IBM System/3
Model 10 Disk System
Communications Control Program
General Information Manual

Feature Codes 6032 and 6033
Program Number 5702-SC1

GC21-7578-0

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PREFACE

This manual provides a general description of the communications control program, a feature of System/3 Model 10 Disk System Management, program number 5702-SC1. It is written for those who are responsible for providing to their organizations an effective communications-based information system.

This manual:

- Describes the concept, advantages, and requirements of a communications-based system.
- Surveys the facilities offered by the communications control program.
- Gives examples of the use of terminals with the communications control program.
- Indicates the relationships between disk system management and the communications control program.
- Lists the communications terminals and features that can be used with the communications control program.
- Defines the machine and programming systems requirements for installing this control program.

This general information manual is an introduction to the communications control program and its facilities, and is intended to serve as an aid in your determination of the usefulness of this program in satisfying your organization's information processing needs.

Publications will follow which describe the procedures for using the communications control program. Prior to the release of this program, a planning manual will be available to provide information needed to prepare for its installation. Upon delivery of this program, a reference manual will replace the planning manual.

First Edition (March 1972)

Changes are periodically made to the information herein; before using this publication in connection with the operation of IBM systems, refer to the latest System/3 Newsletter, Order No. GN20-2228, for the editions that are applicable and current.

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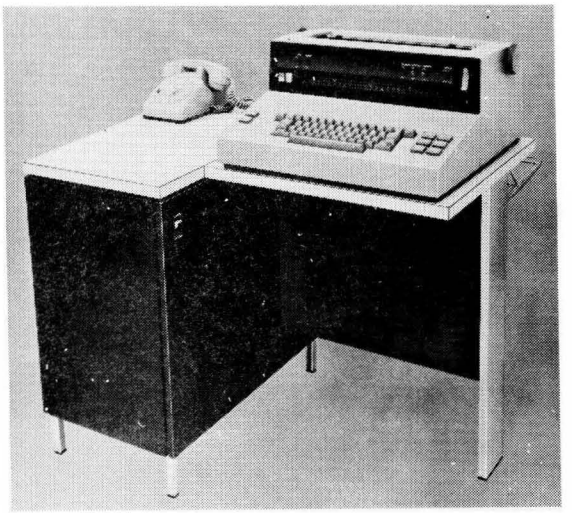

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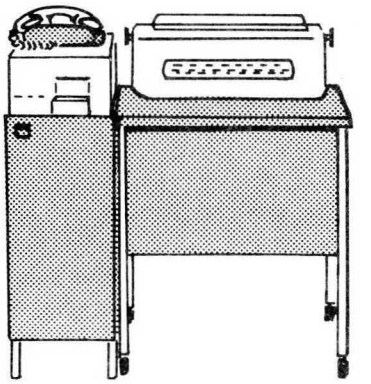

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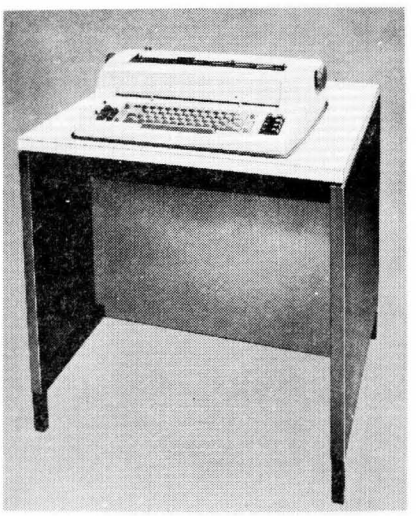

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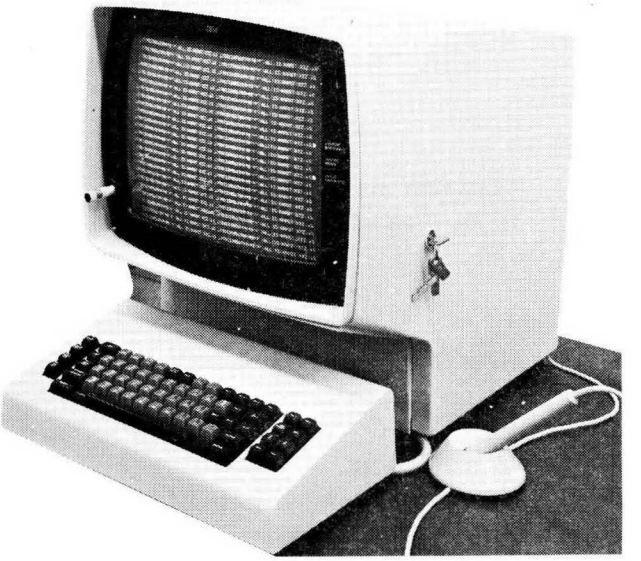

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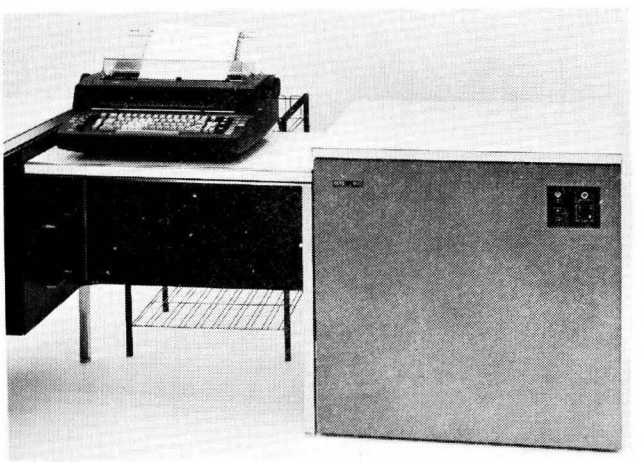

