on-site intervention, but faster and more efficiently.

Access to 3720/3721 via RSF is protected by a password.

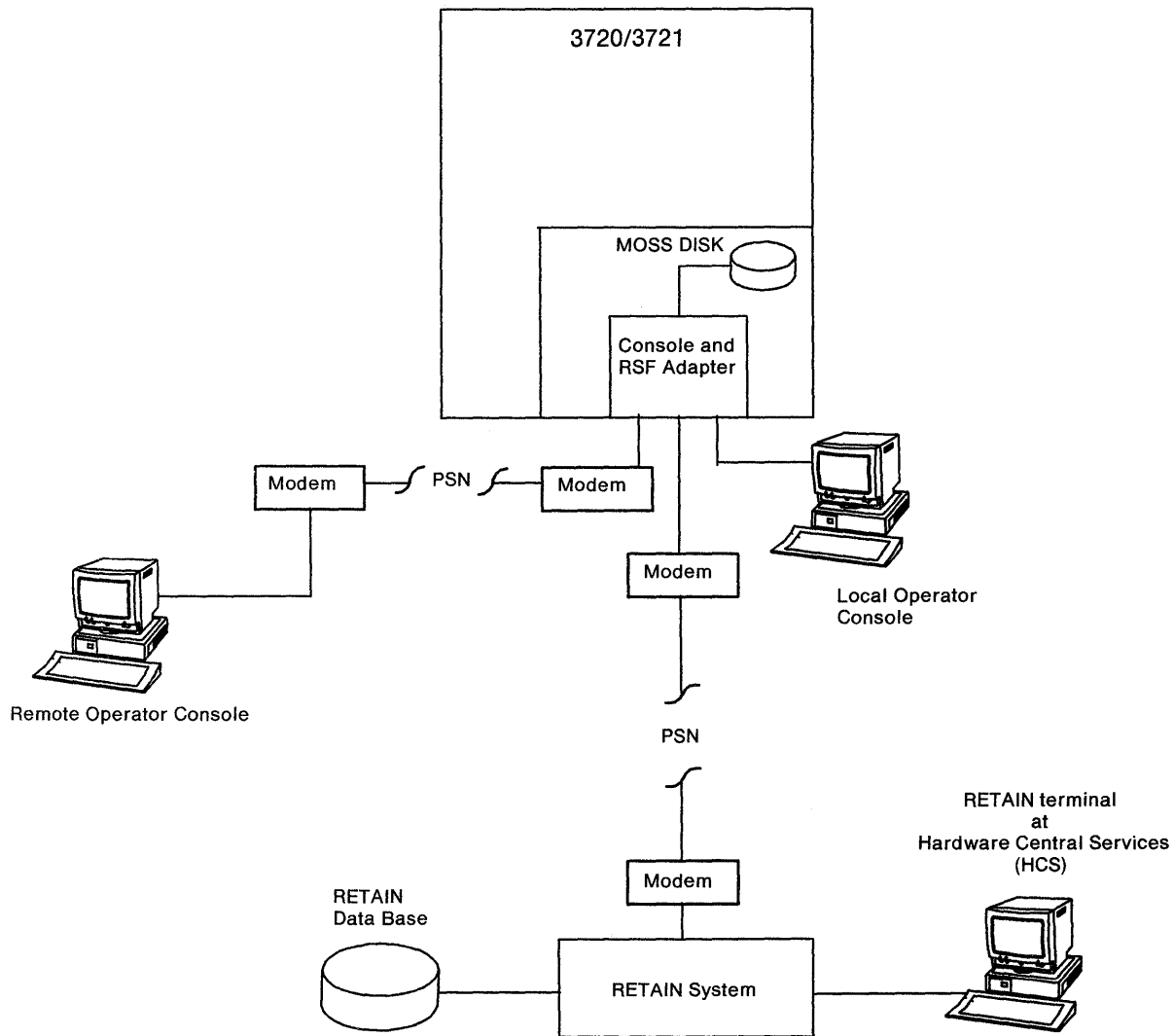


Figure 6-5. Remote Support Facility

Appendix A. General Bibliography

This appendix lists the publications related to the IBM Token-Ring Network, IBM Systems Network Architecture (SNA), ACF/NCP, EP, ACF/SSP, and the NetView program.

These manuals can be ordered from your local IBM branch office, which will order them for you from the IBM Distribution Center.

All the manuals in this section are briefly described in the following form:

<i>Full Title</i> Overview of the Manual	Order Number
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Note: *Version* and *Release* are abbreviated as *V* and *R*. For example, VTAM Version 3 Release 2 is abbreviated as VTAM V3R2.

Data Communications

<i>Data Communications Concepts</i> This manual contains general information about data communications. It is intended for persons planning or using a data communication system with IBM General Systems Division products.	GC21-5169
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SNA

<i>IBM Systems Network Architecture: Concepts and Products</i> This manual introduces IBM systems network architecture, its advantages and concepts, and the IBM products that are designed for use in SNA networks.	GC30-3072
<i>IBM Systems Network Architecture: Technical Overview</i> This manual explains the major SNA functions implemented by hardware and software products and network users. This is the basic publication about SNA functions for system programmers and others who are responsible for defining SNA networks.	GC30-3073
<i>IBM Systems Network Architecture: Reference Summary</i> For all SNA users.	GA27-3136

Input/Output Equipment

<i>IBM Input/Output Equipment Installation Manual - Physical Planning: System 360, System 370 and 4300 Processors</i> This manual contain information necessary for planning the physical installation of IBM input/output equipment. It contains machine specification and cabling information for this equipment.	GC22-7064
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Token-Ring Network

<i>IBM Token-Ring Network: Introduction and Planning Guide</i> This manual introduces the IBM Token-Ring Network and explains the process of planning the network in detail.	GA27-3677
<i>IBM Token-Ring Network Problem Determination Guide</i> This manual contains customer problem determination procedures for token-ring related problems. (The suggestion is made to use an IBM PC with the IBM Token-Ring Network Ring Diagnostic.)	SY27-0280

Network Program Products

<i>Network Program Products General Information</i> This manual provides an overview of a telecommunications network operating with: VTAM V3 R2 NCP V5 SSP V3 R4, NetView and NetView/PC programs. It describes the major tasks involved in using these products, and contains information on hardware and software requirements.	GC30-3350
<i>Network Program Products Planning</i> This manual describes how to plan a network containing VTAM V3 R2 NCP V5 SSP V3 R4, NetView program. It discusses planning, installation, customization, and ressource definition for single-domain, multiple-domain, and interconnected networks.	SC30-3351

<i>Network Program Products Samples</i>	SC30-3352
This manual complements the various installation and planning manuals in the network program products libraries by providing tested samples.	
<i>Network Program Products Bibliography and Master Index</i>	GC30-3353
This book contains a list of manuals that might be useful to someone planning, installing, or using a network that contains VTAM, NCP, SSP, and NetView and NetView/PC programs.	
<i>Network Program Products Storage Estimates</i>	SC30-3403
This manual contains information for estimating required storage for VTAM, NCP and the NetView program.	

