# IBM 3710
# Network Controller

## Introduction

IBM

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Network Controller

Introduction

# Preface

This manual summarizes the advantages and applications of the IBM 3710 Network Controller. It is written for those who will evaluate or plan for the machine. The manual is divided into four chapters and three appendixes:

- **Chapter 1. An Overview of the IBM 3710 Network Controller**
  Describes the machine and its role in a network.

- **Chapter 2. Applications in a Network**
  Describes in detail the functions and services provided by the Network Controller.

- **Chapter 3. Customer Procedures**
  Describes installation, operation, and maintenance procedures.

- **Chapter 4. Optional Host Enhancements**
  Describes the optional program products that may be installed at a host processor to provide enhanced Network Controller applications.

- **Appendix A. Machine Elements**
  Lists and briefly describes the Network Controller's modular machine elements.

- **Appendix B. Compatible Devices**
  Lists the devices that may be connected to the Network Controller.

- **Appendix C. Related Publications**
  Describes the publications in the Network Controller library, and related publications.

A list of abbreviations and a glossary are provided at the back of this manual.

You do not need any other manuals or special knowledge to understand the information presented here. Some concepts and terms used in this manual are taken from Systems Network Architecture (SNA). If you would like more information on SNA, refer to *Systems Network Architecture Concepts and Products*, GC30-3072.

If you need additional information on any topic covered in this manual, talk to your IBM marketing representative.

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The IBM 3710 Network Controller in a Network

# Chapter 1

## An Overview of the IBM 3710 Network Controller

This chapter briefly describes the IBM 3710 Network Controller and its major advantages and features.

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## General Information

The Network Controller is a device that concentrates data from many lines onto one or more lines. It enables SNA as well as non-SNA devices to communicate with SNA program products in one or more host processors, or hosts. The Network Controller operates in an MVS or MVS/XA environment, and communicates with hosts through communication controllers. It requires no additions or significant modifications to networks that use ACF/VTAM Version 2 or later and ACF/NCP Version 3 or later. However, program products are available from IBM that enhance the functions and services provided by the Network Controller.

The Network Controller accommodates a large range of terminals, printers, and controllers. It allows attachment of up to 31 lines from devices. The lines can be either switched or leased, transmitting duplex or half-duplex, using synchronous or asynchronous protocols, at line speeds from 110 bps to 64 kbps.

The Network Controller is made up of modular, customer-replaceable hardware components, called *machine elements*. The individual machine elements are lightweight and simple to insert, making setup quick and easy. The machine elements are also easy to remove and replace, simplifying additions to the machine and installation of features. Growth in storage or line capacity simply requires adding machine elements to an otherwise unchanged machine.

Lines attach to the Network Controller through machine elements that are called *communication adapters*. Communication adapters provide great flexibility when adding or removing lines in a network. They also allow for connection to an X.25 packet-switched data network.

Operators can interact with the Network Controller through a customer-supplied, host-independent *control terminal*, such as the IBM 3101 Display Terminal. The control terminal provides full Network Controller monitoring, network definition, and problem analysis functions, as well as other useful functions. Any start-stop terminal equivalent to the 3101 Display Terminal may be used.

A number of optional host enhancements for the Network Controller are provided by IBM program products that can be installed at a host site. These provide enhanced communication network management (CNM), and allow for a wider range of Network Controller attachments.

# Major Advantages

Adding the Network Controller to an existing network reduces telecommunication costs in a number of ways:

● **Manages protocols for both SNA and non-SNA devices**. The Network Controller manages data-transmission protocols, providing access to Systems Network Architecture (SNA) networks for both SNA and non-SNA devices. In a mixed-protocol network, the Network Controller can manage protocols for many combinations of start-stop, BSC, and SDLC devices. This can reduce network dependencies on other, less flexible protocol-management machines and programs.

● **Eliminates costly lines and devices**. Concentrating lines with the Network Controller makes many of the existing lines and modems in a network unnecessary. And because Network Controller concentration is single-ended, only one new device must be installed: the Network Controller itself.

● **Requires no changes to existing devices**. Installation, operation, and maintenance of the Network Controller require no additions to existing hosts, communication controllers, or other devices. In a network with ACF/VTAM Version 2 and ACF/NCP Version 3, the only modification necessary is a change in the network definition to reflect the presence of the Network Controller and its attached lines.

● **Simplifies installation, operation, and maintenance procedures**. The Network Controller makes use of existing network operator skills. No specially trained customer personnel are required.

● **Provides ease of modification**. The machine elements reduce the impact of modifying and maintaining networks. Their modularity can save time and customer costs, and improve availability and productivity.
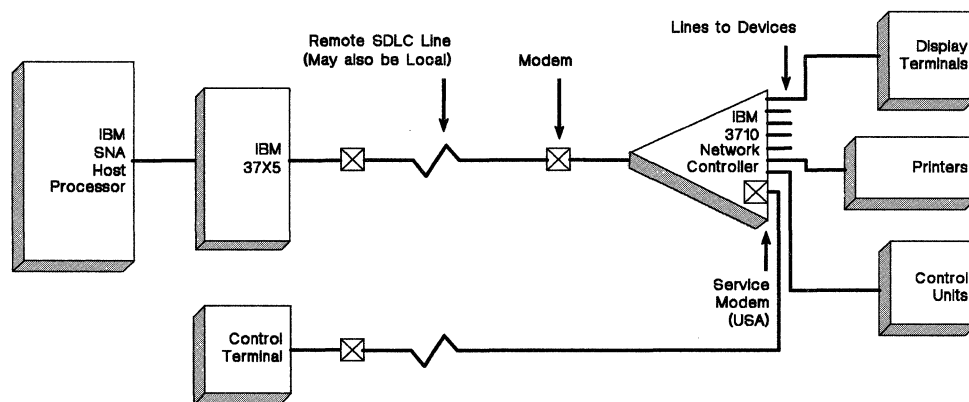


**Figure   1-1.   The Network Controller in a Simple Network**

## Other Highlights

In addition to the Network Controller's major advantages, it also:

● Provides a powerful vehicle for network growth, to satisfy expanding network requirements.

● Expands attachment capabilities by offering:

  — Direct attachment (up to 64 kbps)
  — High-speed attachment (up to 64 kbps)
  — Duplex line attachment
  — Multiple host attachments, all operating concurrently
  — Dialed access to SNA for start-stop devices, including the IBM Personal Computer
  — Automatic line speed and protocol recognition for dial-in start-stop devices
  — Clocking for start-stop and directly attached devices
  — EIA RS-232-C (CCITT V.24), CCITT V.35, and CCITT X.21 line interfaces for device attachment
  — X.25 network attachment (19.2 kbps or less) using the EIA RS-232-C line interface
  — X.25 network high-speed attachment (greater than 19.2 kbps) using the X.21 line interface.

● Provides an enhanced network operator interface and host-independent maintenance functions, through the use of a control terminal.

● Provides host-independent network operator control with a control terminal located at a host site.

● Provides host enhancements, including full network control from a host, using optional program products.

● Provides two storage sizes (384K bytes and 512K bytes; K equals 1024).

● Provides an internal service modem (USA only) with integrated protective circuits for switched line protection.

● Provides for the removal and replacement of communication adapters without turning the power off.

● Provides its own network definition procedures:

  — An operator must establish or *define* a network before it can do productive work. The set of definitions that describes an IBM 3710 Network Controller and its attached lines and devices is called a *3710 configuration*. A complete 3710 configuration can be defined from a control terminal.

  — An operator can change all or part of a 3710 configuration, adding or deleting lines and devices while the Network Controller is operating, without disrupting devices not affected by the changes.

● Improves availability through simple installation, operation, maintenance, and problem analysis and resolution procedures that can be performed by the customer, including:

  — Customer setup, requiring no tools and no assistance from IBM
  — Loading of operational microcode without external devices
  — Automatic restart and extensive self-tests when power is turned on
  — Lights that automatically indicate a failed machine element
  — Backup lines and hosts
  — Problem isolation for lines, modems, and devices

- Online and offline diagnostic procedures
- Customer problem analysis and resolution using the control terminal connected to the service modem
- Access to the IBM Product Support Center for remote assistance, if you have a maintenance agreement with IBM for the Network Controller
- Fast and easy repair and recovery procedures
- Multiple service contracts, allowing the flexibility to plan for individual availability needs
- A 12-month warranty.

# Applications in a Network

This chapter describes applications of the Network Controller in detail.

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## Required Programs

This chapter describes applications of the Network Controller in detail. These applications require the Advanced Communication Function for the Virtual Telecommunications Access Method (ACF/VTAM), Version 2 or later, and the Advanced Communication Function for the Network Control Program (ACF/NCP), Version 3 or later.

## Protocol Management

The Network Controller manages data-transmission protocols to allow SNA networks to handle non-SNA data. This enables some non-SNA devices, as well as all SNA devices, to communicate with SNA program products through the Network Controller. Non-SNA devices attached to the Network Controller appear to the rest of the network to be SNA devices. Up to 31 lines from devices can be attached to the Network Controller.