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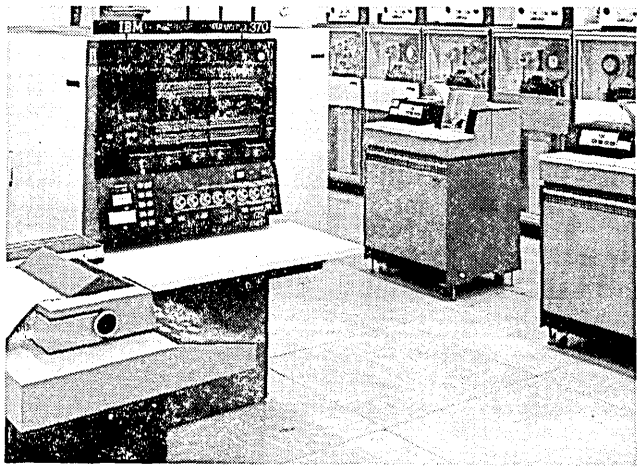

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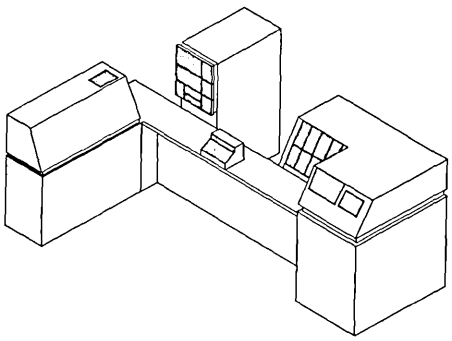

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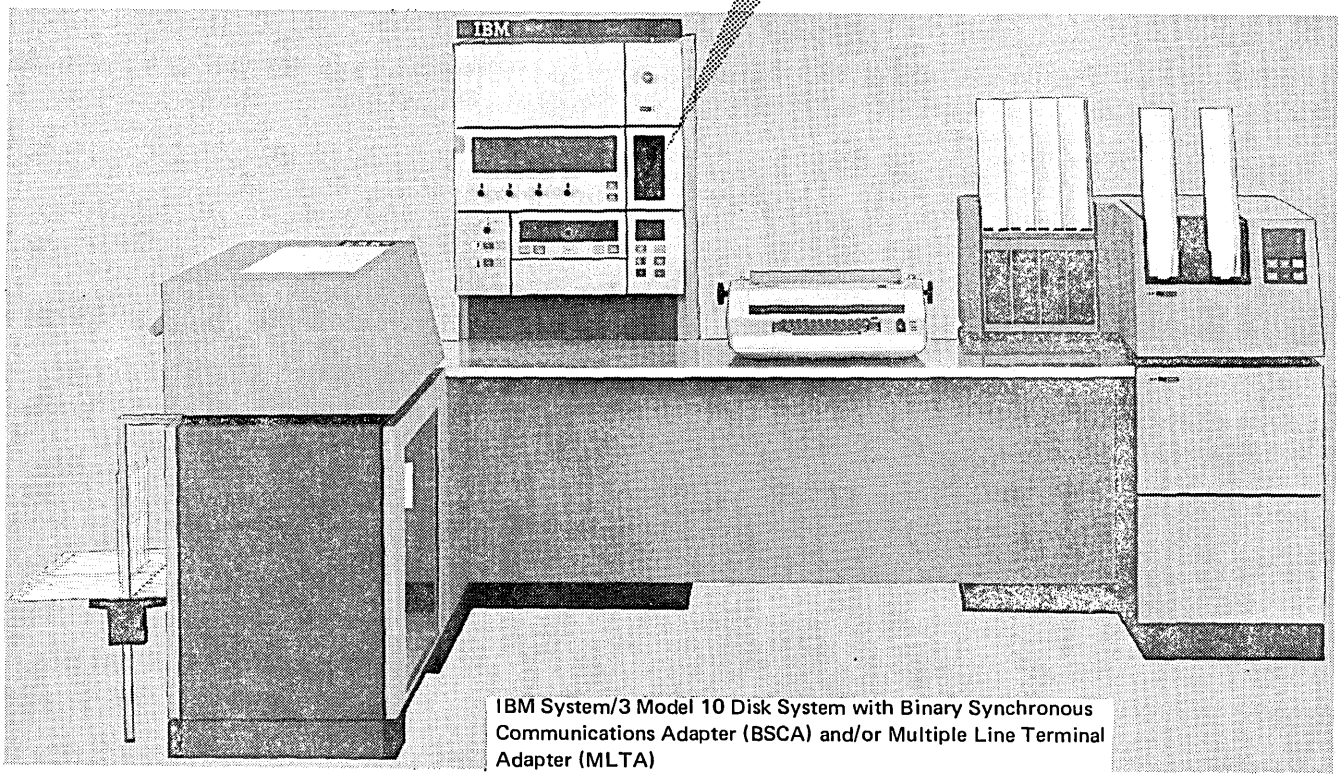

IBM System/3 Model 10 Disk System with Binary Synchronous Communications Adapter (BSCA) and/or Multiple Line Terminal Adapter (MLTA)

WHY IS THE COMMUNICATION CONTROL PROGRAM PROVIDED?

The communications control program (CCP) provides the control program services needed in a telecommunications system using the IBM System/3 Model 10 Disk System. It enables you to establish a telecommunications system with minimum cost and effort.

A brief discussion of the need for, and the system requirements for, telecommunications may help you appreciate the need for a communications control program.

WHY MIGHT I NEED TELECOMMUNICATIONS?

