File Number S360-36
Order No. GC30-2006-4

OS

IBM Systems Reference Library

IBM System/360 Operating System

Remote Job Entry

Program Number 360S-RC-536

This publication is designed to present the general concepts and facilities of Remote Job Entry (RJE). RJE allows users at remote locations to submit jobs over communications lines to an IBM System/360. It is available to users with either multiprogramming version of the IBM System/360 Operating System: multiprogramming with a variable number of tasks (MVT) or multiprogramming with a fixed number of tasks (MFT).

Information on the capabilities and uses of RJE, on the operating environments, and on work station states and activities is included for the systems programmer and operator. The Job Entry Control Language is introduced and explained. The Job Entry Definition Statement, work station commands, messages sent to work stations, and central commands are discussed in terms of their functions, and how the user employs them in his RJE application.

A discussion of RJE generation includes the necessary macro instructions. Communication Serviceability Facilities, such as error recovery procedures, and system restart procedures, are discussed separately as well as with the work stations.

Information about the IBM 2770 Data Communication System with the IBM 2772 Multipurpose Control Unit is included in this publication with descriptions of the input/output devices and RJE functions that are available.

A discussion of programming information for the 2780 Data Transmission Terminal and for the 1130 Computing System is included.

Fifth Edition (June, 1970)

This is a major revision of, and obsoletes, C30-2006-2 and Technical Newsletters N30-2521, N30-2522, and N30-2530. The publication IBM System/360 Operating System: Remote Job Entry, Planning for IBM 2770 RJE Support, GC30-2015-0, is also obsoleted by the inclusion of RJE 2770 information in this edition. Changes to the text, and small changes to illustrations, are indicated by a vertical line to the left of the change; changed or added illustrations are denoted by the bullet symbol (•) to the left of the caption.

This edition applies to Release 19 of IBM System/360 Operating System, and to all subsequent releases until otherwise indicated in new editions or Technical Newsletters. Changes are continually made to the specifications herein; before using this publication in connection with the operation of IBM systems, consult the latest IBM System/360 SRL Newsletter, GN20-0360, for the editions that are applicable and current.

Requests for copies of IBM publications should be made to your IBM representative or to the IBM branch office serving your locality.

A form is provided at the back of this publication for reader's comments. If the form has been removed, comments may be addressed to IBM Corporation, Publications Center, P.O. Box 12275, Research Triangle Park, North Carolina 27709.

Remote Job Entry (RJE) extends operating system facilities to remote users. This publication describes the facilities provided by RJE, the use of these facilities and the creation of an RJE system. A brief description of the related telecommunications systems is included. Operating procedures are defined for the central installation and the various work stations. This publication also introduces Job Entry Control Language (JECL) with which a user requests, controls, and maintains RJE facilities in the system.

The RJE user should be familiar with the concepts and terminology introduced in:

IBM System/360 Operating System:

- Introduction, GC28-6534
- Concepts and Facilities, GC28-6535
- Job Control Language User's Guide, GC28-6703
- Job Control Language Reference, GC28-6704

The installation programmer responsible for the creation and maintenance of the central RJE system also should be familiar with:

IBM System/360 Operating System:

- System Generation, GC28-6554
- Basic Telecommunications Access Method, GC30-2004
- System Programmer's Guide, GC28-6550

Publications relevant to programming and operation of remote work stations are:

IBM System/360 Work Station

IBM System/360 Basic Operating System:

- System Generation and Maintenance, GC24-5060
- Programmer's Guide, GC24-3372
- Operating Guide, GC24-3450
- Operator Messages, GC24-5024
- Assembler With Input/Output Macros, GC24-3361

IBM System/360 Basic Programming Support:

- Programmer's Guide, GC24-3354
- Operating Guide - Basic Tape System (8K), GC24-3391
- System Generation and Maintenance, GC24-5061
- Assembler With Input/Output Macros, GC24-3355

IBM 2770 Data Communication System

- System Components, IBM 2770 Data Communication System, GA27-3013
- IBM 2770 System Summary, GA27-3014

IBM 2780 Data Transmission Terminal Work Station

- IBM 2780 Data Transmission Terminal Component Description, GA27-3005

IBM 1130 Computing System Work Station

- IBM 1130 Functional Characteristics, GA26-5881
- IBM 1130 Disk Monitor System, Version 2, Programming and Operator's Guide, GC26-3717