### Single-Protocol Networks

The Network Controller manages line protocols in the following ways:

● It recognizes Synchronous Data Link Control (SDLC) protocol and passes it through without changing it in any way. SDLC is the protocol used by SNA devices.

● It surrounds or *envelops* some non-SNA protocols so that they appear to be SDLC. The Network Controller envelops three main types of non-SNA protocol:

  − Start-stop transmission
  − BSC for remote job entry (BSC RJE)
  − BSC for the multi-leaving interface.

Start-stop transmission is used by devices such as the IBM 3101 Display Terminal. BSC RJE and BSC for the multi-leaving interface are used by devices such as the IBM 3770 Data Communication System (BSC).

● It changes or *converts* other non-SNA protocols to SDLC. The Network Controller converts BSC 3270 protocol, which is the protocol used by the IBM 3270 Information Display System (BSC).
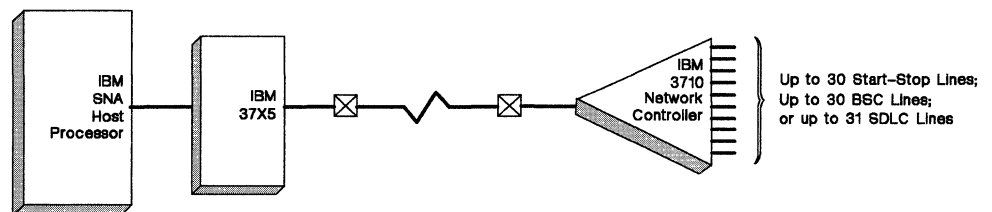


**Figure 2-1. The Network Controller in a Single-Protocol Network**

## Mixed-Protocol Networks

A network arrangement that uses more than one type of protocol (for example, start-stop transmission and SDLC) is called a *mixed-protocol network*. One of the problems with such networks is that few machines or programs are designed to manage more than one type of protocol. As a result, several different protocol-management machines or programs may be needed.

The Network Controller is a very practical and flexible machine in a mixed-protocol network. It can manage protocols for many combinations of start-stop, BSC, and SDLC devices. Depending on the other devices in your network, it may be the only protocol-management machine you need.
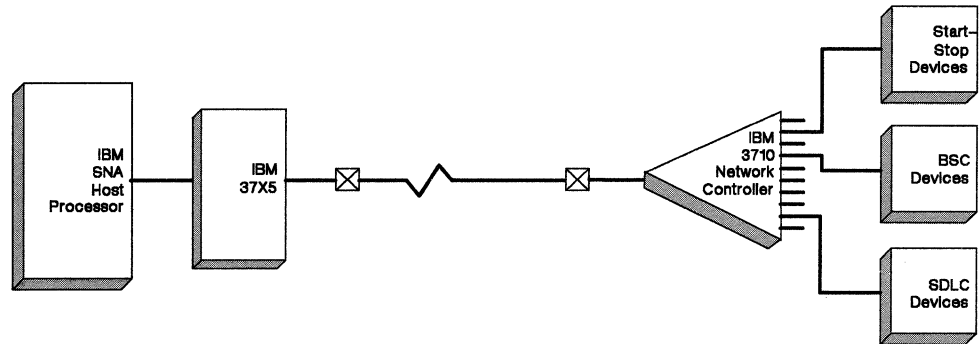


Figure  2-2.   The Network Controller in a Mixed-Protocol Network

## Line Concentration

A large telecommunication network may require dozens of lines and modems. The Network Controller can concentrate device data from as many as 31 switched and leased lines onto a single line to a communication controller. The Network Controller can therefore reduce the number of lines and modems in a network, cutting telecommunication costs.

## Point-to-Point Networks

The Network Controller can concentrate:

● Up to 31 lines that use the EIA RS-232-C (CCITT V.24) line interface
● Up to 14 lines that use the CCITT V.35 line interface
● Up to 14 lines (leased only) that use the CCITT X.21 line interface
● A combination of up to 30 lines using more than one of these interfaces.

The lines may be either switched or leased, transmitting duplex or half-duplex, using either synchronous or asynchronous protocols, at line speeds from 110 bps to 64 kbps.
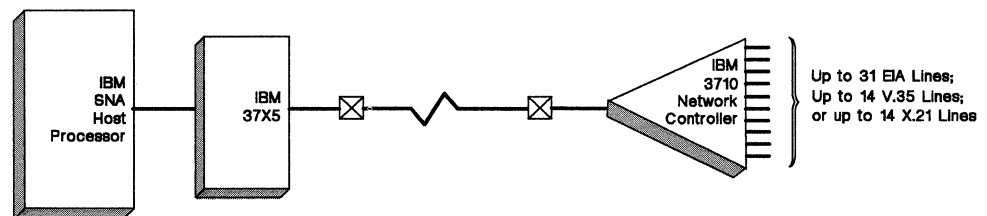


Figure  2-3.   Line Concentration Using Any One Type of Line Interface
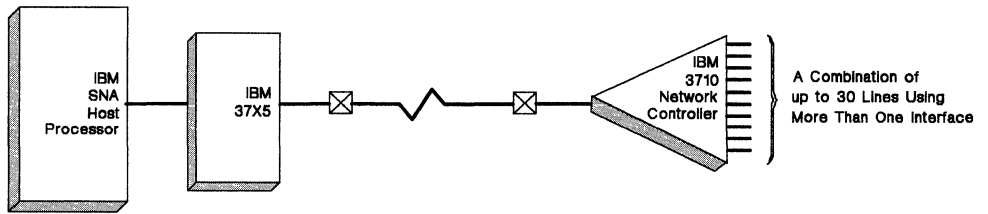
**Figure 2-4. Line Concentration Using Several Types of Line Interfaces**

## Multidrop Networks

Multiple Network Controllers may share a single line to a communication controller. Such a network arrangement is called a *multidrop network*. Network Controllers in a multidrop network, shown following, concentrate many more lines than a single Network Controller can.
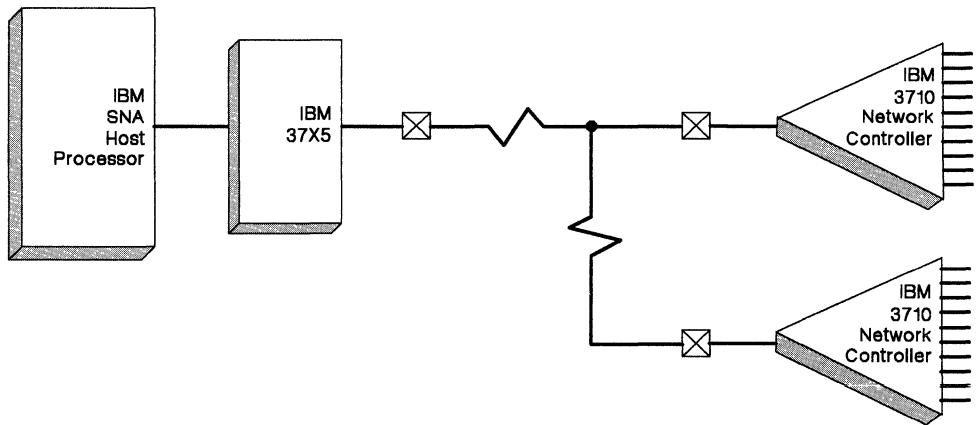


**Figure 2-5. Network Controllers in a Multidrop Network**

The Network Controller is especially suited to a multidrop network. In fact, a single Network Controller and its attached devices logically appear to be a multidrop network to a communication controller.

## Cascaded Networks

A *cascaded network* is a network arrangement of devices in successive levels for greater concentration of lines. Network Controllers can be cascaded, as shown below. A cascaded network can be attached to a multidrop network.
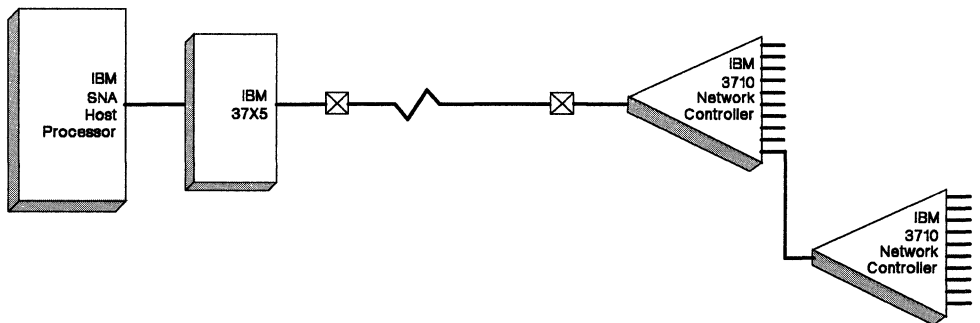


**Figure 2-6. Network Controllers in a Cascaded Network**

## Multiple Upstream Attachments

Hosts and communication controllers are said to be *upstream* from the Network Controller. Many large networks have *multiple upstream attachments*; that is, they have more than one host and communication controller, handling different types of data. Multiple upstream attachments also enable the network operator to initiate backup whenever one host or communication controller fails.