For years, users of large-scale data processing equipment have enjoyed the benefits of telecommunications. For organizations with the necessary equipment, the ability to communicate directly between a central computer system and a set of remotely-located terminals has opened new and effective approaches to satisfying their information processing needs.

The contribution of telecommunications to the user of data processing is that it eliminates bottlenecks in the flow of information needed to operate an organization effectively. Whether it is used to transmit a shipping document to the warehouse while an order is being processed, or as a means of inquiring into the current status of an account, or as a way of capturing data about a transaction from the very source of that transaction, telecommunications helps you get significant data from those who have it, and to make current information available to people who need it.

WHAT MACHINE CAPABILITIES ARE REQUIRED FOR TELECOMMUNICATIONS?

In the past, the machines necessary to establish a communications-based system have been generally unavailable to users of smaller computers. The machine requirements go beyond the communications terminals and the means of attaching them to the central processing unit. Because most users find more and more applications in which a communications-oriented approach can cut through an information bottleneck, telecommunications systems must be *growing* systems. The user must be free to expand direct-access storage capacity to accommodate additional online files and to enlarge main storage to permit several applications to operate concurrently. Expansion capability is a prerequisite to consideration of a computer system as a communications processor.

The System/3 Model 10 Disk System meets the machine requirements of a communications processor with the availability of:

- Large-capacity disk storage
- Highly-expandable main storage
- A variety of line and terminal configurations supported by the multiple line terminal adapter (MLTA) and binary synchronous communications adapter (BSCA)

With these capabilities, the System/3 can process a broad range of communications-based applications.

WHY WOULD I NEED A COMMUNICATIONS CONTROL PROGRAM?

A communication-based information processing system requires special control program functions as well as a special machine configuration. The communications control program provides the necessary control services for a System/3 telecommunications system.

Because terminals use communications lines, the program support for terminal input/output must control those lines and translate the special data codes used by some terminals. The program support that gives your application programs the ability to read from and write to terminals is a component of System/3 Model 10 Disk System Management; it is known as the IOCS support for the MLTA and for the BSCA.

But the communications IOCS provides only for terminal input/output. Further program support, besides an input/output facility, is necessary to operate a data processing system effectively, even one without telecommunications. For example, control programs are required to load and execute programs from a disk library, to access data files, and to communicate with the operator.

A system with telecommunications requires more flexible program support than a system which performs jobs one at a time under control of one system operator. The effectiveness of a communications-based system stems from its ability to perform work presented, as required, by a number of operators at terminals. Operators are seldom aware of what other operators are doing; they may be in separate rooms, or in separate cities. Each request demands that a certain program be executed. Frequently a request arrives while the system is still attempting to satisfy previous requests from other operators; the new request must be remembered and honored at the earliest possible moment. The system should be designed in such a way that it can execute several programs concurrently. In this way, the system will respond quickly to many operator's requests.

Program support of these capabilities has existed for some time on larger computers, making possible information systems that are highly effective in a variety of applications. You may have heard such systems described in various terms, each emphasizing a characteristic they possess:

- *Event-Driven* – Work is performed as required by events which occur within the organization, rather than in a rigid, predefined sequence.

- *Transaction-Oriented* – Each transaction can be processed as it happens, so the effect of that transaction upon the organization can be determined immediately.

- *Real-Time* – The data held in the system reflects the status of the organization's activities as of the moment, and can yield truly current information.

The first systems of this type were used by businesses with a network of many terminals, accessing a huge data-base, and involving hundreds of application programs. Gradually, the principle of this mode of operation has also proven itself effective in systems of more modest scope.

Now, the communications control program offers the program support for a communications-based System/3 Model 10 Disk System. It provides those control capabilities needed to implement an information system of the type described. Because of the facilities it offers, the establishment of such a system can be accomplished with a minimum cost and effort.

WHAT DOES THE COMMUNICATIONS CONTROL PROGRAM DO?

The communications control program provides control program services needed in a telecommunications environment. It is an extension of System/3 Model 10 Disk System Management.

The communications control program supports a network of terminals. It allows the terminals to call asynchronously upon a set of user application programs, then permits those programs to access a common data base consisting of a number of disk files.

The CCP does not itself include telecommunications application programs (programs that access and process your data). They, like the application programs you may be writing today, are necessarily unique to your organization's requirements. But the CCP does control the environment in which those programs must run, and it provides a set of services upon which they can call. This relieves you of most of the special requirements in establishing a communications-based system.

Some of the control program services performed by the communications control program are:

Terminal Monitoring — The terminals of the system are continually monitored for program requests and system commands.

Program Fetch — A terminal operator, or the system operator, may initiate the loading and execution of an application program.

Resource Management — The resources of the communications-based system (terminals, disk files, main storage space) are managed by the communications control program and made available, as required, to each application program.

Concurrent Program Execution — If the system has sufficient main storage space, and the user so specifies, several application programs for different terminals may be run concurrently.

Disk File Access Management — In a system where several programs execute concurrently, access to disk files may be shared among those programs. The communications control program protects against erroneous results that might be caused by conflicting accesses.

The communications control program is designed for ease of use in establishing an organization's first communications-based system; it can be readily tailored to contain only the capabilities you need. The significance of the services it performs is indicated by the freedom it offers you in the design, programming, and operation of the system. For example:

- You can plan and design a telecommunications system that performs its functions when requested by those who need them.

- You can create programs individually to perform those functions without being concerned about what other functions are occurring in the system or what specific terminal is in communication with your program.

- You can incorporate each application program into your system as it is written and tested, without recreating the entire system.

- Your system operator can control which terminals are permitted access to the system.

The following pages describe the facilities offered as they would be viewed by an operator at a terminal, by the operator of the system, and by a programmer.

