



9370 Information System

Planning for Your System



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Planning for Your IBM 9370 Information System



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Who Should Use This Book

This publication assists anyone ordering the IBM 9370 Information System. The information in this publication is useful to both first-time data processing users and experienced users. The chapters provide a building-block approach for planning the 9370 system. First-time users should read the manual in its order of presentation. Experienced users can use the information as a quick reference by accessing desired topics. The *IBM 9370 Information System Planning Forms*, GX24-4093-1 should be used in conjunction with this book when planning for your system.

The normal users for this book include system planners and administrators.

How This Book is Organized

Chapter 1, "*General Planning Activities*," gives an overview of the planning process. It identifies those tasks that must be done to ensure a smooth system installation.

Chapter 2, "*Selecting Your Rack-Mounted Devices*," describes the individual rack-mounted devices that comprise the 9370 system. It also provides directions on selecting 9370 processor features and integrated storage devices.

Chapter 3, "*Planning Your Local Work Stations*," explains how various local work station devices attach to the 9370 processor. It lists some of the IBM products that you can use and provides directions on developing a local work station planning form.

Chapter 4, "*Planning Your Communications*," explains how various communication devices attach to the 9370 processor. It lists some of the IBM products that you can use and provides directions on planning telecommunication subsystems, ASCII subsystems, the IBM Token-Ring network, and local area networks.

Chapter 5, "*Planning Your System/370 Channel(s)*," explains how you can use System/370 input and output devices with the 9370 processor. It lists some of the IBM products that you can use and provides directions for filling in a System/370 channel planning form.

How This Book is Organized (Continued)

Chapter 6, “*System Planning Summary*,” summarizes system planning and provides pointers for site preparation.

Chapter 7, “*Upgrading Your System*,” tells how to plan for and order new features or machines for your system.

Appendix A, “Communication Cables,” describes the communication cables used with the 9370 system. It provides the specifications necessary for assembling these cables and wrap connectors.

This publication also has:

- A *glossary* to look up a term you do not understand.
- An *index* for quick reference to the text.

What You Should Know

You must have a basic knowledge of the system to prepare for the installation. If you do not have a copy of *Introducing the IBM 9370 Information System*, GA24-4030, contact your IBM marketing representative to obtain a copy.

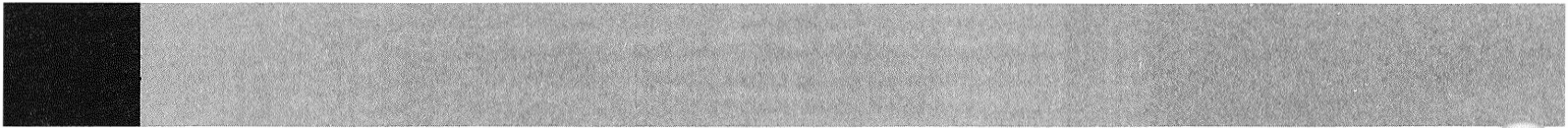
If You Need More Information

More detailed information about the 9370 system is in the 9370 system library:

- *Introducing the IBM 9370 Information System*, GA24-4030
- *Installation Manual – Physical Planning*, GA24-4031
- *Customizing the IBM 9370 Work Station Subsystem*, GA24-4044
- *IBM 9370 Information System Work Station Serial OEM Interface Description and Reference*, SA24-4100.

You can find additional information in:

- *IBM 3270 Information Display System/IBM 3299 Terminal Multiplexer Product Information*, G520-4216
- *IBM Installation and Assembly of Coaxial Cable and Accessories*, GA27-2805
- *IBM Token-Ring Network Introduction and Planning Guide*, GA27-3677
- *IBM Data Communication Concepts*, GC21-5169



| | |
|---|------------|
| 1. General Planning Activities | 1-1 |
| System Planning | 1-1 |
| Planning Forms | 1-2 |
| Scheduling Planning Tasks | 1-2 |
| Customer Identification | 1-3 |
| Estimated Delivery Date | 1-3 |
| Planning Tasks | 1-3 |
| Responsible Person | 1-3 |
| Completion Date | 1-4 |
| Comments | 1-4 |
| 2. Selecting Your Rack-Mounted Devices | 2-1 |
| Processor Types | 2-1 |
| 9373 Processor | 2-2 |
| 9375 Processor | 2-2 |
| 9377 Processor | 2-2 |
| Processor Console | 2-4 |
| I/O Card Units | 2-5 |
| Completing the Processor Configuration | 2-7 |
| 9309 Rack Enclosure | 2-9 |
| DASD/Tape Controller (Feature 6010) | 2-12 |
| Data Storage Devices | 2-12 |
| 3. Planning Your Local Work Stations | 3-1 |
| Introduction | 3-1 |
| System Offerings | 3-2 |
| Work Station Adapter Ports | 3-4 |
| The 3299 Terminal Multiplexer | 3-5 |
| 3299 Port Identification | 3-6 |
| Selecting Local Work Stations | 3-6 |
| Displays | 3-7 |
| Personal Computers (with 3278/3279 Emulator Feature 5050) | 3-8 |
| Printers | 3-8 |
| Original Equipment Manufacturer (OEM) Devices | 3-9 |
| Getting Ready for Form D | 3-9 |
| Begin Filling Out Form D | 3-10 |
| Completing the Rest of Form D | 3-11 |
| Additional Work Station Controllers | 3-15 |
| Filling in Forms B and C3 | 3-15 |
| Customizing the Work Station Subsystem | 3-16 |
| Now That You've Completed the Forms | 3-17 |
| 4. Planning Your Communications | 4-1 |
| Communications Subsystems | 4-1 |
| Telecommunications Subsystem | 4-2 |
| Remote Devices | 4-3 |
| Networks | 4-5 |
| Communications Processor (Feature 6030) | 4-6 |
| Multi-Protocol Adapter (Feature 6031) | 4-7 |
| Asynchronous Adapter (Feature 6032) | 4-9 |
| Defining a Network | 4-10 |
| Communication Line Connections | 4-12 |

Contents

| | |
|--|-------------|
| Communication Line Customization | 4-19 |
| Modems | 4-20 |
| IBM Modems | 4-21 |
| PTT Mandatory Modems | 4-22 |
| Modem Options | 4-23 |
| Ordering IBM Modems | 4-25 |
| Ordering Modems from a Modem Supplier | 4-26 |
| Ordering External Couplers | 4-27 |
| Ordering Modems and Lines from a Common Carrier | 4-27 |
| Ordering Communication Lines from the Common Carrier | 4-29 |
| Data Circuit-Terminating Equipment for CCITT X.21 and V.35 | 4-30 |
| Ordering Auto-Call Units | 4-32 |
| ASCII Subsystem | 4-32 |
| Maximum Lines Supported on an ASCII Subsystem | 4-34 |
| Asynchronous Adapter (Feature 6032) | 4-35 |
| ASCII Devices | 4-36 |
| Personal Computers, Work Stations | 4-36 |
| Printers, Plotters, Graphic Devices | 4-37 |
| Customization | 4-37 |
| Defining an ASCII Subsystem Communication Line | 4-38 |
| IBM Token-Ring Subsystem | 4-43 |
| IBM Token-Ring Adapter (Feature 6034) | 4-43 |
| IEEE 802.3 Local Area Network Subsystem | 4-45 |
| IEEE 802.3 Local Area Network Adapter (Feature 6035) | 4-45 |
| Communication Adapter Cables | 4-47 |
| | |
| 5. Planning Your System/370 Channel(s) | 5-1 |
| Introduction | 5-1 |
| System Offerings | 5-3 |
| System/370 Channel I/O Devices | 5-3 |
| Direct Access Storage Devices | 5-4 |
| Tape Drive Devices | 5-5 |
| Channel Printer Devices | 5-5 |
| Terminal Controllers | 5-6 |
| Communication Controllers | 5-6 |
| Other S/370 Products | 5-7 |
| Channel Adapter Types | 5-7 |
| System/370 Channel Control Units | 5-8 |
| System/370 Channel Power Sequence and Control | 5-8 |
| Form E, System/370 Channel Information | 5-8 |
| Filling In Form E | 5-9 |
| Form B | 5-11 |
| Filling in Form B | 5-11 |
| Filling in Form C3 | 5-12 |
| System/370 Cables | 5-12 |
| | |
| 6. System Planning Summary | 6-1 |
| Preparing to Order The System | 6-1 |
| Ordering Communication Facilities | 6-2 |
| Operating System and Applications | 6-2 |
| Ordering the Applications | 6-2 |
| Writing Your Own Applications | 6-2 |

| | |
|--|------------|
| Contract Programmer Services | 6-3 |
| Microcode Customization | 6-3 |
| Ordering Computer Supplies | 6-3 |
| Ordering Publications | 6-4 |
| Physical Planning | 6-4 |
| 7. Upgrading Your System | 7-1 |
| Preparing to Upgrade Your System | 7-1 |
| Additional Racks | 7-2 |
| Processor Upgrade | 7-2 |
| Processor Model | 7-3 |
| Processor Storage | 7-3 |
| Automated Power Control (Feature 4000) | 7-4 |
| Integrated DASD/Tape Devices | 7-4 |
| Adding DASD/Tape Devices | 7-5 |
| Removing DASD/Tape Devices | 7-7 |
| Adding Local Work Stations | 7-8 |
| Removing a Work Station Controller | 7-9 |
| Communications Subsystems | 7-9 |
| Telecommunications Subsystem | 7-9 |
| ASCII Subsystem | 7-11 |
| IBM Token-Ring Subsystem | 7-13 |
| IEEE 802.3 Local Area Network Subsystem | 7-14 |
| S/370 Block Multiplexer Channels | 7-15 |
| Adding S/370 Block Multiplexer Channels | 7-15 |
| Removing S/370 Block Multiplexer Channels | 7-16 |
| Changing the Type of S/370 Block Multiplexer Channel | 7-16 |
| S/370 Channel Power Sequence and Control | 7-16 |
| Ordering The Upgrade | 7-17 |
| Prepare to Install the Upgrade | 7-17 |
| Appendix A. Communication Cables | A-1 |
| Multi-protocol Adapter Cables | A-1 |
| Assembling Multi-protocol Adapter Cables | A-1 |
| Multi-protocol Adapter Point-to-Point Cable Wiring | A-4 |
| Asynchronous Adapter Cables | A-20 |
| Assembling Asynchronous Adapter Cables | A-20 |
| Asynchronous Adapter Point-to-Point Cable Wiring | A-22 |
| IBM Token-Ring Adapter Cable | A-30 |
| Assembling Token-Ring Adapter Cables | A-30 |
| IEEE 802.3 LAN Adapter Cable | A-33 |
| Glossary | X-1 |
| Index | X-7 |



| Figure No. | | Page No. |
|------------|---|----------|
| 2-1. | Maximum Number of Features by Processor Type | 2-3 |
| 2-2. | I/O Card Units | 2-6 |
| 2-3. | Processor Planning Forms | 2-7 |
| 2-4. | Maximum Number of Integrated DASD and Tape Drives | 2-13 |
| 2-5. | 9332 Model 400 Disk Drives | 2-14 |
| 2-6. | 9335 Model A01 Control Unit with Four 9335 Model B01 Disk Drives. | 2-15 |
| 2-7. | 9332 Model 400 Disk Drives And One 9347 Tape Drive | 2-15 |
| 3-1. | Terminals Attached Through a Work Station Controller | 3-3 |
| 3-2. | Work Station Adapter Ports (viewed from rear of rack) | 3-4 |
| 3-3. | 3299 Terminal Multiplexer | 3-6 |
| 3-4. | 3270-Type Terminals | 3-7 |
| 3-5. | Personal Computers | 3-8 |
| 3-6. | 3270-Type Printers | 3-8 |
| 3-7. | Work Station Adapter Location and Configuration Data | 3-10 |
| 3-8. | Completed Form D for Ports 4, 5, and 6 | 3-12 |
| 3-9. | Work Station Description Block | 3-13 |
| 4-1. | Remote Work Stations | 4-3 |
| 4-2. | Remote Controllers | 4-4 |
| 4-3. | Remote Systems | 4-4 |
| 4-4. | Multi-Protocol Communication Adapter | 4-8 |
| 4-5. | Asynchronous Communication Adapter | 4-9 |
| 4-6. | Type of Network and Interface Determines Your Next Step | 4-20 |
| 4-7. | IBM External Modems | 4-21 |
| 4-8. | Your Modem Source Determines Your Next Step | 4-25 |
| 4-9. | Type of Network and Interface Determines Your Next Step | 4-28 |
| 4-10. | Type of Network and Interface Determines Your Next Step | 4-30 |
| 4-11. | Type of Network and Interface Determines Your Next Step | 4-31 |
| 4-12. | Type of Network and Interface Determines Your Next Step | 4-32 |
| 4-13. | ASCII Subsystem Line Weight Factors | 4-35 |
| 4-14. | Asynchronous Communication Adapter | 4-35 |
| 4-15. | IBM Token-Ring Adapter | 4-43 |
| 4-16. | IEEE 802.3 Local Area Network Adapter | 4-46 |
| 4-17. | Communication Extension Cables | 4-47 |
| 5-1. | System/370 Devices Attached to a System Using the Block Multiplexer Channel | 5-2 |
| A-1. | Multi-protocol Adapter Cable Connector (viewed from connector side) | A-2 |
| A-2. | Multi-protocol Communication Adapter Cables | A-3 |
| A-3. | Asynchronous Adapter Cable Connector (viewed from connector side) | A-20 |
| A-4. | Asynchronous Communication Adapter Cables | A-21 |
| A-5. | IBM Token-Ring Adapter Cables | A-30 |

Figures

| Figure No. | | Page No. |
|------------|---|----------|
| A-6. | IBM Token-Ring Adapter Cable Connector (viewed from connector side) | A-31 |
| A-7. | IEEE 802.3 Adapter Cable Connector | A-33 |

This book can help you select hardware devices and successfully plan the installation of your IBM 9370 Information System. An outline of the tasks this book helps you accomplish is in the preface, titled "How This Book is Organized".

Depending on your data processing experience, you should be able to plan for a relatively small system without any additional help. For larger systems using S/370 channels and/or complex teleprocessing networks, you may need some assistance from your IBM marketing representative. Also, you will probably need marketing assistance for selecting suitable software packages. You can refer to *Introducing the IBM 9370 Information System*, GA24-4030, for a description of the system, devices, and available software packages.

With the 9370 system you can quickly respond to changes in your business. You can easily add, remove, or relocate the system devices to match your business needs. Proper planning for your new system will help your business benefit from it soon after its arrival.

System Planning

As part of your system planning activity, you will make decisions about what features and devices to order, where to locate your equipment, who will operate the computer, and so on. A good plan ensures that the equipment and materials are ready to use when your new computer arrives.

You should select an individual to serve as the planning coordinator for your planning efforts. One person is generally responsible for most or all of the system planning, but it is also possible to divide the responsibilities among other people in your business.

The type of software (operating system and application programs) that you intend to use must support the features and devices on the system. You should be familiar with the software requirements before selecting the hardware features and devices. Contact your IBM marketing representative for information on planning for the software.

Planning Forms

There are several planning forms in the *IBM 9370 System Planning Forms* book, GX24-4093-1; you will use these forms while you select the system components. These forms help you keep track of the required information to install your system. As you progress through the planning steps in this manual, you will be given instructions on how to fill out these forms.

The forms allow you to record information in the following areas of system planning:

- Arranging the layout of the computer equipment
- Establishing a schedule
- Ordering your system and other equipment
- Planning for setup, communications, and system configuration.

All of the planning forms, once completed, should be saved in the planning binder. Refer to them to assist you when the system is installed and performing problem analysis.

Scheduling Planning Tasks

A good schedule ensures that you have the necessary materials and that all employees are ready to use the new equipment when it arrives. A good schedule is easily understood and should be kept up-to-date throughout the planning cycle.

Begin your planning activities by using the *System Planning Schedule*, Form A, in the planning forms packet in the planning binder. You can update this form as you proceed through the planning tasks.

The form has six parts:

- Customer identification
- Estimated delivery date
- Planning tasks

- Responsible person
- Completion date
- Comments.

If you have not already done so, get Form A. We will now begin filling out this form.

Customer Identification

Fill in your *Customer Name* and *Customer Number*. If you do not know your customer number, ask your IBM marketing representative.

Because IBM is interested in your planning progress, it is a good idea to give your marketing representative a copy of your planning schedule. (The IBM representative can make timely visits to review your overall progress.)

Estimated Delivery Date

When you order the system, ask the IBM marketing representative when the system will arrive. Remember that this date is an estimate and that you will be notified later by IBM when you can expect to receive your system.

Planning Tasks

The planning tasks are in a recommended sequence, although they do not necessarily have to be completed in this sequence. The progress of these tasks should be reviewed throughout the planning cycle.

Responsible Person

As the planning coordinator, you are the key person responsible for the successful installation of the system. While you will be handling much of this responsibility, you might have several people helping you with this job. Record the name of the person responsible for each task in the *Responsible Person* column. If you are not sure

Scheduling Planning Tasks (Continued)

who should be responsible for some tasks, wait until you are sure and then come back and complete this part of the form.

Completion Date

The planned date is when you want to have the task completed and the actual date is when the task is actually completed. When filling in the planned date, be sure to consider vacation time, holidays, or special occasions when you or the people assigned to certain tasks are gone.

Comments

There is a comment space across from each task on Form A. Use this space for your own purposes, such as writing in a specific comment about a task.

The 9370 system includes a processor, I/O devices, and the appropriate software to fill your data processing needs. Before selecting what hardware devices to order, you should understand your data processing needs. Some items to consider are:

- The computer applications you want
- The size of your business
- The number of system users
- The amount of data that you wish to process
- The amount of data storage space required
- The operating system (control program) to be used.

Note: The operating system that is used must support the processor features and I/O devices on the system. Therefore, planning your hardware devices should be done in conjunction with selecting an operating system.

While reading this chapter, you will complete one or more of the following planning forms, which are included in the *Planning Forms*, GX24-4093-1, located in the planning binder:

- Processor Configuration (Form B3, B5, or B7)
- Rack Enclosure (Form C1)
- Integrated DASD/Tape Devices (Form C2).

This publication assists you in selecting a hardware configuration. However, you may need the assistance of a data processing professional, such as your IBM marketing representative, to verify your configuration.

Refer to *Introducing the IBM 9370 System*, GA24-4030, for a complete description of the available features and devices.

Processor Types

Three types of processors are available: 9373, 9375, and the 9377.

See Figure 2-1 on page 2-3 for an overview of the type of features available on each processor; this figure shows the maximum number of features for each processor. However, the combination of different features and

Processor Types (Continued)

optimum performance requirements can reduce this number. The total number of all I/O (input/output) controllers on a system cannot exceed 16.

Contact your IBM marketing representative for the availability dates of the processors and features.

Use Figure 2-1 along with *Introducing the IBM 9370 System* to help determine the processor that best meets your requirements. An NA entry in the table means that this feature is not available on this processor type.

9373 Processor

The 9373 Model 20 is an entry-level processor and has 7 integrated I/O card positions. The 9373 Model 20 has 4 megabytes of basic storage and may be increased to 8 or 16 megabytes.

9375 Processor

The 9375 is an intermediate-level processor and is available in two models. Both models have 17 integrated I/O card positions. The two models are:

- Model 40
- Model 60.

The Model 60 provides improved performance over the Model 40. Both models have 8 megabytes of basic storage and may be increased to 16 megabytes.

9377 Processor

The 9377 Model 90 is a high-performance processor and has 8 megabytes of basic storage that may be increased to 16 megabytes. It does not have any integrated I/O card positions. The I/O cards are located in rack-mounted I/O Card Units, which are external to the processor. The I/O Card Units provide up to 54 I/O card positions.

| Feature Name | Feature Number | 9373 | 9375 | 9377 |
|--|----------------|------|------|------|
| Processor Console (standard) | | 1 | 1 | 1 |
| Maximum Storage (in megabytes) | | 16 | 16 | 16 |
| Automated Power Control | 4000 | 1 | 1 | 1 |
| DASD/Tape Controller | 6010 | 2 | 4 | 12 |
| Work Station Controller | 6020 | 2 | 6 | 12 |
| Communications Processor | 6030 | 2 | 4 | 12 |
| Multi-Protocol Adapter (on each communications processor) | 6031 | 3 | 3 | 3 |
| Asynchronous Adapter (on each communications processor using the telecommunications subsystem) | 6032 | 3 | 3 | 3 |
| Asynchronous Adapter (on each communications processor using the ASCII subsystem) | 6032 | 4 | 4 | 4 |
| IBM Token-Ring Adapter (on each communications processor) | 6034 | 1 | 1 | 1 |
| IEEE 802.3 LAN Adapter (on each communications processor) | 6035 | 1 | 1 | 1 |
| S/370 Block Multiplexer Channel | 6003 | 1 | 2 | 12 |
| S/370 Channel Power Sequence and Control | 6001 | NA | 1 | 1 |
| I/O Card Unit Adapter | 5000 | NA | NA | 3 |
| I/O Card Unit | 5010 | NA | NA | 4 |
| I/O Card Unit | 5020 | NA | NA | 3 |
| I/O Card Positions | | 7 | 17 | 54 |

Figure 2-1. Maximum Number of Features by Processor Type

Processor Console

The 9370 system requires a processor console for operation. This processor console is included with all 9370 processors; consequently, you do not have to order it. The processor console is not rack-mounted, but requires a flat surface (table) for use.

If you use the Remote Service Facility (RSF) or Remote Operation Facility (ROF) on the processor console, you must have the following communication equipment:

In the United States and Canada:

- The following is included with the processor console:
 - A 2400 bps (bits per second) auto-answer modem.
 - An RS232/CCITT¹ V.24 cable to allow the modem to be located up to 6 meters (20 feet) from the processor console.
- You must provide:
 - A switched network communication line terminated with an RJ11 modular jack.
 - A compatible telephone, either tone or pulse dial.

For all countries other than the United States and Canada:

- The following is included with the processor console:
 - An RS232/CCITT V.24 cable to allow the modem to be located up to 6 meters (20 feet) from the processor console.
- You must provide:
 - Either a 1200 or 2400 bps (bits per second), CCITT V.22, V.22 bis, or V.23 auto-answer modem that provides clocking.
 - A switched network communication line and a compatible telephone.

For more information on this equipment, refer to the *Installation Manual – Physical Planning*, GA24-4031.

¹ The International Telegraph and Telephone Consultative Committee

I/O Card Units

The I/O Card Units hold the I/O controllers and adapters for the 9377. The 9377 has two available I/O Card Units:

- Feature 5010
- Feature 5020.

Both of these I/O Card Units require an I/O Card Unit Adapter (Feature 5000).

You do not have to specify the required number of I/O Card Units to hold the I/O controller and adapter cards for the 9377 Processor. Your IBM marketing representative will use a configurator program to calculate the kind and number of I/O Card Units the system requires. The following information about the card units is presented here for reference only.

I/O Card Unit (Feature 5010)

This I/O Card Unit, Feature 5010, provides one I/O bus and 11 I/O card positions. You can use this I/O Card Unit for all I/O controller and adapter cards, except the S/370 Block Multiplexer Channel. One card unit adapter, Feature 5000, can support two of these I/O Card Units. Because one I/O Card Unit, Feature 5020, is a standard feature on the 9377 Processor, you can add up to four I/O Card Units, Feature 5010.

I/O Card Unit (Feature 5020)

The I/O Card Unit, Feature 5020, provides two I/O buses and ten I/O card positions, five I/O card positions on each bus. You can use this card unit for all I/O controller and adapter cards. You must use this card unit when using S/370 Block Multiplexer Channels, Feature 6003, on the 9377 Processor.

Each I/O Card Unit, Feature 5020, requires one adapter, Feature 5000. One card unit, Feature 5020, is standard on the 9377 Processor. You can put up to three of these card units on a 9377 processor.

I/O Card Units (Continued)**I/O Card Unit Adapter (Feature 5000)**

The I/O Card Unit Adapter, Feature 5000, is used to connect the I/O Card Units to the 9377 Processor. A single I/O Card Unit Adapter can support either:

- Two I/O Card Units, Feature 5010, or
- One I/O Card Unit, Feature 5020.

One I/O Card Unit Adapter is standard on the 9377 Processor. Two additional I/O Card Unit Adapters may be installed on the 9377. These cards are located in the 9377 Processor (not in the I/O Card Unit).

You do not have to specify the number of card unit adapters you need for the system. The IBM marketing representative will use the configurator program to calculate the number of required adapters.

Figure 2-2 shows the possible combinations of I/O Card Unit Adapters and I/O Card Units.

| I/O Card Unit Adapters | I/O Card Units (Feature 5010) | I/O Card Units (Feature 5020) |
|-------------------------------|--------------------------------------|--------------------------------------|
| 1 (standard) | 0 | 1 (standard) |
| | 2 | 0 |
| 2 | 0 | 2 |
| | 2 | 1 |
| | 4 | 0 |
| 3 | 0 | 3 |
| | 2 | 2 |
| | 4 | 1 |
| | 6 | 0 |

Figure 2-2. I/O Card Units

Completing the Processor Configuration

After you decide which processor you want to order, get the appropriate planning form from the forms packet. See Figure 2-3 for the correct form to use. You will now start to fill in this form.

| Type | Model | Planning Form |
|------|--------|---------------|
| 9373 | 20 | Form B3 |
| 9375 | 40, 60 | Form B5 |
| 9377 | 90 | Form B7 |

Figure 2-3. Processor Planning Forms

Customer Name and Number

Fill in your *Customer Name* and *Customer Number* at the upper right corner of the form. If you are planning to order multiple systems, identify the planning forms for each system. This can be a number or a name.

Processor Model

The 9373 and 9377 Processors have only one model available.

If you are ordering a 9375 Processor, select the desired *Model Number* by placing a check in the appropriate box. The 9375 Processor models are:

- Model 40
- Model 60.

Nomenclature

The processor *nomenclature* for the operator panel will default to the language of the country in which the system is ordered. To override this default, write in the nomenclature that you want. Valid entries are:

- Belgian-Dutch
- Belgian-French
- Canadian-French
- Chinese (simplified)
- Chinese (traditional)
- Danish

Completing the Processor Configuration (Continued)

- Dutch
- Finnish
- French
- German
- Italian
- Japanese (Kanji)
- Korean (Hangeul)
- Norwegian
- Portuguese
- Spanish
- Swedish
- Swiss
- United Kingdom English
- United States English.

Storage

Place a check in the appropriate box to indicate the amount of *Storage* desired. The available storage sizes by processor type are:

- 9373
 - 4 Megabytes (basic)
 - 8 Megabytes (4 megabytes additional, Feature 4002)
 - 16 Megabytes (12 megabytes additional, Feature 4002 and 4008).
- 9375
 - 8 Megabytes (basic)
 - 16 Megabytes (8 megabytes additional, Feature 4008).
- 9377
 - 8 Megabytes (basic)
 - 16 Megabytes (8 megabytes additional, Feature 4108).

Automated Power Control (Feature 4000)

The Automated Power Control feature provides the following functions on the 9370 system:

- *Remote Power-on:* Allows the system to be powered on from a remote location by using the Remote Operation Facility.
- *Timed Power-on:* Allows the system to be powered on at a previously specified time and date.
- *Programmed Power-off:* Allows the system to be powered off through program control.

Place a check in the appropriate box on Form B to order this feature.

You will be given directions on how to fill out the *last* two sections of Form B (Communications Subsystem and I/O Controllers and Adapters) later in this book. *Continue* reading this chapter for information on the 9309 Rack Enclosure and DASD/Tape Controller (Feature 6010).

9309 Rack Enclosure

All of the 9370 system units, except for the processor console, work stations, and S/370 channel devices reside in racks. The racks are available in two heights:

- Model 1 is 1.0 meter (3 feet, 3.4 inches), 19 EIA units.
- Model 2 is 1.6 meter (5 feet, 3 inches), 32 EIA units.

You will not have to determine the number of required racks. The number of racks depends on what rack-mounted I/O devices you use. The IBM configurator program will determine the number of required racks for your system when IBM processes your order. This configurator program also determines the proper cable lengths for the rack-mounted devices based on the racks being installed in the recommended sequence (right-to-left, as viewed from the front of the racks).

Form C1, *9309 Rack Enclosure*, provides space for you to fill in information about the system rack(s). Get Form C1

9309 Rack Enclosure (Continued)

from the planning forms; you will now use the following information to complete this form.

Customer Name and Number

Fill in your *Customer Name* and *Customer Number* in the upper-right corner.

Rack Model

Select the desired model of racks by placing a check in the appropriate box. You can have:

- All Model 1 (1.0 meter) racks
- All Model 2 (1.6 meter) racks
- A combination of Models 1 and 2 (to meet minimum system requirements).

Note: Selecting the combination of Models 1 and 2 to meet minimum system requirements may result in all Model 1, all Model 2, or a combination of both model racks. This combination of models to meet minimum system requirements is calculated by the configurator program.

Nomenclature

The rack *nomenclature* for the operator panel will default to the language of the country in which the system is ordered. To override this default, write in the nomenclature that you want. Valid entries are:

- Belgian-Dutch/French bilingual
- Canadian-French
- Chinese (simplified)
- Chinese (traditional)
- Danish
- Dutch
- Finnish
- French
- German
- Italian
- Japanese (Kanji)
- Korean (Hangeul)

- Norwegian
- Portuguese
- Spanish
- Swedish
- Swiss
- United Kingdom English
- United States English.