The Network Controller supports multiple upstream attachments. It allows up to 30 lines to 37X5 communication controllers. The lines can be attached remotely by telecommunication line or directly by cable, or both. These arrangements are shown in the figure below.
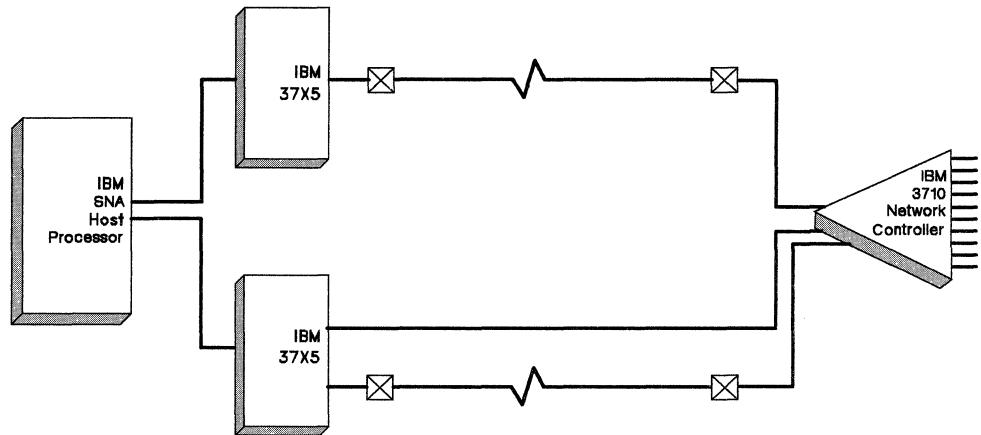


**Figure   2-7.   Network Controller Attachment to Multiple Communication Controllers**

The Network Controller can also be attached to more than one host, as shown below.
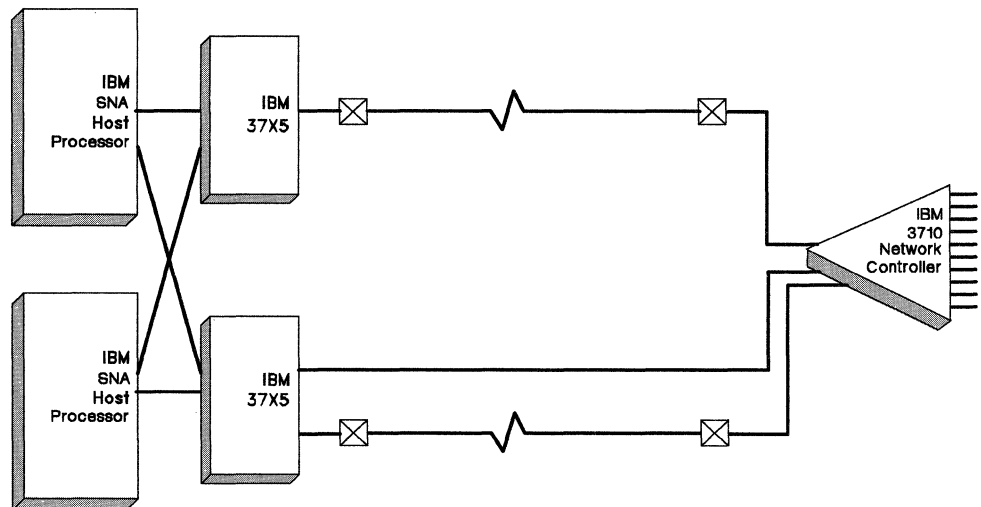


**Figure   2-8.   Network Controller Attachment to Multiple Hosts**

Communication is possible between any host and any device attached through a Network Controller, though each device can communicate with only one host at a time. The Network Controller itself should be owned by only one

host, but one or more hosts can be reserved for network backup in an emergency. The 3710 configuration may be defined so that the Network Controller can switched to a backup host without changing the configuration.

Suitable hosts for the Network Controller include the IBM System/370 and IBM 30XX and 43XX Processors.

## Satellite Attachment

In very large networks, satellites may be used to transmit data. The Network Controller supports satellite services on upstream lines that use the *modulo-128 transmission check*. The Network Controller also supports satellite services on lines to SDLC devices that use modulo-128, and on all lines to start-stop and BSC 3270 devices. Satellite attachments are shown below.
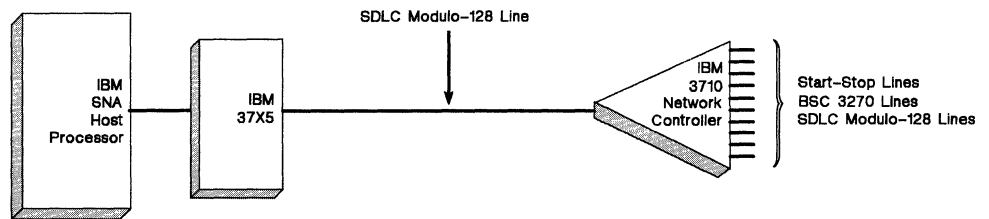


**Figure 2-9. Network Controller Satellite Attachments**

## Remote Assistance

IBM provides easy-to-use procedures for resolving Network Controller problems. If you have not been able to resolve a Network Controller problem using these procedures, and if you have a maintenance agreement with IBM for your Network Controller, IBM can assist through *remote assistance*. Remote assistance may include consultation with an IBM service representative or problem diagnosis by IBM over a switched telecommunication line attached to the Network Controller. Access to the Network Controller for remote assistance is protected by a customer-supplied password. The remote assistance attachment is shown below.
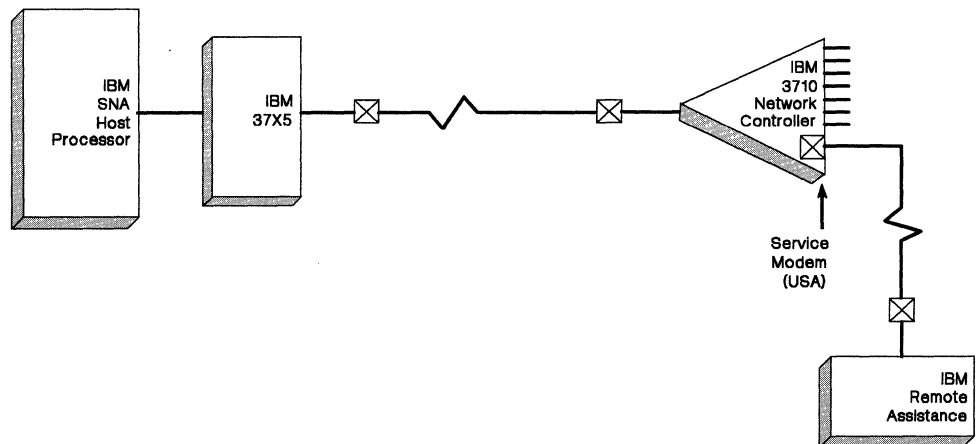


**Figure 2-10. Network Controller Remote Assistance Attachment**

# Customer Procedures

The design of the Network Controller simplifies installation, operation, and maintenance procedures. This chapter describes how easy these procedures are to use.

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## Choosing a Site for the Network Controller

You can locate the Network Controller in any air-conditioned business setting. The small size of the Network Controller allows for a wide range of possible locations. The Network Controller can be placed on a table, in a rack, or anywhere else that meets the physical requirements outlined in *IBM 3710 Network Controller Planning*, GA27-3431.

Without any device cables attached, the Network Controller measures 259 mm by 444 mm by 742 mm (10.2 in. by 17.5 in. by 29.2 in.) and weighs about 50.8 kg (112 lb).
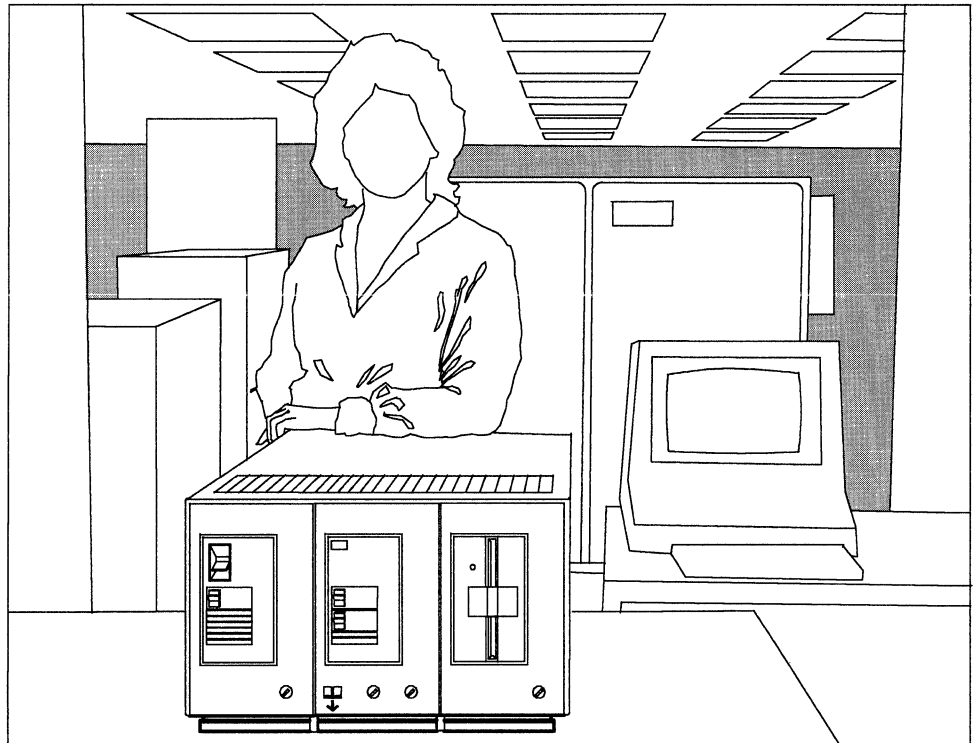


**Figure 3-1. Table-Top Placement of the Network Controller**

## Setting Up the Network Controller

IBM ships easy-to-use unpacking and setup instructions with each Network Controller. These instructions enable customer employees to unpack and install the machine, without using tools and without IBM's assistance. No specially trained customer personnel are required to set up the Network Controller.