ACF/VTAM

<i>VTAM Installation and Resource Definition</i>	SC23-0111
This manual helps system programmers to install VTAM V3R1 or V3R2 define resources to it, and start it. The manual discusses installing VTAM, defining the resources in the network to VTAM, coding start options, and testing VTAM definitions.	
<i>VTAM Customization</i>	SC23-0112
This manual helps system programmers to customize VTAM V3R1 or V3R2 and tune it for better performance. It discusses modifying VTAM messages; modifying VTAM USS commands, installation exit routines, and replaceable modules; and tuning VTAM.	
<i>VTAM Operation</i>	SC23-0113
This manual is a reference manual for VTAM V3R1 or V3R2 network operators. It is also a guide for system programmers who must supply operators with the detailed information that they need to run the VTAM network.	
<i>VTAM Messages and Codes</i>	SC23-0114
This manual contains all messages and codes issued by VTAM V3R1 or V3R2. These messages include VTAM messages for network operators, TSO/VTAM messages for network operators, TSO/VTAM messages for terminal users, USS messages for terminal users, and VSCS messages.	
<i>VTAM Programming</i>	SC23-0115
This manual describes how to use VTAM V3R1 or V3R2 macroinstructions to send data to and receive data from (1) a terminal in either the same or a different domain, or (2) another application program in either the same or a different domain.	

<p><i>VTAM Programming for LU 6.2</i></p> <p>This manual describes VTAM's LU 6.2 programming interface for host application programs. This manual relates to VTAM V3R2 only. It applies to programs that use only LU 6.2 sessions or that use LU 6.2 sessions along with other session types.</p>	SC30-3400
<p><i>VTAM Diagnosis Guide</i></p> <p>This manual is a guide for system programmers to locate problems in VTAM. The book tells how to collect information about the problem in preparation for calling the IBM Support Center. The information collected includes traces, dumps, and other problem documentation.</p>	<p>SC23-0116 for VTAM V3R1.1</p> <p>LY30-5601 for VTAM V3R2</p>

ACF/NCP, ACF/SSP and EP

<p><i>NCP, SSP, and EP Generation and Loading Guide</i></p> <p>This manual contains information on generating and loading NCP V4, NCP V4 Subset, NCP V5 and EP in the PEP environment using SSP V3.</p>	SC30-3348
<p><i>NCP Migration Guide</i></p> <p>This manual is designed to help system analysts, system programmers, and system engineers who are responsible for migrating from their NCP to NCP V4R3, V5R1 or NCP V5R2. This book presents the updates that users must make to their NCP generation definition.</p>	<p>SC-3252 for NCP V4R3</p> <p>SC30-3440 for NCP V5R1 and V5R2</p>
<p><i>NCP, SSP, and EP Resource Definition Guide</i></p> <p>This manual describes the physical and operational characteristics of NCP V4, NCP V4 Subset and EP in the PEP environment using SSP V3 for the IBM 3725 and 3720. It also describes the definition and keywords associated with those characteristics.</p>	SC30-3449 for NCP V4R3
<p><i>NCP, SSP, and EP Resource Definition Guide</i></p> <p>This manual describes the physical and operational characteristics of NCP V5 and EP in the PEP environment using SSP V3 for the IBM 3720. It also describes the definition and keywords associated with those characteristics.</p>	SC30-3447
<p><i>NCP, SSP, and EP Resource Definition Reference</i></p> <p>This manual contains detailed descriptions of the definition statements and keywords used to define NCP V5 and EP in the PEP environment using SSP V3 for the IBM 3720.</p>	SC30-3448
<p><i>NCP and EP Reference Summary and Data Areas</i></p> <p>This manual is for system programmers and IBM program service representatives. They provide quick access to often-used diagnostic and debugging information about NCP V4R3 or NCP V5 and EP in the PEP environment.</p>	<p>LY30-3196 for NCP V4R3</p> <p>LY30-5603 for NCP V5</p>
<p><i>NCP Customization Guide</i></p> <p>This manual is designed to help system analysts, system programmers, and system engineers to modify NCP V4R3 and NCP V5 for the IBM 3720.</p>	<p>LY30-5571 for NCP V4R3</p> <p>LY30-5606 for NCP V5</p>

<p><i>NCP Customization Reference</i></p> <p>This manual supplements the NCP Customization Guide. It describes the resources and macroinstructions provided by IBM for customizing the NCP V4R3 and NCP V5.</p>	<p>LY30-5612 for NCP V4R3 LY30-5607 for NCP V5</p>
<p><i>NCP, SSP, and EP Messages and Codes</i></p> <p>This manual is a reference book of abend codes issued by NCP and EP in the PEP environment, and messages issued by the system support programs associated with the NCP.</p>	<p>SC30-3169</p>
<p><i>NCP, SSP, and EP Diagnosis Guide</i></p> <p>This manual is designed to help customers and IBM program support representatives isolate and define problems in NCP, and EP in the PEP environment using SSP. The primary purpose of the manual is to help the user interact with the IBM Support Center to resolve a problem. In addition, it includes detailed descriptions of how to use the programming tools available with NCP and SSP.</p>	<p>LY30-5591</p>
<p><i>NCP and EP Reference</i></p> <p>This manual contains reference material describing the internal organization and function of the NCP V4R3 or NCP V5 and EP in the PEP environment. It provides information for customization and diagnosis.</p>	<p>LY30-5569 for NCP V4R3 LY30-5605 for NPC V5</p>