IBM System/360 Model 20 Work Station

IBM System/360 Model 20:

- Remote Job Entry Work Station, GC33-4003
- Functional Characteristics, GA26-5847
- Operator's Guide, G229-2137
- Input/Output Control System for the Binary Synchronous Communications Adapter Operating Procedures, GC33-4002
- Tape Programming System Operating Procedures, GC24-9009
- Disk Programming System Operating Procedures, GC33-6004

The Remote Job Entry (RJE) facility of the operating system (OS) provides, for an IBM System/360 with attached communication lines, an efficient and convenient method of entering jobs submitted from remote work stations into the job stream. Once a job has been entered into the job stream by RJE, execution of the job proceeds under the supervision of the operating system job management routines. All data sets created by the job are handled by the operating system data management routines. Output data sets that have been created by remotely submitted jobs and that are to be returned to the remote user are placed in a separate output class. These data sets are removed from this output class and returned to the remote user under the direction of the RJE program. This type of operation provides a remote user with the same batch-computing facility that is available at the central installation.

The capability to accept input automatically from remote stations greatly increases the need for strong system discipline. For example, if a job requiring data sets at the central installation is to be submitted, the volume containing the data set involved must be available for prompt mounting. Otherwise, the system job flow can be upset or interrupted. A job requiring a large amount of main storage also can cause a system problem since processing is delayed until main storage is available.

The Remote Job Entry system provides several facilities to assist installation managers in controlling access to the system, to regulate job flow, and to provide information on system status. User exits (to examine JOB cards, for instance), the broadcast facility, remote and central messages, and the Job Entry Control Language are provided for orderly and efficient system control.

RJE not only provides a means for efficient operation of computing facilities by equipment centralization, but also gives substantial computing power on a demand basis to locations not requiring it on a regular basis. In addition, it allows sharing of a common body of information within a company by widely separated organizational units having related requirements.

RJE provides fast turnaround of computer requirements for people in all parts of a company by placing the computer facilities close to the source of input with high-speed communication lines.

EQUIPMENT AT THE CENTRAL COMPUTING SYSTEM

Remote Job Entry operation is possible either with an IBM System/360 having at least 512K bytes of main storage, which uses the operating system providing multiprogramming with a variable number of tasks (MVT), or with an IBM System/360, having at least 256K bytes of main storage, which uses the improved operating system providing multiprogramming with a fixed number of tasks (MFT). The only additions to the minimum requirements for both MVT and MFT are:

- An IBM 2701 Data Adapter Unit with Synchronous Data Adapter - Type II, an IBM 2703 Transmission Control Unit, with the binary synchronous features, or a World Trade Binary Synchronous Communications Adapter, equipped for EBCDIC code and full transparency operation. The dual communications interface feature is supported on the 2701.
- Direct access storage space for RJE tables is typically less than one IBM 2311 Direct Access Storage Device (DASD). Exact requirements depend on the number of jobs, users, and work stations supported by the system; and the direct access device used (see Appendix B).
- Direct access space for SYSIN data from remotely submitted jobs. The space required is dependent on the SYSIN requirements for the installations.

For example, a system allowing up to 100 active remote jobs, 10 work stations, and 30 users would require 18 tracks of 2311 DASD storage for RJE tables plus the additional SYSIN requirements.

REMOTE WORK STATIONS SUPPORTED

Any of the following devices can serve as work stations in the RJE system.

IBM SYSTEM/360

An IBM System/360, 16K or larger, may be used as an RJE work station. It can be connected to the central System/360 via a switched or nonswitched, point-to-point contention, communications line through an IBM 2701 Data Adapter Unit with Synchronous Data Adapter, Type II with EBCDIC transparency, or through a World Trade Binary Synchronous Communications Adapter that is supported for OS BTAM operation.

The following I/O units are required for RJE operation:

- Card reader and card punch, or a card read punch.
- Printer.
- 1052 Printer-Keyboard.

RJE also supports the following special features on the 2701:

- Auto Call.
- Dual Communications Interface.