. . . FROM THE VIEWPOINT OF THE TERMINAL OPERATOR

To the operator of a terminal, the system is a resource to help him accomplish his tasks as those tasks arise. The terminal operator may think of the system as belonging to him, alone, unless the combined demands upon the system are great enough to cause some delay in its responsiveness to him. All contention among terminal operators for use of the system is managed by the communications control program.

How the Operator Requests a Program

When a terminal is not in use, it is continually monitored by the control program for the presentation of a request. The operator of a terminal calls for the application program to perform a specific function by simply entering the program name at the terminal. The CCP then attempts to load and execute the program and to put that program in communication with the terminal operator. From then until the completion of the program's execution, the interaction between the terminal operator and the system is dictated by that program.

When the application program has completed execution, it yields control of the terminal to the communications control program. The CCP once again monitors the terminal for a program request. The next request may be for the same, or for a different, function.

Each terminal operator must be trained in the functions he can call upon and in the procedures for interacting with the application programs that perform those functions.

How the Operator Requests System Services

While monitoring for program requests, the communications control program can also respond to commands to perform services for the terminal.

The operator can condition the system's response when it is unable to comply immediately with his request for a program. The system may be temporarily too busy with requests from other operators. By command, he may choose one of the following when this condition occurs:

- The system should deny his request and allow him to make some other request.
- The system should hold his request and honor it at the earliest possible moment.

Once the operator of a terminal has specified one of these system responses, the CCP handles all program requests from that terminal accordingly until the operator gives the other specification.

A file specification command allows the operator to specify the disk data files that are to be accessed by programs he requests. Within the information system, there may be several files containing similar data in the same format. A school system, for example, might have a separate student records file for each school. An application program requested by the operator might have been written to access any of these files, but the program must be told which file to use on a particular run. A file specification command issued by the terminal operator applies to all programs requested at that terminal until a contradictory command is issued.

A final command permits the terminal operator to send a message to the system operator, requesting him to take some action.

The commands discussed so far are issued to the communications control program while it is monitoring a terminal for requests. Once a terminal is in interaction with an application program, however, the input from that terminal is meaningful only to the application program, with one exception. The CCP checks each message from a terminal to a program for the appearance of a certain string of characters, specified to be significant in your system. When it detects the presence of these characters in a message, the CCP interprets the message as an attempt by the terminal operator to escape from control of the application program and communicate directly with the CCP. At this point, the communications control program accepts a request from the operator to cancel the execution of the application program, or to send a message to the system operator. If the request was to send a message, the terminal operator can ask the CCP to resume execution of the application program after the message is sent.

Terminal Security

When the system operator initiates execution of the communications control program, the CCP attempts to inform each terminal in the system that the information system is now available for use. If you have specified that no security feature be built into your system, each terminal can now be used to issue program requests and other commands of the system.

On the other hand, if you are concerned with security of access to the system, you can indicate that a password feature be included in the communications control program. The valid password for the current run is established by the system operator when he starts execution of the communications control program. You might change that password on every run, or retain it for days or even weeks. In any case, only operators who know the password are permitted access to the system.

In a system with password protection, no requests are accepted from a terminal until its operator presents the current password, and the communications control program verifies it. Once an operator signs on with the password, he can make any number of requests without repeating it. If the operator is not always at his terminal and if other, possibly unauthorized, persons could gain access to that terminal, he should sign off the terminal anytime he leaves it. When he has signed off, the communications control program requires any further use of the terminal to be accompanied by the password.

. . FROM THE VIEWPOINT OF THE SYSTEM OPERATOR

The system operator exercises final control over the communications-based system. He initiates its activity by loading and running the communications control program. He determines when the system should refuse to accept new requests from terminal operators. While the system is in operation, he may initiate certain system actions, determine the system's status, and alter the set of terminals permitted to access the system. He must also make decisions when exception situations (such as error conditions) are detected by the communications control program or a program running under its control.

Once the CCP has been started, all communication between the control program and the system operator is through the 5471 printer/keyboard. Messages from the system are printed on that device, some requiring responses from the operator. His response also is keyed on that device. At any point during the execution of the communications control program, the operator may wish to command a system action; he does so by pressing the REQ key on the 5471, then keying his command.

Initiating the Communications Control Program

When he starts the execution of the communications control program, the operator can exercise certain options. For example, he can:

- Specify the system password to be used during this run.
- Prevent access to certain disk data files that are normally accessible to programs running under control of the communications control program; for example, the file may not be built every day.
- Prohibit the requesting of certain application programs that are normally part of the information system.
- Specify the set of terminals that can have access to the information system at the time the system begins its activity.
- Cause a service aid program to be included in the communications control program if a malfunction in its operation is suspected.

System Operator Commands

During operation of the communications control program, the system operator can command the CCP to:

- Disable or enable access to the system by any terminal.
- Change the terminal which will actually be addressed by a program when that program attempts to access a terminal by name.
- Initiate the online test of a terminal to determine whether it is operating correctly.
- Initiate the execution of an application program.
- Cancel the execution of an application program currently running.
- Display information about the system's status (see note).
- Accept no new program requests from terminals and notify the system operator when all outstanding requests have been satisfied.
- Cease all activity of the system immediately and terminate execution of the CCP.

Note: Some of the information about system status that may be displayed is:

- The identification of terminals currently permitted access to the system.
- The complete status of any specific terminal in the system.
- The identification of programs currently executing, which terminal each is serving, and which program is currently in control of the central processing unit.
- The identification of programs currently executing, which terminal each is serving, and which program is currently in control of the CPU.

Messages

The system operator can receive messages from the communications control program or from an application program. The CCP prefixes each message with the identification of the program that issued it. Messages which require a reply from the operator are further prefixed with the indication that a reply is required.