NetView Program

<p><i>NetView Installation and Administration Guide</i></p> <p>This manual is accompanied by the distribution tape to assist the customer in installing the NetView program and preparing it to be operational in the installation environment.</p>	<p>SC30-3476</p>
<p><i>NetView Administration Reference</i></p> <p>This manual is to be used with the previous manual to gain a more specific explanation of definition statements and their effect upon the installation.</p>	<p>SC30-3361</p>
<p><i>NetView Command Lists</i></p> <p>This manual provides network system programmers with the tools they need to write command lists (CLISTs) to enhance network operator tasks and automate responses to messages for their own installations.</p>	<p>SC30-3423</p>
<p><i>NetView Operation Primer</i></p> <p>This manual provides network operators with a fundamental understanding of the network management task.</p>	<p>SC30-3363</p>

Appendix B. Job Descriptions, Tasks, and Manuals

This appendix provides:

1. Examples of job descriptions of the various persons in the user's organization who will be responsible for the ordering, planning, and installation of the 3720/3721
2. Step-by-step descriptions of the ordering, planning, and installation tasks, suggestions for who should be responsible for each step (job title of the person), and titles of the appropriate manuals in which the required information can be found.

Examples of Job Descriptions

The IBM 3720/3721 installation and operation may be performed by persons having the following job descriptions.

This list is given for information. You do not have to define all seven functions in your team. This is just to give you an idea of what could be needed.

Your precise needs depend on the size and complexity of your network. Ask your IBM representative for more information.

Telecommunication Network Specialist

Is the contact for communication equipment vendor installation and service activities. Plans and decides on assignment of products and lines within the node. Plans and manages the physical installation and integration of all network hardware at your central site location. Coordinates the installation of communication equipment in remote locations. Is responsible for definition and utilization of the LDF. Performs problem determination tasks related to 3720/3721 hardware and telecommunication lines.

Installation Coordinator

Is the hardware and site preparation specialist. Is the intermediary between the person who sets up the 3720/3721 and the IBM service personnel.

DP System Support

Is the host operating system specialist. Assigns channel adapter addresses for 3720.

TP System Programmer

Is the overall system and communication control program specialist. Uses the MOSS functions related to the control program. Evaluates network load and communication controller software configuration requirements. Orders host resident programs. Orders, installs and maintains control program. Maintains TP software. Enters data for program generation (load module). Tests installation. Performs extended problem determination. Analyzes traces and dumps. Checks performances.

Network Operator

Uses the remote console from the user's control center. May have to control several communication controllers, depending on the size of the network. Starts, stops, and controls elements of the network. Collects information for problem determination. Performs initial problem determination, using predefined procedures adapted to specific problems.

Controller Operator

Uses the local console, if any. Executes port swapping and daily operational tasks. Sets up the 3720 Model 2 and the 3721. Adds and removes communication features. Provides a single interface to host network operations for his or her location. Performs first level problem determination.

Dock Personnel

Unpacks and packs units using *Unpacking/Packing Instructions*.

Ordering, Planning, and Installation Tasks

All the suggested job titles and tasks are briefly described in this section in the following form:

Job Title	Task to be Performed	3720/3721 Manual
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Step 1: Before Ordering

Telecommunication network specialist	Task 1A: NETWORK DEFINITION Define the impact and the place of a 3720/3721 in the network.	<i>Introduction</i> GA33-0060
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Telecommunication network specialist and Installation coordinator	Task 1B: PLANNING Prepare the installation coordination and planning. Train personnel.	<i>Configuration Guide</i> GA33-0063 <i>Planning Guide</i> GA33-0061
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Step 2: Ordering 3720/3721 Units

Telecommunication network specialist	Task 2A: 3720/3721 UNITS DEFINITION Configure 3720/3721 nodes in terms of: <ul style="list-style-type: none">• Units (basic and expansion)• Storage• CAs and TPSs• Lines and token-ring networks• CSs• Console(s). Fill in the configuration worksheets that are used: <ul style="list-style-type: none">• To make a preliminary order• To set up and integrate each node.	<i>Configuration Guide</i> GA33-0063
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Step 3: Ordering Software

TP system programmer and DP system support	Task 3A: SOFTWARE DEFINITION Prepare host-resident communication and system management programs: <ul style="list-style-type: none">• Design application programs• Prepare program order:<ul style="list-style-type: none">– TP Access Method (VTAM)– NCCF (CNM), NPDA, ACF/NCP.• Prepare order of NCP (or EP)• Prepare order of SSP (if not already licensed for SSP Version 3).	See Appendix A, "General Bibliography" in this manual.
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Step 4: Installation Planning, Hardware Environment

Telecommunication network specialist and Installation coordinator	Task 4A: NON-IBM ENVIRONMENT Work with subcontractors. Plan connection with potential non-IBM equipment.	<i>OEM Information</i> GA33-0068
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Installation coordinator	Task 4B: SITE PREPARATION Plan: <ul style="list-style-type: none">• Placement of units, modems, and consoles• Determination of external cables routing and length• Power outlets placement• Cable labelling• Cable pre-order list.	<i>Planning Guide</i> GA33-0061
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Step 5: Installation Planning, Software Environment

DP system support specialist	Task 5A: APPLICATION PROGRAMS Cooperate with the programmer who writes and tests user's application programs.	<i>Principles of Operation</i> GA33-0013
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TP system programmer	Task 5B: IBM PROGRAMS Update already existing, or add new host-resident programs. Perform in host the SYSGEN of NCP (or EP) control program for the 3720/3721.	<i>Principles of Operation</i> GA33-0013
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Step 6: Installation Planning, Lines

Telecommunication network specialist and installation coordinator	Task 6A: LINE DEFINITION Define line parameters for LDF: <ul style="list-style-type: none">• Define the link IPL port (host connection)• List the LICs and their ordered cables. Produce instructions to execute LDF.	<i>Extended Services</i> GA33-0066
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TP system programmer	Task 6B: CHECK TRAFFIC LOADING Check resource loads	<i>Configuration Guide</i> GA33-0063
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Step 7: First Physical Installation