The employees setting up a Network Controller unpack and assemble the lightweight machine elements, attach device cables, and turn power on. The Network Controller runs its own self-contained setup tests automatically when the power is turned on. These tests ensure that the machine and its attached cables are working properly. A green light on the machine begins flashing when the tests are satisfactorily completed.

## Attaching the Control Terminal

The IBM 3101 Display Terminal, shown below, or any 3101-equivalent display terminal is suitable as a control terminal. See *IBM 3710 Network Controller Planning*, GA27-3431, for complete control terminal specifications.
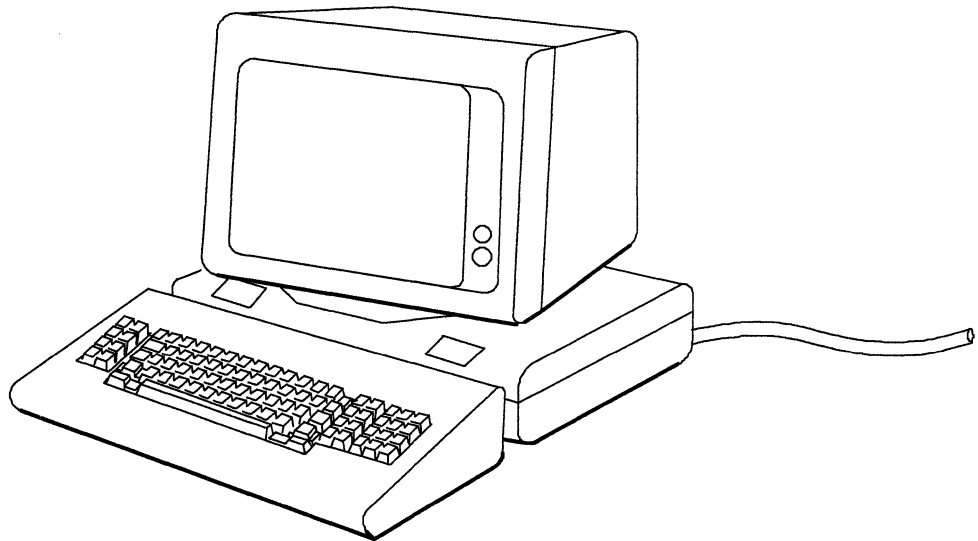


**Figure   3-2.   The IBM 3101 Display Terminal**

Customer employees can use a control terminal to control the operation and monitor the status of the Network Controller, and perform maintenance procedures. When not in use for the Network Controller, the control terminal may either be powered down or used for other applications.

One of the advantages of a control terminal is that it does not have to be directly attached to the Network Controller. It can be remotely attached using the Network Controller's service modem or a customer-supplied external modem. A single control terminal can connect to multiple Network Controllers through the use of asynchronous switched lines.

Locating a control terminal at a host site enables the network operator to maintain centralized control of the Network Controller. Attaching a control terminal requires no changes to existing program products.

Control Terminal Enables Host Site
to Retain Control of Network
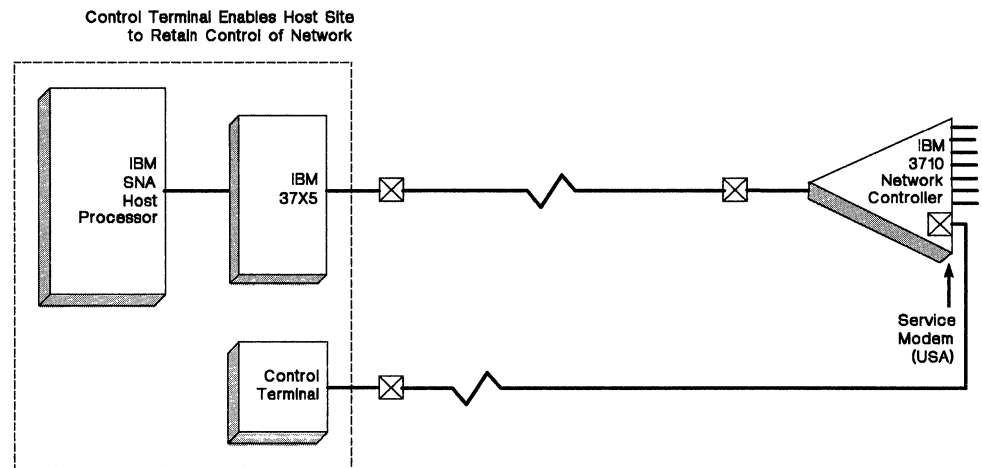
**Figure   3-3.   Control of the Network from a Host Using a Control Terminal**

Specifically, a control terminal can be used to:

● Run Network Controller setup tests and verify that setup is complete

● Load microcode from the system diskette into Network Controller storage

● Copy the system diskette onto a backup diskette

● Copy new or changed 3710 configuration information from the system
   diskette onto a backup diskette

● Enter and verify the Network Controller serial number and model number
   stored on the system diskette, and correct if necessary

● Operate and monitor the Network Controller

● Display information regarding the Network Controller, its machine elements,
   and its attached lines

● Define networks to the Network Controller, and display and change
   already-defined 3710 configurations on the system diskette

● Display alert data generated by the Network Controller

● Isolate, diagnose, and recover from Network Controller problems (online
   and offline)

● Change the status of lines, including setting lines to half- or full-speed and
   setting switched network backup (SNBU) on or off

● Assign a new line to a communication controller

● Change the customer-supplied password.

Some of the above tasks require manual intervention at the Network Controller, which means the control terminal operator will occasionally need the assistance of an operator at the Network Controller.

Unauthorized use of the control terminal is prevented by the use of a sign-on password that you define and control.

## Defining the Network

After setup of the Network Controller is complete, an operator must define the 3710 configuration. The configuration can be defined through the Network Controller, using a control terminal. The operator does not have to be at the Network Controller to define the configuration.

Configuration information is stored on the Network Controller's system diskette and in internal storage.

## Handling Problems

No specially trained customer personnel are required to analyze and resolve Network Controller problems.

## Problem Detection and Alerts

The Network Controller takes the first steps in problem analysis and resolution: detecting the problem and notifying the network operator. The Network Controller continuously monitors itself and its attached lines and devices.

At the control terminal operator's request, the Network Controller sends an *alert* concerning any problem it detects to the control terminal. The alert lists what failed, the probable cause, and how to correct the problem. For most problems, the alert is sufficiently explicit to enable the network operator to take appropriate steps immediately. A control terminal operator can display the Network Controller's last 12 alerts.

## Analyzing and Diagnosing Problems

In addition to alert data, the network operator uses diagnostic tests to assist in locating and diagnosing problems. Online diagnostic tests can be run on communication adapters, attached cables, or the service modem without disrupting the operation of the other adapters.

Offline tests run when the Network Controller is disconnected from the rest of the network. A control terminal must be attached to the Network Controller in order to run offline tests. Depending on which offline tests the control terminal operator requests, the entire Network Controller or the individual machine elements and cables can be tested. Messages the Network Controller sends during and following these tests are self-explanatory.

If the customer problem analysis and diagnosis tests fail, and if you have a maintenance agreement with IBM, the IBM Product Support Center can answer questions that arise and provide remote assistance.

**Resolving Problems**

Most Network Controller problems can be resolved by replacing just one machine element. The Network Controller self-tests verify that the problem has been resolved. If necessary, a control terminal operator can then request additional tests. This process simplifies service and reduces customer costs.

You may choose to have extra machine elements on hand to speed the replacement of failed machine elements. You should also have a backup system diskette, to be used in case the original system diskette is unintentionally altered or destroyed.

## Optional Host Enhancements

This chapter describes the optional host enhancements available for the Network Controller and the additional program products needed for each of them.

## Contents

# Enhanced Applications

As you add Network Controllers to your network, you may want to enhance and expand some Network Controller applications. A number of optional host enhancements are available if additional program products are installed at a host. This chapter describes these optional host enhancements and the program requirements and considerations.