Reserved Space

Vertical space may be reserved in a rack for your use. This space is measured in EIA units (1 EIA unit equals 44.5 mm or 1.75 inches). You may specify that you want to reserve this space in one rack, all racks, and so on. Write in the number of EIA units that you want to reserve and specify which racks to reserve this space in.

Power Requirements

The input power requirements of the rack will default to the country in which the system is ordered. Refer to the *Installation Manual – Physical Planning, GA24-4031*, for details on the available power specifications. Place a check in the appropriate box to indicate the type of power desired as follows:

- 105/120 Volt, 1 Phase, 20 Amp, 2.4 kVA – this has the following restrictions:
 - Only available in the United States
 - Only available with the 9309 Model 1 Rack
 - Only available for use with the 9373 Processor, 9332 Disk Drives, and the 9347 Tape Drives.
- 220/240 Volt, 1 Phase, 25 Amp, 5 kVA
- 220/240 Volt, 3 Phase, 10 Amp, 4.4 kVA
- 220/240 Volt, 3 Phase, 15 Amp, 5 kVA
- 220/240 Volt, 1 Phase, 15 Amp, 3 kVA.

Some I/O devices, such as the 9335 and 9347, have a voltage selection switch that must be set when the system is installed. This voltage selection switch must be set to match the actual AC input voltage supplied to the 9309 rack. Although it is not needed until the system is

9309 Rack Enclosure (Continued)

installed, record this voltage (100, 120, 200, 208, 220, 230, or 240) in the space provided on Form C1.

Power Cord/Plug Type

Select the desired power cord/plug type by placing a check in the appropriate box. The non-watertight power cord/plug is used for above the floor or non-raised floor installations. The watertight power cord/plug is for raised-floor installations.

The standard power cord is 4.3 meters (14 feet) long. The 1.83-meter (6-foot) power cord is for Chicago, Illinois. Place a check in this box if the rack is for a Chicago installation.

You now have finished completing Form C1. Insert it back into the planning binder so that you can refer to it when necessary. The rest of this chapter describes the DASD/Tape Controller (Feature 6010) and explains how to fill in the appropriate forms for this controller.

DASD/Tape Controller (Feature 6010)

The DASD/Tape Controller (Feature 6010) allows you to attach the rack-mounted disk and tape devices. The maximum number of DASD/Tape Controllers permitted on a system depends on the type of processor you use.

You do not have to specify the number of DASD/Tape Controllers; your IBM marketing representative will use the configurator program to automatically calculate the number of necessary controllers.

Data Storage Devices

The DASD/Tape Controller supports the following:

- 9332 Model 400 Direct-Access Storage Device (Disk Drive)
- 9335 Model A01 Device Function Controller (Disk Control Unit)

- 9335 Model B01 Direct-Access Storage Device (Disk Drive)
- 9347 Model 1 Tape Drive.

Each DASD/Tape Controller can support one of the following:

- One 9335 Model A01 Disk Control Unit, with up to four attached 9335 Model B01 Disk Drives
- Up to four 9332 Model 400 Disk Drives
- Up to four 9332 Model 400 Disk Drives and one 9347 Tape Drive
- One 9347 Tape Drive.

Note: When using a DASD/Tape Controller with only a 9347 Tape Drive attached, you must have another DASD/Tape Controller with attached DASD on the system. This is required for loading the microcode.

See Figure 2-4 for the maximum number of DASD/Tape Controllers, disk and tape drives that you can attach to each type of processor. The amount of DASD storage provided by the disk drives is shown in megabytes in parentheses ().

Note: Only **one** DASD/Tape Controller can be used on the 9373 Processor if a S/370 Block Multiplexer Channel (Feature 6003) is also installed.

| Type and Model | 9373 | 9375 | 9377 |
|--|-------------|----------------|----------------|
| DASD/Tape Controllers | 2 | 4 | 12 |
| 9332 Model 400 Disk Drives (Storage in Megabytes) | 8 (2944) | 16 (5888) | 48 (17,664) |
| 9335 Model A01 Disk Control Unit | 1 | 4 | 12 |
| 9335 Model B01 Disk Drives (Storage in Megabytes) | 4 (3296) | 16 (13,186) | 48 (39,552) |
| 9347 Model 1 Tape Drives | 1 | 2 | 12 |

Figure 2-4. Maximum Number of Integrated DASD and Tape Drives

DASD/Tape Controller (Feature 6010) (Continued)

9332 Direct-Access Storage Device (Disk Drive)

The 9332 Model 400 Disk Drive has a capacity of 368 megabytes. Each drive has two actuators and contains its own control unit.

Figure 2-5 shows a logical configuration of four 9332 Model 400 Disk Drives. A maximum of four 9332 Model 400 Disk Drives can be attached to each DASD/Tape Controller on all models of the 9370 processors.

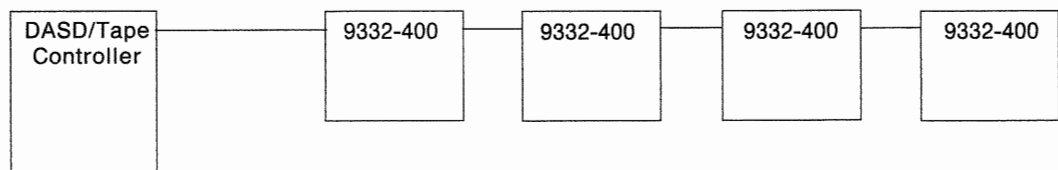


Figure 2-5. 9332 Model 400 Disk Drives

9335 Model A01 Device Function Controller (Disk Control Unit)

The 9335 Model A01 Disk Control Unit is used to attach the 9335 Model B01 Disk Drives. Its four ports (cable connections) connect up to four 9335 Model B01 Disk Drives. Each port connects one 9335 Model B01 Disk Drive. You can attach one 9335 Model A01 Control Unit to each DASD/Tape Controller.

9335 Model B01 Direct-Access Storage Device (Disk Drive)

The 9335 Model B01 Disk Drive has a capacity of 824 megabytes. Each drive has two actuators. Up to four of these disk drives can be attached to a 9335 Model A01 Disk Control Unit.

Figure 2-6 shows a logical configuration of a DASD/Tape Controller with a 9335 Model A01 Disk Control Unit and four attached 9335 Model B01 Disk Drives.

Note: The 9335 Disk Drives cannot be mixed with 9332 Disk Drives or the 9347 Tape Drive on the same DASD/Tape Controller.

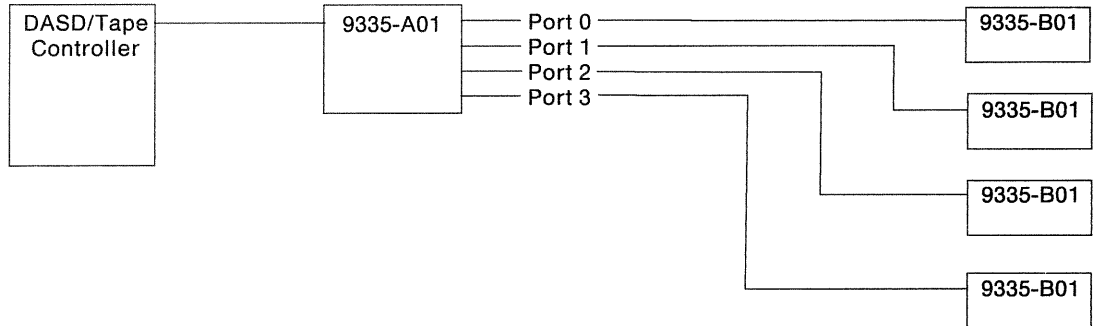


Figure 2-6. 9335 Model A01 Control Unit with Four 9335 Model B01 Disk Drives.

9347 Model 1 Tape Drive

This 1600 BPI (bytes per inch) magnetic tape drive uses the standard 1/2-inch tape reel. The 9347 Tape Drive connects directly to the DASD/Tape Controller or to the last 9332 Disk Drive in the string. See Figure 2-7 for an example of the logical configuration using up to four 9332 Model 400 Disk Drives and a 9347 Tape Drive.

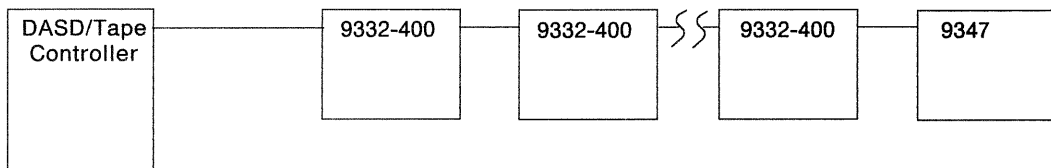


Figure 2-7. 9332 Model 400 Disk Drives And One 9347 Tape Drive

You can connect only one 9347 Tape Drive to a DASD/Tape Controller. The 9347 Tape Drive and 9335 Disk Drives cannot be used on the same DASD/Tape Controller.

Selecting the DASD/Tape Devices

You are now ready to select the DASD/tape devices. Get Form C2, *Integrated DASD/Tape Devices*, from the planning forms packet. Fill in your:

- *Customer Name*
- *Customer Number.*

DASD/Tape Controller (Feature 6010) (Continued)

If you want to order the DASD/tape devices without specifying which devices are attached to each DASD/Tape Controller, continue with “Specifying DASD/Tape Devices When Not Influencing String Positioning.”

If you want to order the DASD/tape devices and specify which devices are attached to each DASD/Tape Controller, continue with “Specifying DASD/Tape Devices When Influencing String Positioning” on page 2-17.

Specifying DASD/Tape Devices When Not Influencing String Positioning

When ordering DASD/tape devices, you do not have to specify which devices attach to a particular DASD/Tape Controller. The configurator program that the IBM marketing representative uses will assign the devices in a balanced load, lowest-cost arrangement. Consequently, all you have to do is enter the desired quantity of each type of disk and tape drive on Form C2 under *When Not Influencing String Positioning*.

Enter the quantity next to the type and model for each of the following:

- 9332 Model 400 Disk Drives
- 9335 Model B01 Disk Drives
- 9347 Model 1 Tape Drives.

Note: When using a DASD/Tape Controller with only a 9347 Tape Drive attached, you must have another DASD/Tape Controller with attached DASD on the system. This is required for loading the microcode.

You do not have to specify the number of 9335 Model A01 Disk Control Units; the IBM configurator program will calculate the number of control units necessary to support the number of selected drives.

Specifying DASD/Tape Devices When Influencing String Positioning

DASD/tape devices can be ordered by specifying the desired number and type of devices on each DASD/Tape Controller. You can do this by using the table under *When Influencing String Positioning* on Form C2. The DASD/Tape Controller numbers are at the top of the table.

The *Controller S/370 Address* cannot be filled in until you install your system. Default addresses will be assigned that can be changed, if desired, at installation time.

To order your DASD/tape devices when influencing the string positioning, fill in the quantity desired next to the device type and model under the DASD/Tape Controller number. Start with controller number one and continue filling in the quantities as follows:

- For 9332 Disk Drives, enter:
 - The number of 9332 Model 400 Disk Drives to be installed on that controller (maximum of four).
- For 9332 Disk Drives with a 9347 Tape Drive, enter:
 - The number of 9332 Model 400 Disk Drives to be installed on that controller (maximum of four), and
 - One for the 9347 Tape Drive.
- For 9335 Disk Drives, enter:
 - One for the 9335 Model A01 Control Unit, and
 - The number of 9335 Model B01 Disk Drives to be installed on that control unit (maximum of four).
- For a 9347 Tape Drive only, enter:
 - One for the 9347 Tape Drive.

Note: When using a DASD/Tape Controller with only a 9347 Tape Drive attached, you must have another DASD/Tape Controller with attached DASD on the system. This is required for loading the microcode.

DASD/Tape Controller (Feature 6010) (Continued)

This completes the tasks necessary for selecting the rack-mounted devices. Continue with one of the following:

- Chapter 3, “Planning Your Local Work Stations,” for planning work stations.
- Chapter 4, “Planning Your Communications,” for planning communication subsystems.
- Chapter 5, “Planning Your System/370 Channel(s),” for planning S/370 channels.
- Chapter 6, “System Planning Summary,” for completing your system planning tasks.

This chapter helps you plan for attaching local work stations. The type of devices you use depend on the type of work you will do and the operating system being used. Refer to the planning information for your operating system for types of work stations supported, addressing, and other restrictions. Your IBM marketing representative will assist you in selecting the devices best suited for your business needs.

In this chapter you will find information on:

- Attaching local work stations
- Using 3299 Terminal Multiplexers
- Filling out the planning forms for your local work stations
- What local work station functions you can customize.

Introduction

The Work Station Controller (Feature 6020) allows direct attachment of the IBM 3270 family of products. This feature, with attached 3270 devices, forms a work station subsystem, which may include:

- Distributed Function Terminals (DFTs)

DFTs are display stations or printers (such as the IBM 3290 Information Panel Display Station) that interpret the data stream and execute functions without the help of the work station controller.

IBM Personal Computers operating the IBM Token-Ring network appear as 3290s to the 9370 system.

- Control Unit Terminals (CUTs)

CUTs are display stations or printers, such as the IBM 4250 Printer, which cannot interpret the data stream or execute functions without the help of the Work Station Controller.

Introduction (Continued)

- Serial Original Equipment Manufacture Interface (SOEMI) adapters.

An SOEMI adapter allows you to attach original equipment manufacturer (OEM) devices.

The Work Station Controller consists of two logic cards: an I/O processor (IOP), and an I/O adapter (IOA). These cards reside in a card enclosure in the system. The IOP card provides overall control of communication between the 9370 processor and the work station adapter card. The IOA card provides six coaxial connector ports to attach 3270-type and original equipment manufacturer (OEM) equipment.

System Offerings

All 9370 processors support the Work Station Controller. The maximum number of work station controllers for each 9370 processor is:

- Two on the 9373
- Six on the 9375
- Twelve on the 9377.

Each Work Station Controller can support a maximum of 32 logical device addresses. Some devices require more than one address, such as the IBM 3290 and personal computers when used as a DFT. This limits the maximum number of devices that can be attached to each controller.

Note: The Work Station Controller requires a DASD that is attached through the DASD/Tape Controller (Feature 6010) for loading the microcode. Refer to "DASD/Tape Controller (Feature 6010)" on page 2-12 for more information on the DASD/Tape Controller.

Refer to Figure 3-1 for an example of work stations connected to the 9370 system.

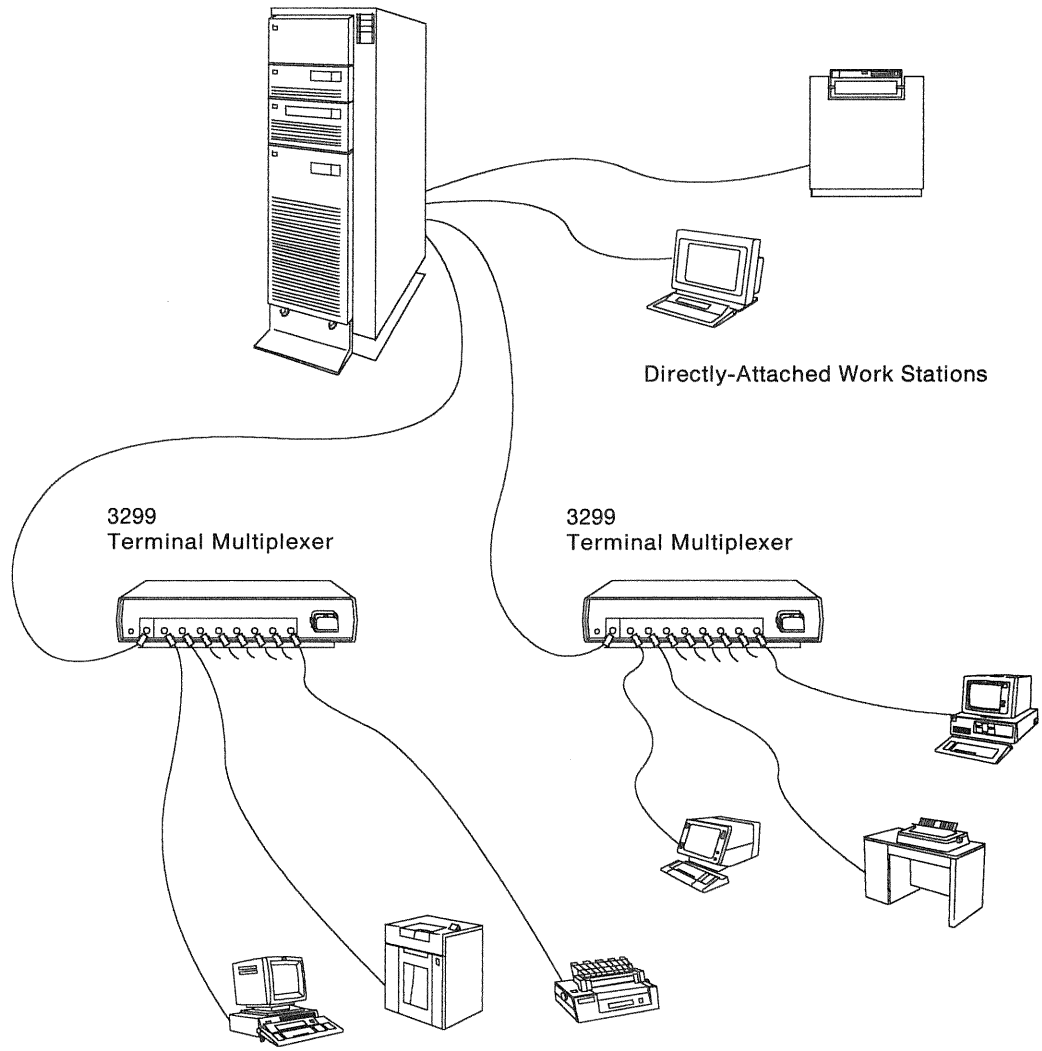


Figure 3-1. Terminals Attached Through a Work Station Controller

Work Station Adapter Ports

The work station adapter has six ports (connectors).
Figure 3-2 shows a work station adapter with its six ports.

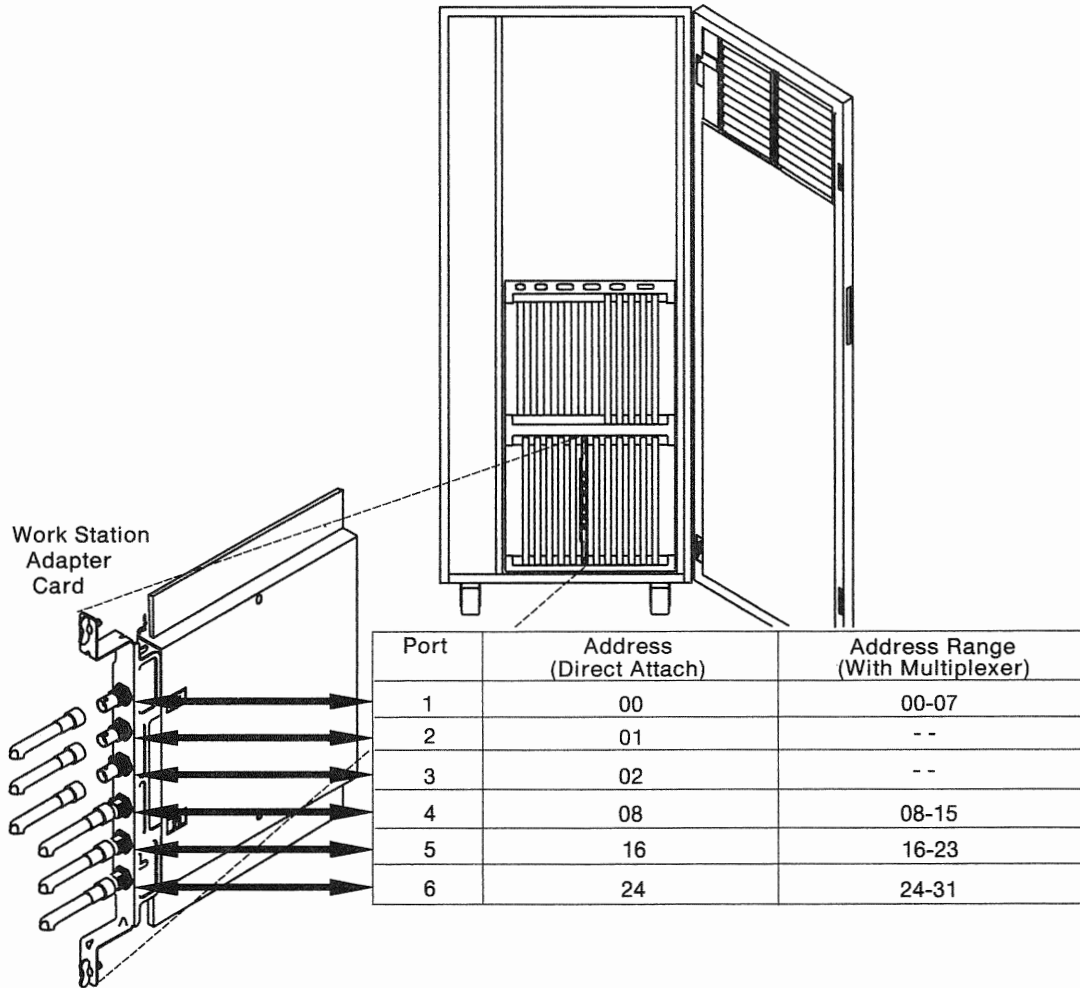


Figure 3-2. Work Station Adapter Ports (viewed from rear of rack)

- Port 1 (connector 1) is at the top of the card. You can attach a work station directly with a terminal address of 00, or you can attach up to eight work stations through a 3299 Terminal Multiplexer. If you use a 3299, the terminal address range is 00 through 07.
- Ports 2 and 3 (connectors 2 and 3) are for directly attaching one work station at each port. You can only use ports 2 and 3 if you do not have a 3299 attached to port 1. (In other words, if a 3299 is attached to port 1, you cannot use ports 2 or 3.) The terminal addresses

of the attaching work stations on ports 2 and 3 are 01 and 02, respectively.

- Use port 4 (connector 4) in the same way as port 1. The terminal addresses of the attaching work stations through a 3299 are from 08 through 15.
- Use port 5 (connector 5) in the same way as port 1. The terminal addresses of the attaching work stations through a 3299 are from 16 through 23.
- Use port 6 (connector 6) in the same way as port 1. The terminal addresses of the attaching work stations through a 3299 are from 24 through 31.

The 3299 Terminal Multiplexer

You can reduce your cabling costs and increase your flexibility by using 3299 Terminal Multiplexers, which eliminate the need for individual cables to extend from the system to each work station. The work station I/O adapter allows you to directly attach from one to six work stations, without using 3299s. However, you can increase this number to a maximum of 32 work stations by using 3299 Terminal Multiplexers. Each 3299 allows you to attach up to eight work stations. The address range of the 3299 is always eight terminal addresses, beginning with 00 at port 1 (connector 1). The remaining seven addresses for the first 3299 are: 01, 02, 03, 04, 05, 06, and 07.

The next 3299 connected to port 4 (connector 4) on the adapter uses terminal addresses 08 through 15. You may also connect 3299s to ports 5 and 6. The terminal address ranges are 16 through 23 for the work stations at port 5, and 24 through 31 for the work stations connected to port 6.

You only need one cable between the work station I/O adapter and a 3299. The maximum length of this cable is 1,500 meters (4,920 feet). The 3299 can then attach up to eight work stations, each with its own cable. The maximum length of each of these cables is 1,500 meters (4,920 feet). By using a 3299 Multiplexer, you can attach work stations up to 3000 meters (9840 feet) away.

The 3299 Terminal Multiplexer (Continued)

Note: If you plan to install 3299s, IBM recommends that you purchase a spare 3299 for backup purposes.

3299 Port Identification

Figure 3-3 shows a 3299 Terminal Multiplexer and its nine ports (connectors).

The cable connection between the 3299 and the work station adapter card is the port on the far left (unnumbered). The cable connections between the 3299 and the individual work stations are the next eight ports, from left to right. Each port supports one work station.

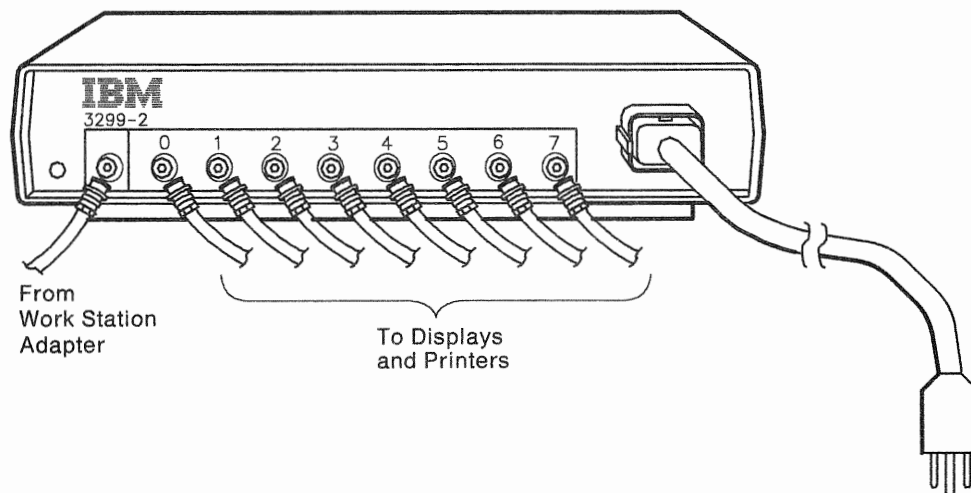


Figure 3-3. 3299 Terminal Multiplexer

Selecting Local Work Stations

Your IBM marketing representative can help you select the work stations and devices you need and help you complete the planning forms.

Figure 3-4, Figure 3-5, and Figure 3-6 show some common IBM terminals and printers that attach to the Work Station Controller.

Note: The I/O devices mentioned here serve only as an example. They do not represent all of the devices that can attach to the system. See your IBM marketing representative for additional information on these and other products that can attach to the Work Station Controller.

Displays

| Product Number and Model | Product Name |
|--|--------------------------------|
| 3178 Models C1, C2, C3 and C4 | Display Station |
| 3179 Model 1 | Color Display Station |
| 3179 Models G1 and G2 (See Note) | Graphics Color Display Station |
| 3180-1 | Display Station |
| 3191 Models A1X, A2X, B1X, and B2X | Display Station |
| 3193 Models 1 and 2 (See Note) | Display Station |
| 3194 Models H20 and H50 | Display Terminal |
| 3278 Models 2, 3, 4 and 5 | Display Station |
| 3279 Models S2A, S2B, S3G, 2X and 3X | Color Display Station |
| 3290 Models 220, 230, and T30 (See Note) | Information Panel |
| 5578 | Japanese Work Station |

Figure 3-4. 3270-Type Terminals

Note: The 3179 Model G, 3193, and 3290 displays require the use of a downstream load program.

Selecting Local Work Stations (Continued)

Personal Computers (with 3278/3279 Emulator Feature 5050)

You can use the 3278/3279 Emulator Feature to use the following personal computers as work stations.

| Product Number and Model | Product Name |
|---|-----------------------------------|
| 5271 | 3270 PC |
| 5273 | 3270 PC/AT |
| 5371 | 3270-PC/G and GX |
| 5373 | 3270-PC AT/G, AT/GX |
| 5150 | Personal Computer |
| 5160 Models 068, 078, 086, 087, 088, 089, 267, 268, and 277 | Personal Computer XT |
| 5170 Models 068, 099, 239, 319, and 339 | Personal Computer AT [®] |
| 5170 Models 599, 739, 919, and 939 | Personal Computer AT/370 |
| 6150 Models 20, 25, and A25 | RT Personal Computer |
| 6151 Model 10 | RT Personal Computer |

Figure 3-5. Personal Computers

Printers

| Product Number and Model | Product Name |
|------------------------------|----------------------|
| 3262 Models 3 and 13 | Line Printer |
| 3268 Models 2 and 2C | Color Matrix Printer |
| 3287 Models 1, 2, 1C, and 2C | Matrix Printer |

Figure 3-6 (Part 1 of 2). 3270-Type Printers

| Product Number and Model | Product Name |
|------------------------------------|------------------------------------|
| 3287 Models 1C and 2C | Color Matrix Printer |
| 4214 Model 1 | Line Printer |
| 4224 Models 201, 202, 2E2, and 2C2 | Line Printer |
| 4234 Model 1 | Dot Band Printer |
| 4245 Models D12 and D20 | Line Printer |
| 4250 Model 1 | High resolution non-impact printer |
| 5210 Models G1 and G2 | Correspondence Quality Printer |
| 5227 Model 11 | Printer |

Figure 3-6 (Part 2 of 2). 3270-Type Printers

Original Equipment Manufacturer (OEM) Devices

The Work Station Controller attaches OEM devices through an OEM adapter, which you must supply if you use OEM equipment.

The OEM adapter must perform control functions and protocol conversion between the Work Station Controller and the appropriate industry standard. See the *IBM 9370 Work Station Serial OEM Interface Description and Reference*, SA24-4100, for additional information.

There are also OEM 3270 compatible devices that you can connect directly to the work station adapter.

Getting Ready for Form D

After you select the sites and local work stations, you are ready to begin filling in the *Local Work Station Diagram*, Form D. Get this form from the planning forms.