Dock personnel	Task 7A: UNPACK the 3720/3721	Use the <i>Unpacking/Packing</i> notice delivered with the unit
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(IBM service personnel only)	Task 7B: 3720 Model 1 INSTALLATION The installation is done by IBM service personnel.	<i>3720-1 Installation</i> SY33-2053
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Controller operator or other	Task 7C: 3720 Model 2 and 12, 3721 Models 1 and 2 SETUP This task is performed without console (use control panel): <ul style="list-style-type: none"> • Install the 3720 Model 2 or 12 • Install the 3721 • Install the cables • Perform the checkout (including power on, program loading, diagnostics) 	<i>3720 Model 2 Setup Instructions</i> GA33-0112 (can also be ordered as GK2T-0282) <i>3720 Model 12 Setup Instructions</i> GA33-0113 (can also be ordered as GK2T-0283)
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Step 8: Modification of an Already Existing 3720/3721

Contrary to the case of a first installation, this step is performed with the help of a console.

Controller operator or other	Task 8A: ADD OR REMOVE COMMUNICATION FEATURES Remove communication features	<i>3720 Model 1 Feature Addition Instructions</i> GA33-0110 (can also be ordered as GK2T-0280) <i>3720 Model 11 Feature Addition Instructions</i> GA33-0111 (can also be ordered as GK2T-0281) <i>3720 Model 2 Setup Instructions</i> GA33-0112 (can also be ordered as GK2T-0282) <i>3720 Model 12 Setup Instructions</i> GA33-0113 (can also be ordered as GK2T-0283)
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Step 9: Integration into the Network, Preliminary Connections

Controller operator	Task 9A: CONNECT AND TEST IBM TERMINALS AND MODEMS Connect: <ul style="list-style-type: none">• Terminals• Modems• RSF attachment	<i>System Integration</i> GA33-0067
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Controller Operator	Task 9B: OPERATOR CONSOLES Connect and test the console(s)	<i>System Integration</i> GA33-0067
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Installation Coordinator	Task 9C: CONNECT NON-IBM EQUIPMENT Connection of non-IBM equipment (including Common Carriers/PTT).	<i>System Integration</i> GA33-0067
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Step 10: Integration into the Network, Connection of the 3720/3721

Installation coordinator	<p>Task 10A: CUSTOMIZE the 3720/3721</p> <ul style="list-style-type: none">• Customize line speeds and update CDF• Define link IPL port (3720 Model 2 or 12)• Update passwords and user's identification• Execute LDF function• Customize RSF link if present	<i>System Integration</i> GA33-0067
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Controller operator	<p>Task 10B: SAVE DISK</p> <p>Save disk content on backup diskettes</p>	<i>System Integration</i> GA33-0067
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Network operator	<p>Task 10C: IPL CONTROL PROGRAM</p> <p>IPL control program from host in 3720/3721</p>	<i>System Integration</i> GA33-0067
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Step 11: Normal Daily Operations

Controller operator	Task 11A: DAILY OPERATIONS Run daily applications.	<i>Operator's Guide</i> GA33-0065
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Controller operator Network operator	Task 11B: SERVICES Manage 3720/3721 functions: <ul style="list-style-type: none">● Controller initialization● Controller supervision	<i>Extended Services</i> GA33-0066
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Step 12: Problem Determination by User

1st level: Controller operator 2nd level: Network operator 3rd level: Telecommunication network specialist and TP system programmer	Task 12A: PROBLEM DETERMINATION Perform problem determination using: <ul style="list-style-type: none">● Problem determination procedures● Alerts and alarms● Hexadecimal codes	<i>Problem Determination Guide</i> GA33-0086 <i>IBM Token-Ring Network Problem Determination Guide</i> SY27-0280
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Step 13: Maintenance by IBM Service Personnel

IBM service personnel with assistance of user's team.	Task 13A: Maintenance, problem analysis, problem resolution.	<i>Maintenance Procedures</i> SY33-2050 <i>Maintenance Reference</i> SY33-2040 <i>Service Guide</i> SY33-2039 <i>Parts Catalog</i> S135-2009 <i>Diagrams</i> (part numbers)
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Appendix C. 3720/3721 Library

All the manuals in this section are briefly described in the following form:

Full Title Overview of the Manual	Order Number Short Title
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Manuals Supplied via IBM Marketing

These manuals can be ordered from your local IBM Branch Office, which will order them for you from the nearest IBM Distribution Center.

If you would like to receive revised copies of any manual as and when it is available, request your IBM Marketing Representative to establish a subscription in your name in the IBM System Library Subscription Service (SLSS).

<i>3720/3721 Communication Controllers Introduction</i> Describes highlights of the 3720/3721 communication controller and the software support. Provides introductory information, and helps the reader to select other 3720/3721 manuals. Presents the concepts of 3720/3721 problem determination and shows the reader a complete example from the detection of a failure up to determination of the problem.	GA33-0060 <i>Introduction</i>
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<i>3720/3721 Communication Controllers, Configuration Guide</i> Explains how to prepare the order for one or more 3720/3721s with their configurable features, with respect to the traffic load involved. The configuration task is based on the filling in of sets of worksheets. The setup worksheet is used at installation time to plug in the cables and remains with the controller. Some of the worksheets are used for system integration.	GA33-0063 <i>Configuration Guide</i>
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<p><i>3720/3721 Communication Controllers, Planning and Site Preparation Guide</i></p> <p>Gives how-to and descriptive information for planning the physical installation of the 3720/3721, which is designed for partial setup by the user.</p> <p>Allows the user to select hardware, cables, modems, and an optional operator console, and prepare an installation plan for those who are to prepare for and carry out the installation with the Setup Instructions.</p> <p>Includes scale drawings that can be cut out and positioned on the user building plan view drawn to the same scale.</p>	<p>GA33-0061</p> <p><i>Planning Guide</i></p>
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<p><i>3725 and 3720/3721 Communication Controllers, Principles of Operation</i></p> <p>Describes in detail the operations and instruction set of the 3725 and 3720/3721, thus enabling the user to efficiently modify NCP/EP, or create a new program for the communication controllers.</p>	<p>GA33-0013</p> <p><i>Principles of Operation</i></p>
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<p><i>3720/3721 Communication Controllers, Original Equipment Manufacturer's Information</i></p> <p>Provides the necessary information for designing compatible interfaces to enable non-IBM units to be attached to the 3720/3721.</p>	<p>GA33-0068</p> <p><i>OEM Information</i></p>
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Manuals Supplied with the Product