IBM 2770 DATA COMMUNICATION SYSTEM

The IBM 2770 Data Communication System with the 2772 Multipurpose Control Unit (hereafter called a 2770) may be used as a Remote Job Entry (RJE) work station. It can be connected to a central System/360 by a switched or nonswitched, point-to-point contention line, or a nonswitched multipoint line. On switched point-to-point lines or nonswitched multipoint lines, the 2770 may be intermixed with the IBM 2780 Data Transmission Terminal, the IBM 1130 Computing System, and the IBM System/360 Model 20 or larger. The following features are required:

- EBCDIC Transparency.
- A Card Reader.
- A Printer.
- A Punch Unit.
- EBCDIC Transmission Code.
- Print Line (either 120-character or 132-character).

In addition, the 2770 Multipoint Line Control and Expanded Buffer special features are supported. The printer-keyboard is not a supported I/O device for RJE operation. The other input/output devices available for the 2770 (except those listed above) are also not supported by RJE. The card reader, the printer, and the punch are the only devices supported by RJE and all are mandatory for RJE operation.

IBM 2780 DATA TRANSMISSION TERMINAL

The IBM 2780 Data Transmission Terminal (Model 1 or 2) may be used as an RJE work station. It can be connected to the central System/360 by a switched or nonswitched point-to-point contention line, or a nonswitched multipoint line. The following special features are required:

- EBCDIC Transmission Code.
- EBCDIC Transparency.
- Print Line (either 120-character or 144-character).
- Auto Turnaround (only required on Model 2).
- Extended (Enquiry-ENQ) Retry Transmission.
- Operator Intervention.

In addition, the following 2780 special features are supported:

- Multipoint Line Control.
- Multiple Record Transmission.

IBM 1130 COMPUTING SYSTEM

An IBM 1130 Computing System may also be used as an RJE work station. The 1130 work station requires an 1131 CPU (Central Processing Unit), including a console printer-keyboard, with a single disk storage drive and at least 8K words of main storage. The system is connected to a 1200-2400 bit-per-second line via a Synchronous Communications Adapter in binary mode. The line may be a switched or a nonswitched, point-to-point line or a nonswitched multipoint line.

The following I/O units are required for RJE operation:

- Card reader and card punch, or a card read-punch.
- Line printer with 120-character print line.

The following special features are supported:

- One or more disk storage drives for input.
- One disk storage drive for output.

IBM SYSTEM/360 MODEL 20

RJE facilities are available for the IBM System/360 Model 20 under Card Programming

Support (CPS), the Tape Programming System (TPS) and the Disk Programming System (DPS); the Model 20 work station can be connected to the central System/360 by a 600-50,000 bit-per-second switched or non-switched, point-to-point (contention) line or nonswitched multipoint line. Line speed over 4800 bits per second is available only in PTP.

The minimum system requirements under CPS, TPS and DPS are:

- An IBM 2020 Central Processing Unit (submodels 2, 4 and 5) with 12K bytes of main storage.
- A card reader.
- A printer.
- An IBM Binary Synchronous Communications Adapter (Feature No. 2074 for submodel 5 and 2720 for submodels 2 and 4 for the World Trade supported adapter, and Feature No. 2074 only for all submodels for the domestically supported adapter) with EBCDIC and Full Transparency Text Mode Features.

The following additional features are supported:

- A card punch (may be required for generating the program).
- Under TPS, tape input and output.
- Under DPS, both tape and disk input and output.
- Under DPS, an IBM 2152 Printer-Keyboard.

This section describes the basic characteristics and operational concepts of the Remote Job Entry telecommunications system: what it is, how its sections are related, how communication proceeds, and how control is maintained. A number of commonly used terms are defined.

The RJE system is, in effect, a specific application of a computer-based telecommunications system. The particular telecommunications system used for Remote Job Entry is characterized by a number of work stations that are connected to a central processor by one or more communication lines operating in half-duplex mode. A half-duplex line is a line over which data can flow in either direction, but in only one direction at a time.

The RJE program uses the OS Basic Telecommunications Access Method (BTAM) to control the communication lines and communicate with the work stations. Work station is used as a general term to represent interconnected equipment at the remote location having both input and output capability. Work stations are usually separated from the central processor by a distance sufficient to require common carrier facilities to accomplish communication with the central processor. The system, however, may include work stations attached to the central location by local lines. Regardless of location, all supported work stations are classified as "remote" since they are attached to the central system by an IBM 2701 or 2703 transmission control unit.