Getting Ready for Form D (Continued)

When you first look at Form D, you will notice that connector ports 2 and 3 on Form D have no area for 3299s. This is because you cannot use 3299s on ports 2 and 3. Notice that the area to the left of the ports on Form D is for individual work stations; the area to the right of the ports is for work stations attaching through 3299s.

An accurately filled out diagram is important because you use it to:

- Make the physical floor plan
- Create input for customizing work stations
- Analyze local work station problems
- Consider possible relocations.

The work station diagram is also necessary because you must know where your devices go to determine the proper cable lengths.

Begin Filling Out Form D

The next few pages explain how to fill out Form D. Use a pencil to fill in the diagram; you may want to make changes later. After you complete this form, put it back in the *Planning Forms*, GX24-4093-1, so that other people using it can readily locate it.

Customer Name and Number

Fill in *Customer Name and Customer Number* in the upper-right corner of the diagram.

Work Station Adapter Location

After you install your system, enter the physical location of this *work station adapter* in the spaces at the top of Form D.

| RACK | UNIT | CARD | CHANNEL NUMBER (0-F) | ADDRESS RANGE | COMMENTS |
|-------|-------|-------|----------------------------|------------------|----------|
| _____ | _____ | _____ | _____ | _____ | _____ |

Figure 3-7. Work Station Adapter Location and Configuration Data

Channel Number

The system is shipped with a channel number assigned to the Work Station Controller. You can use this default or change it to suit your system configuration when the system is installed. Valid channel numbers range from 0–F in hexadecimal (0–15 decimal).

Address Range

This entry defines the System/370 address assignment of the attached devices to the system. The 9370 processor uses a System/370 channel address for I/O operations. This address consists of a channel number and a device address. The first digit indicates the channel number. This is the same digit that you entered on the line labeled *Channel Number*. The last two digits indicate the device address.

The Work Station Controller has a default address range of 00 through 1F in hexadecimal (Form D uses 00–31, which is decimal notation). You can change this default address range at the time the system is installed. For example, if you want

- Your work stations to start at channel 2, and
- Your device address range to start at 80.

You enter *280–29F* under *Address Range*. (280 now corresponds with 00 on Form D.)

Comments

You can note anything special about the devices or the cluster on this line.

Completing the Rest of Form D

Figure 3-8 on page 3-12 shows a section of Form D (ports 4, 5, and 6) filled in. Refer to this example while reading the following information on completing Form D.

Getting Ready for Form D (Continued)

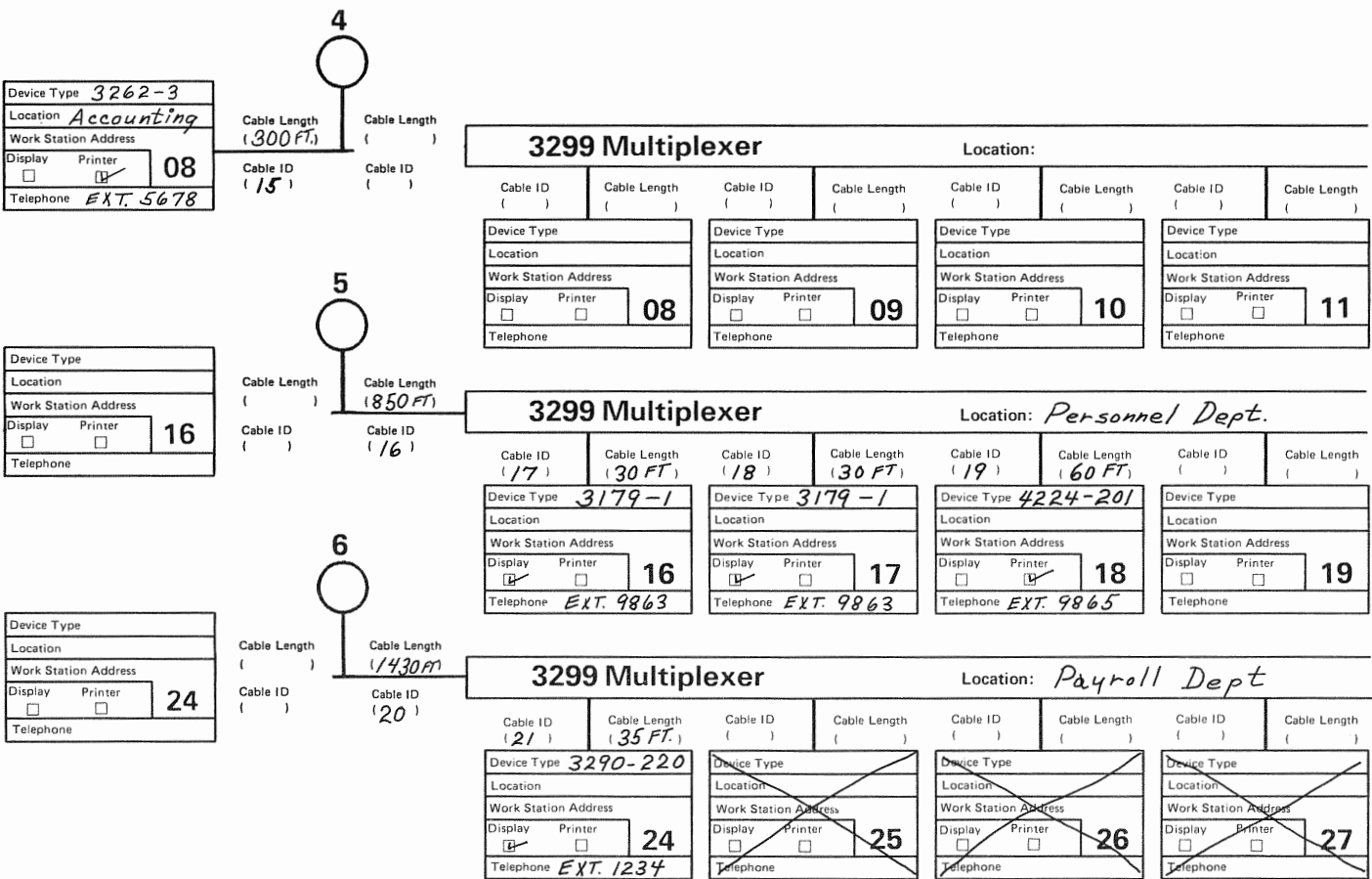


Figure 3-8. Completed Form D for Ports 4, 5, and 6

Work Station Description Block

The work station description block (see Figure 3-9), when filled in, allows you to identify:

- Terminal type and model number (if it has one)
- The location of the device
- Work station address of the device
- Whether it is a display station or printer
- Telephone number located nearest to the device.

| | |
|-------------------------------------|-------------------------------------|
| Device Type | |
| Location | |
| Work Station Address | |
| Display <input type="checkbox"/> | Printer <input type="checkbox"/> |
| 08 | |
| Telephone | |

Figure 3-9. Work Station Description Block

Device Type: Write in the *type* and *model number* of the work station that you assign to each port. For example, 3287 Model 2C or 3279 Model S3G.

Location: Write a brief description of the terminal's *physical location*, such as building name or number, floor, or office number.

Work Station Address: The preprinted work station address number is the address assigned to this device. This address is determined by the port to which the device is connected.

Display/Printer: If the device is a display, place a check in the display box.

If the device is a printer, place a check in the printer box.

Getting Ready for Form D (Continued)

Telephone: Write the *phone number* of a telephone located near each terminal.

If you are attaching the work station directly to the adapter (not using a 3299 Multiplexer), draw a line from the work station description block to the adapter port.

Repeat “Work Station Description Block” on page 3-13 for each work station that you plan to attach to the work station I/O adapter.

Refer to Figure 3-8 on page 3-12 for an illustration of the way you fill in Form D to attach a work station directly to port 4.

Using 3299s

As we have already discussed, the area to the left of the ports on Form D is for individual work stations; the area to the right of the ports is for work stations attaching through 3299s.

For example, suppose you want to use a 3299 multiplexer to attach work stations to port 5 and you want to also use a 3299 to attach DFTs to port 6. Figure 3-8 on page 3-12 shows Form D filled in for this example.

To attach work stations through a 3299 on port 5, first draw a line from port 5 to the 3299 area on the right. Then fill in the work station description blocks; the address ranges for port 5 are 16 – 23.

To correctly fill out port 6, you must remember that a 3290 or PC can use more than one logical address as follows:

- The 3290 as a DFT can use up to five addresses.
- The PC in a Token-Ring network can use up to four addresses.

As Figure 3-8 on page 3-12 shows, if you are attaching a 3290 DFT (using five consecutive addresses) to port 6, you will have to reserve addresses 24 – 28 on Form D for the 3290. Cross out addresses 25, 26, 27, and 28 to show that they cannot be used for attaching other devices.

Cable Length and Cable ID

The entries *Cable Length* and *Cable ID* cannot be filled in now. This should be done by the person doing the physical planning for your system.

Keeping a record of each work station and its cable length and routing is an important part of good planning. It will help to prevent cable misconnections during installation. It will also serve as a record for possible changes to the work station subsystem.

3299 Multiplexer Location and Phone

Write a brief description of the 3299's *physical location*, such as, building name or number, floor, and office number. Also, write the *phone number* of a telephone near the 3299, if it is available. You can use this telephone to install and test the 3299 during setup and problem analysis. (Refer to Figure 3-8 on page 3-12 to see a completed section.)

Additional Work Station Controllers

If you require additional work station controllers, return to "Getting Ready for Form D" on page 3-9 and fill out another *Local Work Station Diagram* for each additional work station controller.

Filling in Forms B and C3

After you select your work station devices and decide how you want to connect them, you can determine the number of Work Station Controllers that you need.

Select Form B3, B5, or B7 (as appropriate) from the planning forms. This is the same form that you started filling out in Chapter 2.

Find the table *I/O Controllers and Adapters* for the processor model you have.

Filling in Forms B and C3 (Continued)

1. Count the number of Form Ds that you have completed.
2. Enter this number under *Quantity* next to *Feature Number 6020* (Work Station Controller) on Form B.
3. List the work stations, printers, and 3299s that you need on Form C3, *Other I/O Devices and Accessories*, by entering quantity, type, model, and description.

Downstream Load Programs

A downstream load (control program) is required when using the 3179 Model G, 3192, 3193, and 3290 displays on the Work Station Controller. Find the table for *Accessories* on Form C3, and enter a '1' under *Quantity* next to the appropriate specify code for the downstream load (DSL) required for the device types being used. Only one downstream load is required for each device type regardless of the quantity of devices used.

Customizing the Work Station Subsystem

Customization refers to the functions that allow you to organize the cluster of devices into a unique configuration. The Work Station subsystem must be customized if a 3290 is used as a DFT or a PC is used in a Token-Ring network.

The system is shipped with a set of default options so that you can install the system without invoking any of these customizing support functions. Use these functions when you wish to change any of the default options. If you want to change any of the following options from their defaults or require additional information, refer to *Customizing the IBM 9370 Work Station Subsystem*, GA24-4044. A CUT type terminal, such as a 3178, 3179, 3278, or 3279, is required to do customization.

- Port Assignment
- Language and Character Set Interface Code
- Miscellaneous Feature Options, including

- Dual Function Clear Key
 - Unsupported Control Code Translation
 - Clicker Option
 - PS (Program Symbols) Load Altered Screen
 - File Transfer Aid
-
- Alternate Keyboard Selection
 - Modify Keyboards
 - Magnetic Character Set
 - Decompression
 - Attribute Select Keyboard
 - 3290 Options
 - 3290 Password
 - Define Printers
 - Merge RPQs (Request for Price Quotation)
 - Merge DSL (Down Stream Load) Code
 - Response Time Monitor.

Now That You've Completed the Forms

This completes the tasks necessary for planning your local work station network.

Continue with one of the following:

- Chapter 4, "Planning Your Communications," for planning communications subsystems.
- Chapter 5, "Planning Your System/370 Channel(s)," for planning S/370 channels.
- Chapter 6, "System Planning Summary," for completing your system planning tasks.

Use this chapter if you are planning to order communications subsystems. You should be familiar with data communication terminology before you begin planning your teleprocessing networks. The *IBM Data Communications Concepts* manual, GC21-5169, provides you with an overview of the basic elements and terminology of data communications.

To select the proper adapters and devices, you must define your communication network. You must also contact your local communication common carrier (the telephone company or public data network) to arrange to have the communication lines installed.

While planning the communications subsystems, you will use one or more of the following planning forms.

- Communication Line Information (Form F1, F2, F3, or F4)
- Modem Information (Form G)
- ASCII Line Information (Form H1 or H2)
- Processor Configuration (additional information on Form B3, B5, or B7).

Consider the following before you select your equipment:

- Volume of interchanged data
- Type of application
- Specifications of the remote devices.

For a complete description of the communications subsystems, refer to *Introducing the IBM 9370 Information System*, GA24-4030.

Communications Subsystems

Four types of communications subsystems are available on the 9370 processors.

- The *Telecommunications Subsystem* is used for communications with remote terminals, controllers, and systems over switched, nonswitched, and X.25 networks. If you are planning to use this subsystem, go to "Telecommunications Subsystem" on page 4-2.

Communications Subsystems (Continued)

- The *ASCII Subsystem* is used for communicating with ASCII work stations that are directly attached or are connected over switched and nonswitched lines with modems. If you are planning to use this subsystem, go to “ASCII Subsystem” on page 4-32.
- The *IBM Token-Ring Subsystem* is used for communication with terminals using the IBM Token-Ring network. If you are planning to use this subsystem, go to “IBM Token-Ring Subsystem” on page 4-43.
- The *IEEE 802.3 Local Area Network Subsystem* is used for communicating with other systems, controllers, and work stations that use the *Carrier-Sense Multiple Access with Collision Detection* transmission control. If you are planning to use this subsystem, go to “IEEE 802.3 Local Area Network Subsystem” on page 4-45.

Telecommunications Subsystem

The telecommunications subsystem consists of:

- One communications processor
- One or more communication adapters
- The telecommunications subsystem microcode
- A communication network and terminals.

When using this subsystem, the 9370 processor can:

- Be a host to remote terminals or other systems
- Act as a terminal to a remote host system.

The use of this subsystem requires that at least one DASD/Tape Controller (Feature 6010) with attached DASD be installed on the system for loading the microcode.

9370 as a Host System

As a host system, the 9370 processor can communicate with a remote terminal, controller, or system. When your system communicates with remote terminals, it treats them as if they were directly attached to the system unit. The only difference is that you must establish the communication link before the system can access the device.

9370 as a Remote System

The 9370 system can communicate as a remote terminal to another host system. Normally, the host system dictates many of the variables for communication planning, such as line type, line speed, modem type, and protocol. Consequently, before you begin planning, contact the host system personnel to determine their requirements relative to your system.

Remote Devices

Figure 4-1, Figure 4-2, and Figure 4-3 show work stations, controllers, and systems that you can use for communications with 9370 processors. The tables also show the protocol supported on each device. Your IBM marketing representative can provide information on any devices that do not appear in these tables.

| Product Type | Product Name | Protocol Supported |
|--------------|----------------------|--------------------|
| 3101 | Display Terminal | TTC2 |
| 3812 | Page Printer | BSC |
| 3820 | Page Printer | BSC, SDLC |
| 5150 | Personal Computer | TTC2, BSC, SDLC |
| 5160 | Personal Computer XT | TTC2, BSC, SDLC |
| 5170 | Personal Computer AT | TTC2, BSC, SDLC |
| 6670 | Page Printer | BSC, SDLC |

Figure 4-1 (Part 1 of 2). Remote Work Stations

Telecommunications Subsystem (Continued)

| Product Type | Product Name | Protocol Supported |
|--------------|------------------|--------------------|
| 8775 | Display Terminal | SDLC |
| 8815 | Scan Master I | SDLC |

Figure 4-1 (Part 2 of 2). Remote Work Stations

| Product Type | Product Name | Protocol Supported |
|--------------|--------------------------|--------------------|
| 3274 | Terminal Control Unit | BSC, SDLC |
| 3276 | Terminal Control Unit | BSC, SDLC |
| 3704 | Communication Controller | BSC |
| 3705 | Communication Controller | BSC, SDLC |
| 3725 | Communication Controller | BSC, SDLC |
| 7426 | Terminal Interface Unit | SDLC |

Figure 4-2. Remote Controllers

| Product Type | Product Name | Protocol Supported |
|--------------|--------------|--------------------|
| 4331 | Processor | BSC, SDLC |
| 4361 | Processor | BSC, SDLC |
| 495X | Series/1 | BSC |
| 5340 | System/34 | BSC, SDLC |
| 536X | System/36 | BSC, SDLC |
| 538X | System/38 | BSC, SDLC |
| 81XX | Processor | BSC, SDLC |

Figure 4-3. Remote Systems

Networks

A data communications network consists of data processing devices connected by communication lines for information exchange among stations. The telecommunications subsystem provides the following types of data communication networks:

- Switched
- Nonswitched
- X.25 packet switching.

Switched Networks

A switched network:

- Is always considered a point-to-point network.
- Is connected to the communication line by dialing.
- Can use the auto-call feature to perform automatic dialing.
- Can use auto-answer to automatically answer incoming calls.

Nonswitched Networks

A nonswitched network:

- Is permanently connected to the communication line.
- Can be either a 2-wire or a 4-wire connection.
- Can be conditioned to reduce transmission errors and increase transmission speed.
- Is a point-to-point network when only two stations are connected to the communication line.
- Is a multipoint network when three or more stations connect to the same communication line.

In a multipoint network, the host system is normally the primary or control station and the remote stations are the secondary or tributary stations.

Telecommunications Subsystem (Continued)

X.25 Network

The 9370 system uses the X.25 network to communicate with other systems and controllers over a packet switching data network. The X.25 network operates with public network services that comply with the 1980 X.25 CCITT (The International Telegraph and Telephone Consultative Committee) specifications.

To decide on a packet switching data network, you must first evaluate your needs and then determine which options best meet these needs. You should contact the common carrier for information on available options and the price of each option. You should also ask the carrier what optional facilities are available, because these facilities vary with each carrier.

Communications Processor (Feature 6030)

All 9370 processors support the communications processor. The maximum number of communication processors for each 9370 processor is:

- Two on the 9373
- Four on the 9375
- Twelve on the 9377.

Each communications processor using the telecommunications subsystem can support:

- Up to three multi-protocol adapters
- Up to three asynchronous adapters
- Any mixture of the multi-protocol and asynchronous adapters up to a total of three adapters.

The actual number of adapters is also limited by the communications processor aggregate line speed. You do not have to specify the number of communication processors and adapters required for the communication lines. The configurator program that will be used by the IBM marketing representative to configure the system will automatically calculate this from the information specified for each line.

The following information on the communications processor aggregate line speed is presented here for reference only.

Communications Processor Aggregate Line Speed

The communications processor normalized aggregate line speed determines how many communication lines can be attached to each subsystem.

The maximum communications processor aggregate line speed depends on the protocol and line speeds used. You can calculate the aggregate line speed by:

1. Multiplying the sum of the line speeds for all lines using TTC2, BSC, and HDLC (except for auto-call, RS366/V.25 interface) by two.
2. Adding the result (from above) to the sum of the line speeds for all lines using SDLC (except for auto-call, RS366/V.25 interface).

The total for each communications processor cannot exceed:

- 76,800 if all line speeds are 9600 or less.
- 57,600 if any single line speed is greater than 9600, but less than 56,000.
- The actual speed of the line if that line is 56,000 or greater (in this case only one line is allowed on the communications processor).

Multi-Protocol Adapter (Feature 6031)

The multi-protocol adapter can be used for either synchronous or asynchronous protocol. It is available on all 9370 processors and supports both half duplex and duplex operation. Simultaneous bi-directional data transmission over one line is not supported, except when operating in an HDLC (X.25) network. Each adapter can have two lines attached to it. You can independently configure each line for protocol, interface and line speed.

An auto-call unit can be used with this adapter and must be connected to the lower port (cable connector). The corresponding switched line must use the upper port (cable connector) of the same adapter.

Telecommunications Subsystem (Continued)

A multi-protocol adapter card is shown in Figure 4-4.

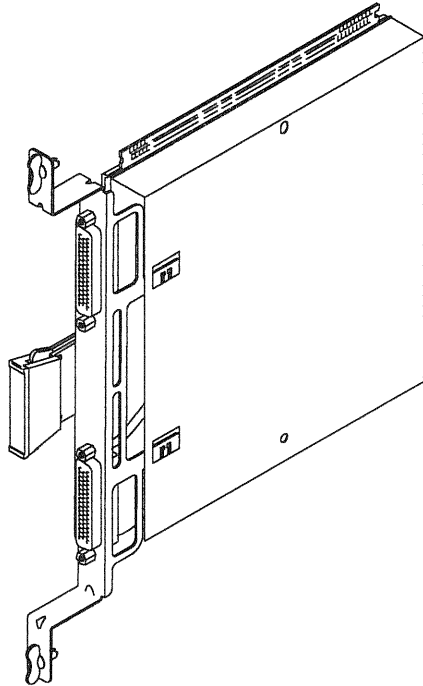


Figure 4-4. Multi-Protocol Communication Adapter

This adapter supports:

- Protocol:
 - US Telegraph Terminal Control – Type 2 (TTC2).
 - Binary Synchronous (BSC)
 - Synchronous Data Link Control (SDLC)
 - High-level Data Link Control (HDLC-LAPB).
- Interface:
 - EIA RS-232-C
 - CCITT V.24
 - EIA RS-366-A/CCITT V.25 (Auto-call)
 - CCITT V.35
 - EIA RS-422-A
 - CCITT X.21.
- Speed:
 - 75 to 64,000 bps (bits per second).

The RS-422-A interface on the multi-protocol adapter allows you to directly attach (without modems) work stations at a maximum distance of 1219 meters (4000 feet).

Note: All communication adapter cables must be located within a building. They cannot be used outside or between buildings.

Asynchronous Adapter (Feature 6032)

The asynchronous adapter uses asynchronous protocol. It is available on all 9370 processors and supports half duplex operation. Each adapter can have four attached lines. Each line can be independently configured for interface and line speed.

Figure 4-5 shows an asynchronous communication adapter card.

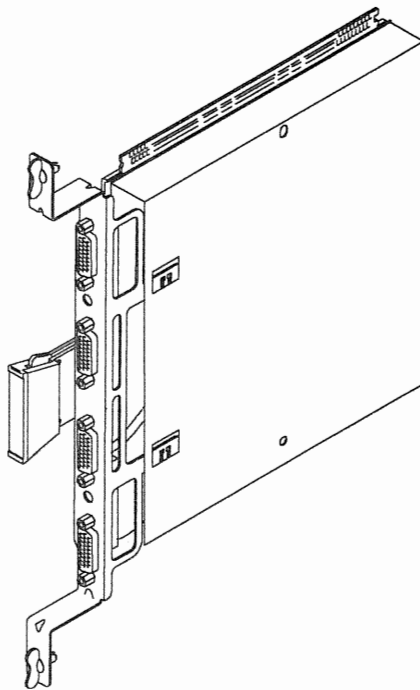


Figure 4-5. Asynchronous Communication Adapter

Telecommunications Subsystem (Continued)

When this adapter is used with the telecommunications subsystem, it supports:

- Protocol:
 - US Telegraph Terminal Control – Type 2 (TTC2).
- Interface:
 - EIA RS-232-C
 - CCITT V.24
 - EIA RS-422-A.
- Speed:
 - 75 to 19,200 bps.

The RS-422-A interface on the asynchronous adapter allows you to directly attach (without modems) work stations at a maximum distance of 1219 meters (4000 feet).

Note: All communication adapter cables must be located within a building. They cannot be used outside or between buildings.

Because you can use either the asynchronous or the multi-protocol adapter for TTC2 protocol, the configurator program that IBM uses will select the lowest-cost combination of adapters. The adapter type selected depends on the combination of the number of lines, line speeds, and protocols.

Defining a Network

For planning purposes, you should make a diagram of each communication network. You should show the type, location and telephone number of all control units and devices attached to each line. This diagram will also be useful for documenting any changes to your communication networks.

To order the microcode for the Telecommunications Subsystem, use *Form B3, B5, or B7* (as appropriate, depending on the type of processor that you are ordering). Use the same form that you used when specifying the other features on the system.

Find the heading *Communications Subsystem* and place a check in the appropriate box for the *Telecommunications Subsystem*. This only has to be done once, regardless of the number of communication lines specified on the system.

Fill out a copy of the *Communication Line Information*, Form F1, F2, F3, or F4, for each communication line. The type of protocol used determines which form to use. The correct form to use is:

- F1 for TTC2
- F2 for BSC
- F3 for SDLC
- F4 for HDLC.

There is room for defining four communication lines on each copy of the forms. The forms provide information for ordering adapters, communication lines, modems, and couplers. However, depending on the type of network used, you will not fill out all of the information shown on the form.

A digit (0-9) will be used to designate the protocol, interface, line connection, and line speed of each communication line. These digits, when rearranged in the sequence of line connection, protocol, interface, and line speed become what is known as a specify code. The IBM configurator program uses this specify code to properly configure each line and supply the correct adapter cable.

Select a copy of Form F1, F2, F3, or F4 from the planning forms and enter the following:

- *Customer Name*
- *Customer Number*
- *Line Identification* (the identification that you want to refer to this line by; this may be a name or number).

The *S/370 Address* cannot be filled in until the communication line is installed. The system will have default S/370 addresses assigned to all communication lines that can be changed when the system is installed.

The *Interface*, *Line Connection*, and *Line Speed* that you use depends on the type of protocol.

Defining a Network (Continued)

Note: For planning purposes, the interface types shown will be shortened. RS-232-C will be shown as RS232, CCITT V.24 will be shown as V.24, and so on.

Communication Line Connections

Due to space limitations on the planning forms it was necessary to shorten the descriptions of the line connections on the forms. The full descriptions of these line connections (in alphabetical order) follow.

Auto-Call Unit: This line connects to an auto-call unit that will be used to automatically dial the connection for the corresponding switched line.

BIS: A nonswitched network used with CCITT X.21.

IBM Cabling System: The system is directly attached to another 9370 system or work station through the IBM Cabling System. The cable does not provide for clocking from this system to be used by the other system (or work station). Both this system and the other system (or work station) must provide their own clocking.

Nonswitched: A nonswitched network using modems or other data circuit-terminating equipment to connect to the communication facilities.

Primary System-to-System with Clock: This is the primary system that is directly attached (without the use of modems) to a secondary 9370 system. The cable provides for clocking from this system to be used by the secondary system. The secondary system cannot provide the clocking.

Secondary System-to-System with Clock: This is the secondary system that is directly attached (without the use of modems) to a primary 9370 system. The cable provides for clocking from the primary system to be used by this system. This system cannot provide the clocking.

Switched/Nonswitched with SNBU: A switched network without auto-call or a nonswitched network using manual dial SNBU (switched network back up).

Switched with Auto-Call: A switched network that uses an auto-call unit to automatically dial the connection.

System-to-System without Clock: This system is directly attached (without the use of modems) to another 9370 system. The cable does not provide for clocking from either system to be used by the other system. Both systems must provide their own clocking.

System-to-Work Station without Clock: A work station that is directly attached (without the use of modems) to this system. The cable does not provide for clocking from either the work station or the system to be used by the other unit. Both the work station and the system must provide their own clocking.

Depending on the protocol selected for this communication line, continue with one of the following,

- “TTC2 Interface, Line Connection, and Line Speed”
- “BSC Interface, Line Connection, and Line Speed” on page 4-15
- “SDLC Interface, Line Connection, and Line Speed” on page 4-17
- “HDLC Interface, Line Connection, and Line Speed” on page 4-19.

TTC2 Interface, Line Connection, and Line Speed

Listed below are the valid combinations of interface, line connections, and line speeds that you can use with TTC2. The type of *interface* and *line connection* has a *digit* shown in parentheses () next to it. Enter these *digits* in the space provided on Form F1.

- Using RS232 (4)
 - Switched/nonswitched with SNBU (5)
 - Switched with auto-call (6)
 - Directly attached system-to-work station without clock (7)
 - Nonswitched (9).

Defining a Network (Continued)

- Using RS422 (5)
 - Directly attached system-to-system without clock (6)
 - Directly attached system-to-work station without clock (7)
 - IBM Cabling System; either system-to-system or system-to-work station without clock (9).
- Using V.24 (6)
 - Switched/nonswitched with SNBU (5)
 - Switched with auto-call (6)
 - Nonswitched (9).
- Using RS366/V.25 (7)
 - Auto-call unit (8).

Select the *Line Speed* by entering the appropriate digit as follows:

- 0 for 75 bps
- 1 for 110 bps
- 2 for 134.5 bps
- 3 for 300 bps
- 4 for 600 bps
- 5 for 1,200 bps
- 6 for 2,400 bps
- 7 for 4,800 bps*
- 8 for 9,600 bps*
- 9 for 19,200 bps*.

** Line speeds of 4,800, 9,600, and 19,200 are recommended to only be used with directly attached system-to-work station or system-to-system line connections and the 'permanent request to send' parameter is specified in the line configuration.*

Note: If you have specified a switched line with auto-call, you must specify a second line using the same protocol and line speed that was selected on the switched line. Also select RS366/V.25 (7) for the interface and auto-call unit (8) for the line connection.

If you are using any other lines with TTC2 protocol, go back to "TTC2 Interface, Line Connection, and Line Speed" on page 4-13.