<p><i>3720 Model 1 Feature Addition Instructions</i></p> <p>Contains the procedures needed to install additional features (and check the result).</p>	<p>GA33-0110</p> <p><i>Feature Addition Instructions</i></p>
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<p><i>3720 Model 11 Feature Addition Instructions</i></p> <p>Contains the procedures needed to install additional features (and check the result)</p>	<p>GA33-0111</p> <p><i>Feature Addition Instructions</i></p>
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<p><i>3720 Model 2 Setup Instructions</i></p> <p>Contains the procedures needed to physically set up the unit with or without a 3721 Model 1 or 2 and check out that it is (or they are) working. Enables a user to install additional features and check the result. Enables the user to relocate a 3720 Model 2 alone or with a 3721 to the same location for reinstallation together or to relocate a 3720 Model 2 and/or its 3721 to different locations.</p>	<p>GA33-0112</p> <p><i>Setup Instructions</i></p>
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<p><i>3720 Model 12 Setup Instructions</i></p> <p>Contains the procedures needed to physically set up the unit with or without a 3721 Model 1 or 2 and check out that it is (or they are) working. Enables a user to install additional features and check the result. Enables the user to relocate a 3720 Model 12 alone or with a 3721 to the same location for reinstallation together or to relocate a 3720 Model 12 and/or its 3721 to different locations.</p>	<p>GA33-0113</p> <p><i>Setup Instructions</i></p>
<p><i>3721 Model 1 or 2 Setup Instructions</i></p> <p>Contains the procedures needed to physically set up the unit on an installed 3720 Model 1, 11, 2 or 12 and set up a 3720 Model 1 or 2 with a 3721 Model 1 or 2 after both units have been rolled to a new location. Enables a user to install additional features in 3721 Model 1 or 2 and check the result. Enables the user to relocate a 3721 Model 1 or 2 alone.</p>	<p>GA33-0114</p> <p><i>Setup Instructions</i></p>
<p><i>3720/3721 Communication Controllers, System Integration</i></p> <p>Describes how to integrate the 3720/3721 into a user network after physical setup has been completed without error.</p>	<p>GA33-0067</p> <p><i>System Integration</i></p>
<p><i>3720/3721 Communication Controllers, Operator's Guide</i></p> <p>Provides the basic operating procedures needed for the 3720/3721.</p>	<p>GA33-0065</p> <p><i>Operator's Guide</i></p>
<p><i>3720/3721 Communication Controllers, Problem Determination Guide</i></p> <p>Explains problem determination procedures for the 3720/3721 communication controllers.</p>	<p>GA33-0086</p> <p><i>Problem Determination</i></p>
<p><i>3720/3721 Communication Controllers, Extended Services</i></p> <p>Gives a thorough description of 3720/3721 functions.</p>	<p>GA33-0066</p> <p><i>Extended Services</i></p>

Service Manuals Supplied with the Product

<p><i>3720/3721 Communication Controllers, Maintenance Information Procedures</i></p> <p>Provides the IBM service personnel with procedures for isolating and fixing a failure, using diagnostic information given by the machine, or exits from the <i>Problem Determination Guide</i>.</p>	<p>SY33-2050</p> <p><i>Maintenance Procedures</i></p>
<p><i>3720/3721 Communication Controllers, Maintenance Information Reference</i></p> <p>Describes how to isolate failures in the 3720/3721, and provides additional information to the <i>Maintenance Information Procedures</i> manual.</p> <p>This manual is designed for the product support service personnel to cover the problems not found by the first level service personnel using the <i>Maintenance Information Procedures</i> manual.</p> <p>For panel and console procedures see the <i>Maintenance Information Procedures</i> and <i>Service Guide</i> manuals.</p>	<p>SY33-2040</p> <p><i>Maintenance Reference</i></p>
<p><i>3720/3721 Communication Controllers, Service Guide</i></p> <p>Describes how the service functions specific to the IBM service personnel and not intended for the user (service menus) are used from an operator console.</p>	<p>SY33-2039</p> <p><i>Service Guide</i></p>
<p><i>3720/3721 Communication Controllers, Parts Catalog</i></p> <p>Provides reference information for ordering 3720/3721 parts, subassemblies, and/or assemblies.</p> <p>Diskette and disk drive part numbers are included in this manual.</p>	<p>S135-2009</p> <p><i>Parts Catalog</i></p>
<p><i>3720 Models 1 and 11 Communication Controllers, Installation Manual</i></p> <p>Provides instructions for:</p> <ul style="list-style-type: none"> • Installing the 3720 Model 1 or 11 • Installing jumpers • Connecting the LIC, TIC, and channel interface cables • Performing the final checks (channel adapter diagnostic programs and online tests). 	<p>SY33-2053</p> <p><i>3720-1 and 11 Installation</i></p>

3720/3721 Communication Controllers, Machine Diagrams <i>(YZ pages)</i> Provides reference information to the IBM service personnel for locating machine components, checking wire continuity using pin and net lists, and troubleshooting using wiring diagrams.	Part numbers Diagrams
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Service Manuals Available from IBM Distribution Centers

This manual can be ordered from your local IBM Branch Office, which will order it for you from the IBM Distribution Center.