Among the messages to the system operator which require reply are halt codes. In a system with several application programs operating concurrently, a halt issued for one program causes only that program to suspend operations until a response is supplied. The communications control program and other application programs under its control continue to operate.

. . . FROM THE VIEWPOINT OF THE PROGRAMMER

The communications control program aids the programmer in two primary ways:

- By relieving him of many programming concerns inherent in an event-driven system, it lets him concentrate on application programs that solve the problems of his organization.
- It permits him to write application programs that include communications input/output in a high-level language.

Programs that run under the communication control program can be written in any of four languages:

- RPG II
- COBOL
- FORTRAN IV
- Basic Assembler

By writing in RPG II, COBOL, or FORTRAN, the programmer can avoid the strict rules required when using Basic Assembler Language.

Although his program may have to contend with others for system resources, the programmer can ignore the problems that arise from this. Those problems are managed by the control program. The programmer is assured that all required resources are available to his program each time it is executed. If necessary, the CCP defers the execution of his program until those resources are available. If his program shares access to a disk data file with another concurrently executing program, the CCP manages the contention and does not permit the two programs to cause an erroneous record update through conflicting reads and writes.

Programs that execute under the control of the communications control program are written much the same as programs in the same language for a system without telecommunications. That is, the statements used to process data and the handling of data files are identical. The standard disk data management methods are supported by the control program. Only two elements are likely to differ significantly:

- The overall design of the program.
- The statements used to communicate with terminals or with the system operator.

Program Design

If you currently use a data processing system without telecommunications, many programs in your system operate upon a long series of transactions — hundreds or perhaps thousands. The data from those transactions probably updates a single disk file. Once started, such a program processes all the transactions before it is finished. Of course, the transactions represented by the data actually happened earlier in the day, week, or month. The data is collected into a batch before it is used to update the files of the system. When they have been updated, the files contain information reflecting the state of your organization's affairs as of the last transaction in the batch.

It is also possible to design programs that use the batch processing method to advantage in a communications-based system. If a terminal is located where transactions are occurring and if data is entered regarding the transactions as they occur, the system can reflect the current status of your organization.

Batch processing requires that the terminal be dedicated to input of one kind, or several closely related kinds, of transaction data. Frequently, however, during a period of time, a terminal is used to inquire into information contained in a number of files, or to enter data concerning transactions of many different types affecting several different files. In these cases, it is unlikely that the terminal would be served for any length of time by a single program. In fact, each program may be written to process completely only a single transaction or inquiry from the terminal, then terminate immediately. In practice, the majority of applications of telecommunications involve this kind of processing, therefore, programs are required to update all files affected by a transaction, but handle only a single transaction per execution. This certainly implies a program design different from that for a batch-oriented system.

Terminal Input/Output

The second significant difference in programming under the communications control program is the manner of programming for communication with a terminal and the system operator.

Except for RPG II, the high-level languages do not offer any statements for accomplishing terminal input/output. Terminals cannot be treated as data files. Furthermore, the MLTA IOCS and BSCA IOCS do not permit access to their facilities directly from a high-level programming language. The communications control program incorporates MLTA IOCS or BSCA IOCS (or both, if you have both line types in your system) and offers the application programmer a method of using these IOCS facilities to interact with terminals.

Since there are no statements in the languages to specify terminal actions, the application program indicates those actions to the communications control program by means of one of the following statements, each of which causes a branch to a supplied subroutine:

- In COBOL or FORTRAN – CALL statement
- In RPG II – EXIT statement, or use of a SPECIAL file
- In Basic Assembler – EXTRN statement and branch instruction

Each of these statements is accompanied by parameters to indicate the specifics for the operation.

Those specifics include the following information necessary to control the terminal action requested:

- The operation desired.
- The length of the message to be sent, or the maximum length of a message to be received.

- The name of the terminal with which this communication is to take place.
- The area in main storage which contains the message to be sent, or should contain a message to be received.

The operations that can be specified are:

- Read a message
- Write a message
- Write a message and wait for a reply
- Release the terminal from any further use in this program

Previous discussion may have implied that an application program communicates only with the terminal that requested it. In fact, most communication by programs running under the CCP is with the requesting terminal. But the ability also exists to address other terminals. A terminal is addressed in the program by a name that is chosen by the user; the name normally applies to one particular terminal. However, should a certain terminal become unavailable during a run of the communications control program, the system operator can reassign the name to another terminal. Any program addressing a terminal by the reassigned name addresses the new terminal. For the most part, the application program need not be concerned with the type of terminal with which it is communicating.

An application program communicates with the system operator by addressing the 5471 printer/keyboard as another terminal. A certain constant name is always used to address the 5471. The only operations available here are:

- Write a message
- Write a message and wait for a reply

HOW CAN THE CCP BE TAILORED TO MY NEEDS?

The communications control program feature of disk system management, like disk system management itself, can be tailored to suit your processing requirements.

When you receive the communications control program, you must first generate a disk system for your installation if you have not already done so. At that point, you are ready to tailor a communications control program according to a number of options you select.

Generating the Communications Control Program

The communications control program is a highly modular program designed so you can include functions you require and exclude those of no value to your installation. The process of selecting functions you want is known as *generating* the control program.

The process involves:

1. Creating a set of control routines whose specific content may be absolutely unique to your installation.

2. Joining these routines by a linkage edit process.

3. Copying appropriate additional supporting routines.

The output of the generation process is a set of object modules and subroutines on a disk pack specified by you. This output is your version of the communications control program. It includes the program to be loaded and run each time the system operator initiates your communications-based system.