If you want to order any communication lines using BSC, SDLC, or HDLC, go to “Defining a Network” on page 4-10.

Otherwise, continue with “Communication Line Customization” on page 4-19.

BSC Interface, Line Connection, and Line Speed

Listed below are the valid combinations of interface, line connections, and line speeds that you can use with BSC. The type of *interface* and *line connection* has a *digit* shown in parentheses () next to it. Enter these *digits* in the space provided on Form F2.

- Using RS232 (4)
 - Switched/nonswitched with SNBU (5)
 - Switched with auto-call (6)
 - Nonswitched (9).
- Using RS422 (5)
 - Directly attached primary system-to-system with clock (3)
 - Directly attached secondary system-to-system with clock (5)
 - Directly attached system-to-system without clock (6)
 - IBM Cabling System; system-to-system without clock (9).
- Using V.24 (6)
 - Switched/nonswitched with SNBU (5)
 - Switched with auto-call (6)
 - Nonswitched (9).
- Using RS366/V.25 (7)
 - Auto-call unit (8).
- Using V.35 (8)
 - Nonswitched (9).

Defining a Network (Continued)

Select the *Line Speed* by entering the appropriate digit as follows:

- Using RS232, V.24, RS366/V.25, and RS422 system-to-system *without* clock:
 - 0 for 600 bps
 - 1 for 1,200 bps
 - 2 for 2,400 bps
 - 3 for 4,800 bps
 - 4 for 9,600 bps
 - 5 for 14,400 bps
 - 6 for 19,200 bps.

- Using V.35 and RS422 system-to-system *with* clock:
 - 0 for 2,400 bps
 - 1 for 4,800 bps
 - 2 for 9,600 bps
 - 3 for 14,400 bps
 - 4 for 19,200 bps.

Note: If you have specified a switched line with auto-call, you must specify a second line using the same protocol and line speed that was selected on the switched line. Also select RS366/V.25 (7) for the interface and auto-call unit (8) for the line connection.

If you are using any other lines with BSC protocol, go back to “BSC Interface, Line Connection, and Line Speed” on page 4-15.

If you want to order any communication lines using TTC2, SDLC, or HDLC, go to “Defining a Network” on page 4-10.

Otherwise, continue with “Communication Line Customization” on page 4-19.

SDLC Interface, Line Connection, and Line Speed

Enter either a 6 for SDLC without NRZI (non-return to zero inverted) or a 7 for SDLC with NRZI next to *protocol* on Form F3.

Listed below are the valid combinations of interface, line connections, and line speeds that you can use with SDLC. The type of *interface* and *line connection* has a *digit* shown in parentheses () next to it. Enter these *digits* in the space provided on Form F3.

- Using RS232 (4)
 - Switched/nonswitched with SNBU (5)
 - Switched with auto-call (6)
 - Nonswitched (9).
- Using RS422 (5)
 - Directly attached primary system-to-system with clock (3)
 - Directly attached secondary system-to-system with clock (5)
 - Directly attached system-to-system without clock; *only valid when NRZI is specified* (6)
 - IBM Cabling System; system-to-system without clock; *only valid when NRZI is specified* (9).
- Using V.24 (6)
 - Switched/nonswitched with SNBU (5)
 - Switched with auto-call (6)
 - Nonswitched (9).
- Using RS366/V.25 (7)
 - Auto-call unit (8).
- Using V.35 (8)
 - Nonswitched (9).
- Using X.21 (9)
 - BIS Network (3)
 - Nonswitched (9).

Defining a Network (Continued)

Select the *Line Speed* by entering the appropriate digit as follows:

- Use for all *except* RS422 system-to-system *with* clock and V.35:
 - 0 for 600 bps
 - 1 for 1,200 bps
 - 2 for 2,400 bps
 - 3 for 4,800 bps
 - 4 for 9,600 bps
 - 5 for 14,400 bps
 - 6 for 19,200 bps
 - 7 for 48,000 bps*
 - 8 for 56,000 bps*
 - 9 for 64,000 bps*.

* *Valid for X.21 only.*

- Use for RS422 system-to-system *with* clock and V.35:
 - 0 for 2,400 bps
 - 1 for 4,800 bps
 - 2 for 9,600 bps
 - 3 for 14,400 bps
 - 4 for 19,200 bps
 - 5 for 48,000 bps
 - 6 for 50,000 bps
 - 7 for 56,000 bps
 - 8 for 57,600 bps
 - 9 for 64,000 bps.

Note: If you have specified a switched line with auto-call, you must specify a second line using the same protocol and line speed that was selected on the switched line. Also select RS366/V.25 (7) for the interface and auto-call unit (8) for the line connection.

If you are using any other lines with SDLC protocol, go back to “SDLC Interface, Line Connection, and Line Speed” on page 4-17.

If you want to order any communication lines using TTC2, BSC, or HDLC, go to “Defining a Network” on page 4-10.

Otherwise, continue with “Communication Line Customization” on page 4-19.

HDLC Interface, Line Connection, and Line Speed

Listed below are the valid combinations of interface, line connections, and line speeds that you can use with HDLC. The type of *interface* and *line connection* has a *digit* shown in parentheses () next to it. Enter these *digits* in the space provided on Form F4.

- Using X.21 (9)
 - BIS Network (3)
 - Nonswitched Network (9).

Select the *Line Speed* by entering the appropriate digit as follows:

- 0 for 600 bps
- 1 for 1,200 bps
- 2 for 2,400 bps
- 3 for 4,800 bps
- 4 for 9,600 bps
- 5 for 14,400 bps
- 6 for 19,200 bps.

If you are using any other lines with HDLC protocol, go back to “HDLC Interface, Line Connection, and Line Speed.”

If you want to order any communication lines using TTC2, BSC, or SDLC, go to “Defining a Network” on page 4-10.

Otherwise, continue with “Communication Line Customization.”

Communication Line Customization

The communication lines are configured according to the information specified when the system was ordered. There are some other line parameters that you may want to change after the system is installed. The manual, *Operating Your 9370 System*, SA24-4036, explaining the parameters and how to change them will be shipped with the system.

Note: The ‘permanent request to send’ line parameter must be specified for all communication lines using

Defining a Network (Continued)

directly attached system-to-work station or system-to-system line connections.

The type of network and interface determines the other equipment that you need. See Figure 4-6 for your next step. You should continue with the type of network and interface in the order shown in the table.

| Network and Interface | Continue With |
|---|---|
| Switched and nonswitched networks using RS232/V.24 interface | "Modems" |
| Auto-call using RS366/V.25 interface | "Ordering Auto-Call Units" on page 4-32 |
| All networks using X.21 or V.35 interface | "Data Circuit-Terminating Equipment for CCITT X.21 and V.35" on page 4-30 |
| Direct attachment system-to-system or system-to-work station using RS232 or RS422 interface | "Communication Adapter Cables" on page 4-47 |

Figure 4-6. Type of Network and Interface Determines Your Next Step

Modems

You will need to order a modem for each switched and nonswitched communication line that uses the RS-232-C or CCITT V.24 interface. You will also need a compatible modem (preferably the same type) for each remote location that communicates with your system on that same line. You can order the modems from IBM, the communication common carrier [telephone company or PTT (Post Telephone and Telegraph Administration)], or a modem supplier.

Note: The modem must provide for turnaround delay, except when 'permanent request to send' is specified on a 4-wire nonswitched network. (See turnaround delay).

Turnaround Delay

Turnaround delay is the required time to reverse the direction of transmission from send to receive or receive to send. Time is required for line propagations, line distortions, modem timing, and the terminal equipment reaction time.

The required turnaround delay is dependent on the line speed. The actual delay must be equal to or greater than the duration of 3 characters. The delay time in milliseconds for each data rate is shown in the following table.

| Line Speed (bps) | Turnaround Delay (milliseconds) |
|------------------|---------------------------------|
| 75 | 320.0 |
| 110 | 219.0 |
| 134.5 | 179.0 |
| 300 | 80.0 |
| 600 | 40.0 |
| 1200 | 20.0 |
| 2400 | 10.0 |
| 4800 | 5.0 |
| 9600 | 2.5 |
| 14400 | 1.7 |
| 19200 | 1.3 |

IBM Modems

See Figure 4-7 for some of the IBM external modems that you can use with the communication adapters. Contact your IBM marketing representative for information on any IBM modems that do not appear in this table.

| Type | Model | Maximum Speed (bps) | Network Type | Modem Enclosure |
|------|-------|---------------------|--------------|-----------------|
| 3863 | 1 | 2,400 | Nonswitched | None |
| | 2 | 2,400 | Switched | None |
| 3864 | 1 | 4,800 | Nonswitched | None |
| | 2 | 4,800 | Switched | None |

Figure 4-7 (Part 1 of 2). IBM External Modems

Modems (Continued)

| Type | Model | Maximum Speed (bps) | Network Type | Modem Enclosure |
|------|-------|---------------------|------------------|-----------------|
| 3865 | 1 | 9,600 | Nonswitched | None |
| | 2 | 9,600 | Multipoint | None |
| 3868 | 1 | 2,400 | Nonswitched | 3866 |
| | 2 | 4,800 | Nonswitched | 3866 |
| | 3 | 9,600 | Nonswitched | 3866 |
| | 4 | 9,600 | Nonswitched | 3866 |
| 5811 | 10 | 9,600 | Limited distance | None |
| | 18 | 14,400 | Limited distance | 5810 |
| 5841 | — | 1,200 | Switched | None |
| 5842 | — | 2,400 | Switched | None |
| 5865 | — | 9,600 | Nonswitched | None |
| 5866 | — | 14,400 | Nonswitched | None |
| 5868 | 51 | 9,600 | Nonswitched | 3866 |
| | 61 | 19,200 | Nonswitched | 3866 |

Figure 4-7 (Part 2 of 2). IBM External Modems**PTT Mandatory Modems**

The communication adapters support attachment of PTT (Post Telephone and Telegraph Administration) mandatory modems meeting International Organization Standardization 2111 (1979) and one of the following CCITT recommendations (1976):

- Switched network:
 - V.21: up to 300 bps
 - V.23: up to 600/1200 bps
 - V.25: all modems
 - V.26 bis: 1200/2400 bps
 - V.27 ter: 2400/4800 bps.
- Nonswitched network:
 - V.21: up to 300 bps
 - V.23: up to 600/1200 bps
 - V.26: 1200/2400 bps

- V.27: 4800 bps
- V.27 bis: 2400/4800 bps
- V.29: 4800/7200/9200 bps.

Modem Options

You will need to know several options about each modem before you can order one. Select a copy of Form G, *Modem Information*, from the forms packet. Use a separate copy of Form G for each communication line requiring modems. Form G has two parts. The first part, on the front of the form, is for the local modem; the second part, on the back of the form, is for the remote location(s).

Note: While planning for modems and communication equipment, Forms F1, F2, F3, and F4 will be referred to as Form F only. Forms H1 and H2 will be referred to as Form H.

Fill in the following information on form G:

- *Customer Name*
- *Customer Number*
- *Communication Line Identification* (this should be the same line identification you used on Form F or H).

Fill in the *Location(s) and Phone Number(s)* of both the local and remote modem(s), [items 1 for the local modem and 22 for the remote modem(s)].

Select the following options by placing a check in the appropriate box on **Form G**:

- *Type of Station:* Select *Control* if this is the primary station on a multipoint line. Otherwise, select *Tributary* (items 2 and 23).
- *Clocking:* Select either *DCE* (the modem supplies the clock) or *DTE* (the communication adapter supplies the clock—items 3 and 24).
- *Continuous Carrier* (constant request to send/clear to send): Select *Y* if this modem is for the control station on a 4-wire nonswitched network. Otherwise, mark *N* to indicate that the request to send (RTS) signal controls the carrier (items 4 and 25).

Modems (Continued)

- *Data Set Ready on during Loopback:* Some modems can loop data back to the system for testing purposes. This option assists in problem determination. Mark *Y* if you want this option (items 5 and 26).
- *Grounding to Modem Frame:* The signal ground should not be connected to the frame ground in the modem. Mark *N* for this option (items 6 and 27).
- *Local Loopback Initiated by Pin 18:* Select this option to provide local loopback if it is available. Mark *Y* for this option (items 7 and 28).
- *Full Duplex:* Mark *Y* if you use the modem to connect to a duplex or X.25 packet switching data network (items 8 and 29).
- *Auto-Answer Control:* Mark *Y* if this is a switched line and you want the incoming calls answered automatically. Otherwise, mark *N* (items 9 and 30).
- *Auto-Call Unit:* Mark *Y* if this modem is used with an auto-call unit. Otherwise, mark *N* (items 10 and 31).
- *Ring Indicator:* EIA/CCITT signal level is required on pin 22. Mark *Y* if this is on a switched line (items 11 and 32).
- *Other Options:* Enter any other modem options that you require (items 12 and 33).

If you have more lines that require modems, go back to “Modem Options” on page 4-23 and select the modem options for all lines.

You will need to know the manufacturer of your modems before you can complete Form G.

After you decide on a modem supplier, see Figure 4-8 for your next step.

| Modem Source | Continue With |
|------------------|--|
| IBM | “Ordering IBM Modems” |
| Common Carrier | “Ordering Modems and Lines from a Common Carrier” on page 4-27 |
| Another supplier | “Ordering Modems from a Modem Supplier” on page 4-26 |

Figure 4-8. Your Modem Source Determines Your Next Step

Ordering IBM Modems

Refer to the *IBM Modem Introduction and Site Preparation Guide* for the type of modem that you are ordering for the following line requirements and other planning information; you may need help from your IBM marketing representative.

Enter the following on *Form G*:

- *Manufacturer*: IBM (items 13 and 34).
- *Modem Type and Model*: (items 14 and 35).
- *PTT Homologation Number*: (for countries other than the United States and Canada—items 17 and 38).
- If no external coupler is required, record the following information on Form G:
 - *FCC Registration Number*: (United States only—items 15 and 36).
 - *Ringer Equivalence Number*: (switched lines only—items 16 and 37).

Enter the following information for this communication line on **Form F or H** as appropriate:

- *2 or 4-wire*: for nonswitched lines only; specify if a 2 or 4-wire line is to be used.

Modems (Continued)

- *Line Termination Requirements:*
- *Line Conditioning:* for nonswitched lines only
- *Telephone Set Options* for switched lines only; exclusion key, rotary or push button dial

After you complete this part of Form F, G, and H for all lines, enter the quantity, type, model and description of the modems on Form C3, *Other I/O Devices*.

If external couplers are required, go to “Ordering External Couplers” on page 4-27.

If no couplers are required, continue with “Ordering Communication Lines from the Common Carrier” on page 4-29 to order your communication lines.

Ordering Modems from a Modem Supplier

Call the modem supplier and order the modems by specifying the following from *Forms F, G, or H*.

- *Interface:* (Form F or H)
- *Line Connection:* (Form F or H; also specify 2 or 4-wire)
- *Line Speed:* (Form F or H)
- *Modem Options:* (Form G, items 2 through 12 and 23 through 33)

You should also request the following information from the modem supplier and record it on Form F, H, or G:

- *PTT Homologation Numbers:* (for countries other than the United States and Canada—items 17 and 38 on Form G).
- *Line Termination Requirements:* (Form F or H).
- *Line Conditioning:* for nonswitched lines only, Form F or H.
- *Telephone Set Options:* (Form F or H).
- *Modem Manufacturer:* (items 13 and 34 on Form G).

- *Modem Type and Model:* (items 14 and 35 on Form G).
- If no external coupler is required, ask for the following information and record it on Form G:
 - *FCC Registration Number:* (United States only, items 15 and 36).
 - *Ringer Equivalence Number:* (switched lines only, items 16 and 37).

If external couplers are required, go to “Ordering External Couplers.”

If no couplers are required, continue with “Ordering Communication Lines from the Common Carrier” on page 4-29 to order your communication lines.

Ordering External Couplers

Call the coupler supplier and order the required couplers for all communication lines. Record the following information for each line on Form G.

- *Manufacturer’s Name:* (items 18 and 39).
- *Coupler Type:* (items 19 and 40).
- *FCC Registration Number:* (United States only, items 20 and 41).
- *Ringer Equivalence Number:* (switched lines only, items 21 and 42).

Go to “Ordering Communication Lines from the Common Carrier” on page 4-29 to order your communication lines.

Ordering Modems and Lines from a Common Carrier

Call the common carrier and specify the following from Form F or H:

- *Interface:*

Modems (Continued)

- *Line Connection:* (for nonswitched lines also specify 2 or 4-wire).
- *Line Speed:*
- *Homologation Number:* (except US and Canada, Form F or H—this number can be obtained from the IBM marketing representative).

Also specify the following from Form G:

- *Modem Options:* (items 2 through 12 and 23 through 33)

You should order your modems and lines based on this information. You should also order auto-call units for any lines that you plan to use the auto-call feature on. You can order these from the common carrier or another supplier. Order the auto-call units now if you want to order them from the common carrier. To order auto-call units from another supplier, go to “Ordering Auto-Call Units” on page 4-32.

If you are planning another type of network and interface, see Figure 4-9 for your next step. Otherwise, continue with “Communication Adapter Cables” on page 4-47 for information on adapter cables.

| Network and Interface | Continue With |
|---|---|
| Switched and nonswitched networks using RS232/V.24 interface | “Modems” on page 4-20 |
| Auto-call using RS366/V.25 interface | “Ordering Auto-Call Units” on page 4-32 |
| All networks using X.21 or V.35 interface | “Data Circuit-Terminating Equipment for CCITT X.21 and V.35” on page 4-30 |
| Direct attachment system-to-system or system-to-work station using RS232 or RS422 interface | “Communication Adapter Cables” on page 4-47 |

Figure 4-9. Type of Network and Interface Determines Your Next Step

Ordering Communication Lines from the Common Carrier

Call the common carrier and order the lines by specifying the following from Form F or H.

- *Line Connection:* (for nonswitched lines also specify 2 or 4-wire).
- *Line Speed:*
- *Line Termination Requirements:*
- *Line Conditioning:* (for nonswitched lines only)
- *Telephone Set Options* (for switched lines only)

Also specify the following information from Form F, G, or H.

- *FCC Registration Number:* (United States only, Form G—items 15 and 36 or 20 and 41)
- *Ringer Equivalence Number:* (for switched lines only, Form G—items 16 and 37 or 21 and 42)
- *Homologation Number:* (for countries other than the United States or Canada, Form G—items 17 and 38, or Form F or H).

Note: If you do not have the homologation number, contact your IBM marketing representative for it.

You should also order auto-call units for any lines on which you plan to use the auto-call feature. You can order these from the common carrier or another supplier. Order the auto-call units now if you want to order them from the common carrier. To order auto-call units from another supplier, go to “Ordering Auto-Call Units” on page 4-32.

If you are planning another type of network and interface, see Figure 4-10 for your next step. Otherwise, continue with “Communication Adapter Cables” on page 4-47 for information on adapter cables.

Modems (Continued)

| Network and Interface | Continue With |
|---|--|
| Switched and nonswitched networks using RS232/V.24 interface | "Modems" on page 4-20 |
| Auto-call using RS366/V.25 interface | "Ordering Auto-Call Units" on page 4-32 |
| All networks using X.21 or V.35 interface | "Data Circuit-Terminating Equipment for CCITT X.21 and V.35" |
| Direct attachment system-to-system or system-to-work station using RS232 or RS422 interface | "Communication Adapter Cables" on page 4-47 |

Figure 4-10. Type of Network and Interface Determines Your Next Step

Data Circuit-Terminating Equipment for CCITT X.21 and V.35

You will have to order data circuit-terminating equipment and the communication facilities for each line that uses the CCITT X.21 or CCITT V.35 interface. Call the common carrier and order this equipment.

Note: The data circuit-terminating equipment must provide for turnaround delay, except when 'permanent request to send' is specified on a 4-wire nonswitched network. (See turnaround delay).

Turnaround Delay

Turnaround delay is the required time to reverse the direction of transmission from send to receive or receive to send. Time is required for line propagations, line distortions, modem timing, and the terminal equipment reaction time.

The required turnaround delay is dependent on the line speed. The actual delay must be equal to or greater than

the duration of 3 characters. The delay time in milliseconds for each data rate is shown in the following table.

| Line Speed (bps) | Turnaround Delay (milliseconds) |
|------------------|---------------------------------|
| 600 | 40.0 |
| 1200 | 20.0 |
| 2400 | 10.0 |
| 4800 | 5.0 |
| 9600 | 2.5 |
| 14400 | 1.7 |
| 19200 | 1.3 |
| 48000 | 0.5 |
| 50000 | 0.5 |
| 56000 | 0.5 |
| 57600 | 0.5 |
| 64000 | 0.4 |

If you are planning another type of network and interface, see Figure 4-11 for your next step. Otherwise, continue with “Communication Adapter Cables” on page 4-47 for information on adapter cables.

| Network and Interface | Continue With |
|---|---|
| Switched and nonswitched networks using RS232/V.24 interface | “Modems” on page 4-20 |
| Auto-call using RS366/V.25 interface | “Ordering Auto-Call Units” on page 4-32 |
| All networks using X.21 or V.35 interface | “Data Circuit-Terminating Equipment for CCITT X.21 and V.35” on page 4-30 |
| Direct attachment system-to-system or system-to-work station using RS232 or RS422 interface | “Communication Adapter Cables” on page 4-47 |

Figure 4-11. Type of Network and Interface Determines Your Next Step

Modems (Continued)

Ordering Auto-Call Units

You will need to order auto-call units for all lines on which you want to use the auto-call feature. Auto-call units must conform to EIA specification RS-366 or CCITT specification V.25. Call the common carrier or another supplier and order the auto-call units.

If you are planning another type of network and interface, see Figure 4-12 for your next step. Otherwise, continue with “Communication Adapter Cables” on page 4-47 for information on adapter cables.

| Network and Interface | Continue With |
|---|---|
| Switched and nonswitched networks using RS232/V.24 interface | “Modems” on page 4-20 |
| Auto-call using RS366/V.25 interface | “Ordering Auto-Call Units” |
| All networks using X.21 or V.35 interface | “Data Circuit-Terminating Equipment for CCITT X.21 and V.35” on page 4-30 |
| Direct attachment system-to-system or system-to-work station using RS232 or RS422 interface | “Communication Adapter Cables” on page 4-47 |

Figure 4-12. Type of Network and Interface Determines Your Next Step

ASCII Subsystem

The ASCII Subsystem is used for attaching ASCII devices, such as displays, printers, plotters, and graphic devices. These can be directly attached (without data circuit-terminating equipment), or attached through switched and nonswitched lines using modems.

For the attached ASCII devices, the ASCII Subsystem provides:

- 3270 emulation
- IX/370 device control
- Interactive session switching
- Transparent mode (in 3270 mode)
- Customization.

When using 3270 emulation mode, the ASCII Subsystem appears to the System/370 host as a 3274 Terminal Control Unit with 16 device addresses.

For the subchannel addresses 0-F, the subsystem provides the same functions as a 3178 C2 display station, with one subchannel address corresponding to each ASCII port number.

For IX/370, the subsystem provides one subchannel address for each IX/370. All terminals attached to a particular IX/370 system are multiplexed through this subchannel. Up to eight IX/370 systems, each using one subchannel can be supported. The address range can be configured from the 9370 processor console.

The ASCII Subsystem consists of:

- One communications processor (Feature 6030)
- Up to four asynchronous adapters (Feature 6032)
- The ASCII Subsystem microcode
- The network and terminals.

All 9370 processors support this subsystem. The maximum number of ASCII Subsystems for each processor is:

- Two on the 9373
- Four on the 9375
- Twelve on the 9377.

To use this subsystem, you need at least one DASD/Tape Controller (Feature 6010) with attached DASD on the system for loading the microcode.

Each ASCII Subsystem:

- Provides up to 16 EIA RS-232-C/CCITT V.24 or EIA RS-422-A lines for attaching a maximum of 16 devices

ASCII Subsystem (Continued)

- Allows direct attachment of devices up to 1219 meters (4000 feet), using the EIA RS-422-A interface

Note: All communication adapter cables must be located within a building. They cannot be used outside or between buildings.

- Supports transmission speeds from 50 to 19,200 bps
- Supports duplex operation
- Supports both character (keying) and transparent (file transfer) modes of operation.

The actual number of lines that you can attach to one communications processor using this subsystem is limited by:

- The mode of operation (character or transparent)
- The speed of the lines.

You do not have to specify the number of communication processors and adapters required for the ASCII Subsystems. This will be calculated by the configurator program used by your IBM representative. The following information on the maximum lines supported on a subsystem is for reference only.

Maximum Lines Supported on an ASCII Subsystem

You can determine the maximum number of lines that you can attach to one ASCII Subsystem by:

1. Referring to Figure 4-13 to assign a “weight” factor to each line depending on the mode of operation (character or transparent), and line speed.
2. Adding up the “weight” factors for all of the lines.

The total of the “weight” factors for all lines on a subsystem cannot exceed 16.

| Mode of Operation | Line Speed Ranges | Weight Factor |
|-------------------|-------------------|---------------|
| Character | All Speeds | 1 |
| Transparent | Less than 2400 | 1 |
| | 2400 to 4800 | 2 |
| | 4801 to 9600 | 4 |
| | 9601 to 19,200 | 8 |

Figure 4-13. ASCII Subsystem Line Weight Factors

Asynchronous Adapter (Feature 6032)

The asynchronous adapter is used to attach up to four asynchronous lines. You can independently configure all four lines for mode of operation, interface, and line speed.

Figure 4-14 shows an asynchronous communication adapter card.

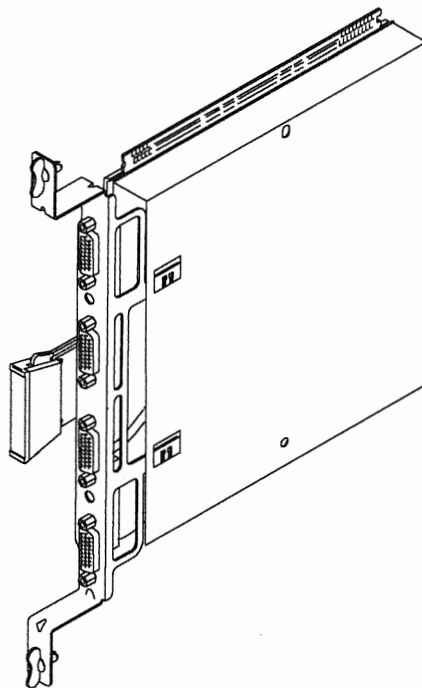


Figure 4-14. Asynchronous Communication Adapter

ASCII Subsystem (Continued)

When this adapter is used with the ASCII subsystem, it supports:

- Protocol:
 - Asynchronous ASCII
- Interface:
 - EIA RS-232-C
 - CCITT V.24
 - EIA RS-422-A
- Speed:
 - 50 to 19,200 bps.

ASCII Devices

The ASCII Subsystem lets you attach a variety of IBM and OEM ASCII devices to your system, including display terminals, personal computers, intelligent work stations, printers, plotters and graphic devices. The ASCII Subsystem supports the following IBM ASCII device types for use in 3270 emulation mode through device definition tables (DDTs):

- 3101
- 3161
- 3162
- 3163
- 3164
- IBM PC with 3101 emulation
- Rolm 3270 Series.

Personal Computers, Work Stations

The ASCII Subsystem lets you attach personal computers and work stations that can emulate an ASCII character-mode asynchronous display terminal. Support of these devices using 3178 emulation is the same as for display terminals.

An IBM 3101 emulation program is available for the IBM Personal Computer.

New device definition tables can be created to support other ASCII device types using the customization facilities at the processor console.

Printers, Plotters, Graphic Devices

The ASCII Subsystem transparent interface, a part of 3270 emulation mode, allows you to attach printers, plotters, graphic equipment, and other hosts. You must, however, provide the software support for these devices on your system.

You can also use auxiliary printers with some terminals or personal computers. Examples are the IBM 3101 and the IBM Personal Computer in 3101 emulation mode.

The ASCII Subsystem provides 3287 emulation for attaching ASCII printers.

Customization

ASCII Display Terminals for 3270 Emulation

The ASCII Subsystem supports several IBM display terminals for 3178 emulation, for which it provides device definition tables.

A device definition table—there must be one for each terminal running 3270 terminal emulation—controls the assignment of keyboard functions to keys. If the subsystem does not contain a device definition table for a particular terminal type, customization facilities allow you to create your own.

For OEM standard ANSI X3.64-type terminals, this subsystem includes a device definition table for use as a model to create your own tables.

OEM ASCII terminals can be attached for 3270 device emulation if they have:

- Required Screen Functions
 - Clear screen, or clear-to-end-of-screen
 - Absolute cursor positioning

ASCII Subsystem (Continued)

- Replace (not overstrike) of a character written to the screen
- Operates on a character mode basis.
- A device definition table defining the terminal's characteristics.

Your ASCII Subsystem is configured with default options, which allow you to install and use it without any customization. Customization means choosing optional functions to configure your system to your own needs.

Customizing System-Related Functions

Some of the functions that you might want to change for the ASCII Subsystem during installation are listed below.

Define Printers: You can attach ASCII printers, either by providing your own line drivers or your own host applications.

Customizing Terminal-Related Functions

After installation is complete, there are several aspects of the ASCII Subsystem that you can customize from the 9370 processor console. This customization allows you to control which types of ASCII terminals attach to the subsystem and what their characteristics should be. Customizing is described in detail in "Customizing the ASCII Subsystem", which is shipped with the system.