3720/3721 Communication Controllers, Diagnostic Descriptions Describes the diagnostic programs and the purpose of each routine. Gives the related repair action and error recovery codes, and also provides the running options.	SY33-2042 Diagnostics
IBM Token-Ring Network Problem Determination Guide Contains customer problem determination procedures for ring-related problems. It is suggested to use an IBM PC with the Ring Diagnosis Program.	SY27-0280

List of Abbreviations

ACF	Advanced Communications Function	DCE	data circuit-terminating equipment (modem)
ACF/NCP	Advanced Communications Function for the Network Control Program	DDP	distributed data processing
ACF/VTAM	Advanced Communications Function for the Virtual Telecommunications Access Method	DLC	data link control
ANSI	American National Standards Institute	DTE	data terminal equipment
ASCII	American National Standard Code for Information Interchange	EBCDIC	extended binary-coded decimal interchange code
BCD	binary-coded decimal notation	ECC	error checking and correction
BER	box event record	EIA	Electronic Industries Association
bps	bits per second	EP	Emulation Program
BSC	binary synchronous communication	EREP	environmental recording, editing, and printing program
BTAM	Basic Telecommunications Access Method	ERP	error recovery procedures
BTAM-ES	BTAM-extended support	ESC	emulated subchannel
BTAM-SP	BTAM-system product	FCC	Federal Communications Commission
CA	channel adapter	ft	foot
CCA	common communication adapter	HCS	Hardware Central Service
CDS	configuration data set	ICA	integrated communication adapter
CCITT	Comite Consultatif International Telegraphique et Telephonique	ICC	internal clock control (card)
CCU	central control unit	IML	initial microcode load
CDF	configuration data file	IMPP	installation manual-physical planning
CS	communication scanner	IMS/VS	Information Management System/Virtual Storage
CSS	control subsystem	INOP	line, modem, or terminal inoperative
		I/O	input/output

IOC	input/output control	NRF	network routing facility
IPL	initial program load(er)	NSC	native subchannel
ISO	International Standards Organization	NSI	non-SNA interconnection
JES	job entry subsystem	NTO	Network Terminal Option
K	1024	OEM	original equipment manufacturer
LDF	line definition file	OLT	online test
LIC	line interface coupler	OLTT	online terminal test
LOGREC	error recording program of host operating system	PC	personal computer
LPDA	Link Problem Determination Aid	PCA	primary communication attachment
LSI	large scale integration	PD	problem determination
m	meter	PEP	partitioned emulation programming
MAP	maintenance analysis procedure	PSN	public switched network
MCF	microcode fix	PSPG	planning and site preparation guide
MLT	machine level table	PSR	program support representative
MOSS	maintenance and operator subsystem	PTT	Post, Telephone, and Telegraph administration
MP	MOSS processor	RAS	reliability, availability, and serviceability
MPX	multiplex	RECMS	record maintenance statistic
MS	MOSS storage	RETAIN	Remote Technical Assistance Information Network
MVS	multiple virtual storage	RJE	remote job entry
MVS/XA	Multiple Virtual Storage for Extended Architecture	RSF	remote support facility
NCCF	Network Communications Control Facility	RTAM	remote terminal access method
NCP	network control program	SDLC	Synchronous Data Link Control
NLDM	Network Logical Data Manager	SLSS	System Library Subscription Service
NMPF	network management productivity facility	SNA	Systems Network Architecture
NMVT	network management vector transport	SP	system product
NPDA	Network Problem Determination Application	SSCP	system services control point
NPM	Network Performance Monitor	SSP	system support program (ACF/NCP/VS)
NPSI	NCP packet switching interface		

TCAM	Telecommunications Access Method
TIC	token-ring interface coupler
TP	teleprocessing
TPNS	teleprocessing network simulator
TPS	two-processor switch
TRA	token-ring adapter
TRM	token-ring multiplexer
TRSS	token-ring subsystem
TSS	transmission subsystem
USS	unformatted system services

VCNA	VTAM communications network application
VM	virtual machine
VM/SP	Virtual Machine/System Product
VM/XA	Virtual Machine/Extended Architecture
VS	virtual storage
VSE	Virtual Storage Extended
VTAM	Virtual Telecommunications Access Method
WT	world trade
XA	extended architecture
XRF	extended recovery facility

Glossary

This glossary defines all new terms and abbreviations that are used in this manual. It also includes definitions developed by the American National Standards Institute (ANSI), by the International Organization for Standardization (ISO), and by the International Telegraph and Telephone Consultative Committee (CCITT).

If you do not find the term you are looking for, refer to the index or to the *IBM Dictionary of Computing*, SC20-1699.

access method. A technique for moving data between main storage and input/output devices.

address stop. A capability to specify at the console an address which, when encountered, causes a halt in processing.

Advanced Communications Function (ACF). A group of IBM licensed programs (principally ACF/VTAM, and ACF/NCP) that uses the concepts of systems network architecture (SNA), including function distribution and resource sharing.

asynchronous transmission. Transmission in which each character is individually synchronized, usually by the use of start and stop elements. The start-stop link protocol, for example, uses asynchronous transmission. (Contrast with *synchronous transmission*.)

auto-answer. Pertaining to a machine, feature that allows a transmission control unit or a station to respond automatically to a call that it receives over a switched line.

availability. The degree to which a system or resource is ready when needed to process data.

Bell 212A, 303. Bell recommendations on transmission interface

binary synchronous communication (BSC). A line control procedure for communicating. It can be expressed in several data codes: 8-bit EBCDIC, 7-bit ASCII, or 6-bit transcode. The only requirements are that the code should include the required line control

characters and that these characters should be used according to specified rules.

box. Stands for 3720/3721 controller (or for one 3720/3721 component), as opposed to the network in which this "box" is included.

box event record (BER). The record in storage of the machine environment at the instant of detection of machine failure. The record is added to a file of BERs that represents the immediate past failure history of the machine.

cabling system. The IBM Cabling System is used to provide physical interconnection between network attaching devices and access units. Two twisted pairs are used to accommodate the receive and transmit path requirements for data transmission.

carrier. A continuous frequency capable of being modulated or impressed with a second (informative carrying) signal.

central control unit (CCU). The communication controller hardware unit that contains the circuits and data flow paths needed to execute instructions and to control its storage and the attached adapters.

channel. 1. A device that connects the processing unit and main storage with the I/O control units. 2. In SNA, a logical path established for transfer of data during session.

channel adapter (CA). A communication controller hardware unit used to attach the controller to the host via an I/O channel.

cluster controller. A remote unit that controls the input/output operations of more than one device. It can be attached to a host processor via a communication controller.

communication adapter. A machine element of the controller that enables one or more telecommunication lines to be connected to the machine.

communication common carrier. In the USA and Canada, a public data transmission service that provides the general public with transmission service facilities; for example, a telephone or telegraph company.

communication controller. A type of communication control unit whose operations are controlled by one or more programs stored and executed in the unit.

communication scanner (CS). The communication scanner monitors telecommunication lines and local/remote data links for service request.

compatible. Pertaining to computers on which the same computer programs can be run without appreciable alteration.

compile. 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.

concentration. The process of combining multiple messages into a single message for transmission.

configuration control program (CCP). An IBM program product, provided by SSP, that is used interactively to define, display, and alter configurations that contain communication controllers.

configuration data set (CDS). Contains a description of the hardware features in terms of presence, type, address and characteristics. It is located on the hard disk.

console.