The method by which you specify the functions and options you wish to generate into your system is straightforward (and familiar if you are already a System/3 Model 10 user). Statements are used (with keywords and associated values) that are similar to those used in generating your disk system. The functions and options you choose are completely your decision. However, they should be chosen on the basis of careful evaluation of the way you want your information system to operate. IBM systems engineering assistance may be helpful to you in this evaluation.

The specifications you make during generation determine the functional scope and the size of your system. But there are many specifics that are not established at generation. For example, you specify:

- The communications adapter types, line types, and terminal types to be handled by your communications control program, but not the actual configuration of those terminals on the lines.

- The maximum number of files, the types of file organizations, and the range of access methods to be supported, but not the specific files to be accessed.

- The maximum number of application programs that may be invoked, but not the names of the programs themselves.

This distinction between scope and specifics is part of the design of the communications control program. The scope of function you require in your system will not change frequently, but you may wish to add new application programs to your system and to modify others, add to or reorganize data files of the system, and even change your terminal configuration. The tailoring facilities permit you to do so without a regeneration of the communications control program.

System Assignments

Setting the specifics under which the communications control program operates is called making *system assignments*.

System assignments are made by a special run, the *assignment run,* very brief in duration, that does not require the use of communications lines or terminals. Once again you make specifications in the form of control statements with keywords and values. You specify:

- The application programs that may be run under control of the communications control program and the system resources each will require.
- The files that will be accessible to those programs.
- The current line/terminal configuration.
- The set of terminal names that may be used by programs and the actual terminal to which each will apply (until and unless changed by the system operator).

The result of this run is a short disk file containing control tables for the communications control program. The file is known as the *assignment file.* Each time the communications control program is loaded and run by the system operator, a major part of its initialization consists of accessing that file, modifying main storage control tables to reflect assignments, finding the disk data files that are to be accessed, locating the programs that may be invoked, and establishing connection with each terminal in the configuration.

An assignment run must be made after generation of the communications control program and before the program is executed for the first time. From that point forward, the run need be repeated only when one or more of the specifics involved changes; otherwise, a set of assignments holds for any number of executions of the communications control program.

An operator-oriented terminal can be used in three basic ways in a System/3 communications-based system. It might be used to create data files, refer to existing data files, or update existing data files. These uses are commonly called *data entry, inquiry,* and *inquiry-with-update,* respectively.

The two types of *data entry* applications involve continuous operation of the terminal. In the first type, the terminal operator may be preparing a document such as a sales order. The system guides the preparation and supplies some of the data to be printed. The operator keys in the customer number, item numbers, and quantities. The system could supply the customer name and address, item descriptions, unit prices, and extensions for the items ordered. The operator-entered data is retained by the system and files are updated to reflect changes in inventory and accounts receivable.

The second type of data entry application provides for capture of coded data in much the same way as a keypunch or data recorder is used to prepare cards. In this case, the information is entered directly into data files of the system. However, this type of data entry requires more system time than it usually desirable in a System/3 communications-based system.

When used for *inquiry,* the terminal is often not in continuous operation. Rather, the person at the terminal typically asks one or more short questions. In some cases the response from the system is lengthy and requires the requestor to read and interpret the information returned. Based on the first system response, he might ask other questions. While he is reading the returned information, the system turns to other requestors or other processing requirements until he again asks for more information. When he has satisfied his requirement, he leaves the terminal and returns to other work until he has another question that requires an answer from the system. Meanwhile someone else with a different responsibility may use the terminal. In this way, the terminal can be shared by people with different work requirements. The number of shareable terminals needed depends on the number and frequency of questions (inquiries), the duration of an inquiry session, and the location of departments or persons needing access.

The ability to find and change a record, called *inquiry-with-update,* is a natural follow-on to the inquiry-for-status. Changes to records being referred to by inquiry sometimes need to be made as those changes become known. For example, a hospital patient's record being used for medicine dosage may need to be changed quickly to reflect changes in his condition. Another example is the updating of hotel guest records to show charges made immediately before check-out.

Figure 1 shows a possible configuration of a System/3 communication-based information processing system. Imagination and available resources (main storage size, disk storage capacity, input/output devices available) are the only limitations to the possible uses of a communications-based system. Some examples of specific applications are:

Inventory Management	Sales Analysis
Purchase Orders	Patient Accounting
Service Orders	Billing
Accounts Receivable	Payroll Accounting
Policy Writing	General Accounting
Student Records	Stock Movement
Shipping Orders	Subscriber Accounting
Hotel Guest Accounting	Waybill Preparation