Defining an ASCII Subsystem Communication Line

You have to define the ASCII Subsystem communication lines for interface, line connection, and line speed. Fill out a copy of the *ASCII Line Information* (Form H1 or H2), for each ASCII communication line. Use Form H1 for character (keying) mode of operation and Form H2 for transparent (file transfer) mode. There is room for defining four communication lines on each copy of the form.

The forms provide information for ordering adapters, communication lines, modems, and couplers. However,

depending on the type of network used, you will not fill out all of the information shown on the form.

A digit (0-9) will be used to designate the protocol, interface, line connection, and line speed of each ASCII line. These digits, when rearranged in the sequence of line connection, protocol, interface, and line speed become what is known as a specify code. The IBM configurator program uses this specify code to properly configure each line and supply the correct adapter cable.

Select a copy of Form H1 or H2 (depending on the mode of operation desired) from the planning forms and fill it out as you continue defining your ASCII Subsystem network. Enter the following information:

- *Customer Name*
- *Customer Number*
- *Line Identification* (the identification that you want to refer to this line by).

The *S/370 Address* cannot be filled in until the communication line is installed. The system will come with default addresses assigned to all lines. You can change these addresses when the system is installed.

Fill in the *Device Type* that will be connected to this line. This can be a display, printer, plotter, or other device.

The *Protocol* for the ASCII Subsystem must always be ASCII for ordering purposes. This has already been filled in.

For planning purposes the type of interface have been shortened; RS232 for RS-232-C, RS422 for RS-422-A, and V.24 for CCITT V.24. Select the *Interface* that is desired for each communication line by entering a *digit* on the form as shown below. Enter a:

- 1 for RS232
- 2 for RS422
- 3 for V.24.

The *Line Connection* you use depends on the interface and mode of operation. Continue with:

- “ASCII Line Connections Using Character Mode (Form H1)” on page 4-40, or

ASCII Subsystem (Continued)

- “ASCII Line Connections Using Transparent Mode (Form H2)” on page 4-41.

ASCII Line Connections Using Character Mode (Form H1)

Select the desired ASCII line connections when using character mode. The valid combinations are listed below, along with the appropriate digit in parentheses (). Enter this *digit* on Form H1.

Note: Auto-answer must be used with the switched line connection.

- Using RS232:
 - Switched (0)
 - Directly attached system-to-work station without clock (2). (Both the system and work station must furnish clocking.)
 - Nonswitched (4).
- Using RS422:
 - Directly attached system-to-work station without clock (2). (Both the system and work station must furnish clocking).
 - IBM Cabling System; system-to-work station without clock (3). (Both the system and work station must furnish clocking).
- Using V.24:
 - Switched (0)
 - Nonswitched (4).

After you select the line connections for all lines using character mode, continue with:

- “ASCII Line Connections Using Transparent Mode (Form H2)” on page 4-41, or
- “ASCII Subsystem Line Speed” on page 4-42.

ASCII Line Connections Using Transparent Mode (Form H2)

Select the desired ASCII line connections when using transparent mode. The valid combinations are listed below, along with the appropriate digit in parentheses (). Enter this *digit* on Form H2.

Note: Auto-answer must be used with the switched line connection.

- Using RS232:
 - Switched (5)
 - Directly attached system-to-work station without clock (7). (Both the system and work station must furnish clocking).
 - Nonswitched (9).

- Using RS422:
 - Directly attached system-to-work station without clock (7). (Both the system and work station must furnish clocking).
 - IBM Cabling System; system-to-work station without clock (9). (Both the system and work station must furnish clocking).

- Using V.24:
 - Switched (5)
 - Nonswitched (9).

After you select the line connections for all lines using transparent mode, continue with “ASCII Subsystem Line Speed.”

ASCII Subsystem (Continued)

ASCII Subsystem Line Speed

The *Line Speed* that you can use is shown below, along with the digit to be entered on Form H1 or H2. Enter this *digit* for each communication line on Form H1 or H2.

- 0 for 75 bps or less
- 1 for 110 bps
- 2 for 150 bps
- 3 for 300 bps
- 4 for 600 bps
- 5 for 1,200 bps
- 6 for 2,400 bps
- 7 for 4,800 bps
- 8 for 9,600 bps
- 9 for 19,200 bps.

Complete this portion of Form H1 or H2 for all communication lines using the ASCII Subsystem. Go back to “Defining an ASCII Subsystem Communication Line” on page 4-38 for all remaining lines to be ordered.

To order the ASCII Subsystem microcode, use *Form B3*, *B5*, or *B7* (as appropriate), depending on the type of processor that you are ordering. Use the same form that you used when specifying the other features on the system. Find the heading *Communications Subsystem* and place a check in the appropriate box for the *ASCII Subsystem*.

For all lines using switched or nonswitched modems, continue with “Modems” on page 4-20.

For all directly attached system to work station connections, go to “Communication Adapter Cables” on page 4-47.

IBM Token-Ring Subsystem

The IBM Token-Ring Subsystem consists of:

- One communications processor (Feature 6030)
- One IBM Token-Ring Adapter (Feature 6034)
- The Token-Ring microcode
- A Token-Ring network and terminals.

All 9370 processors support this subsystem. The maximum number of subsystems for each processor is:

- Two on the 9373
- Four on the 9375
- Twelve on the 9377.

To use this subsystem you need at least one DASD/Tape Controller (Feature 6010) with attached DASD on the system for loading the microcode.

IBM Token-Ring Adapter (Feature 6034)

Figure 4-15 shows the IBM Token-Ring Adapter.

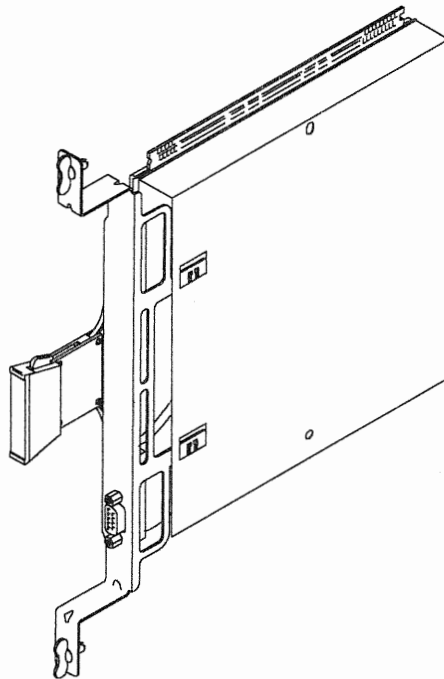


Figure 4-15. IBM Token-Ring Adapter

IBM Token-Ring Subsystem (Continued)

The Token-Ring adapter provides for:

- The attachment of one Token-Ring network
- A speed of four million bps (bits per second)
- Compatibility with the IEEE 802.5 interface.

To order the Token-Ring microcode, use *Form B3, B5, or B7* (as appropriate), depending on the type of processor that you are ordering. Use the same form that you used when specifying the other features on the system.

Find the heading *Communications Subsystem* and place a check in the appropriate box for the *IBM Token-Ring Subsystem (IEEE 802.5)*.

Once you decide how many networks you need, locate the table under *I/O Controllers and Adapters* on Form B. Enter the number of required token-ring adapters (one for each network) under *Quantity*, next to the Feature Number 6034 (Token-Ring Adapter). You do not have to specify the number of required communication processors. The IBM configurator program will automatically calculate this.

For more information on planning and installing a token-ring network, refer to the *IBM Token-Ring Network Introduction and Planning Guide*, GA27-3677.

For additional information on the IBM Cabling System, refer to the following:

- *IBM Cabling System Planning and Installation Guide*, GA27-3361
- *Using the IBM Cabling System with Communication Products*, GA27-3620
- *A Building Planning Guide for Communication Wiring*, G320-8059.

Information on customization and using the token-ring network will be provided with the manuals shipped with the system.

Continue with "Communication Adapter Cables" on page 4-47.

IEEE 802.3 Local Area Network Subsystem

The local area network uses the *Carrier-Sense Multiple Access with Collision Detection* transmission control. It supports a large number of OEM devices and provides interconnection to other IBM systems compatible with the IEEE 802.3 interface.

The IEEE 802.3 Local Area Network subsystem consists of:

- One communications processor (Feature 6030)
- One IEEE 802.3 Local Area Network Adapter (Feature 6035)
- The local area network microcode
- The local area network, systems, and terminals.

All 9370 processors support this subsystem. The maximum number of subsystems for each processor is:

- Two on the 9373
- Four on the 9375
- Twelve on the 9377.

To use this subsystem you need at least one DASD/Tape Controller (Feature 6010) with attached DASD on the system for loading the microcode.

IEEE 802.3 Local Area Network Adapter (Feature 6035)

Figure 4-16 on page 4-46 shows an IEEE 802.3 Local Area Network adapter card.

IEEE 802.3 Local Area Network Subsystem (Continued)

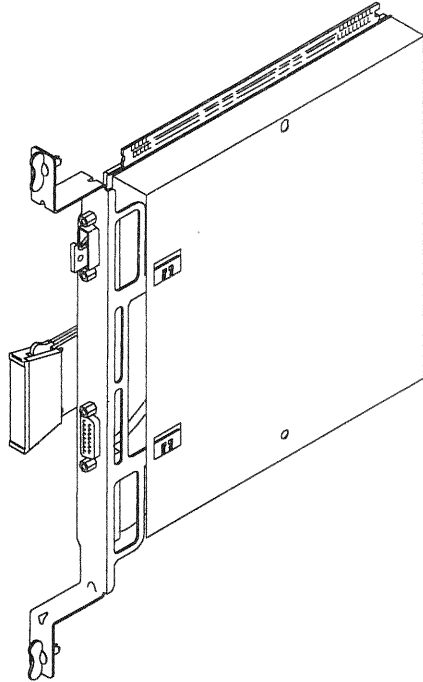


Figure 4-16. IEEE 802.3 Local Area Network Adapter

Each local area network controller (communications processor and adapter) provides for:

- The attachment of one local area network
- A speed of 10 million bps (bits per second)
- Compatibility with the IEEE 802.3 interface
- Connectivity to a maximum of 1023 stations on a network.

To order the local area network microcode, use *Form B3*, *B5*, or *B7* (as appropriate), depending on the type of processor that you are ordering. Use the same form that you used when specifying the other features on the system.

Find the heading *Communications Subsystem* and place a check in the appropriate box for the *IEEE 802.3 Local Area Network Subsystem*.

Once you decide how many networks you need, locate the table under *I/O Controllers and Adapters* on Form B.

Enter the number of the local area adapters needed (one for each network) under *Quantity*, next to Feature Number 6035 (IEEE 802.3 Adapter). You do not have to specify the number of required communication processors (Feature 6030). The IBM configurator program will automatically calculate this.

The external LAN hardware consists of multi-wire cables, terminators, transceivers (only version 2 transceivers are supported), repeaters, and coaxial cables. This external equipment is not available from IBM and must be purchased from other manufacturers.

Communication Adapter Cables

A communication adapter cable is shipped with the system for each communication line that is defined, except for the *IEEE 802.3 Local Area Network adapter*. The type of cable that is used determines the interface for the communication line. Changing the interface or line connection may require using a different communication adapter cable. Each communication adapter cable is wired for a specific interface and line connection.

Refer to *Appendix A, "Communication Cables"* for information on the communication cables. The cable part numbers, IBM's standard length, and the information necessary for assembling your own cables is provided in Appendix A.

Extension cables for the RS-232-C interface and the IBM Token-Ring adapter are available and must be ordered separately. See Figure 4-17 on page 4-48 for the specify codes and enter the quantity of each type of extension cable desired under *Quantity* on Form C3 under accessories.

Communication Adapter Cables (Continued)

| Description | Specify Code | Part Number | Length |
|----------------|--------------|-------------|----------------------|
| RS-232-C | 9232 | 6240608 | 6 meters (20 feet) |
| IBM Token-Ring | 9201 | 8642551 | 2.4 meters (8 feet) |
| | 9202 | 8642552 | 9.1 meters (30 feet) |

Figure 4-17. Communication Extension Cables

All communication adapter cables must be located within a building. They cannot be used outside or between buildings.

The following items on forms F1, F2, F3, F4, H1, and H2 cannot be completed until the communication networks are installed.

- Cable part number
- Communications processor card location
- Adapter card location and cable connector.

If you want to plan another type of communication subsystem:

- Go to “Telecommunications Subsystem” on page 4-2 for planning a telecommunications subsystem.
- Go to “ASCII Subsystem” on page 4-32 for planning an ASCII Subsystem.
- Go to “IBM Token-Ring Subsystem” on page 4-43 for planning an IBM Token-Ring Subsystem.
- Go to “IEEE 802.3 Local Area Network Subsystem” on page 4-45 for planning an IEEE 802.3 Local Area Network Subsystem.

This completes the tasks necessary for planning and selecting the equipment for the communications subsystems. Continue with one of the following:

- Chapter 5, “Planning Your System/370 Channel(s),” for planning S/370 channels.
- Chapter 6, “System Planning Summary,” for completing your system planning tasks.

This chapter helps you plan for standard System/370 channel I/O requirements. The devices you order depend on the type of work you are going to do. Your IBM marketing representative will assist you in selecting the machines best suited to your business needs.

Besides giving you information about I/O devices that attach to the S/370 Block Multiplexer Channel, this chapter also supplies you with information on:

- Using System/370 channels
- Addressing I/O devices
- Filling out the planning form for your System/370 I/O devices.

Introduction

The System/370 Block Multiplexer Channel (Feature 6003) consists of one logic card and two cables. The card resides in the processor card enclosure for the 9373 and 9375. It must be installed in the I/O Card Unit, Feature 5020, for the 9377. See "I/O Card Units" on page 2-5 for additional information on the I/O Card Unit.

The channel adapter directs the flow of data between processor storage and channel I/O devices. Each channel adapter provides a single System/370 standard block multiplexer channel. The channel adapter communicates with the I/O devices through control units.

A control unit may be a separate unit, or have its function integrated in the I/O device. For example, the IBM 3370, 3375 and 3380 Disk Drives attach to the channel through the IBM 3880 Storage Control Unit. The IBM 3430 Magnetic Tape Subsystem Model A01 contains a tape control unit and a tape drive in a single frame.

Many System/370 channel control units offer a multiple channel switch feature. This feature allows the control unit to attach to more than one System/370 channel.

Figure 5-1 shows an example of a System/370 channel subsystem.

Introduction (Continued)

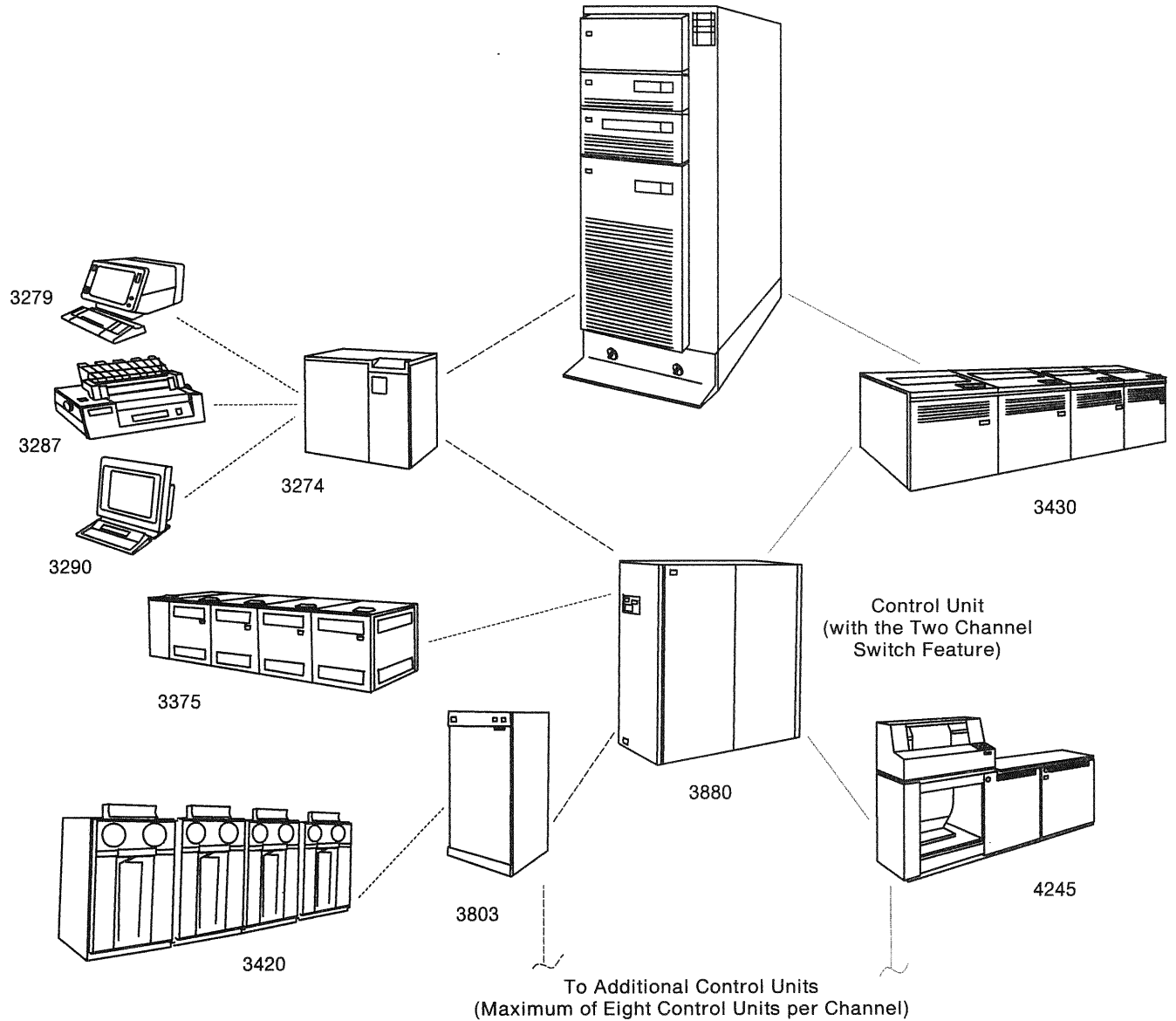


Figure 5-1. System/370 Devices Attached to a System Using the Block Multiplexer Channel

System Offerings

In the 9370 family of processors, the maximum number of S/370 Block Multiplexer Channel Adapters are:

- One on the 9373
- Two on the 9375
- Twelve on the 9377.

Restrictions for using channel adapters with the 9375:

Depending on the combination of the types of channel adapters you use with the 9375 Processor, you may exceed the available I/O card positions on the 9375.

Consequently, you may want to re-evaluate your system needs.

Restrictions for using channel adapters with the 9377:

- Depending on the combination of channel adapters you use in the I/O Card Unit for the 9377, you may exceed the available I/O card positions for the card unit. Consequently, you may need an additional I/O Card Unit (Feature 5020) and an I/O Card Unit Adapter (Feature 5000) for use with the 9377.
- Because of cabling limitations, the 9309 Rack can only hold eight channel adapters. If you use more than eight channel adapters with a 9377 Processor, a minimum of four of these channel adapters must reside in another 9309 Rack.

Note: You may be able to reduce required I/O card positions by re-evaluating how the I/O devices connect to the system. Contact your IBM marketing representative for assistance.

System/370 Channel I/O Devices

The channel adapter allows you to use a variety of System/370 I/O devices. The following tables show some common IBM disk drives, tape drives, printers, terminal controllers, and communication controllers that attach to the channel adapter. The type of channel adapter that can be used for each device type is also shown. See "Channel Adapter Types" on page 5-7, for a definition of

System/370 Channel I/O Devices (Continued)

the channel types. The 9375 and 9377 Processors support all of the devices shown. The 9373 Processor only supports those devices that can be used on a *Type C* channel adapter.

The I/O devices mentioned here serve only as an example. They do not represent all of the devices that can be attached. Your software must support any I/O devices that you use. See your IBM marketing representative for additional information on these products and other System/370 products.

Direct Access Storage Devices

This table shows direct access storage devices that you can connect to the System/370 channel adapter. All of these storage devices attach through a 3880 control unit and must operate in data streaming mode.

| Product Number | Product Description | Channel Type |
|-------------------------|---------------------------|--------------|
| 3330 | Direct Access Storage | A, B |
| 3340/44 | Direct Access Storage | A, B |
| 3350 | Direct Access Storage | A, B |
| 3370 | FBA Direct Access Storage | A, B |
| 3375 | Direct Access Storage | A, B |
| 3380 | CKD Direct Access Storage | A |
| 3880 (Models 1, 2, 4) | Storage Control Unit | A, B |
| 3880 (Models 3, 21, 23) | Storage Control Unit | A |

Tape Drive Devices

This table shows magnetic tape storage devices that you can connect to the System/370 channel adapter. The 3420 attaches through the 3803 control unit. The 3422, 3430, and 3480 do not require an external control unit.

| Product Number | Product Description | Channel Type |
|-------------------|-------------------------------|--------------|
| 3420 (See Note 1) | High Performance Tape Drive | A, B |
| 3422 | High Performance Tape Drive | A, B, C |
| 3430 | Medium Performance Tape Drive | A, B, C |
| 3480 | Cartridge Tape Drive | A, B, C |
| 3803 (See Note 2) | Tape Control Unit | A, B |

Notes:

- 1. The maximum channel cable length for 3420 Model 8 Tape Drives is limited to 22 meters (72 feet).*
- 2. The offset inter-lock data transfer feature is not supported on the 3803 Tape Control Unit.*

Channel Printer Devices

This table shows channel printers that connect directly to the System/370 channel adapter and do not require an external control unit.

| Product Name | Product Description | Channel Type |
|-------------------------|----------------------------|--------------|
| 3203 (Model 5) | Line Printer | A, B, C |
| 3262 (Model 5) | 650 LPM Line Printer | A, B, C |
| 3820 | 20 PPM Laser Page Printer | A, B, C |
| 4245 (Models 1, 12, 20) | 1200-2000 LPM Line Printer | A, B, C |
| 4248 | High-Speed Line Printer | A, B, C |

System/370 Channel I/O Devices (Continued)**Terminal Controllers**

This table shows 3270-type terminal controllers that you can connect to the System/370 channel adapter.

| Product Number | Product Description | Channel Type |
|----------------|------------------------------------|--------------|
| 3174 | Display/Printer Control Unit | A, B, C |
| 3274 | Display/Printer Control Unit | A, B, C |
| 7171 | ASCII Display/Printer Control Unit | A, B, C |

Communication Controllers

This table shows channel-attached communication controllers. Emulation Program (EP) and Partitioned Emulation Program (PEP) modes are not supported. These controllers must be run in Network Control Program (NCP) mode.

| Product Number | Product Description | Channel Type |
|----------------|---------------------------|--------------|
| 3705 | Communications Controller | A, B, C |
| 3720 | Communications Controller | A, B, C |
| 3725 | Communications Controller | A, B, C |

Other S/370 Products

This table shows other IBM products that you can connect to the System/370 channel adapter.

| Product Number | Product Description | Channel Type |
|---------------------|----------------------------------|--------------|
| 3044-C01 (See Note) | Channel Extender Link to 370 CTC | A, B, C |
| 4381 CTCA | Channel to Channel Adapter | A, B, C |
| 5080 | High-Function Graphics System | A, B, C |
| Series/1 | Mini-Computer | A, B, C |

Note: The 4381 CTCA (channel-to-channel adapter) is the only device supported through the 3044.

Channel Adapter Types

The System/370 channel adapters are divided into three types, depending on the speed of the fastest I/O device attached to the channel:

- *Type A* is used for speeds up to 3 megabytes/second.
- *Type B* is used for speeds up to 1.86 megabytes/second.
- *Type C* is used for speeds up to 1.5 megabytes/second.

Note: The 9373 Processor supports only the Type C channel adapter and can only be used if no more than one DASD/Tape Controller (Feature 6010) is also used.

The data rate of the devices you use determines which type of channel adapter you specify. The number of channel adapters that you can use on a single 9370 I/O bus is limited by the channel adapter types you specify. The IBM configurator program will determine where these cards are installed and will also determine the number of I/O Card Units, Feature 5020, required on a 9377 Processor.

Channel Adapter Types (Continued)

System/370 Channel Control Units

Each channel adapter can connect from one to eight control units.

Data Streaming Devices

Data streaming mode is an extension of the hardware protocol for I/O data transfer. It permits faster data transfer rates and increased System/370-to-control-unit cable length. Data streaming mode can operate on a System/370 channel, up to the maximum data rate of 3 megabytes per second.

Some System/370 channel control units can operate in this mode.

The 9373 Processor cannot use data streaming devices.

System/370 Channel Power Sequence and Control

The System/370 Channel Power Sequence and Control (Feature 6001) is used to sequentially power up the channel control units. This feature can control up to 16 control units and is only available on the 9375 and 9377 Processors. Only one channel power sequence and control feature can be installed on the 9375 and 9377 Processors.

Form E, System/370 Channel Information

Form E helps the person doing the physical planning determine on which channels to place each device and determine the proper cable lengths. It will also be used for the configuration phase when the system is installed.

This form is necessary to define the System/370 I/O devices to the system. The following people can help you get the necessary information to accurately fill out Form E:

- System programmer
- IBM marketing representative
- IBM service representative who will install the System/370 channel devices.

Filling In Form E

Select Form E, *System/370 Channel Information*, from the *Planning Forms*.

Customer Name and Number

Fill in the *Customer Name* and *Customer Number* in the upper-right corner of the planning form.

The form is designed for you to fill out a separate table for each channel with the control units to be attached to it.

Channel Identification

Fill in the *Channel Identification* for the channel you are defining. Use a number to refer to this channel.

Type

Enter the *Type* of channel needed: type A, B, or C depending on the speed required for this channel.

Control Unit Type and Model

This entry describes the channel control unit to the system.

Enter the *control unit type* and *model* for each System/370 control unit that you plan to attach to this channel.

Form E, System/370 Channel Information (Continued)**Address Range**

This entry defines the System/370 address assignment of the channel control unit and its attached devices to the system.

The 9370 processors use System/370 channel addresses for I/O operations. An address consists of the channel and device number. The first digit indicates the channel number. Channel numbers range from 0 to 15 (0–F in hexadecimal). The last two digits indicate the device address.

The system will be configured with default channel numbers and S/370 addresses when it arrives. You can use these S/370 channel numbers and addresses or change them when your system is installed. These channel numbers and addresses are assigned the default values necessary for using the VM/IS (Virtual Machine/Integrated System) operating system.

After you decide on which channel you want to put each device and the device address you want assigned to it, enter this data under the heading *Address Range*. For example, if you want to attach a 3803 Tape Control Unit and four 3420 Tape Drives to channel 2:

- Assign the device address range to start at 80.
- Enter 280–287 in the Address Range column. The 3803 Control Unit requires a block of 8 consecutive addresses, even if less than 8 devices are attached.
- Enter the address range data in hexadecimal (0–F).

Data Streaming Mode

System/370 control units that can operate in data streaming mode are set by the IBM service representative to operate in that mode for each channel to which they are attached. The IBM service representative sets data streaming on or off at the time the machine is installed.

Locate the column labeled *Data Stream*.

Place a check in the *Yes* box if you want the device to operate in data streaming mode. Place a check in the *No* box if you want the device to operate in non-data

streaming mode or if the control unit cannot operate in data streaming mode. For example, the 3803 Tape Control Unit cannot operate in data streaming mode. Consequently, place a check in the *No* box.

Comments

If you have any comments, put them on the line under the *Comments* column. For example, *6250 BPI tape drives*.

Go back to "Filling In Form E" on page 5-9 for any remaining S/370 channels that you need and repeat the procedure for filling out Form E.

Form B

After you select the System/370 I/O devices and know what channels you plan to install, you can determine the number of channel adapters that you will need. You will need one channel adapter for each required channel.

Select *Form B3*, *B5*, or *B7* from the *Planning Forms*. Use the same form that you started filling out in Chapter 2.

Filling in Form B

Add up the number of each type of channels that you have defined on *Form E*.

Locate the table under *I/O Controllers and Adapters* on *Form B*. Enter the quantity of each type of System/370 block multiplexer channel (type A, B, or C) desired in the *quantity* column next to Feature 6003 (A, B, or C).

Note: Type C is the only channel adapter that can be used on the 9373 Processor and can only be used if no more than one DASD/Tape Controller, Feature 6010, is also used.

If you are planning to use *System/370 Channel Power Sequence and Control* (Feature 6001), enter 1 under *Quantity* next to Feature 6001 on *Form B*. A maximum of

Form B (Continued)

one can be used with the 9375 and 9377 Processors. This feature cannot be used with the 9373 Processor.

Filling in Form C3

Use Form C3, *Other I/O Devices*, to record the machines that you want to order for use on the System/370 channels. Get a copy of Form C3 from the *Planning Forms*. If you have already used a copy of Form C3 to record other devices, use the same form.

Fill in the *Customer Name* and *Customer Number* if you have not already done so. Enter the quantity, type, model and description of each System/370 channel control unit and device desired.

System/370 Cables**Channel Signal Cable Lengths**

You and the person doing site planning must consider channel cable lengths when planning for System/370 channels. Maximum channel cable lengths are:

- 61 meters (200 feet) for non-data streaming devices
- 122 meters (400 feet) for data streaming devices operating in that mode.