For detailed descriptions of the program products, see *IBM 3710 Network Controller Planning*, GA27-3431. Your IBM marketing representative can give you the current version and release numbers for these program products.

# Communication Network Management

*Communication network management* (CNM) is the process of designing, installing, operating, and managing the distribution of both information and control in a network. The Network Controller and an attached control terminal provide a basic level of CNM. IBM program products provide additional levels of CNM. CNM functions that are unique to the Network Controller are provided by the following IBM program product versions and releases:

- Advanced Communication Function for the Virtual Telecommunications Access Method (ACF/VTAM), Version 3. ACF/VTAM is installed at a host, and is required for the Network Controller trace function.

- System Support Programs for ACF/NCP/VS (SSP), Version 3. SSP operates with ACF/NCP in a 37X5 communication controller. It provides a number of utilities and programs, including the Configuration Control Program (CCP) and the Trace Analysis Program (TAP).

- Network Communications Control Facility (NCCF), Version 2, Release 2. NCCF is installed at a host, and provides a network operator interface to the Network Controller from the host console. NCCF also provides online diagnostic tests, a CCP interface and transport facility, and some additional operator commands.

- Network Problem Determination Application (NPDA), Version 3, Release 2. NPDA is installed at a host, and provides Link Problem Determination Aids (LPDA) and automatic display of alerts, in addition to the Network Controller's requested display at the control terminal. If NPDA is present in a network, the Network Controller's alerts are sent to NPDA as well as being available for display at the control terminal.

  *Note:* In a multidrop or cascaded network that has NPDA, all of the devices attached to a Network Controller, and the Network Controller itself, must share the same NPDA.

# X.25 Packet-Switched Data Network Attachment

A packet-switched data network carries data that has been divided into segments called *packets* over lines that are shared by many users. X.25 has been defined by the International Telegraph and Telephone Consultative Committee (CCITT) as the standard interface to packet-switched data networks.

The Network Controller provides upstream X.25 support on leased and switched virtual circuits. For this enhancement, the Network Controller requires the X.25 NCP Packet Switching Interface, Release 4.2 operating with ACF/NCP, Version 4, in a 3725 Communication Controller. The X.25 NCP Packet Switching Interface is an IBM program product that enables SNA users to connect to packet-switched data networks that have interfaces complying with CCITT Recommendation X.25 (Geneva 1980).
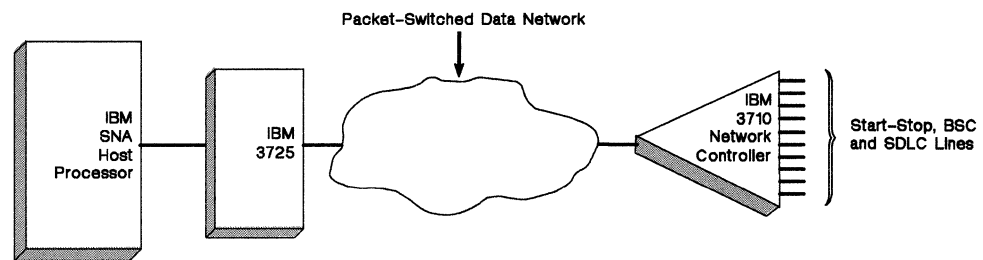


Figure   4-1.   Network Controller Packet-Switched Data Network Attachment

# Enhanced Definition Capability

IBM offers enhanced configuration definition with the Configuration Control Program (CCP), which is part of SSP, Version 3. CCP is an interactive IBM program product that employs easy-to-use terminal panels to guide operators through the processes of defining, displaying, and changing all or part of a 3710 configuration. The definitions can be stored and used later. NCCF provides transport for CCP information and supports updates. For the Network Controller, CCP:

● Uses data entered by the operator to produce the instructions that define 3710 configurations
● Allows complete definition loads and nondisruptive updates
● Keeps track of all 3710 configurations defined in a network
● Can be used to copy configurations
● Can define up to 5 lines to communication controllers
● Supports two levels of cascading.

# Remote Job Entry

The Network Controller supports remote job entry (RJE), which enables jobs to be submitted for processing by non-SNA program products in a remote host. RJE requires the Non-SNA Interconnection (NSI), Release 1.3. NSI is an IBM program product that operates with ACF/NCP in a 3725 communication controller, and provides terminal functions for devices that use BSC RJE. NSI allows non-SNA BSC RJE data to be transported on an SNA network.

## Network Controller Trace

The Network Controller can trace the data and the control information it sends or receives. Information from two devices can be traced at the same time, if the devices are not connected to the same line. For example, a network operator can trace information exchanged between the Network Controller and a communication controller, and between the Network Controller and an attached device.

While the trace is running, ACF/VTAM collects the trace data and formats it into trace records. The network operator can then use the Trace Analysis Program (TAP) to format and analyze the records and print a trace report.

To produce a trace, the Network Controller requires:

● ACF/VTAM, Version 3
● SSP, Version 3, which includes TAP.


## Link Problem Determination Aids

Link Problem Determination Aids (LPDA) is a set of tests executed by IBM 386X modems to determine which of various network components may be causing an error in the network.


### LPDA on Lines to Devices

If a network uses IBM 386X modems and NPDA, Version 3, Release 2, the network operator can use LPDA to run tests on BSC and SDLC lines to devices, and on the modems themselves.


### LPDA in Multidrop Networks

If a network uses IBM 386X modems; NPDA, Version 3, Release 2 or later; and ACF/NCP, Version 4 or later, in a 3725 Communication Controller, the network operator can run LPDA tests on one or more multidrop upstream lines.

# Appendixes
# Abbreviations
# Glossary
# Index

The appendixes list the components of the Network Controller, devices compatible with it, and related publications for additional information. They are followed by a list of abbreviations, a glossary, and an index.

# Contents

# Appendix A. Machine Elements

Machine elements are the modular, customer-replaceable hardware components that make up the Network Controller. The power unit, control unit, and diskette unit slide into the front of the frame and lock in place. The service modem and 16 communication adapters slide into the back of the frame and lock in place.

## Machine Orders and Options

The minimum Network Controller machine order contains the following:

- 1 frame
- 1 power unit
- 1 control unit
- 1 diskette unit
- 1 system diskette
- 1 communication adapter (EIA)
- 16 adapter blanks
- 1 service modem (USA only)
- 1 service modem cable (USA only)
- 1 common-carrier cable (USA only)
- 1 power cord
- 3 keys
- Spare fuses and lights.

A number of options are available:

- Replacing adapter blanks with working communication adapters, and increasing the number of device cables accordingly

- Adding the storage expansion unit (128K bytes)

- Stocking spare machine elements

- Stocking backup diskettes

- Stocking additional spare fuses and lights.

## List of Machine Elements

The Network Controller machine elements are briefly described below:

- The *frame* houses the Network Controller's other machine elements.

- The *power unit* controls the voltage used by the Network Controller.

- The *control unit* is the heart of the Network Controller. It controls the way the Network Controller manages protocols and line interfaces.

- The *diskette unit* reads information from and writes information onto the Network Controller's system diskette.

- The 5-1/4 inch *system diskette* contains all Network Controller operational microcode. It is inserted into the front of the diskette unit.

- Up to 16 *communication adapters* can be inserted into the back of each Network Controller. An *adapter blank* maintains proper airflow wherever there is no communication adapter. Three types of communication adapters can be ordered:

  1. An EIA communication adapter uses the EIA RS-232-C (CCITT V.24) line interface and can handle either one or two lines at speeds up to 19.2 kbps.
  2. A V.35 communication adapter uses the CCITT V.35 line interface and can handle one line at speeds up to 64 kbps.
  3. An X.21 communication adapter uses the CCITT X.21 line interface and can handle one line at speeds up to 64 kbps.

- The *service modem* is used for a remotely attached a control terminal It operates at 1200 bps half-duplex with auto-answer, and is equipped with integrated protective circuits for switched line protection. It is compatible with other 1200-bps, half-duplex, auto-answer modems. It also enables IBM to communicate with the Network Controller when performing remote assistance.

- The *storage expansion unit* is an optional machine element that slides into the top of the control unit and contains 128K bytes of additional storage. If you do not order the storage expansion unit, IBM provides a *storage expansion blank* to maintain proper airflow through the Network Controller.

- The *device cables* connect modems and devices to the communication adapters.

- The *common-carrier cable* connects the service modem to a customer-supplied telephone jack. This cable is used for remote assistance and for remotely attaching a control terminal.