1. 3720/3721:
 - a. General term:
 - 3720/3721 console (contrast with host console)
 - operator console, when no ambiguity, or
 - console
 - b. Specific term, according to location:
 - local console (contrast with remote console)
 - remote console (contrast with local console)
 - c. Specific term, according to function:
 - controller console (contrast with network console), generally the local console,
 - network console (contrast with controller console), generally a remote console, or
 - (main console, for network console)

2. Host
 - host console

control program. A computer program designed to schedule and to supervise the execution of programs of a communication controller.

control program generation procedure. A two-stage process that creates a control program load module for a communication controller based on parameters specified by a user through the control program generation language.

control program generation language. The set of macro instructions and associated operands with which a user defines the network configuration for a communication controller.

controller-controller link. An SDLC link between two communication controllers.

cross-domain link. In SNA, a special case of a controller-controller link where the communication controllers belong to different domains. Contrast with *controller-controller link*.

data circuit-terminating equipment (DCE). The functional unit of a data station that establishes, maintains, and releases a connection and provides those functions necessary for any code or signal conversion between the data terminal equipment and the data transmission line.

data link. 1. An assembly of those parts of two data terminal equipments that are controlled by a link protocol, together with their interconnecting data circuit, that enables data to be transferred from a data source to a data link. 2. The physical connection and the connection protocols between the host and communication controller modes via the host data channel.

data terminal equipment (DTE). That part of a data station that serves as a data source, data link, or both, and provides for the data communication control function according to protocols.

direct attachment. Connection of a DTE to a communication controller directly by cable without modems or other devices. Contrast with *remote*.

disconnect. In data communication, to disengage the apparatus used in a connection and to restore it to its ready condition when not in use.

diskette. A thin, flexible magnetic disk, and its protective jacket, that is used with 3720/3721 to record

control codes, diagnostics, programs for MOSS functions, errors, and monitored data.

diskette drive. A mechanism to read diskettes (3720/3721).

distributed data processing (DDP). data processing in which the main part of storage, control functions, and input/output functions are situated in different places and connected by transmission facilities.

domain. In SNA, the set of communication controllers and terminals normally controlled by a host. Some of the terminals in the domain may be connected to communication controllers normally controlled by a different host.

dump. (ISO) To write the contents of a storage, or of part of a storage, usually from an internal storage to an external medium, for a specific purpose such as to allow other use of the storage, as a safeguard against faults or errors, or in connection with debugging.

duplex. In data communication, pertaining to a simultaneous two-way independent transmission in both directions. Synonymous with full duplex. Contrast with *half duplex*.

EIA 232D, RS-366A. EIA recommendations on transmission interface

emulation mode. See *emulation program*.

emulation program (EP). A program that allows the controller to emulate most of the functions of an IBM 2701, 2702, or 2703 control unit, or any combination of the three.

end user. The ultimate source or destination of application data flowing through an SNA network. It may be an application program or a terminal operator.

error correcting code (ECC). (CCITT) A code in which each telegraph or data signal conforms to specific rules of construction that departures from this construction in the receive signals can be so automatically detected, permitting the automatic correction, at the receiving terminal, of some or all of the errors.

error isolation. When the syndrome which results from a detected error is unambiguously identified, it is said that the error is isolated (synonymous with fault isolation).

error recovery procedures (ERP). Procedures designed to help isolate and, where possible, to recover from errors in equipment. The procedures are often used in

conjunction with programs that record the statistics of machine malfunctions.

failure. The termination of the capability of a functional unit to do its required function. A failure is the result of a fault.

fault. A physical state or condition that may cause a failure of a functional unit.

Federal Communications Commission (FCC). A board of seven commissioners appointed by the President under the Communications Act of 1934, having the power to regulate all interstate and foreign electrical communication systems originating in the United States.

half duplex. In data communication, pertaining to an alternate, one way at a time, independent transmission. Contrast with *duplex*.

host system. A data processing system connected to and communicating with a data communication network through the controller.

IBM cabling system. See cabling system

IBM Token-Ring Network. See token-ring network

initial microcode load (IML). The loading of the control code from the diskette into the MOSS and the communication scanner processors.

initial program load (IPL). The process by which a configuration image is loaded into storage at the beginning of a work day or after a system malfunction.

integrated communication adapter (ICA). An integrated adapter that allows connection of multiple telecommunication lines to a processing unit.

interface. A shared boundary between two functional units, defined by functional characteristics, common physical interconnection characteristics, signal characteristics, and other characteristics as appropriate (ISO).

leased line. A telecommunication line on which connections do not have to be established by dialing. Contrast with *switched line*.

line. See *telecommunication line*.

line adapter. A modem which is a feature of a particular device.

line weight. the percentage of the communication scanner capacity (the maximum scanner weight is 100) consumed by a given line.

line interface coupler (LIC). A circuit that attaches up to four communication interface cables to the controller. The line interface coupler achieves the DTE function.

line speed. The number of binary digits that can be sent over a telecommunication line in one second, expressed in bits per second (bps).

link. The connection between the controller and another system (terminal, token-ring). It is both:

- Logical: protocol and program
- Physical: medium of transmission

Link Problem Determination Aids (LPDA). A series of testing procedures initiated by NCP that provide modem status, attached device status, and the overall quality of a communication link.

mesh network. A network configuration in which there are two or more paths between any two nodes.

microcode. A code used as an alternative to "hard-wired" circuitry to implement certain functions of a processor.

modem. (modulator-demodulator) A device that modulates and demodulates signals transmitted over data communication facilities.

modulation. The process by which some characteristic of one wave is varied in accordance with another wave or signal. This technique is used in modems to make business machine signals compatible with communication facilities.

multiplex (MPX). To interleave or simultaneously transmit two or more messages on a single channel.

multiplexing. The division of a transmission facility into two or more channels either by splitting the frequency band transmitted by the channel into narrower bands, each of which is used to constitute a distinct channel (frequency-division multiplex), or by allotting this common channel to several different information channels, one at a time (time-division multiplexing).