Ordering

The site planner will specify the required length of the channel cables after deciding where the machines are going to be placed. The IBM marketing representative will then order these cables. IBM will supply and ship the channel cables before the channel control units arrive. Refer to the *IBM Sys/360, Sys/370, 4300 Processors I/O Equipment Installation Manual-Physical Planning*, GC22-7064 for more information on ordering these cables.

Installation

IBM will install and connect the I/O channel signal and power sequencing cables after customer setup is complete. If IBM is not installing the I/O control units, it is your responsibility to attach the cables to the system.

This completes the tasks for planning the System/370 channels. Continue with Chapter 6, "System Planning Summary."

The previous chapters have guided you on planning and selecting the hardware devices and features that will comprise your system. This chapter continues to provide you with necessary information for ordering and installing your system.

Preparing to Order The System

Your IBM marketing representative will need copies of the following planning forms as input to the configurator program to properly configure the system. The forms needed (if applicable) are:

- Form B3, B5, or B7 (Processor Configuration)
- Form C1 (9309 Rack Enclosure)
- Form C2 (Integrated DASD/Tape Devices)
- Form C3 (Other I/O Devices); verify that all of the following are included:
 - Work stations (displays, printers, plotters, personal computers)
 - 3299 Multiplexers
 - Communication devices (modems, terminals, control units)
 - S/370 channel devices
 - Accessories (downstream load programs and extension cables).
- Form F1, F2, F3, and F4 (Communication Line Information)
- Form H1 and H2 (ASCII Line Information).

This information will be used by the configurator program to determine the total minimum system requirements. The program will determine the required number of I/O processors, I/O adapters, I/O Card Units, and 9309 Racks.

Your IBM marketing representative will then contact you with this information and the current price of the system. The system will not be placed on order without your authorization.

Ordering Communication Facilities

After you confirm the system order, you should order any other needed equipment. If this has not already been done, you should do the following:

- If you are ordering modems from a modem supplier, contact them and order your modems.
- Order any other communication equipment, such as auto-call units and line couplers.
- Order your communication lines through the common carrier.

Operating System and Applications

The operating system should be ordered now if it has not already been ordered. Choosing an operating system depends on your type of business, the kind of hardware on the system, and the type of data processing that is being done. Your IBM marketing representative will help you define this. Contact your IBM marketing representative and select the type of operating system that best meets your requirements.

Ordering the Applications

If you want to order application programs from IBM, you can order them now. You should plan to have your applications arrive just before your system.

Writing Your Own Applications

Writing your own applications is a good idea if you currently have a programmer or want to train someone to be responsible for the programming activities.

If you plan to write your own programs, you must allow enough time to do so. The length of time required to write an application is difficult to estimate because of the variables involved. You should ask your programmer to estimate the time to do the job.

All applications should be tested once they are written. Plan to test your programs before your computer arrives. Consequently, you will do testing on another system and you will have to schedule test time in advance. Contact your IBM marketing representative for more information on testing your application programs.

Contract Programmer Services

If you decide to hire an outside programmer rather than use one of your own employees to write your applications, you should analyze your business needs and understand what is involved in writing your applications. The programmer should work with you on which business activities will be put on the computer. You should take sufficient time to explain the business to the contract programmer and what it is that you are trying to accomplish.

Microcode Customization

When your system is installed, you may want to customize specific areas of the microcode. The following items may be customized:

- Work Station Subsystem
- Telecommunications Subsystem
- ASCII Subsystem
- IBM Token-Ring Subsystem.

Although there is no prior planning needed for these tasks, you should choose someone to be responsible for this when the system is installed.

Ordering Computer Supplies

IBM offers a variety of supplies and accessories to operate your computer. Some of these supplies are:

- Diskettes
- Tape and tape reels
- Printer paper and ribbons

Ordering Computer Supplies (Continued)

- Office supplies
- Computer furniture.

Every supply, accessory, and piece of furniture can be ordered by phone. To get your catalog, call 1-800-IBM-2468. In Alaska or Hawaii, call 1-800-526-2484. Outside the United States, call 001-914-686-1900.

Some applications such as billing, payroll, and invoice may require special forms. If you have special form requirements for your printer, you should order the *Form Design Reference Guide for Printers*, GA24-3488.

Ordering Publications

To plan for and use your computer, applications, and program products, you should have a complete library of required publications.

At the time your IBM marketing representative gave you the manuals you are now using, you should have also received a copy of your System Library Subscription Service (SLSS) profile. This profile lists the manuals that you ordered. If you find that you are not receiving a manual that you need and it is not listed on your SLSS profile, call your IBM marketing representative. The manual will be added to your SLSS profile.

Physical Planning

You are now ready to complete your physical planning tasks. The individual that you have chosen to do your physical planning will find detailed information in the *Installation Manual – Physical Planning*, GA24-4031, which is included in this binder. This manual should be used for:

- Selecting the computer site
- Making a floor plan
- Determining S/370 channel cable lengths and ordering them
- Determining power requirements
- Making arrangements for building alterations.

You will be responsible for supplying cables for the:

- Work stations
- Local area network
- Token-Ring network.

Information on how to make these and other cables can be found in:

- *Appendix A, "Communication Cables"* of this manual
- *Installation and Assembly of Coaxial Cable and Accessories for Attachment to IBM Products, GA27-2805*
- *The IBM Cabling System Planning and Installation Guide, GA27-3361.*

You should now begin the physical planning activities, using the *IBM Installation Manual – Physical Planning, GA24-4031.*

This chapter describes how to plan for and order an upgrade for your system. One or more planning forms will be used to describe your upgrade and the necessary information that is needed for the IBM marketing representative to process your upgrade order.

Refer to *Introducing the IBM 9370 Information System*, GA24-4030, for a complete description of the available features and devices. Planning information and limitations on features and devices can be found in other chapters of this publication.

Preparing to Upgrade Your System

A copy of the current system configuration file will be required for all upgrades.

Begin preparing to order an upgrade for your system by copying the system configuration file on a diskette. This file contains specific information about the devices and features that comprise your system, their location, and how they are interconnected. Refer to *Operating Your System*, SA24-4036, for the procedure called *Prepare for System Upgrade* to generate this diskette.

Fill out a copy of Form J for all upgrades. Get a copy of Form J from the planning forms packet, GX24-4093-1, and fill in the following:

- Customer Name and Number
- System Type and Number (this information is printed on the external label on the Configuration Diskette)
- Your present processor type, model, and serial number
- Place a check in the appropriate box(es) that this upgrade applies to:
 - Processor
 - Integrated DASD/Tape
 - Local Work Stations
 - Communications
 - S/370 Channels.

Preparing to Upgrade Your System (Continued)

Additional Racks

When adding new features and devices, IBM will try to place these in your existing racks if there is room for them. In the event that your upgrade will include new racks, you should enter the following at the bottom of Form J1 under *Additional 9309 Rack Enclosures*:

- Place a check in the box for the model desired of any new racks. This may be all model 1, model 2, or a combination of model 1 and 2. This combination will result in the minimum size racks needed to hold the new devices.
- Reserved space (enter the number of EIA units to be reserved in a particular rack).

Additional 9309 racks will have the same nomenclature, power specification, and power cord as the existing racks in your system.

Processor Upgrade

A processor upgrade may consist of one or more of the following:

- Model Upgrade
- Processor Storage
- Automated Power Control.

Processor Model

The 9375 Model 40 can be upgraded to a Model 60 (Feature 4060). Either model of the 9375 can be upgraded to a 9377. Place a check in the appropriate box next to *Model Upgrade* on Form J to order the upgrade for your processor.

An upgrade from a 9375 to a 9377 will include:

- A 9377 with 8 megabytes of storage
- A new 9309 Model 2 rack containing the 9377 Processor
- An I/O Card Unit, Feature 5020
- A second I/O Card Unit, either Feature 5010 or 5020 as required for any remaining I/O controller cards.

Note: If 16 megabytes of storage is needed on the 9377, order Feature 4108 (8 megabytes of additional storage; see processor storage).

Due to cabling restrictions, the new rack containing the 9377 should be installed adjacent to the rack enclosure that presently contains the 9375. The 9375 Processor will be removed and the new I/O Card Units will be installed in its place. The I/O controller cards will be removed from the 9375 and installed in the new card unit(s).

Processor Storage

The amount of processor storage can be increased to a maximum of 16 megabytes for all processors. The following table shows the feature codes to order for each processor type. Find the present and desired storage size (in megabytes) for your processor. This specifies which feature code(s) to order.

Processor Upgrade (Continued)

| Processor Type | Present Storage | Desired Storage | Feature Code |
|----------------|-----------------|-----------------|---------------|
| 9373 | 4 | 8 | 4002 |
| | 4 | 16 | 4002 and 4008 |
| | 8 | 16 | 4008 |
| 9375 | 8 | 16 | 4008 |
| 9377 | 8 | 16 | 4108 |

Place a check in the appropriate box(es) under *Storage Upgrade* on Form J to indicate the Feature(s) needed for the additional storage.

If you are increasing the amount of storage on a 9373, Feature 4002 is a prerequisite for Feature 4008. That is, Feature 4002 must be installed prior to or in conjunction with Feature 4008. If you are increasing the storage from 4 to 16 megabytes on a 9373 Processor, place a check to indicate both Feature 4002 and 4008.

Automated Power Control (Feature 4000)

The Automated Power Control is an optional feature available on all 9370 processors. This feature provides for:

- Remote Power-on
- Timed Power-on
- Programmed Power-off.

Place a check in the appropriate box on Form J to add or remove this feature.

Integrated DASD/Tape Devices

Upgrades for the integrated (rack-mounted) DASD/tape devices may consist of:

- Additional disk drives
- Additional tape drives
- A combination of disk drives and tape drives.

Refer to “DASD/Tape Controller (Feature 6010)” on page 2-12 for information on integrated DASD/Tape devices and the DASD/Tape Controller.

Adding DASD/Tape Devices

Each DASD/Tape Controller can support:

- Up to four 9332 Model 400 Disk Drives and one 9347 Model 1 Tape Drive.
- One 9335 Model A01 Disk Drive Control Unit with up to four 9335 Model B01 Disk Drives.
- One 9347 Model 1 Tape Drive.

DASD/tape devices can be ordered either by specifying how they will be attached or by using the lowest-cost, balanced load arrangement. The balanced load arrangement will add devices to existing controllers up to the maximum allowed before adding an additional controller.

If you want to add DASD/tape devices without specifying which ones will be attached to a particular DASD/Tape Controller, continue with “Adding DASD/Tape Devices When Not Influencing String Positioning.”

If you want to specify which devices will attach to a particular controller (define the string positioning), continue with “Adding DASD/Tape Devices When Influencing String Positioning.”

Adding DASD/Tape Devices When Not Influencing String Positioning

Enter the quantity of additional devices under *Adding DASD/Tape When Not Influencing String Positioning* on Form J, part 2 (on the back of Form J) for each of the following:

- 9332 Model 400 Disk Drive
- 9335 Model B01 Disk Drive
- 9347 Model 1 Tape Drive.

Integrated DASD/Tape Devices (Continued)

The IBM configurator program will calculate the number of 9335 Model A01 Disk Drive Control Units and DASD/Tape Controllers (Feature 6010) needed, therefore you do not have to specify them. The configuration program will assign the devices to the controllers in a balanced load providing the lowest-cost combination.

Adding DASD/Tape Devices When Influencing String Positioning

DASD/tape devices may be ordered to be placed on a specific controller instead of defaulting to load balancing between controllers. If the string positioning is to be specified, enter the following information on Form J, part 2 (on the back of Form J) under *Adding DASD/Tape When Influencing String Positioning*.

If you are adding DASD/tape devices to an existing DASD/Tape Controller:

- Find the controller number to which you want to add the devices
- Fill in the present S/370 address of that controller
- Enter the number of additional devices to be added to that controller in the space provided below the controller number and next to the appropriate device type and model.

If you are adding DASD/tape devices to a new DASD/Tape Controller:

- Find the next available controller number
- Enter the number of disk drives or tape drives to be attached to that controller in the space provided below the controller number and next to the appropriate device type and model.

Note: The column 'Controller S/370 Address' is not used. A default address, which can be changed when the devices are installed, is assigned by the configurator program.

The DASD/Tape Controller for each new string must be specified. Continue with "DASD/Tape Controller (Feature 6010)."

DASD/Tape Controller (Feature 6010)

When adding DASD/tape devices and specifying the string positioning on a new controller, the DASD/Tape Controllers must also be specified. Fill in the following information on Form J under *I/O Controllers and Adapters*:

- 'Add' for adding the DASD/Tape Controller
- The 'Quantity' of DASD/Tape Controllers needed
- '6010' under feature number
- 'DASD/Tape Controller' under description
- 'Form J' under planning form.

Note: The column 'S/370 Address' is not used when adding a new DASD/Tape Controller. A default address, which can be changed when the controller is installed, is assigned by the configurator program.

Removing DASD/Tape Devices

If you are removing DASD/tape devices, enter the following on Form J, part 2 (on the back of Form J) under *Removing DASD/Tape Devices*:

- Type, model, and serial number of the device to be removed
- Description of the device to be removed
- S/370 address of the device to be removed.

Note: If all the DASD/tape devices are removed from a specific DASD/Tape Controller, the configurator program will also remove the DASD/Tape Controller and the 9335 Model A01 Disk Control Unit, if present.

Adding Local Work Stations

Refer to Chapter 3, “Planning Your Local Work Stations” for information on planning and ordering local work stations. This chapter also explains how to fill out the local work station diagram (Form D). After deciding on how many and what type of additional work stations are needed:

- Determine how many of these additional work stations are to be attached to existing local work station adapters (Feature 6020). Add these work stations to the local work station diagrams (Form D), for the existing adapters.
- Make out a new work station diagram (Form D) for any remaining additional devices.
- If you have filled out a new Form D, you will need to order a Work Station Controller, Feature 6020. Fill in the following information on Form J under *I/O Controllers and Adapters*.
 - ‘Add’ for adding the controller
 - The ‘Quantity’ of additional work station controllers (this is equal to the number of new Form Ds that you used)
 - ‘6020’ under feature number
 - ‘Work Station Controller’ under description
 - ‘Form D’ under planning form.

Note: The column ‘S/370 Address’ is not used when adding a new Work Station Controller. A default address, which can be changed when the controller is installed, is assigned by the configurator program.

- Use a copy of Form C3 for ordering any new work stations and multiplexers by specifying quantity, type, model and description. Enter a ‘1’ under quantity next to the appropriate specify code for the downstream load programs as required for the new work stations.

Removing a Work Station Controller

To remove a Work Station Controller, enter the following on Form J under *I/O Controllers and Adapters*:

- 'Remove' for removing the controller
- '1' for the quantity
- '6020' for the feature number
- 'Work Station Controller' for the description
- The present 'S/370 Address' of the Work Station Controller to be removed.

Note: The column 'Planning Form' is not used when removing a Work Station Controller.

Communications Subsystems

Refer to Chapter 4, "Planning Your Communications" for information on planning for a communications subsystem. If you are planning a new communication line or subsystem, place a check in the appropriate box(es) for the type of communication subsystem that you want to order under *Communications Subsystem* on Form J. Continue with the following information depending on the type of subsystem that is being ordered.

Telecommunications Subsystem

Refer to "Telecommunications Subsystem" on page 4-2 for information on planning a telecommunications subsystem.

Communications Subsystems (Continued)

Adding A Telecommunications Line

Fill out the following forms for all desired communication lines being added:

- Form F (F1, F2, F3, or F4 depending on the protocol used). Refer to “Defining a Network” on page 4-10, for information on filling out these forms.
- Form G (for any communication lines using modems). Refer to “Modems” on page 4-20, for information on filling out Form G.
- Form C3 (list any IBM modems and devices that you want to order for use on the telecommunications subsystem).

Note: When ordering the telecommunications subsystem, the number of communication processors and adapters do not have to be specified. The IBM configurator program will automatically calculate these requirements.

Removing A Telecommunications Line

Fill in the following information on Form J under *I/O Controllers and Adapters* for each telecommunications line to be removed:

- ‘Remove’ for removing the telecommunications line
- ‘1’ for the quantity
- ‘Telecommunications Line’ under description
- The present S/370 address of the telecommunications line to be removed under ‘S/370 Address’.

Note: The columns ‘Feature Number’ and ‘Planning Form’ are not used when removing a telecommunications line.

Altering A Telecommunications Line

Some characteristics on the telecommunications line, such as, interface, protocol, line speed, number of stop bits, and NRZI can be changed without using the IBM configurator program. Refer to *Operating Your System*, SA24-4036, for information on how to change the line parameters on the telecommunications line. When increasing the line speed of any telecommunications line, refer to “Communications Processor Aggregate Line Speed” on page 4-7 for information on the total aggregate line speed permissible on a telecommunications subsystem. Changing the interface or line connection may require using a different communication cable. Refer to Appendix A for information on communication cables. Individual cables may be ordered from IBM.

If you are changing the characteristics of a telecommunications line and you want to use the IBM configurator program, fill out both a *Remove* (to remove the existing line) and an *Add* (to add the new line with the desired characteristics) under *I/O Controllers and Adapters* on Form J as previously explained.

ASCII Subsystem

Refer to “ASCII Subsystem” on page 4-32 for information on planning an ASCII Subsystem.

Adding An ASCII Line

Fill out the following forms for all desired ASCII lines being added:

- Form H (H1 or H2 depending on the mode of operation used). Refer to “Defining an ASCII Subsystem Communication Line” on page 4-38, for information on filling out these forms.
- Form G (for any ASCII lines using modems). Refer to “Modems” on page 4-20, for information on filling out Form G.
- Form C3 (list any IBM modems and devices that you want to order for use on the ASCII subsystem).

Communications Subsystems (Continued)

Note: When ordering the ASCII subsystem, the number of communication processors and adapters do not have to be specified. The IBM configurator program will automatically calculate these requirements.

Removing An ASCII Line

Fill in the following information on Form J under *I/O Controllers and Adapters* for each ASCII line to be removed:

- 'Remove' for removing the ASCII line
- '1' for the quantity
- 'ASCII Line' under description
- The present S/370 address of the ASCII line to be removed under 'S/370 Address'.

Note: The columns 'Feature Number' and 'Planning Form' are not used when removing an ASCII line.

Altering An ASCII Line

Some characteristics on the ASCII subsystem, such as, interface, line speed, mode of operation, and number of stop bits can be changed without using the IBM configurator program. Refer to *Customizing the ASCII Subsystem* for information on customizing the ASCII subsystem. When increasing the line speed or changing the mode of operation (character or transparent) of any ASCII line, refer to "Maximum Lines Supported on an ASCII Subsystem" on page 4-34 for information on determining the total number of lines allowed on an ASCII subsystem. Changing the interface or line connection may require using a different communication cable. Refer to Appendix A for information on communication cables. Individual cables may be ordered from IBM.

If you are changing the characteristics of an ASCII line and you want to use the IBM configurator program, fill out both a *Remove* (to remove the existing line) and an *Add* (to add the new line with the desired characteristics)

under *I/O Controllers and Adapters* on Form J as previously explained.

IBM Token-Ring Subsystem

Refer to “IBM Token-Ring Subsystem” on page 4-43 for information on planning an IBM Token-Ring Subsystem. After you have decided how many networks are needed, fill in the following on Form J under *I/O Controllers and Adapters*:

- ‘Add’ for adding the token-ring adapter
- The ‘Quantity’ of networks needed
- ‘6034’ under feature number
- ‘IBM Token-Ring Adapter’ under description.

Note: The columns ‘Planning Form’ and ‘S/370 Address’ are not used. A default S/370 address, which can be changed when the subsystem is installed, is assigned by the configurator program.

When ordering the IBM Token-Ring Subsystem, the number of communication processors do not have to be specified. The IBM configurator program will automatically calculate this requirement.

Removing An IBM Token-Ring Adapter

Fill in the following under *I/O Controllers and Adapters* on Form J:

- ‘Remove’ for removing the adapter
- ‘1’ for the quantity to be removed
- ‘6034’ under feature number
- ‘IBM Token-Ring Adapter’ for the description
- The present ‘S/370 Address’ of the IBM Token-Ring Adapter to be removed.

Communications Subsystems (Continued)

Note: The column 'Planning Form' is not used when removing an IBM Token-Ring Adapter. Removal of the associated communications processor does not have to be specified; the configurator program will automatically remove it from the system.

IEEE 802.3 Local Area Network Subsystem

Refer to "IEEE 802.3 Local Area Network Subsystem" on page 4-45 for information on planning an IEEE 802.3 Local Area Network Subsystem. After you have decided how many networks are needed, fill in the following on Form J under *I/O Controllers and Adapters*:

- 'Add' for adding the IEEE 802.3 adapter
- The 'Quantity' of networks needed
- '6035' under feature number
- 'IEEE 802.3 Adapter' under description.

Note: The columns 'Planning Form' and 'S/370 Address' are not used. A default S/370 address, which can be changed when the subsystem is installed, is assigned by the configurator program.

When ordering the IEEE 802.3 Local Area Network Subsystem, the number of communication processors do not have to be specified. The IBM configurator program will automatically calculate this requirement.

Removing An IEEE 802.3 Adapter

Fill in the following under *I/O Controllers and Adapters* on Form J:

- 'Remove' for removing the adapter
- '1' for the quantity to be removed
- '6035' under feature number
- 'IEEE 802.3 Adapter' for the description

- The present 'S/370 Address' of the IEEE 802.3 Adapter to be removed.

Note: The column 'Planning Form' is not used when removing an IEEE 802.3 adapter. Removal of the associated communications processor does not have to be specified; the configurator program will automatically remove it from the system.

S/370 Block Multiplexer Channels

Refer to Chapter 5, "Planning Your System/370 Channel(s)" for information on planning S/370 Block Multiplexer Channels.

Adding S/370 Block Multiplexer Channels

Fill out a table on Form E for each new S/370 channel adapter. Fill in the following information on Form J under *I/O Controllers and Adapters* for each type (A, B, or C) of S/370 channel required.

- 'Add' for adding the channel adapter
- The 'Quantity' of each type of adapter
- '6003' under feature number (also specify type A, B, or C)
- 'S/370 Block Multiplexer' under description
- 'Form E' under planning form.

Note: The column 'S/370 Address' is not used when adding a new S/370 Block Multiplexer Channel. A default address, which can be changed when the channel adapter is installed, is assigned by the configurator program.

Use a copy of Form C3 to list all of the additional S/370 channel devices to be ordered by specifying quantity, type, model, and description.

S/370 Block Multiplexer Channels (Continued)

Removing S/370 Block Multiplexer Channels

Fill in the following information on Form J under *I/O Controllers and Adapters* for each S/370 channel to be removed:

- 'Remove' for removing the channel adapter
- '1' for the quantity
- '6003' under feature number (also specify type A, B, or C)
- 'S/370 Block Multiplexer' under description
- The present S/370 address of the channel adapter to be removed under 'S/370 Address'.

Note: The column 'Planning Form' is not used when removing a S/370 channel adapter.

Changing the Type of S/370 Block Multiplexer Channel

The type (A, B, or C) of S/370 channel adapter may be changed to a different type. To change the type of an installed channel adapter, fill out both a *Remove* (to remove the existing channel), and an *Add* (to add the new channel type) on Form J under *I/O Controllers and Adapters* as previously explained.

S/370 Channel Power Sequence and Control

To add or remove the S/370 Channel Power Sequence and Control, Feature 6001, fill in the following information on Form J under *I/O Controllers and Adapters*:

- 'Add' for adding or 'Remove' for removing the feature
- '1' for quantity
- '6001' under feature number

- 'S/370 Channel Power Sequence and Control' under description.

Note: The columns 'Planning Form' and 'S/370 Address' are not used with the Channel Power Sequence and Control feature.

Ordering The Upgrade

Contact your IBM marketing representative and give him or her a copy of the following planning forms, as applicable, that have been used while planning this upgrade.

- Form J (Upgrade Information)
- Form C3 (Other I/O Devices)
- Form F1, F2, F3, and F4 (Communication Line Information)
- Form H1 and H2 (ASCII Line Information)

Also, give him or her the diskette containing the system configuration file.

The upgrade order will be configured and the marketing representative will contact you with the current price of the upgrade before confirming the order.

Prepare to Install the Upgrade

All upgrades must be installed in the sequence in which they were ordered, unless your IBM marketing representative is notified to alter this sequence. After the upgrade has been ordered, the following tasks should be completed, as required.

- Change your floor plan to include any new equipment.
- Obtain or assemble work station cables.

Ordering The Upgrade (Continued)

- Obtain or assemble any communication cables where a length greater than the IBM standard length is required (See Appendix A for standard length).
- Obtain or assemble any IEEE 802.3 LAN cables.
- Determine the required length of S/370 channel cables and order them.
- Make arrangements for any additional power requirements for the new equipment.

Information on these tasks can be found in the *Installation Manual—Physical Planning*, GA24-4031 and Appendix A of this manual.

This appendix describes the communication cables used with the 9370 communication adapters. A section is provided for each adapter type which gives the information necessary for assembling your own cables, cable wrap connectors, and card wrap connectors.

Multi-protocol Adapter Cables

IBM supplies standard length communication cables and cable wrap connectors for each communication line with the multi-protocol adapter. The type of cable supplied is determined by the way that the communication line was defined when it was ordered. If more than the IBM standard length is required, you will have to assemble (or have a vendor assemble) the cable. See Figure A-2 on page A-3, for information on the multi-protocol adapter cables.

Assembling Multi-protocol Adapter Cables

If you are assembling your own cables, read the following information on bulk cable, connectors, and grounding.

Bulk Cable: Always use shielded bulk cable. The cable type (number of conductors and wire gauge) for each cable is shown in Figure A-2. To reduce the effects of crosstalk on the RS-232-C and CCITT V.24 interfaces, use a bulk cable with individually shielded conductors. The bulk cable can be purchased from IBM by the part number (P/N) provided. Specify the number of meters (feet) required when ordering the bulk cable from IBM.

Connectors: Always use tin-plated D-shell type connectors with industry-standard pins. IBM recommends that pins with snap-in, precision-formed contacts with insulation support be used. The connectors should be encased in a shielded housing. These are not available from IBM and must be purchased from other manufacturers.

The multi-protocol adapter uses a 50-pin, D-type, female cable connector to attach the cable to the adapter port. This connector, with pin locations, is shown in Figure A-1 on page A-2 (not drawn to scale).

Multi-protocol Adapter Cables (Continued)

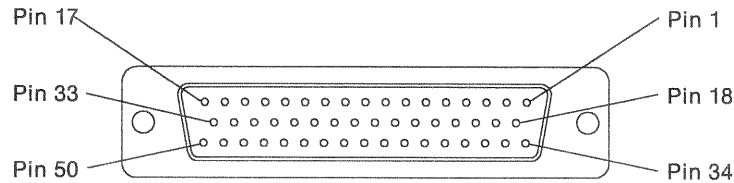


Figure A-1. Multi-protocol Adapter Cable Connector (viewed from connector side)

Plastic inserts are used in pin locations number 23 and 32 of the cable connector to prevent accidental plugging of the cables into the DASD/Tape Controller card. The multi-protocol adapter card does not have pins in these 2 positions.

The type of connector used on the DCE (data circuit-terminating equipment) end of the cable is shown in Figure A-2.

Grounding: The braided shield of the bulk cable should be attached to the D-shell connector only at the 9370 adapter end of the cable. The braid must be soldered continuously to the entire circumference of the D-shell connector. The shields of individually shielded conductors should be soldered to the signal ground conductor (pin 7) at the 9370 adapter end only. They should be left open, not connected, at the DCE end.