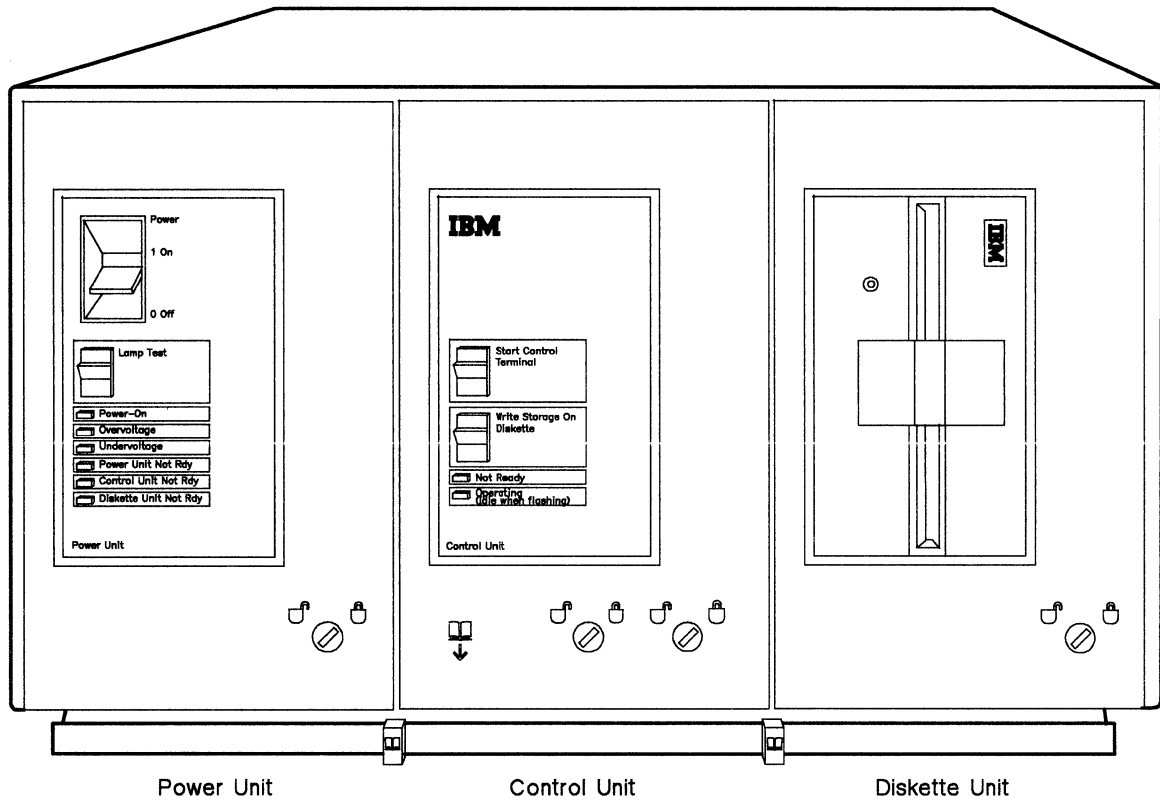- The *power cord* connects the Network Controller to an electrical outlet.

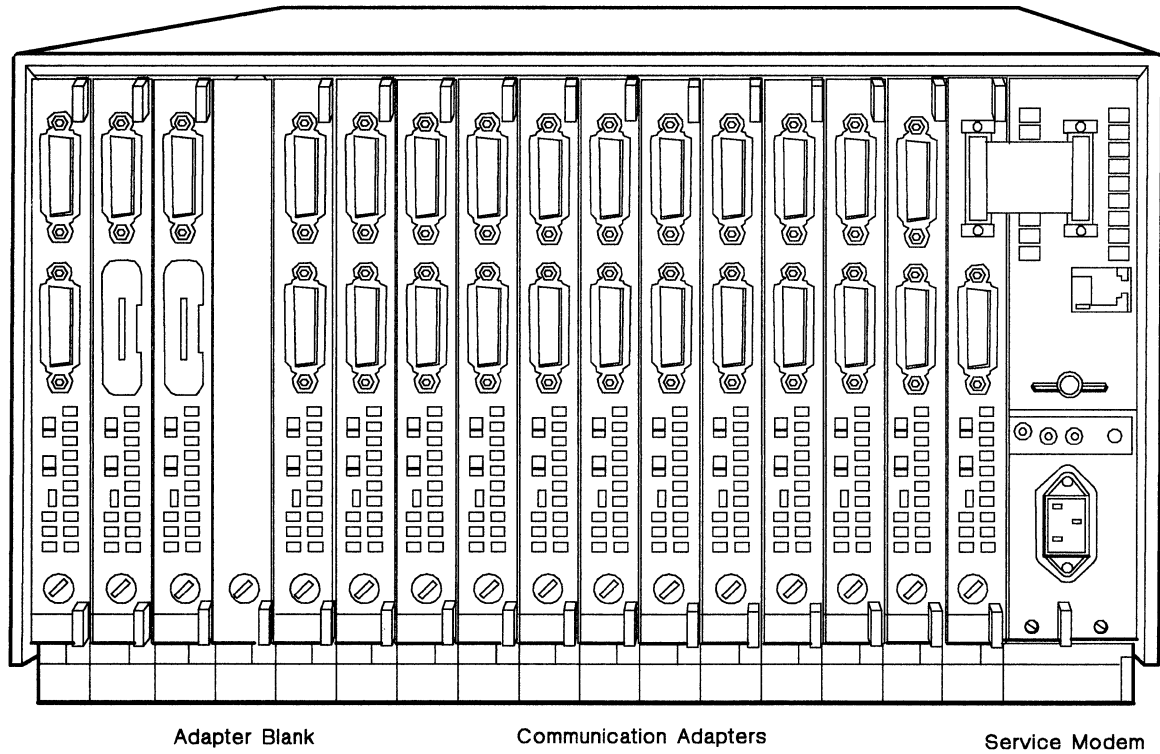**Figure   A-1.   A Front View of the Network Controller**



**Figure   A-2.   A Back View of the Network Controller, without Cables**

# Appendix B. Compatible Devices

The following systems and devices are compatible with the Network Controller.

*Note: The following lists of devices are not exhaustive and may change. Consult your local IBM representative for a complete description of the devices currently supported, and for the specific requirements for the support of each of these devices.*

## Host Processors

- IBM System/370
- IBM 30XX Processor
- IBM 43XX Processor.

## Communication Controllers

- IBM 3705 Communications Controller
- IBM 3725 Communication Controller.

## Start-Stop Devices

- Non-IBM teletypewriter equipment (TTY Model 33/35)
- IBM 3101 Display Terminal operating as a TTY Model 33/35
- IBM Personal Computer operating in 3101 Emulator mode.

## Binary Synchronous Communication (BSC) Devices

- **BSC RJE:**

    - IBM 3776-1 Communication Terminal (BSC)
    - IBM 3776-2 Communication Terminal (BSC)
    - IBM 3777-1 Communication Terminal (BSC)
    - IBM 3780 Data Communication Terminal (BSC).

- **BSC for the Multi-Leaving Interface:**

    - IBM 3777-2 Communication Terminal (BSC).

- **BSC 3270:**

    - IBM 3271 Control Unit (BSC)
    - IBM 3274 Control Unit (BSC)
    - IBM 3276 Control Unit Display Station (BSC).

## Synchronous Data Link Control (SDLC) Devices

- IBM 3274 Control Unit
- IBM 3276 Control Unit Display Station
- IBM 3600 Finance Communication System
- IBM 3630 Plant Communication System
- IBM 3650 Retail Store System
- IBM 3660 Supermarket System
- IBM 3680 Programmed Store System
- IBM 3730 Distributed Office Communication System
- IBM 3770 Data Communication System
- IBM 3790 Communication System
- IBM 4700 Finance Communication System
- IBM 5280 Distributed Data System
- IBM 5520 Administrative System
- IBM 7426 Model 2 Terminal Interface Unit
- IBM 8100 Information System (DPCX)
- IBM 8100 Information System (DPPX)
- IBM 8775 Display Terminal
- IBM Series/1
- IBM System/32
- IBM System/34
- IBM System/36
- IBM System/38
- Another IBM 3710 Network Controller.

# Appendix C. Related Publications

The following lists describe the manuals in the Network Controller library, and other manuals that you might find helpful. Your IBM marketing representative can help you obtain the manuals you need.

## The Network Controller Library

- *IBM 3710 Network Controller Introduction*, GA27-3430.
  Enables the reader to evaluate the Network Controller.

- *IBM 3710 Network Controller Planning*, GA27-3431.
  Enables the reader to plan for and prepare a network for the addition of a Network Controller.

- *Unpacking instructions*.
  Enable the reader to unpack the Network Controller correctly.

- *Customer setup instructions*.
  Enable the reader to set up and test the Network Controller, and also describe procedures for relocating the Network Controller.

- *Host guide*.
  Enables the network operator to operate the Network Controller and diagnose Network Controller problems from a host location.

- *Control terminal guide*.
  Enables an operator to operate the Network Controller and diagnose Network Controller problems using a control terminal.

- *Operator's guide*.
  Enables the reader to identify, remove, and replace machine elements.

- *Problem report*.
  Provides the means for the reader to record necessary problem diagnosis information.

- *Maintenance guide*.
  Enables the reader to identify, test, and repair failed machine elements.