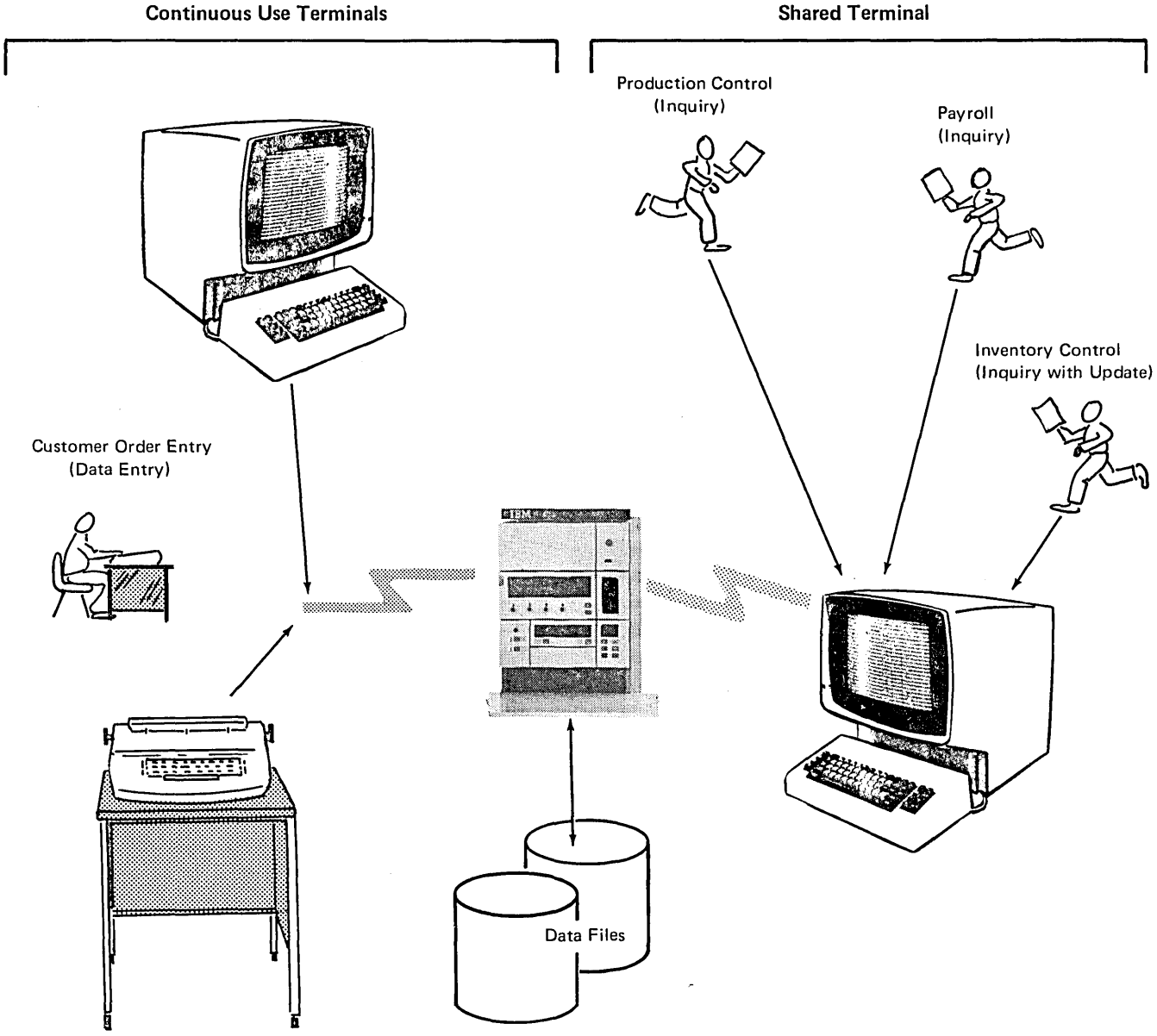

Figure 1. Sample Configuration of a Communication-Based Information Processing System

HOW IS THE CCP RELATED TO DISK SYSTEM MANAGEMENT?

The communications control program operates under control of disk system management. Your telecommunications application programs are under control of the communications control program, and are one step removed from control by disk system management (Figure 2). They are, for example, loaded by the CCP on request from an operator and receive control of the central processing unit from the control program. Your programs issue requests for services. The requests are received by the communications control program. Some of these services are performed by the CCP itself, such as communications I/O. Other service requests are passed on by the CCP to disk system management.