The cables used with the multi-protocol adapter are shown in Figure A-2.

| Interface Type | Line Connection | Cable P/N | DCE Cable Connector Type | Bulk Cable Type | Bulk Cable P/N | IBM Standard Length | Wiring Details On Page |
|-------------------------|-----------------------------------|-----------|--------------------------|---------------------------|----------------|---------------------|------------------------|
| RS-232-C | System-to-work station (no clock) | 70X8651 | 25-pin male | 14-wire 26 gauge | 60X8685 | 6 meters (20 feet) | A-5 |
| | Modem | 70X8655 | 25-pin male | 14-wire 26 gauge | 60X8685 | 6 meters (20 feet) | A-6 |
| | Extension cable | 6240608 | 25-pin male/female | 19-wire 26 gauge | 2452196 | 6 meters (20 feet) | A-8 |
| CCITT V.24 | Modem | 70X8659 | 25-pin male | 19-wire 26 gauge | 2452196 | 6 meters (20 feet) | A-9 |
| RS-366-A/ CCITT V.25 | Auto-call unit | 70X8656 | 25-pin male | 14-wire 26 gauge | 60X8685 | 6 meters (20 feet) | A-11 |
| RS-422-A | System-to-work station (no clock) | 70X8652 | 25-pin male | 2-twisted pair, 26 gauge | 4716743 | 15 meters (50 feet) | A-12 |
| | System-to-system (no clock) | 70X8661 | 50-pin female | 2-twisted pair, 26 gauge | 4716743 | 6 meters (20 feet) | A-13 |
| | System-to-system with clock | 70X8657 | 50-pin female | 8-twisted pair, 26 gauge | 2438315 | 6 meters (20 feet) | A-14 |
| | IBM Cabling System | 70X8658 | ICS Data connector | 2-twisted pair, 26 gauge | 4716743 | 6 meters (20 feet) | A-15 |
| CCITT X.21 | Nonswitched | 70X8653 | 15-pin male | 8-twisted pair, 26 gauge | 2438315 | 6 meters (20 feet) | A-16 |
| | Bis | 70X8660 | 25-pin male | 14-wire 26 gauge | 60X8685 | 6 meters (20 feet) | A-17 |
| CCITT V.35 | Nonswitched | 70X8654 | V.35 male | 11-twisted pair, 24 gauge | 58X7980 | 6 meters (20 feet) | A-19 |

Figure A-2. Multi-protocol Communication Adapter Cables

Multi-protocol Adapter Cables (Continued)

Multi-protocol Adapter Wrap Connector

A card wrap connector (P/N 60X8704) is furnished with each multi-protocol adapter for use with diagnostics. The wiring for the card wrap connector is shown below.

| Description | From Pin | To Pin |
|---|----------|----------------|
| Transmit data to receive data | 2 | 3 |
| Request to send to clear to send | 4 | 5 |
| Data terminal ready to data set ready | 24 | 6 |
| Data signal rate selector to receive line signal | 43 | 8 |
| Transmit signal element timing (DTE) to receive signal element timing (DCE) | 11 | 21 |
| Select standby to transmit signal element timing (DCE) | 29 | 19 |
| Remote loopback to ring indicator | 25 | 27 |
| Local loopback to test indicator | 22 | 12 |
| Transmit data A to receive data A (RS-422-A) | 18 | 37 |
| Transmit data B to receive data B (RS-422-A) | 34 | 20 |
| Control A to indicator A (RS-422-A) | 36 | 38 |
| Control B to indicator B (RS-422-A) | 35 | 39 |
| DTE clock A to select standby A (RS-422-A) | 10 | 40 |
| DTE clock B to select standby B (RS-422-A) | 9 | 41 |
| Transmit data A to receive data A, receive clock A, and transmit clock A (V.35) | 42 | 44, 13, 48 |
| Transmit data B to receive data B, receive clock B, and transmit clock B (V.35) | 26 | 31, 46, 30 |
| Signal ground to cable ID bits 1, 2, 3, and 4 | 7 | 16, 17, 33, 50 |

Multi-protocol Adapter Point-to-Point Cable Wiring

The point-to-point wiring for all cables used with the multi-protocol communication adapter card is shown on the following pages. Each type of cable is identified by specific pins (16, 17, 33, and 50) being connected to the signal ground (pin 7) of the adapter cable connector. This is called the ID (identification) bit configuration and allows the software to determine what type of cable, if any, is attached.

The end of the cable attaching to the adapter card is referred to as the 9370 connector and the other end is called the DCE (data circuit-terminating equipment) connector. When more than one pin number is shown in a column, it means that those pins are connected together at the connector.

RS-232-C System-to-Work Station (No Clock) Cable (P/N 70X8651)

| Interface Line Name | 9370 Connector Number | DCE Connector Number |
|--|-----------------------------|----------------------------|
| Transmit data to receive data | 2 | 3 |
| Receive data to transmit data | 3 | 2 |
| Request to send (RTS) and clear to send (CTS) to carrier detect | 4, 5 | 8 |
| Carrier detect to request to send (RTS) and clear to send (CTS) | 8 | 4, 5 |
| Data set ready (DSR) and data terminal ready (DTR) to data set ready (DSR) | 6, 24 | 6 |
| Wrap connector test indicator | 12 | 18 |
| Cable ID bits 2, 3, signal ground (Note 1) | 16, 50, 7 | 7 |

Notes:

1. Cable ID bits 2 and 3 (pins 16 and 50) are connected to pin 7 at the 9370 connector end of the cable and pin 7 at both ends are connected together.
2. IBM recommends that the maximum cable length should not exceed 15.2 meters (50 feet).

The wiring for the cable wrap connector (P/N 60X8668) is shown below.

| Description | From Pin | To Pin |
|---------------------------------------|----------|--------|
| Transmit data to receive data | 3 | 2 |
| Request to send to carrier detect | 4 | 8 |
| Test indicator to data data set ready | 18 | 6 |

Multi-protocol Adapter Cables (Continued)

RS-232-C Modem Cable (P/N 70X8655)

| Interface Line Name | Interchange Circuit Number | 9370 Connector Number | DCE Connector Number |
|---|----------------------------|-----------------------|----------------------|
| Transmit data | 103 | 2 | 2 |
| Receive data | 104 | 3 | 3 |
| Request to send (RTS) | 105 | 4 | 4 |
| Clear to send (CTS) | 106 | 5 | 5 |
| Data set ready (DSR) | 107 | 6 | 6 |
| Data terminal ready (DTR)/ Connect dataset to line (CDSTL) | 108.2, 108.1 | 24 | 20 |
| Receive line signal (Carrier detect) | 109 | 8 | 8 |
| Data signal rate selector | 111 | 43 | 23 |
| Transmit signal element timing (DTE) | 113 | 11 | 24 |
| Transmit signal element timing (DCE) | 114 | 19 | 15 |
| Receive signal element timing (DCE) | 115 | 21 | 17 |
| Select standby | 116 | 29 | 11 |
| Ring indicator | 125 | 27 | 22 |
| Cable ID bits 1, 4, signal ground (Note 1) | 102 | 17, 33, 7 | 7 |

Notes:

1. Cable ID bits 1 and 4 (pins 17 and 33) are connected to pin 7 at the 9370 connector end of the cable and pin 7 at both ends are connected together.
2. IBM recommends that the maximum cable length should not exceed 15.2 meters (50 feet).

The wiring for the RS-232-C modem cable wrap connector (P/N 60X8661) is shown below.

| Description | From Pin | To Pin |
|---|----------|--------|
| Transmit data to receive data | 2 | 3 |
| Request to send to clear to send | 4 | 5 |
| Data terminal ready to data set ready and ring indicator | 20 | 6, 22 |
| Data signal rate selector to receive line signal | 23 | 8 |
| Transmit signal element timing (DTE) to receive signal element timing (DCE) | 24 | 17 |
| Select standby to transmit signal element timing (DCE) | 11 | 15 |

Multi-protocol Adapter Cables (Continued)

RS-232-C Extension Cable (P/N 6240608)

| Interface Line Name | Extension Connector Number | DCE Connector Number |
|--------------------------------------|----------------------------------|----------------------------|
| Signal ground | 7 | 7 |
| Transmit data | 2 | 2 |
| Receive data | 3 | 3 |
| Request to send (RTS) | 4 | 4 |
| Clear to send (CTS) | 5 | 5 |
| Data set ready (DSR) | 6 | 6 |
| Data terminal ready (DTR) | 20 | 20 |
| Receive line signal (Carrier detect) | 8 | 8 |
| Data signal rate selector | 23 | 23 |
| Transmit signal element timing (DTE) | 24 | 24 |
| Transmit signal element timing (DCE) | 15 | 15 |
| Receive signal element timing (DCE) | 17 | 17 |
| Select standby | 11 | 11 |
| Ring indicator | 22 | 22 |
| Remote loopback | 21 | 21 |
| Local loopback | 18 | 18 |
| Test indicator | 25 | 25 |

Notes:

1. *Extension connector is a 25-pin female connector.*
2. *DCE connector is a 25-pin male connector.*
3. *IBM recommends that the maximum RS-232-C cable length, including the extension cable, should not exceed 15.2 meters (50 feet).*

There is no wrap connector for the extension cable.

CCITT V.24 Modem Cable (P/N 70X8659)

| Interface Line Name | Interchange Circuit Number | 9370 Connector Number | DCE Connector Number |
|---|---|--------------------------------------|-------------------------------------|
| Transmit data | 103 | 2 | 2 |
| Receive data | 104 | 3 | 3 |
| Request to send (RTS) | 105 | 4 | 4 |
| Clear to send (CTS) | 106 | 5 | 5 |
| Data set ready (DSR) | 107 | 6 | 6 |
| Data terminal ready (DTR)/ Connect dataset to line (CDSTL) | 108.2, 108.1 | 24 | 20 |
| Receive line signal (Carrier detect) | 109 | 8 | 8 |
| Data signal rate selector | 111 | 43 | 23 |
| Transmit signal element timing (DTE) | 113 | 11 | 24 |
| Transmit signal element timing (DCE) | 114 | 19 | 15 |
| Receive signal element timing (DCE) | 115 | 21 | 17 |
| Select standby | 116 | 29 | 11 |
| Ring indicator | 125 | 27 | 22 |
| Remote loopback | 140 | 25 | 21 |
| Local loopback | 141 | 22 | 18 |
| Test indicator | 142 | 12 | 25 |
| Cable ID bit 1, signal ground (Note 1) | 102 | 17, 7 | 7 |

Notes:

1. *Cable ID bit 1 (pin 17) is connected to pin 7 at the 9370 connector end of the cable and pin 7 at both ends are connected together.*
2. *IBM recommends that the maximum cable length should not exceed 15.2 meters (50 feet).*

Multi-protocol Adapter Cables (Continued)

The wiring for the CCITT V.24 modem cable wrap connector (P/N 60X8674) is shown below.

| Description | From Pin | To Pin |
|---|----------|--------|
| Transmit data to receive data | 2 | 3 |
| Request to send to clear to send | 4 | 5 |
| Data terminal ready to data set ready | 20 | 6 |
| Data signal rate selector to receive line signal | 23 | 8 |
| Transmit signal element timing (DTE) to receive signal element timing (DCE) | 24 | 17 |
| Remote loopback to ring indicator | 21 | 22 |
| Local loopback to test indicator | 18 | 25 |
| Select standby to transmit signal element timing (DCE) | 11 | 15 |

RS-366-A/CCITT V.25 Auto-call Unit Cable (P/N 70X8656)

| Interface Line Name | Interchange Circuit Number | 9370 Connector Number | DCE Connector Number |
|--|-----------------------------------|------------------------------|-----------------------------|
| Call request | 202 | 4 | 4 |
| Data line occupied (DLO) | 203 | 8 | 22 |
| Distant station connected | 204 | 5 | 13 |
| Abandon call and retry | 205 | 27 | 3 |
| Digit signal (2 ⁰) | 206 | 25 | 14 |
| Digit signal (2 ¹) | 207 | 43 | 15 |
| Digit signal (2 ²) | 208 | 21, 24 | 16 |
| Digit signal (2 ³) | 209 | 29 | 17 |
| Present next digit | 210 | 6 | 5 |
| Digit present | 211 | 22 | 2 |
| Power Indication | 213 | 12 | 6 |
| Cable ID bit 2, signal ground (Note 1) | 201 | 16, 7 | 7 |

Notes:

- 1. Cable ID bit 2 (pin 16) is connected to pin 7 at the 9370 connector end of the cable and pin 7 at both ends are connected together.*
- 2. IBM recommends that the maximum cable length should not exceed 15.2 meters (50 feet).*

The wiring for the cable wrap connector (P/N 60X8663) is shown below.

| Description | From Pin | To Pin |
|--|-----------------|---------------|
| Call request to distant station connected | 4 | 13 |
| Digit present to present next digit | 2 | 5 |
| Digit signal (2 ⁰) to data line occupied | 14 | 22 |
| Digit signal (2 ³) to abandon call and retry | 17 | 3 |
| Digit signal (2 ¹) to power indication | 15 | 6 |

Multi-protocol Adapter Cables (Continued)**RS-422-A System-to-Work Station (No Clock)
Cable (P/N 70X8652)**

| Interface Line Name | 9370 Connector Number | DCE Connector Number |
|---|-----------------------------|----------------------------|
| Transmit data A to receive data A | 18 | 15 |
| Transmit data B to receive data B | 34 | 17 |
| Receive data A to transmit data A | 37 | 19 |
| Receive data B to transmit data B | 20 | 25 |
| Cable ID bits 1, 3, signal ground (see Note 1) | 17, 50, 7 | 7 |

Notes:

- Cable ID bits 1 and 3 (pins 17 and 50) are connected to pin 7 at the 9370 connector end of the cable and pin 7 at both ends are connected together.*
- IBM recommends that the maximum cable length should not exceed 1219 meters (4000 feet).*

The wiring for the cable wrap connector (P/N 60X8669) is shown below.

| Description | From Pin | To Pin |
|-----------------------------------|----------|--------|
| Transmit data A to receive data A | 15 | 19 |
| Transmit data B to receive data B | 17 | 25 |

**RS-422-A System-to-System (No Clock) Cable
(P/N 70X8661)**

| Interface Line Name | 9370 (primary) Connector Number | 9370 (secondary) Connector Number |
|--|--|--|
| Transmit data A to receive data A | 18 | 37 |
| Transmit data B to receive data B | 34 | 20 |
| Receive data A to transmit data A | 37 | 18 |
| Receive data B to transmit data B | 20 | 34 |
| Cable ID bits 1, 3, signal ground (Note 1) | 17, 50, 7 | NA |
| Cable ID bits 1, 3, signal ground (Note 1) | NA | 17, 50, 7 |

Notes:

1. *Cable ID bits 1 and 3 (pins 17 and 50) are connected to pin 7 at both ends of the cable, but pin 7 is not connected between the cable ends.*
2. *IBM recommends that the maximum cable length should not exceed 1219 meters (4000 feet).*

The wiring for the cable wrap connector (P/N 60X8666) is shown below.

| Description | From Pin | To Pin |
|-----------------------------------|-----------------|---------------|
| Transmit data A to receive data A | 18 | 37 |
| Transmit data B to receive data B | 34 | 20 |

Multi-protocol Adapter Cables (Continued)

RS-422-A System-to-System (With Clock) Cable
(P/N 70X8657)

| Interface Line Name | 9370 (primary) Connector Number | 9370 (secondary) Connector Number |
|---|---------------------------------------|---|
| Transmit data A to receive data A | 18 | 37 |
| Transmit data B to receive data B | 34 | 20 |
| Receive data A to transmit data A | 37 | 18 |
| Receive data B to transmit data B | 20 | 34 |
| DTE clock A to signal timing A | 10 | 40 |
| DTE clock B to signal timing B | 9 | 41 |
| Control A to indicate A | 36 | 38 |
| Control B to indicate B | 35 | 39 |
| Wrap test wire indicator A | 38 | 38 |
| Wrap test wire indicator B | 39 | 39 |
| Wrap test wire ST A | 40 | 40 |
| Wrap test wire ST B | 41 | 41 |
| Cable ID bits 1, 2, 3, signal ground (Note 1) | 17, 16, 50, 7 | NA |
| Cable ID bit 4, signal ground (Note 1) | NA | 33, 7 |

Notes:

- Cable ID bits 1, 2, and 3 (pins 17, 16, and 50) are connected to pin 7 at the 9370 primary station end. Cable ID bit 4 (pin 33) is connected to pin 7 at the 9370 secondary station end. Pin 7 is not connected between the cable ends.*
- IBM recommends that the maximum cable length should not exceed 300 meters (985 feet).*

The wiring for the cable wrap connector (P/N 60X8666) is shown below.

| Description | From Pin | To Pin |
|-----------------------------------|----------|--------|
| Transmit data A to receive data A | 18 | 37 |
| Transmit data B to receive data B | 34 | 20 |

RS-422-A IBM Cabling System Cable (P/N 70X8658)

| Interface Line Name | 9370 Connector Number | ICS Connector |
|--|------------------------------|----------------------|
| Transmit data A | 18 | Orange dot |
| Transmit data B | 34 | Black dot |
| Receive data A | 37 | Red dot |
| Receive data B | 20 | Green dot |
| Cable ID bits 1, 3, signal ground (Note 1) | 17, 50, 7 | NA |

Notes:

- 1. Cable ID bits 1 and 3 (pins 17 and 50) are connected to pin 7 at the 9370 connector end of the cable.*
- 2. IBM recommends that the maximum cable length (adapter cable plus building wiring) should not exceed 1219 meters (4000 feet).*

There is no wrap connector for this cable.

Multi-protocol Adapter Cables (Continued)

CCITT X.21 Nonswitched Cable (P/N 70X8653)

| Interface Line Name | 9370 Connector Number | DCE Connector Number |
|--|-----------------------|----------------------|
| Transmit data A | 18 | 2 |
| Transmit data B | 34 | 9 |
| Receive data A | 37 | 4 |
| Receive data B | 20 | 11 |
| Control A | 36 | 3 |
| Control B | 35 | 10 |
| Indication A | 38 | 5 |
| Indication B | 39 | 12 |
| Signal element timing A | 40 | 6 |
| Signal element timing B | 41 | 13 |
| Cable ID bit 3, signal ground (Note 1) | 50, 7 | 8 |

Notes:

1. Cable ID bit 3 (pin 50) is connected to pin 7 at the 9370 connector end of the cable and pin 7 at the 9370 connector end is connected to pin 8 at the DCE end.
2. IBM recommends that the maximum cable length should not exceed 300 meters (985 feet).

The wiring for the cable wrap connector (P/N 60X8664) is shown below.

| Description | From Pin | To Pin |
|---|----------|--------|
| Transmit data A to receive data A and signal element timing A | 2 | 4, 6 |
| Transmit data B to receive data B and signal element timing B | 9 | 11, 13 |
| Control A to Indication A | 3 | 5 |
| Control B to Indication B | 10 | 12 |

CCITT X.21 Bis Cable (P/N 70X8660)

| Interface Line Name | Interchange Circuit Number | 9370 Connector Number | DCE Connector Number |
|--|---|--------------------------------------|-------------------------------------|
| Transmit data | 103 | 2 | 2 |
| Receive data | 104 | 3 | 3 |
| Request to send (RTS) | 105 | 4 | 4 |
| Clear to send (CTS) | 106 | 5 | 5 |
| Data set ready (DSR) | 107 | 6 | 6 |
| Data terminal ready (DTR)/ Connect data set to line (CDSTL) | 108.2, 108.1 | 24 | 20 |
| Receive line signal (Carrier detect) | 109 | 8 | 8 |
| Transmit signal element timing (DCE) | 114 | 19 | 15 |
| Receive signal element timing (DCE) | 115 | 21 | 17 |
| Ring indicator | 125 | 27 | 22 |
| Local loopback | 141 | 22 | 18 |
| Remote loopback | 140 | 25 | 21 |
| Test Indicator | 142 | 12 | 25 |
| Cable ID bits 2, 4, signal ground (Note 1) | 102 | 16, 33, 7 | 7 |

Notes:

1. *Cable ID bits 2 and 4 (pins 16 and 33) are connected to pin 7 at the 9370 connector end of the cable and pin 7 at both ends are connected together.*
2. *IBM recommends that the maximum cable length should not exceed 300 meters (985 feet).*

Multi-protocol Adapter Cables (Continued)

The wiring for the CCITT X.21 bis cable wrap connector (P/N 60X8662) is shown below.

| Description | From Pin | To Pin |
|---|-----------------|---------------|
| Transmit data to receive data and receive signal element timing | 2 | 3, 17 |
| Request to send to clear to send and receive line signal | 4 | 5, 8 |
| Data terminal ready to data set ready | 20 | 6 |
| Remote loopback to ring indicator | 21 | 22 |
| Local loopback to test indicator and transmit signal element timing | 18 | 25, 15 |

CCITT V.35 Nonswitched Cable (P/N 70X8654)

| Interface Line Name | 9370 Connector Number | DCE Connector Number |
|--|-----------------------|----------------------|
| Transmit data A | 42 | P |
| Transmit data B | 26 | S |
| Receive data A | 44 | R |
| Receive data B | 31 | T |
| Request to send (RTS) | 4 | C |
| Clear to send (CTS) | 5 | D |
| Data set ready (DSR) | 6 | E |
| Receive line signal (carrier detect) | 8 | F |
| Transmit signal element timing A (DCE) | 48 | Y |
| Transmit signal element timing B (DCE) | 30 | a |
| Receive signal element timing A (DCE) | 13 | V |
| Receive signal element timing B (DCE) | 46 | X |
| Cable ID bits 1, 2, signal ground (Note 1) | 17, 16, 7 | B, L |

Notes:

- Cable ID bits 1 and 2 (pins 17 and 16) are connected to pin 7 at the 9370 connector end of the cable and pin 7 at the 9370 connector end is connected to pins B and L at the DCE end.*
- IBM recommends that the maximum cable length should not exceed 300 meters (985 feet).*

The wiring for the cable wrap connector (P/N 60X8665) is shown below.

| Description | From Pin | To Pin |
|--|----------|---------|
| Transmit data A to receive data A, transmit signal element timing A, and receive signal element timing A | P | R, Y, V |
| Transmit data B to receive data B, transmit signal element timing B, and receive signal element timing B | S | T, A, X |
| Request to send to clear to send, data set ready, and receive line signal | C | D, E, F |

Asynchronous Adapter Cables

IBM supplies standard length communication cables and cable wrap connectors for each communication line with the asynchronous adapter. The type of cable supplied is determined by the way that the communication line was defined when it was ordered. If more than the IBM standard length is required, you will have to assemble (or have a vendor assemble) the cable. See Figure A-4 on page A-21, for information on the asynchronous adapter cables.

Assembling Asynchronous Adapter Cables

If you are assembling your own cables, read the following information on bulk cable, connectors, and grounding.

Bulk Cable: Always use shielded bulk cable. The cable type (number of conductors and wire gauge) for each cable is shown in Figure A-4. To reduce the effects of crosstalk on the RS-232-C and CCITT V.24 interfaces, use a bulk cable with individually shielded conductors. The bulk cable can be purchased from IBM by the part number (P/N) provided. Specify the number of meters (feet) required when ordering the bulk cable from IBM.

Connectors: Always use tin-plated D-shell type connectors with industry-standard pins. IBM recommends that pins with snap-in, precision-formed contacts with insulation support be used. The connectors should be encased in a shielded housing. These are not available from IBM and must be purchased from other manufacturers.

The asynchronous adapter uses a 26-pin, D-type, male cable connector to attach the cable to the adapter port. This connector, with pin locations, is shown below (not drawn to scale).

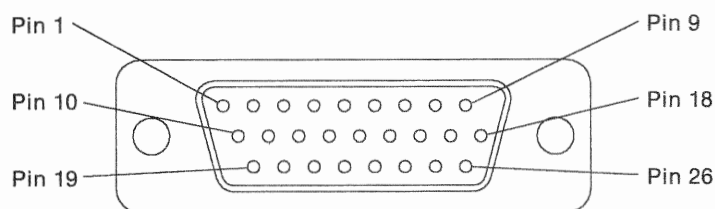


Figure A-3. Asynchronous Adapter Cable Connector (viewed from connector side)

The type of connector used on the DCE (data circuit-terminating equipment) end of the cable is shown in Figure A-4.

Grounding: The braided shield of the bulk cable should be attached to the D-shell connector only at the 9370 adapter end of the cable. The braid must be soldered continuously to the entire circumference of the D-shell connector. The shields of individually shielded conductors should be soldered to the signal ground conductor (pin 10) at the 9370 adapter end only. They should be left open, not connected, at the DCE end.

The cables used with the asynchronous adapter are shown in Figure A-4.

| Interface Type | Line Connection | Cable P/N | DCE Cable Connector Type | Bulk Cable Type | Bulk Cable P/N | IBM Standard Length | Wiring Details On Page |
|----------------|-----------------------------------|-----------|--------------------------|--------------------------|----------------|---------------------|------------------------|
| RS-232-C | System-to-work station (no clock) | 6240581 | 25-pin male | 14-wire 26 gauge | 60X8685 | 6 meters (20 feet) | A-23 |
| | Modem | 6240555 | 25-pin male | 14-wire 26 gauge | 60X8685 | 6 meters (20 feet) | A-24 |
| | Extension cable | 6240608 | 25-pin male/female | 19-wire 26 gauge | 2452196 | 6 meters (20 feet) | A-26 |
| CCITT V.24 | Modem | 6240555 | 25-pin male | 14-wire 26 gauge | 60X8685 | 6 meters (20 feet) | A-24 |
| RS-422-A | System-to-work station (no clock) | 6240583 | 25-pin male | 2-twisted pair, 26 gauge | 4716743 | 15 meters (50 feet) | A-27 |
| | System-to-system (no clock) | 6240556 | 26-pin male | 2-twisted pair, 26 gauge | 4716743 | 6 meters (20 feet) | A-28 |
| | IBM Cabling System | 6240557 | ICS Data connector | 2-twisted pair, 26 gauge | 4716743 | 6 meters (20 feet) | A-29 |

Figure A-4. Asynchronous Communication Adapter Cables

Asynchronous Adapter Cables (Continued)

Asynchronous Adapter Wrap Connector

A card wrap connector (P/N 60X8732) is furnished with each asynchronous adapter for use with diagnostics. The wiring for the card wrap connector is shown below.

| Description | From Pin | To Pin |
|--|----------|--------|
| Transmit data to receive data | 2 | 3 |
| Request to send to clear to send | 4 | 5 |
| Data terminal ready to data set ready | 21 | 6 |
| Data signal rate selector to receive line signal | 13 | 11 |
| Remote loopback to ring indicator | 14 | 12 |
| Local loopback to test indicator | 23 | 22 |
| Transmit data A to receive data A (RS-422-A) | 16 | 19 |
| Transmit data B to receive data B (RS-422-A) | 15 | 20 |

Asynchronous Adapter Point-to-Point Cable Wiring

The point-to-point wiring for all cables used on the asynchronous communication adapter card is shown on the following pages. Each type of cable is identified by specific pins (24 and 25) being connected to the signal ground (pin 10) of the adapter cable connector. This is called the ID (identification) bit configuration and allows the software to determine what type of cable, if any, is attached.

The end of the cable attaching to the adapter card is referred to as the 9370 connector and the other end will be called the DCE (data circuit-terminating equipment) connector. When more than one pin number is shown in a column, it means that those pins are connected together at the connector.

**RS-232-C System-to-Work Station (No Clock)
Cable (P/N 6240581)**

| Interface Line Name | 9370 Connector Number | DCE Connector Number |
|--|--------------------------------------|-------------------------------------|
| Transmit data to receive data | 2 | 3 |
| Receive data to transmit data | 3 | 2 |
| Request to send and clear to send to receive line signal (carrier detect) | 4, 5 | 8 |
| Receive line signal (carrier detect) to request to send and clear to send | 11 | 4, 5 |
| Data set ready and data terminal ready to data set ready | 6, 21 | 6 |
| Wrap connector test indicator | 22 | 25 |
| Cable ID bit 2, signal ground (Note 1) | 25, 10 | 7 |

Notes:

- 1. Cable ID bit 2 (pin 25) is connected to signal ground (pin 10) at the 9370 connector end of the cable and pin 10 at the 9370 connector end is connected to pin 7 at the DCE end.*
- 2. IBM recommends that the maximum cable length should not exceed 15.2 meters (50 feet).*

The wiring for the cable wrap connector (P/N 60X8672) is shown below.

| Description | From Pin | To Pin |
|---|-----------------|---------------|
| Transmit data to receive data | 3 | 2 |
| Request to send to receive line signal | 4 | 8 |
| Data set ready to test indicator | 6 | 25 |

Asynchronous Adapter Cables (Continued)

**RS-232-C/CCITT V.24 Modem Cable (P/N
6240555)**

| Interface Line Name | Interchange Circuit Number | 9370 Connector Number | DCE Connector Number |
|--|---|--------------------------------------|-------------------------------------|
| Transmit data | 103 | 2 | 2 |
| Receive data | 104 | 3 | 3 |
| Request to send (RTS) | 105 | 4 | 4 |
| Clear to send (CTS) | 106 | 5 | 5 |
| Data set ready (DSR) | 107 | 6 | 6 |
| Data terminal ready (DTR) | 108.2 | 21 | 20 |
| Receive line signal (Carrier detect) | 109 | 11 | 8 |
| Data signal rate selector | 111 | 13 | 23 |
| Ring indicator | 125 | 12 | 22 |
| Remote loopback | 140 | 14 | 21 |
| Local loopback | 141 | 23 | 18 |
| Test indicator | 142 | 22 | 25 |
| Cable ID bits 1, 2, signal ground (Note 1) | 102 | 24, 25, 10 | 7 |

Notes:

- Cable ID bits 1 and 2 (pins 24 and 25) are connected to pin 10 at the 9370 connector end of the cable and pin 10 at the 9370 end is connected to pin 7 at the DCE end.*
- IBM recommends that the maximum cable length should not exceed 15.2 meters (50 feet).*

The wiring for the RS-232-C and CCITT V.24 modem cable wrap connector (P/N 60X8670) is shown below.

| Description | From Pin | To Pin |
|--|-----------------|---------------|
| Transmit data to receive data | 2 | 3 |
| Request to send to clear to send | 4 | 5 |
| Data terminal ready to data set ready | 20 | 6 |
| Data signal rate selector to receive line signal | 23 | 8 |
| Local loopback to test indicator | 18 | 25 |
| Remote loopback to ring indicator | 21 | 22 |

Asynchronous Adapter Cables (Continued)**RS-232-C Extension Cable (P/N 6240608)**

| Interface Line Name | Extension Connector Number | DCE Connector Number |
|--------------------------------------|---|-------------------------------------|
| Signal ground | 7 | 7 |
| Transmit data | 2 | 2 |
| Receive data | 3 | 3 |
| Request to send (RTS) | 4 | 4 |
| Clear to send (CTS) | 5 | 5 |
| Data set ready (DSR) | 6 | 6 |
| Data terminal ready (DTR) | 20 | 20 |
| Receive line signal (Carrier detect) | 8 | 8 |
| Data signal rate selector | 23 | 23 |
| Transmit signal element timing (DTE) | 24 | 24 |
| Transmit signal element timing (DCE) | 15 | 15 |
| Receive signal element timing (DCE) | 17 | 17 |
| Select standby | 11 | 11 |
| Ring indicator | 22 | 22 |
| Remote loopback | 21 | 21 |
| Local loopback | 18 | 18 |
| Test indicator | 25 | 25 |

Notes:

1. *Extension connector is a 25-pin female connector.*
2. *DCE connector is a 25-pin male connector.*
3. *IBM recommends that the maximum RS-232-C cable length, including the extension cable, should not exceed 15.2 meters (50 feet).*

There is no wrap connector for the extension cable.