**Manuals
That
Contain
Related
Information**

● *Network Program Products General Information*, GC27-0657.
Describes the services you can obtain from a telecommunication network
operating with the following IBM program products:

  − Advanced Communication Function for the Virtual Telecommunications
    Access Method (ACF/VTAM)
  − Advanced Communication Function for the Network Control Program
    (ACF/NCP)
  − System Support Programs for ACF/NCP/VS (SSP)
  − Network Communications Control Facility (NCCF)
  − Network Problem Determination Application (NPDA)
  − Network Logical Data Manager (NLDM).

● *Non-SNA Interconnection General Information Manual*, GC33-2023.
Describes the functions and use of the IBM Non-SNA Interconnection (NSI)
program product. This manual also explains the relationship of NSI to other
network components and provides an example of how NSI is used.

● *Systems Network Architecture Concepts and Products*, GC30-3072.
Describes the IBM Systems Network Architecture (SNA), including its
benefits, its concepts, and the IBM products that are designed for use in SNA
networks.

● *X.25 NCP Packet Switching Interface General Information*, GC30-3189.
Introduces the IBM X.25 NCP Packet Switching Interface. This manual also
briefly presents packet-switched data networks and the X.25 interface to
packet switching.

# List of Abbreviations

| | |
|---|---|
| **ACF/NCP** | Advanced Communication Function for the Network Control Program |
| **ACF/VTAM** | Advanced Communication Function for the Virtual Telecommunications Access Method |
| **bps** | bits per second |
| **BSC** | binary synchronous communication |
| **CCITT** | The International Telegraph and Telephone Consultative Committee |
| **CCP** | Configuration Control Program |
| **CNM** | communication network management |
| **EIA** | Electronic Industries Association |
| **K bytes** | 1024 bytes |
| **kbps** | kilobits per second (1000 bits per second) |
| **LPDA** | Link Problem Determination Aids |
| **MVS** | multiple virtual storage |
| **MVS/XA** | multiple virtual storage/extended addressing |
| **NCCF** | Network Communications Control Facility |
| **NPDA** | Network Problem Determination Application |
| **NSI** | Non-SNA Interconnection |
| **RJE** | remote job entry |
| **SDLC** | Synchronous Data Link Control |
| **SNA** | Systems Network Architecture |
| **SNBU** | switched network backup |
| **SSP** | System Support Programs for ACF/NCP/VS |
| **TAP** | Trace Analysis Program |
| **TTY** | teletypewriter equipment |

# Glossary

This glossary defines Network Controller terms and abbreviations used in this manual. This glossary includes terms and definitions from the *IBM Vocabulary for Data Processing, Telecommunications, and Office Systems*, GC20-1699. 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).

Entries from the *American National Dictionary for Information Systems*, published by the Computer and Business Equipment Manufacturers Association, are identified by an asterisk (*).

Entries from the *ISO Vocabulary of Data Processing*, developed by the international Standards Organization, Technical Committee 97, Subcommittee 1, are identified by the symbol "(ISO)" for published sections of this vocabulary, or "(TC97)" for definitions on which agreement has not yet been reached.

Entries from the *CCITT Sixth Plenary Assembly Orange Book, Terms and Definitions*, published by the International Telecommunication Union, Geneva, 1978, are identified by the symbol "(CCITT/ITU)."

If you do not find the term you are looking for, refer to the index or to the *IBM Vocabulary for Data Processing, Telecommunications, and Office Systems*, GC20-1699.

## A

**ACF.** See *Advanced Communication Function (ACF)*.

**ACF/NCP.** See *Advanced Communication Function for the Network Control Program (ACF/NCP)*.

**ACF/VTAM.** See *Advanced Communication Function for the Virtual Telecommunications Access Method (ACF/VTAM)*.

**adapter.** See *communication adapter*.

**adapter blank.** A nonfunctional machine element of the Network Controller that maintains proper airflow at an empty communication adapter position.

**Advanced Communication Function (ACF).** A group of IBM program products (including ACF/NCP and ACF/VTAM) that use the concepts of Systems Network Architecture (SNA), including distributed functions and shared resources.

**Advanced Communication Function for the Network Control Program (ACF/NCP).** An IBM program product that provides communication controller support for single-domain and multiple-domain networks. Synonymous with *NCP*.

**Advanced Communication Function for the Virtual Telecommunications Access Method (ACF/VTAM).** An IBM program product that provides single-domain network capability and optional multiple-domain capability. ACF/VTAM runs under MVS and supports direct-control application programs and subsystems, such as VM/VCNA and VM/VSPC. Synonymous with *VTAM*.

**asynchronous.** Pertaining to a device or line in which the sending or receiving of data is not governed by a timing signal. Contrast with *synchronous*.

**auto-answer.** A feature that allows a device to respond automatically to a call that it receives over a switched line.

## B

**backup diskette.** A diskette that contains information copied from another diskette. It is used in case the original information is unintentionally altered or destroyed. See *spare diskette, system diskette*.

**binary synchronous communication (BSC).** A uniform procedure, using a standardized set of control characters and control character

sequences, for synchronous transmission of binary-coded data between devices.

**BSC.** See *binary synchronous communication (BSC)*.

# C

**cascading.** Connecting Network Controllers to each other in a succession of levels, to concentrate many more lines than a single level permits. See also *line concentration*.

**CCP.** See *Configuration Control Program (CCP)*.

**CNM.** See *communication network management (CNM)*.

**common-carrier cable.** A Network Controller customer-replaceable cable that connects the service modem to a standard modular telephone jack.

**communication adapter.** A machine element of the Network Controller that enables one or more telecommunication lines to be connected to the machine. See *EIA communication adapter, V.35 communication adapter, X.21 communication adapter*.

**communication controller.** A type of communication control unit whose operations are controlled by one or more programs stored and executed in the unit; for example, the IBM 3705 Communications Controller and 3725 Communication Controller. They manage the details of line control and the routing of data through a network.

**communication network management (CNM).** The process of designing, installing, operating, and managing the distribution of both information and control among end users of communication systems.

**concentration.** See *line concentration*.

**configuration.** A collective set of definitions that describe the physical and logical arrangement of telecommunication lines and devices in a 3710 network. See also *define, 3710 configuration*.

**Configuration Control Program (CCP).** An IBM program product, provided by SSP, that is used interactively to define, display, and alter configurations that contain Network Controllers.

**control terminal.** A display terminal, equivalent to the IBM 3101 Display Terminal, that enables an operator to communicate with the Network Controller for purposes of controlling, monitoring, and diagnosing problems in a 3710 configuration. The control terminal may be

either directly attached or remotely attached to the Network Controller. See also *3101 Display Terminal*.

**control terminal operator.** The network operator or system programmer who uses a Network Controller control terminal. See also *control terminal*.

**control unit.** A machine element of the Network Controller that controls the handling of data and provides network interfaces.

**copy.** See *write*.

**customer-replaceable.** Designed to be removed and replaced by the customer, according to instructions provided by IBM, without the use of tools or the assistance of IBM personnel.

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

# D

**define.** To describe to a network the arrangement of telecommunication lines and devices in the network; to create a configuration. See also *configuration*.

**device.** For the Network Controller, any terminal, printer, or other piece of data communication equipment that sends data to a host, or receives data from a host.

**device cable.** For the Network Controller, a customer-replaceable cable that is used to directly attach a device to a communication adapter.

**diagnosis.** See *problem diagnosis*.

**diskette.** A thin, flexible magnetic disk permanently enclosed in a semi-rigid protective jacket. See *backup diskette, spare diskette, system diskette*.

**diskette unit.** A machine element of the Network Controller that reads information from and writes information onto the system diskette.

**display terminal.** A terminal that gives a visual representation of data, such as the IBM 3101 Display Terminal.

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

# E

**EIA communication adapter.** A Network Controller communication adapter that can combine and send information on two lines at speeds up to 19.2 kbps, and conforms to EIA RS-232-C (CCITT V.24) standards.

**end user.** In SNA, the ultimate source or destination of application data flowing through an SNA network. An end user may be an application program or a terminal operator.

# F

**frame.** A machine element of the Network Controller that houses the other machine elements.

# H

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

**host.** See *host processor*.

**host processor.** (TC97) A processor that controls all or part of a user-application network. Synonymous with *host*. See also *processor*.

# I

**indicator light.** A light that signals a change in status or the presence of a certain predefined condition. See also *light-emitting diode (LED)*.

**interactive.** Pertaining to an application in which each entry calls forth a response from a system or program. An interactive system may also be conversational, implying a continuous dialog between the user and the system.

**\* interface.** A shared boundary. An interface might be a hardware component to link two devices or it might be a portion of storage or registers accessed by two or more computer programs.

# J

**jack.** A connecting device to which a wire or wires of a circuit may be attached and which is arranged for the insertion of a plug.

# L

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

**line.** See *telecommunication line*.

**line concentration.** Combining data from many lines or devices onto fewer lines. See also *cascading*.

**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.** In SNA, the combination of the physical medium of data transmission (such as a telephone wire or a microwave beam), the protocol, and associated devices and programming. A link is both logical and physical.

**Link Problem Determination Aids (LPDA).** A set of test commands executed by an IBM 3863, 3864, or 3865 Modem or an IBM 3867 Link Diagnostic Unit to determine which of various network components may be causing an error in the network.