NCP. See *network control program*.

NetView. An IBM licensed program used to monitor a network, manage it, and diagnose its problems

network. Is used in at least two ways: 1. A public network, is established and operated by carriers for the specific purpose of providing circuit switched, packed switched and leased circuit services to the public. 2. A user application (data processing) network is a configuration of data processing products, such as processors, controllers and terminals, for the purpose of data processing and information exchange which may use services (circuit switched, packed switched, and leased circuit) provided by carriers. This type of network is often called a private network or private user network.

Network Communication Control Facility (NCCF). An IBM program product consisting of command processors that can monitor, control, and improve the operation of a network.

network control program (NCP). A program, generated by the user from a library of IBM-supplied modules, that controls the operation of a communication controller.

network problem determination application (NPDA or NetView). A IBM licensed program that helps the user identify network problems from a central control point using interactive display techniques.

node. In a network, a point at which one or more functional units connect channels or data circuits (ISO).

Non-SNA Interconnection (NSI). A IBM licensed program that extends the capabilities of ACF/NCP to provide SNA transport for BSC RJE data from selected non-SNA facilities.

nonswitched line. See *leased line*.

object code. Output from a compiler or assembler which is itself executable machine code or is suitable for processing to produce executable machine code.

online terminal test (OLTT). A diagnostic aid by which a terminal or console may request any of several kinds of test to be performed on either the same terminal or console or a different one.

operator.

1. 3720/3721:
 - a. General term:
 - 3720/3721 operator (contrast with host operator), or
 - operator, when no ambiguity

- b. Specific term, according to function:

- *network operator* (contrast with controller operator)
- *controller operator* (contrast with network operator), or

2. Host

- *host operator* (contrast with 3720/3721 operator)

option. A selectable characteristic of an IBM product. It is selected by means of switches or wiring, or in the present case, from the operator keypad.

partitioned emulation programming (PEP) extension. A function of a network control program that enables a communication controller to operate some telecommunication lines in network control mode while simultaneously operating others in emulation mode.

receive level. The power of the receive signal expressed in dBm and measured on a single tone.

reliability. The ability of a functional unit to perform its intended function under stated conditions for a stated period of time.

remote. In data communication, about devices that are connected to a data processing system through a data link.

serviceability. The capability to perform effective problem determination, diagnosis, and repair on a data processing system.

setup (SU). Initial installation of an IBM product or system performed by the user.

source code. A set of statements, written in a programming language, that constitute the input to a compiler or translator.

start-stop transmission. Asynchronous transmission in which each group of code elements corresponding to a character signal is preceded by a start signal which serves to prepare the receiving mechanism for the reception and registration of a character, and is followed by a stop signal which service to bring the receiving mechanism to rest in preparation for the reception of the next character.

station. 1. One of the input or output points of a communication system; for example, the telephone set in the telephone system or the point where the business machine interfaces the channel on a leased private line.
2. In SNA, one of the input or output points on an SDLC data link.

subsystems. The components of 3720/3721, that is CSS, TSS, and MOSS.

switched connection. A mode of operating a data link in which a circuit or channel is established to switching facilities, as, for example, in a public switched network. Synonymous with dial line, switched line.

switched line. A telecommunication line on which the connection is established by dialing. Contrast with *leased line*.

synchronous mode. A mode of data transmission in which character synchronism is controlled by timing signals generated at the sending and receiving stations. (Contrast with *start-stop mode*.)

Synchronous Data Link Control (SDLC). A discipline 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 leased lines. The configuration of the link may be point-to-point, multipoint, or loop.

System Support Program for ACF/NCP/VS (SSP). An IBM licensed program consisting of utilities and small programs, that supports and is required for the operation of ACF/NCP.

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.

telecommunication line. Any physical medium such as a wire or microwave beam that is used to transmit data synonymous with *transmission line*.

terminal. Any device capable of sending and/or receiving information over a communication channel.

token-ring network. The IBM Token-Ring Network is a high-speed communication network for interconnecting processing equipment at a local site. Network attaching devices are cabled one to another through a network access unit to form a logical ring configuration. Access to the shared ring is controlled by a token (a special signal circulating on the ring). Each attaching device regenerates the signal as information is passed around the ring.

trace. A function that enables the controller to copy the data and control information it sends or receives. ACF/VTAM collects the trace data, which can be formatted and printed using trace analysis programs.

track. The portion of a moving data medium, such as a drum, tape, or disk, that is accessible to a given reading head position.

user application network. A configuration of data processing products such as processors, controllers, and terminals, established and operated by users for data processing or information exchange.

user setup. The unpacking, setup, and checkout of IBM machines designated for setup by user personnel, according to a sequence of instructions provided by IBM, without the use of tools or the assistance of IBM personnel.

utility (program). The function of a MOSS control program that provides the tasks such as: dump the MOSS storage, dump the CS processor storage, edit the dumps, display the dumps, and transfer the dumps to the diskette drive.

Virtual Telecommunications Access Method (VTAM). A set of programs that maintain control of the

communication between terminals and application programs running under VSE, OS/VS1, and OS/VS2 operating systems.

V.24/25/35. CCITT recommendations on transmission interfaces

weight. see line weight

wrap capability. The ability to directly connect the transmit circuit of a telecommunication component back to its own receive circuit for test purposes. For example: the output of a DTE is connected back to its input, the transmit pair of a modem is connected back to the receive pair, etc.

X.20bis/X.21/X.21bis/X.25. CCITT recommendations on transmission interface

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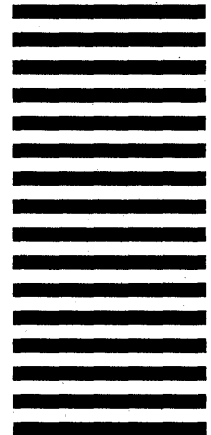
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