**RS-422-A System-to-Work Station (No Clock)
Cable (P/N 6240583)**

| Interface Line Name | 9370 Connector Number | DCE Connector Number |
|--|--------------------------------------|-------------------------------------|
| Transmit data A to receive data A | 16 | 15 |
| Transmit data B to receive data B | 15 | 17 |
| Receive data A to transmit data A | 19 | 19 |
| Receive data B to transmit data B | 20 | 25 |
| Cable ID bit 1, signal ground (Note 1) | 24, 10 | 7 |

Notes:

1. *Cable ID bit 1 (pin 24) is connected to signal ground (pin 10) at the 9370 connector end of the cable and pin 10 at the 9370 end is connected to pin 7 at the DCE end.*
2. *IBM recommends that the maximum cable length should not exceed 1219 meters (4000 feet).*

The wiring for the cable wrap connector (P/N 60X8673) is shown below.

| Description | From Pin | To Pin |
|-----------------------------------|-----------------|---------------|
| Transmit data A to receive data A | 15 | 19 |
| Transmit data B to receive data B | 17 | 25 |

Asynchronous Adapter Cables (Continued)

RS-422-A System-to-System (No Clock) Cable
(P/N 6240556)

| Interface Line Name | 9370 (primary) Connector Number | 9370 (secondary) Connector Number |
|--|---------------------------------------|---|
| Transmit data A to receive data A | 16 | 19 |
| Transmit data B to receive data B | 15 | 20 |
| Receive data A to transmit data A | 19 | 16 |
| Receive data B to transmit data B | 20 | 15 |
| Cable ID bit 1, signal ground (Note 1) | 24, 10 | NA |
| Cable ID bit 1, signal ground (Note 1) | NA | 24, 10 |

Notes:

- Cable ID bit 1 (pin 24) is connected to signal ground (pin 10) at both ends of the cable, but pin 10 is not connected between the cable ends.*
- IBM recommends that the maximum cable length should not exceed 1219 meters (4000 feet).*

The wiring for the cable wrap connector (P/N 60X8671) is shown below.

| Description | From Pin | To Pin |
|-----------------------------------|----------|--------|
| Transmit data A to receive data A | 19 | 16 |
| Transmit data B to receive data B | 20 | 15 |

**RS-422-A IBM Cabling System Cable (P/N
6240557)**

| Interface Line Name | 9370 Connector Number | ICS Connector |
|--|--------------------------------------|--------------------------|
| Transmit data A | 16 | Orange dot |
| Transmit data B | 15 | Black dot |
| Receive data A | 19 | Red dot |
| Receive data B | 20 | Green dot |
| Cable ID bit 1, signal ground (Note 1) | 24, 10 | NA |

Notes:

- 1. Cable ID bit 1 (pin 24) is connected to signal ground (pin 10) at the 9370 connector end of the cable.*
- 2. IBM recommends that the maximum cable length (adapter cable plus building wiring) should not exceed 1219 meters (4000 feet).*

There is no wrap connector for this cable.

IBM Token-Ring Adapter Cable

IBM supplies a cable (P/N 6339098) with each token-ring adapter card for connecting to a token-ring network. Extension cables must be ordered separately. See Figure A-5 for information on IBM token-ring adapter cables.

| Description | Specify Code | Part Number | Length |
|-----------------|--------------|-------------|----------------------|
| Adapter Cable | NA | 6339098 | 2.4 meters (8 feet) |
| Extension Cable | 9201 | 8642551 | 2.4 meters (8 feet) |
| | 9202 | 8642552 | 9.1 meters (30 feet) |

Figure A-5. IBM Token-Ring Adapter Cables

A telephone twisted-pair token-ring network with a type 3 media filter (not available from IBM) can be used instead of the IBM Cabling System. When using media cable, refer to the *IBM Token-Ring Network Telephone Twisted-Pair Media Guide*, GA27-3714.

Token-Ring Adapter Wrap Connector

IBM supplies a wrap connector (P/N 6165899) with the adapter card for use with diagnostics. The point-to-point wiring of the token-ring adapter wrap connector is shown below.

| Description | From Pin | To Pin |
|-------------|----------|--------|
| TX+ to RX+ | 9 | 1 |
| TX- to RX- | 5 | 6 |

Assembling Token-Ring Adapter Cables

If you are assembling your own cables (or having a vendor assemble them), read the following information on bulk cable and connectors.

Bulk cable: Use a 2-twisted pair, 4-conductor, 26 gauge cable. This can be purchased from IBM by part number 4716743. Specify the number of meters (feet) required.

Connectors: The token-ring adapter uses a 9-pin D-type male connector to attach the cable to the adapter port. On the 9370 end, use tin-plated connectors with industry standard pins. IBM recommends that pins with snap-in, precision-formed contacts with insulation support be used. Make sure that the connectors are encased in a shielded housing. The token-ring adapter cable connector, with pin locations, is shown below (not drawn to scale).

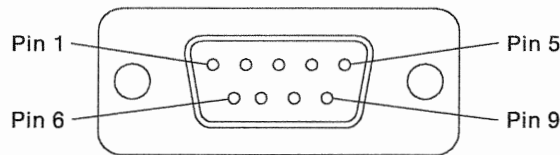


Figure A-6. IBM Token-Ring Adapter Cable Connector (viewed from connector side)

On the DCE end, use an IBM Cabling System (ICS) Data connector. This connector is available from IBM (P/N 8310574) or can be purchased from another vendor.

Grounding: No special grounding is necessary for this adapter.

Token-Ring Adapter Cable Point-to-point Wiring (P/N 6339098)

The token-ring adapter cable point-to-point wiring is shown below.

| Interface Line Name | 9370 Connector Number | ICS Data Connector |
|--------------------------|-----------------------------|-----------------------|
| Transmit positive (TX +) | 9 | Orange dot |
| Transmit negative (TX-) | 5 | Black dot |
| Receive positive (RX +) | 1 | Red dot |
| Receive negative (RX-) | 6 | Green dot |

A token-ring adapter cable wrap connector is not required.

IBM Token-Ring Adapter Cable (Continued)**Token-Ring Adapter Extension Cable
Point-to-point Wiring**

The token-ring adapter extension cable point-to-point wiring is shown below.

| Interface Line Name | Extension Connector | ICS Data Connector |
|--------------------------------|--------------------------------|-------------------------------|
| Transmit positive (TX+) | Orange dot | Orange dot |
| Transmit negative (TX-) | Black dot | Black dot |
| Receive positive (RX+) | Red dot | Red dot |
| Receive negative (RX-) | Green dot | Green dot |

IEEE 802.3 LAN Adapter Cable

IBM does not supply IEEE 802.3 LAN adapter cables. Therefore, you will have to assemble them, have a vendor assemble them, or purchase them from a LAN supplier. The cables must implement the ANSI 802.3 specification. For additional information, see the IEEE 802.3 standards.

IEEE 802.3 LAN Wrap Connector

IBM supplies a wrap connector (P/N 70X8670) with each adapter card for use with diagnostics. The point-to-point wiring of the IEEE 802.3 LAN adapter wrap connector is shown below.

| Description | From Pin | To Pin |
|-------------------------|----------|--------|
| Data out A to data in A | 3 | 5 |
| Data out B to data in B | 10 | 12 |

IEEE 802.3 LAN Adapter Cable Connector

The IEEE 802.3 adapter uses a 15-pin D-type male connector to attach the cable to the adapter port. Always use tin-plated connectors with industry standard pins. IBM recommends that pins with snap-in, precision-formed contacts with insulation support be used. Make sure that the connectors are encased in a shielded housing. The IEEE 802.3 LAN adapter cable connector, with pin locations, is shown in Figure A-7 (viewed from the connector side and not drawn to scale). The cable should attach to the center of the connector (not the top or bottom) as shown.

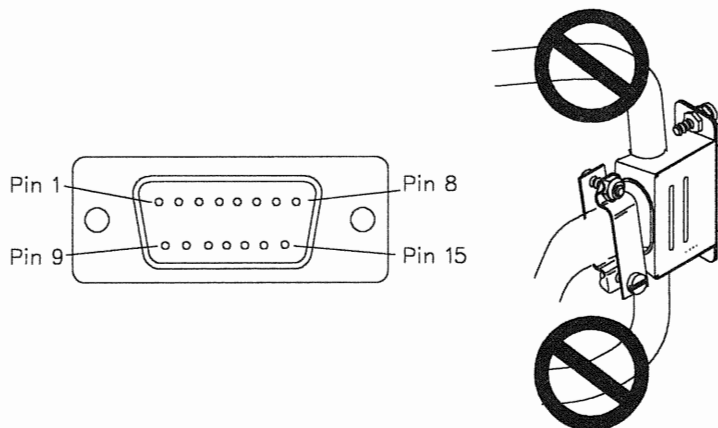


Figure A-7. IEEE 802.3 Adapter Cable Connector



This glossary includes terms and definitions from the *IBM Vocabulary for Data Processing, Telecommunications, and Office Systems*, GC20-1699.

A

address. A name, label, or number that identifies a location in storage, a device in a network, or any other data source.

AID. Attention identification. A code that the terminal sends in the inbound data stream to identify the operator action or structured field function that caused the data stream to be sent to the application program. An AID is always sent as the first byte of the inbound data stream. Structured fields in the data stream may also contain an AID.

ASCII. American National Standard Code for Information Interchange. The standard code, using a coded character set consisting of 7-bit coded characters (8 bits including the parity bit), used for information exchange among data processing systems, data communication systems, and associated equipment.

asynchronous. Without regular time relationship.

auto-answer. In telecommunications, the ability of a station to receive a call over a switched line without operator action.

auto-call. In telecommunications, the ability of a station to place a call over a switched line without operator action.

auto-call unit. A dialing device that permits a system to automatically dial calls over a switched network.

B

binary synchronous communication. A form of communication line control that uses transmission control characters for synchronous transmission of binary-coded data between stations.

block multiplexer channel. A multiplexer channel that interleaves blocks of data.

block multiplexer mode. A data transfer mode that permits interleaving of records in block form. Contrast with selector mode.

BPI. Bytes per inch.

bps. Bits per second.

BSC. Binary Synchronous Communication.

byte. In System/370, a sequence of eight adjacent binary digits that are operated upon as a unit and that constitute the smallest addressable unit in the system.

C

CCITT. The International Telegraph and Telephone Consultative Committee.

channel. A path along which signals can be sent—for example, an input/output channel.

channel-attached. (1) Pertaining to the attachment of devices directly by data channels (I/O channels) to a computer (2) Pertaining to devices that are attached to a controlling unit by cables, rather than by telecommunication lines. (3) Contrast with link-attached. (4) Synonymous with local, locally-attached.

clocking. In telecommunications, the use of clock pulses to control synchronization of data and control characters.

coaxial cable. A cable consisting of one conductor, usually a small copper tube or

wire, within and insulated from another conductor of larger diameter, usually copper tubing or copper braid.

communication adapter. A hardware feature that permits telecommunication lines to be attached to the processor.

communications. See data communication.

configuration. The devices and programs that make up a system, subsystem, or network. The term configuration may refer to a hardware configuration or a software configuration.

control station. The station in a point-to-point or multipoint network that controls the sending and receiving of data. A station that can poll or address tributary stations.

controller. See input/output controller.

control unit. Circuitry or a device used to coordinate and control the operation of one or more I/O or storage devices and to synchronize the operation of the computer as a whole.

coupler. In telecommunications, a protective device that connects a modem to the telecommunication line.

crosstalk. The unwanted energy transferred from one circuit, called the disturbing circuit, to another circuit, called the disturbed circuit.

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

customization. The process of designing a data processing installation or network to meet the requirements of particular users. IBM, without the use of tools or the assistance of IBM personnel.

CUT. Control unit terminal.

D

data communication. The transmission of data between computers and/or remote devices according to appropriate protocols.

data streaming mode. The I/O interface protocol that operates at the data rate governed by the control unit.

DCE. Data circuit-terminating equipment.

default. See default value.

default value. A value stored in the system when no other value is specified.

Direct Access Storage Device (DASD). A device in which the access time is effectively independent of the location on the data.

DFT. Distributed function terminal. See intelligent work station.

DSL. Downstream load. The microcode that the work station controller sends to a distributed function terminal, such as the IBM 3290.

DSR. Data set ready.

DTE. Data terminal equipment.

duplex. In data communication, pertaining to a simultaneous two-way independent transmission in both directions.

E

EIA. Electronics Industries Association.

F

FCC. Federal Communications Commission.

feature. A particular part of an IBM product that can be ordered separately

fixed-block-architecture (FBA) device. A disk storage device that stores data in blocks of fixed size; these blocks are addressed by block number relative to the beginning of the particular file.

G

gigabyte. (1) one billion (10^9), (2) 1000 megabytes.

H

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

hardware. The physical equipment used in data processing as opposed to programs or procedures.

HDLC. High-level Data Link Control.

hexadecimal. Pertains to a system of numbers to the base sixteen: hexadecimal digits range from 0 (zero) through 9 (nine) and A (ten) through F (fifteen). Each hexadecimal digit represents 4 binary bits (1/2 byte).

host system. The data processing system to which a network is connected and with which the system can communicate.

I

ICS. IBM Cabling System

IEEE. Institute of Electronic and Electrical Engineers.

interface. A shared boundary defined by functional characteristics, common physical interconnection characteristics, signal characteristics, and other characteristics, as appropriate.

I/O adapter. A part of some machines allowing direct attachment of specific I/O devices to the processor instead of a channel and control unit.

input/output (I/O). (1) Pertains to a device or to a channel that may be involved in an input process, and at a different time, in an output process. (2) Pertains to a device whose parts can be performing an input process and an output process at the same time. (3) Pertains to either input or output, or both.

input/output controller (IOC). A feature of the processing unit that acts as a control unit and allows direct attachment of I/O devices to the computer. (An exception is the standard-channel controller, which represents a System/370 standard block multiplexer channel and requires separate I/O control unit devices.)

I/O devices. A device or collective set of devices used both to enter data into a system and to receive data from a system.

I/O interface. The physical and the logical connection between the channel and the I/O control unit.

Input/output adapter (IOA). A functional unit of an input/output controller that allows to attach I/O devices directly, without separate control units.

Input/output processor (IOP). A functional unit of an input/output controller that controls one or more input adapters.

J

job. A unit of work to be done on a system. One or more related procedures or programs grouped into a procedure.

K

kilobyte (Kb). 1024 bytes.

L

LAPB. Link access procedure balanced.

LPI. Lines per inch.

local. Pertaining to a device that is accessed directly from the system, without the use of a communication line.

M

megabyte (Mb). 1,048,576 bytes.

message. Information sent to an operator or programmer from a program or another operator.

microcode. One or more micro instructions. A code representing the instructions of an instruction set. The term microcode represents micro instructions used in a product as an alternative to "hard-wired" circuitry to implement certain functions of a processor or other system component.

modem. A device that modulates and demodulates signals transmitted over data communication facilities. One of the functions of a modem is to enable digital data to be transmitted over analog transmission facilities.

multipoint network. In data communication, a configuration in which

more than two terminal installations are connected.

N

network. A system of connected lines and terminals. The assembly of equipment through which connections are made between data stations.

nonswitched line. A telecommunication line on which connections do not have to be established by dialing.

O

OEM. Original equipment manufacturer

P

packet switching. 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.

page printer. (1) A device that prints one page at a time—for example, xerographic printer, cathode ray tube printer, film printer. Synonymous with page-at-a-time printer. (2) Contrast with character printer, line printer.

PAM. Printer authorization matrix.

PC. Personal computer.

performance. One of the major factors on which the total productivity of a system depends. Performance is largely determined by a combination of three other factors: throughput, response time, and availability.

point-to-point line. A communication line that connects only two stations.

port. (1) The hardware coupling used to attach work stations to the work station. (2) In data communication, the part of an adapter that is dedicated to a single data channel for the purpose of receiving data from or transmitting data to one or more external, remote devices.

problem determination. The process of identifying the source of a problem, for example, a program component, a machine failure, telecommunication facilities, or a user error.

procedure. A set of related statements that causes a particular program or set of programs to be run.

prompt. A message to a terminal user, requesting information necessary to continue processing.

protocol. In communications, a specification for the format and relative timing of information exchanged between devices. A set of rules governing the operation of functional units of a communication system that must be followed if communication is to be achieved.

PTT. Post Telephone and Telegraph Administration.

R

remote. Pertaining to devices that are connected to a controlling unit by a data link. Contrast with local.

RPQ. Request for price quotation.

RTM. Response time monitor.

S

SDLC. Synchronous Data Link Control.

selector mode. One of the modes in which a block multiplexer channel can operate. See also block multiplexer mode.

storage. The retention of data in a storage device. A storage device.

simplex. In communications, transmission in only one preassigned direction. Synonym for one-way communication.

switched line. A telecommunication line in which the connection is established by dialing.

synchronous. Occurring with a regular or predictable time relationship. In data transmission, the time of occurrence of each signal representing a bit is related to a fixed time frame.

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

T

telecommunication. Communication over a distance, as by telegraph or telephone.

terminal. See work station.

terminal multiplexer. A device, such as the IBM 3299 Terminal Multiplexer, for interleaving the signals for many devices onto a single coaxial cable.

tributary station. In teleprocessing, any station on a multipoint network other than the control station. A station that can be polled or addressed by a control station.

TTC2. US Telegraph Terminal Control Type 2.

V

voice-grade channel. A channel suitable for transmission of speech, digital or analog data or facsimile, generally in the frequency range of about 300 to 3000 cycles per second.

W

work station. A station at which an individual can send data to or receive data from a computer for the purpose of performing a job; for example, the IBM 3279 Display Station or the IBM 3287 Printer.

work station address. The address to which a work station is set or the internal default address.

X

X.21. In data communications, a specification of the CCITT that defines the connection of data terminal equipment to an X.21 (public data) network.

X.25. In data communications, a specification of the CCITT that defines the interface to an X.25 (packet switching) network.

A

adapter
 asynchronous 4-9, 4-35
 IBM Token-Ring 4-43
 IEEE 802.3 local area network 4-45
 multi-protocol 4-7
 OEM 3-9
 work station 3-2
 additional racks 7-2
 addressing
 work station 3-5, 3-11, 3-13
 3299 3-6
 aggregate line speed, communications 4-7
 application
 ordering 6-2
 writing 6-2
 ASCII
 line connections using character
 mode 4-40
 line connections using transparent
 mode 4-41
 line information 4-38
 line speed 4-42
 subsystem 4-32
 Asynchronous Adapter 4-9, 4-35
 asynchronous adapter cables A-20
 auto-call unit, ordering 4-32
 auto-call, using 4-7
 Automated Power Control 2-9

B

BSC line connection and speed 4-15

C

cables
 asynchronous adapter A-20
 communication adapter 4-47, A-1
 IBM Token-Ring adapter A-30
 IEEE 802.3 LAN adapter A-33
 installing S/370 channel 5-13

multi-protocol adapter A-1
 ordering S/370 channel 5-12
 System/370 channel 5-12
 work station 3-5
 communication
 adapter cables 4-47, A-1
 line connections 4-12
 line customization 4-19
 line identification 4-11, 4-39
 lines, ordering 4-29
 network 4-5
 Communications Processor 4-6
 communications subsystems 4-1, 7-9
 completion date, Form A 1-4
 computer supplies 6-3
 console, processor 2-4
 contract programmer services 6-3
 control station 4-5
 Control Unit Terminals (CUTs) 3-1
 controller
 DASD/Tape 2-12
 remote 4-3
 work station 3-2
 couplers, ordering 4-27
 customer identification 1-3
 customer number 1-3
 customizing the work station 3-16

D

DASD/Tape Controller 2-12, 7-7
 data circuit-terminating equipment for CCITT
 X.21 and V.35 4-30
 data storage devices 2-12
 data streaming devices 5-8
 data streaming mode 5-10
 defining a network 4-10
 delivery date 1-3
 device definition table 4-37
 disk drives
 additional 7-4
 removing 7-7
 9332 Model 400 2-14
 9335 Model A01 2-14
 9335 Model B01 2-14
 Distributed Function Terminals (DFTs) 3-1
 downstream load (DSL) 3-16

E

enclosure, rack 2-9

F

Feature

- Asynchronous Adapter (6032) 4-9, 4-35
- Automated Power Control (4000) 2-9
- Communications Processor (6030) 4-6
- DASD/Tape Controller (6010) 2-12
- I/O Card Unit (5010) 2-5
- I/O Card Unit (5020) 2-5
- I/O Card Unit Adapter (5000) 2-6
- IBM Token-Ring Adapter (6034) 4-43
- IEEE 802.3 Local Area Network Adapter (Feature 6035) 4-45
- Multi-Protocol Adapter (6031) 4-7
- System/370 Block Multiplexer Channel (6003) 5-1
- System/370 Channel Power Sequence and Control (6001) 5-8
- Work Station Controller (Feature 6020) 3-1

Form

- A, System Planning Schedule 1-2
- B, Processor Configuration 2-7
- C1, 9309 Rack Enclosure 2-9
- C2, Integrated DASD/Tape Devices 2-15
- C3, Other I/O Devices 3-16, 4-26, 5-12
- D, Work Station Diagram 3-9
- E, System/370 Channel Information 5-8
- F, Communication Line Information 4-11
- G, Modem Information 4-23
- H, ASCII Line Information 4-38
- J, Upgrade Information 7-1

forms, planning 1-2

H

HDLC line connection and speed 4-19
host system 4-3

I

- I/O Card Unit 2-5
- I/O Card Unit Adapter 2-6
- IBM modems 4-21
- IBM Token-Ring Adapter 4-43
- IBM Token-Ring Adapter cable A-30
- IBM Token-Ring subsystem 4-43
- IEEE 802.3 LAN adapter cable A-33
- IEEE 802.3 Local Area Network Adapter 4-45
- IEEE 802.3 local area network subsystem 4-45
- interface
 - ASCII line connection and speed 4-38
 - BSC line connection and speed 4-15
 - HDLC line connection and speed 4-19
 - SDLC line connection and speed 4-17
 - TTC2 line connection and speed 4-13

L

line

- conditioning 4-26
- connections 4-12
- customization, communication 4-19
- identification 4-11, 4-39
- termination 4-26
- type 4-25

line speed

- ASCII 4-42
- BSC 4-15
- HDLC 4-19
- SDLC 4-17
- TTC2 4-13

local work station

- additional 7-8
- customizing 3-16
- devices 3-6
- diagram 3-9
- port identification 3-4
- using 3299 3-5

M

microcode customization 6-3
 modem
 IBM 4-21
 options 4-23
 ordering IBM 4-25
 PTT mandatory 4-22
 supplier 4-26
 modems 4-20
 multi-protocol adapter 4-7
 multi-protocol adapter cables A-1
 multiplexer, terminal 3-5
 multipoint network 4-5

N

network
 communication 4-5
 defining 4-10
 IEEE 802.3 local area 4-45
 multipoint 4-5
 nonswitched 4-5
 point-to-point 4-5
 switched 4-5
 X.25 packet switching 4-6
 nomenclature
 processor 2-7
 rack 2-10
 nonswitched network 4-5

O

options, modem 4-23
 ordering
 applications 6-2
 auto-call unit 4-32
 communication lines 4-29
 external couplers 4-27
 IBM modems 4-25
 modems and lines from a common carrier 4-27
 modems from a modem supplier 4-26
 publications 6-4
 S/370 channel cables 5-12
 supplies and accessories 6-3
 system upgrade 7-17

the operating system 6-2
 the system 6-1
 Original Equipment Manufacturer (OEM) 3-2, 3-9
 work station adapter 3-4

P

packet switching data network 4-6
 physical planning 6-4
 planning
 forms 1-2
 tasks 1-3
 point-to-point network 4-5
 port identification
 work station adapter 3-4
 3299 3-6
 power cord/plug, rack 2-12
 power requirements, rack 2-11
 primary station 4-5
 processor
 configuration, Form B 2-7
 console 2-4
 features 2-1
 model upgrade 7-3
 models 2-2
 nomenclature 2-7
 storage 2-8
 storage upgrade 7-3
 types 2-1
 upgrade 7-2
 9373 2-2
 9375 2-2
 9377 2-2
 protocol 4-13
 PTT mandatory modems 4-22
 publications, ordering 6-4

R

rack
 additional 7-2
 enclosure 2-9
 model 2-9
 nomenclature 2-10
 power cord/plug 2-12
 power requirements 2-11
 reserved space 2-11

remote
 devices 4-3
 station 4-5
 system 4-3
 Remote Operation Facility 2-4
 Remote Service Facility 2-4
 removing
 a DASD/tape controller 7-7
 a telecommunications line 7-10
 a work station controller 7-9
 an ASCII line 7-12
 an IBM Token-ring adapter 7-13
 an IEEE 802.3 adapter 7-14
 DASD/tape devices 7-7
 S/370 channel adapter 7-16
 S/370 channel power sequence and control 7-16
 reserved space, rack 2-11
 responsible person 1-3

S

scheduling
 planning tasks 1-2
 SDLC line connection and speed 4-17
 secondary station 4-5
 SLSS 6-4
 storage
 devices 2-12
 processor 2-8
 subsystem,
 ASCII 4-32
 communications 4-1
 IBM Token-Ring 4-43
 IEEE 802.3 Local Area Network Subsystem 4-45
 telecommunications 4-2
 supplies 6-3
 switched network 4-5
 system
 host 4-3
 remote 4-3
 supplies and accessories 6-3
 upgrade 7-1
 System Library Subscription Service 6-4
 System/370 Block Multiplexer Channel 5-1, 7-15
 System/370 Channel Power Sequence and Control 5-8, 7-16
 System/370 control unit
 data streaming mode 5-8

description 5-1
 devices 5-3
 types 5-7
 System/370 Controller
 address range 5-10
 worksheet 5-11

T

tape drive, 9347. 2-15, 7-4
 tasks, planning 1-3
 telecommunications
 line connections 4-12
 line customization 4-19
 line identification 4-11
 subsystem 4-2
 telephone set options 4-26
 terminal multiplexer
 attaching work stations 3-4
 port identification 3-6
 use of 3-5
 terminals
 description 3-1
 remote 4-3
 work station 3-6
 tributary station 4-5
 TTC2 line connection and speed 4-13
 turnaround delay 4-21, 4-30

U

upgrade
 ASCII subsystem 7-11
 automated power control 7-4
 communication subsystems 7-9
 DASD/tape devices 7-4
 IBM Token-Ring subsystem 7-13
 IEEE 802.3 local area network subsystem 7-14
 local work stations 7-8
 ordering 7-17
 processor 7-2
 processor storage 7-3
 S/370 block multiplexer channel 7-15
 S/370 channel power sequence and control 7-16
 system 7-1
 telecommunications subsystem 7-9

W

work station adapter 3-2
 cables 3-5
 customizing 3-16
 Form D, Local Work Station Diagram 3-9
 listing, I/O devices 3-6
 port identification 3-4
 using 3299 3-5
Work Station Controller 3-1, 7-8
wrap connector
 asynchronous adapter A-22
 IEEE 802.3 LAN adapter A-33
 multi-protocol adapter A-4
 token-ring adapter A-30
writing your own applications 6-2

X

X.25 packet switching network 4-6

Numerics

3299
 attaching work stations 3-4
 port identification 3-6
 use of 3-5
9309 Rack Enclosure 2-9
9332 Model 400 Disk Drive 2-14
9335 Model A01 Disk Control Unit 2-14
9335 Model B01 Disk Drive 2-14
9347 Model 1 Tape Drive 2-15
9373 Processor 2-2
9375 Processor 2-2
9377 Processor 2-2

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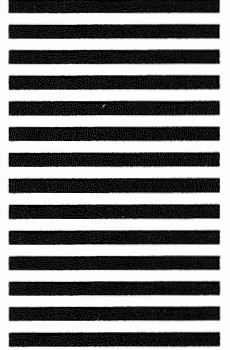
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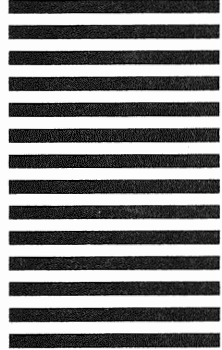
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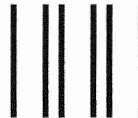
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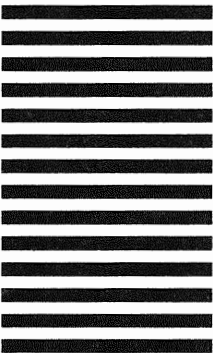
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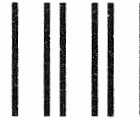
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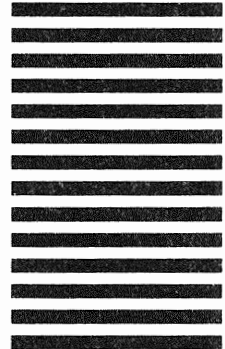
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