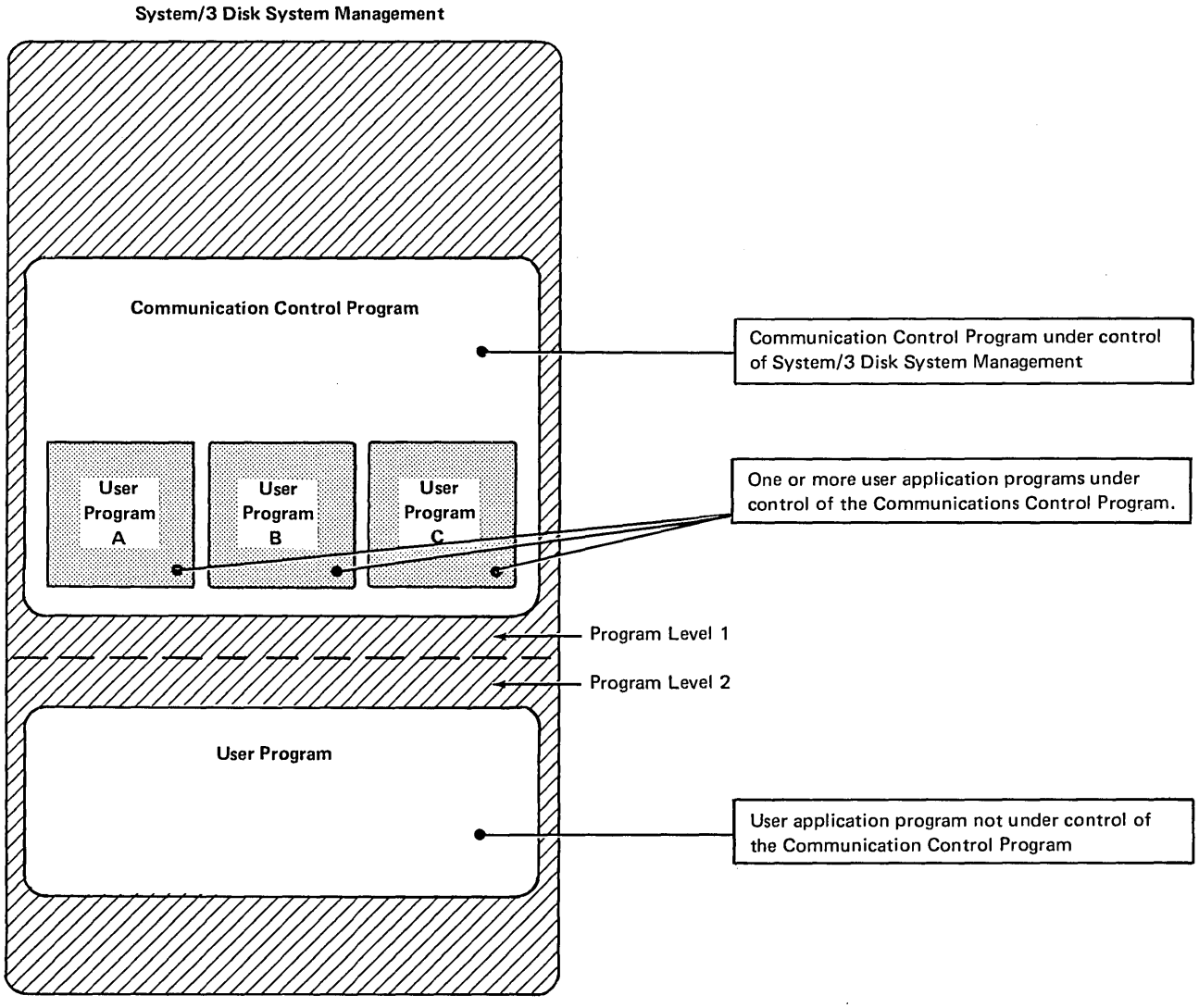

Figure 2. Main Storage Diagram Showing the Relationships Between System/3 Disk System Management, the Communications Control Program, and User Application Programs

DUAL PROGRAM FEATURE SUPPORT

If your system has the dual program feature, a second program can be in main storage at the same time that the communications control program is in operation (Figure 2). The CCP and the application programs that run under it occupy only one program level. The other level is available to accommodate another program that can operate under direct control of disk system management. That other program is not controlled by the communications control program.

While communications control program can operate in either program level, it cannot operate in both program levels concurrently.

USE OF THE COMMUNICATIONS IOCS

The communications control program incorporates and uses the IOCS appropriate to the communications adapters to be used in your system. If both MLTA and BSCA are to be supported in your system, the communications control program uses both MLTA IOCS and BSCA IOCS.

The IOCS routines are used for communication with terminals by both the control program and your application programs. Your application programs do not call directly on an IOCS routine; rather, they invoke routines provided by the communications control program, which then translates your request into an invocation of IOCS.

TERMINALS AND FEATURES SUPPORTED

The following terminals may be used with the communications control program:

- Through the multiple line terminal adapter:
  - 1050 Data Communication System
    - Multipoint switched
    - Multipoint nonswitched
  - 2740 Communication Terminal Model 1
    - Basic
    - Basic with checking
    - Dial
    - Dial with checking
    - Dial with transmit control
    - Dial with transmit control and checking
    - Station control
    - Station control with checking
  - 2740 Communication Terminal Model 2
    - Basic
    - Buffer receive
  - 2741 Communication Terminal
    - Basic
    - Switched
  - Communicating Magnetic Card SELECTRIC® Typewriter
    - Point-to-point switched
- With the binary synchronous communications adapter:
  - 3270 Information Display System
    - Multipoint nonswitched
  - 3735 Programmable Terminal
    - Point-to-point switched
    - Multipoint nonswitched
  - System/3
    - Point-to-point switched
    - Point-to-point nonswitched
  - System/360, System/370
    - Point-to-point switched
    - Point-to-point nonswitched

MACHINE REQUIRMENTS

The following is the minimum machine configuration necessary for a communications-based information system using the communications control program:

- 5410 Model A15 Processing Unit with 24,576 bytes of main storage
- One 5444 Model 2 Disk Storage Drive
- 5471 Printer-Keyboard
- 5424 Multi-Function Card Unit (MFCU) or 1442 Card Read/Punch
- 5203 or 1403 Printer
- Multiple-Line Terminal Adapter RPQ (RPQ nos. S40028, S40033) or one Binary Synchronous Communications Adapter
- At least one communications terminal of a type listed under terminals and features supported

With the above configuration, no more than one application program may be executing at a time. The minimum main storage size in which concurrent execution of more than one program is supported is 32,768 bytes (5410 Model A16).

ADDITIONAL MACHINES SUPPORTED

The following machine facilities are supported by the communications control program:

- Up to 65,536 bytes of main storage
- Up to two 5445 Disk Drives (for data files only)
- An additional 5444 Model 2 or 3 Disk Storage Drive
- Both 5424 MFCU and 1442 Card Read/Punch
- 120 or 132 print positions on the 5203
- As many as two Binary Synchronous Communication Adapters, and one Multiple Line Terminal Adapter with up to eight lines
- Dual Program Feature (see note)

Note: The communications control program does not require the dual program feature to allow more than one program to be executed at a time. Use of the dual program feature is not prohibited during execution of the communications control program, but any program executed in the other program level does not run under control of the communications control program. The communications control program can not be run in both program levels concurrently.

PROGRAMMING SYSTEMS REQUIRED

Execution of the communications control program requires IBM System/3 Model 10 Disk System Management, including all transient modules for the appropriate IOCS.

Generation of the communications control program requires IBM System/3 Model 10 Disk System Management including:

- Macro Processor (feature codes 6020, 6021)
- Overlay Linkage Editor (feature codes 6026, 6027)
- The appropriate communications IOCS (program number 5799-WAU for MLTA, and/or program number 5702-SC1, feature codes 6030, 6031 for the Model 10 Disk System BSCA).

No special programming systems requirements exist for the running of system assignments.

For the preparation of application programs, an applicable compiler or assembler is required.

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