**link protocol.** (CCITT/ITU) The set of rules by which a logical data link is established, maintained, and terminated, and by which data is transferred across the link. It includes the format by which control information is passed, and the rules by which it is interpreted, in order to transmit data across the link. See *protocol*.

**LPDA.** See *Link Problem Determination Aids (LPDA)*.

# M

**machine element.** Any of those elements of the Network Controller that have been designed to be removed and replaced by the customer, without tools or the assistance of IBM personnel.

**microcode.** A code that represents instructions used as an alternative to "hard-wired" circuitry in a product to implement certain functions of a processor or other system component.

**mixed-protocol network.** A network arrangement that uses more than one type of protocol for data transmission (for example, start-stop transmission and SDLC together).

**modem.** (TC97) A functional unit that modulates and demodulates signals. One of the functions of a modem is to enable digital data to be transmitted over analog transmission facilities.

**modulo-128 transmission check.** In SDLC, a data transmission check used with satellite services.

**multidrop line.** A telecommunication line interconnecting several devices. Contrast with *point-to-point link.*

**multidrop network.** A network arrangement in which more than one device is connected to a single telecommunication line.

**multi-leaving.** Fully synchronized, two-directional transmission of data between a host and devices, using binary synchronous communication (BSC) facilities.

# N

**NCCF.** See *Network Communications Control Facility (NCCF).*

**NCP.** See *Advanced Communication Function for the Network Control Program (ACF/NCP).*

**network.** In data processing, a user-application network. See *user-application network.*

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

**network operator.** A person responsible for controlling the operation of all or part of a network.

**Network Problem Determination Application (NPDA).** An IBM program product that helps the user identify network problems from a central control point using interactive display techniques.

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

**nonswitched line.** See *leased line.*

**NPDA.** See *Network Problem Determination Application (NPDA).*

**NSI.** See *Non-SNA Interconnection (NSI).*

# O

**offline.** (TC97) Pertaining to the operation of a functional unit without the continual control of a computer. Contrast with *online.*

**online.** (TC97) Pertaining to the operation of a functional unit that is under the continual control of a computer. Contrast with *offline.*

**\* operator.** A person who operates a machine. See *network operator.*

# P

**packet switching.** (TC97) The process of routing and transferring data by means of addressed packets so that a channel is occupied only during the transmission of a packet; upon completion of the transmission, the channel is made available for the transfer of other packets. See *circuit switching.*

**panel.** A predefined display image that defines the locations and characteristics of display fields on a screen.

**point-to-point link.** A link that connects a single remote link device to a node; the link may be switched or leased. Contrast with *multidrop line.*

**point-to-point network.** A network arrangement made up of point-to-point links. Contrast with *multidrop network.*

**power cord.** A customer-replaceable cord supplied with the Network Controller that connects the machine to an electrical outlet, and provides electrical power.

**power unit.** A machine element of the Network Controller that controls the electrical power used by the machine.

**problem diagnosis.** Analysis that results in identifying the precise cause of a hardware, software, or system failure.

**problem resolution.** A process of diagnosing and correcting a problem.

**processor.** (ISO) In a computer, a functional unit that interprets and executes instructions.

**program.** A set of actions or instructions that a machine is capable of interpreting and executing.

**program product.** A licensed program that performs a function for the user and usually interacts with and relies upon system control programming or some other IBM-provided control program.

**protocol.** (CCITT/ITU) A specification for the format and relative timing of information exchanged between communicating parties. See *link protocol.*

**protocol conversion.** Changing a protocol so that it appears to be a different protocol. For example, the Network Controller changes BSC 3270 protocol to appear as SDLC.

**protocol envelopment.** Surrounding a protocol with appropriate information so that it appears to be a different protocol. For example, the Network Controller envelops start-stop transmission to make it appear as SDLC.

# R

**Recommendation X.25 (Geneva 1980).** A CCITT recommendation for the interface between data terminal equipment and packet-switched data networks. See *packet switching*.

**remote assistance.** Problem diagnosis and recovery, maintenance, and program help offered by IBM by telephone or over a telecommunication line.

**\* remote job entry (RJE).** (ISO) Submission of jobs through an input unit that has access to a computer through a data link.

**remotely attached.** Pertaining to devices that are connected to another device by a telecommunication line and modems.

**RJE.** See *remote job entry (RJE)*.

# S

**SDLC.** See *Synchronous Data Link Control (SDLC)*.

**service modem.** A machine element of the Network Controller that attaches to an EIA communication adapter and enables communication with the Network Controller over a telecommunication line.

**setup tests.** Tests performed by the customer during and after customer setup to verify that a machine is ready for operation.

**SNA.** See *Systems Network Architecture (SNA)*.

**SNA device.** A device that supports SNA protocols. See also *Systems Network Architecture (SNA)*.

**SNA network.** The part of a user-application network that conforms to the formats and protocols of SNA. See also *Systems Network Architecture (SNA)*.

**SNBU.** See *switched network backup*.

**spare diskette.** A diskette that has not been formatted as a Network Controller system diskette or backup diskette. It may or may not be a blank diskette. See *backup diskette, system diskette*.

**SSP.** See *System Support Programs for ACF/NCP/VS (SSP)*.

**start-stop transmission.** (TC97) Asynchronous transmission such that a group of signals representing a character is preceded by a start element and is followed by a stop element.

**\* storage.** A storage device.

**storage device.** (ISO) A functional unit into which data can be entered, in which it can be retained, and from which it can be retrieved.

**storage expansion blank.** A nonfunctional machine element of the Network Controller that maintains proper airflow in the Network Controller's control unit in the absence of the storage expansion unit.

**storage expansion unit.** A machine element of the Network Controller that fits into the Network Controller's control unit and provides additional storage.

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

**switched network backup (SNBU).** An optional facility that allows a user to specify, for certain types of physical units, a switched line to be used as an alternate path if the primary line becomes unavailable or unusable.

**synchronous.** Pertaining to a device or line in which the sending or receiving of data is governed by a timing signal. Contrast with *asynchronous*.

**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 nonswitched links. The configuration of the link connection may be point-to-point, multipoint, or loop. SDLC conforms to subsets of the Advanced Data Communication Control Procedures of the American National Standards Institute and High-level Data Link Control (HDLC) of the International Standards Organization.

**\* system.** In data processing, a collection of personnel, machines, and methods organized to accomplish a set of specific functions.

**system diskette.** On the Network Controller, a 5-1/4 inch diskette that contains operational microcode, diagnostic microcode, the configuration table, the serial number, the password, error logs, and other information. The diskette is inserted into the front of the Network Controller's diskette unit. See *backup diskette, spare diskette.*

**System Support Programs for ACF/NCP/VS (SSP).** An IBM program product, 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 networks and controlling the configuration and operation of networks.

# T

**TAP.** See *Trace Analysis Program (TAP).*

**telecommunication.** (TC97) Communication over a distance, as by telegraph or telephone.

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

**teletypewriter equipment (TTY).** A generic term referring to the basic equipment made by Teletype Corporation, and to teleprinter equipment.

**trace.** A function that enables the Network Controller to copy the data and control information it sends or receives. ACF/VTAM collects the trace data, which can then be formatted and printed using the Trace Analysis Program.

**Trace Analysis Program (TAP).** An IBM program product, provided by SSP, that merges and formats SNA and SDLC trace data into formatted trace reports.

**TTY.** See *teletypewriter equipment (TTY).*

# U

**upstream.** In the direction of data flow from the end user to the host.

**upstream line.** For the Network Controller, a telecommunication line attaching a Network Controller to an upstream device.

**user-application network.** (TC97) A configuration of data processing products such as processors, controllers, and terminals, established and operated by users for the purpose of data processing or information exchange, which may use services provided by communication common carriers.

# V

**VTAM.** See *Advanced Communication Function for the Virtual Telecommunications Access Method (ACF/VTAM).*

**V.35 communication adapter.** A Network Controller communication adapter that can combine and send information on one line at speeds up to 64 kbps, and conforms to CCITT V.35 standards.

# W

**\* write.** (ISO) To make a permanent or transient recording of data in a storage device or on a data medium.

# X

**X.21 communication adapter.** A Network Controller communication adapter that can combine and send information on one line at speeds up to 64 kbps, and conforms to CCITT X.21 standards.

**X.25.** See *Recommendation X.25 (Geneva 1980).*

**X.25 NCP Packet Switching Interface.** An IBM program product that allows SNA users to communicate over packet-switched data networks that have interfaces complying with Recommendation X.25 (Geneva 1980) of the International Telegraph and Telephone Consultative Committee (CCITT). It allows SNA programs to communicate with SNA devices or with non-SNA devices over such networks.

**3101 Display Terminal.** A tabletop IBM keyboard display terminal that uses the asynchronous line protocol and the USA ASCII or ISO code character set. The 3101 Display Terminal is suitable for use as a Network Controller control terminal.

**3710 configuration.** The definitions that describe a 3710 network.

**3710 network.** A Network Controller and its attached lines and devices.

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**IBM 3710 Network Controller**
**Introduction**

**Order No. GA27-3430-0**

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