TELECOMMUNICATIONS NETWORKS

A telecommunications system may utilize a nonswitched network, a switched network, or a combination of the two.

A nonswitched network consists of a number of private or leased lines that connect the computer to one or more work stations. The computer and work stations are physically connected; that is, the circuits making up the communication lines are continuously established for predetermined time periods during which data may be transmitted over them. The lines that comprise a nonswitched network are known variously as private, leased, or dedicated lines. These lines are usually furnished by a common carrier on a contract basis between specified locations for a continuous period or for regularly recurring periods at stated hours for the exclusive use of one customer.

A switched network allows many work stations to communicate with the computer without requiring dedicated communication connections. The computer and the several work stations are connected by access lines to the common-carrier exchanges serving their respective locations. A complete and continuous data path is established between computer and work station only for the period of time in which transmission takes place. The connection is established by dialing the telephone number of the unit at the other end. In this case, line refers to a discrete data path between the telecommunications control unit and the common carrier exchange. The service provided by the common carrier is usually on a time-used basis.

Some communication networks have characteristics typical of both switched and nonswitched networks. In this publication, the term switched network refers to any network in which a direct physical connection between computer and work station must be established by dialing in order for data transmission to occur. The term nonswitched network refers to a network in which the communication lines linking computer and work station are continuously established, thus requiring no dialing.

NETWORK CONTROL

Initial contact between the central system and the remote work stations in an RJE system may occur in two ways, dependent on the type of line connection between them. The connections possible are multipoint (on nonswitched lines) and point-to-point contention (on both switched and nonswitched lines). The RJE system permits communication using either type of connection.

If a work station is connected via a multipoint line, data is sent and received under control of the central system. In order to send data, the work station must be polled by the central system. In order to receive data, the work station must be selected by the central system. Polling is an invitation to a work station to transmit data to the central system. Once a work station has accepted this invitation (through recognition of its polling characters), it may use the line to send data.

When it has finished, it sends the central system an End-of-Transmission (EOT) character. At such time, the central system is again free to poll or select another work station.

Selection, on the other hand, is an invitation to a work station to receive data from the central system. If it is a multiple component work station (more than one output device, for example, the IBM 2780 Model 2), the selection characters specify the component that is to receive the data. When the central system has finished transmitting, it sends an End-of-Transmission character and polls or selects another work station on the line. Selection normally has precedence over polling. That is, after initial contact, output is sent by the central system before any input is collected from a work station.

The other type of line connection possible in an RJE system is point-to-point contention, with one work station connected over a switched or nonswitched line. On a nonswitched line, either the central system or the work station may initiate transmission of data after the work station is logically attached to the system. The central system always yields to a work station, even though it may itself desire to transmit.

Over switched lines (dial connection), operation is similar to nonswitched once initial contact has been made. In the RJE communications environment, the central system never initiates communications with a work station on a switched line. The central system breaks the connection only after receiving a disconnect sequence or an RJEND command from the work station. (Refer to the section on Work Station Commands for a description of the RJEND command.)

Data transmission in the RJE system uses binary synchronous communication in the EBCDIC transparent mode of transmission. The transparent mode of communication allows transmission of the full EBCDIC character set as data.

GENERAL CONCEPTS

Remote Job Entry controls a flow of data and processes that data as required. Data entering from remote sources is the primary input to the RJE system and consists of job entries and work station commands. Commands are also entered by the central operator.

Jobs submitted by remote users are passed to the operating system for scheduling and execution. When the output resulting from these jobs becomes available, it is returned to the user as requested--either immediately or on command.

OPERATING ENVIRONMENT

RJE operates in conjunction with either Operating System Option 4 (MVT), or the improved Option 2 (MFT) as a system task, much like a combined reader and output writer.

RJE FACILITIES

In addition to those facilities provided by the operating system, the RJE user is provided with the following capabilities:

- He can submit a job via a communication line to the central system from a remote location. This job is submitted just as it would be at a local card reader except for the possible addition of control statements requesting special RJE processing.
- Using the command language provided, the RJE user can request services not otherwise available in the remote environment. The work station commands are:

1. RJSTART - Attach a work station to the RJE system.
2. RJEND - Detach a work station from the RJE system.
3. LOGON - Attach a user to the RJE system.
4. LOGOFF - Detach a user from the RJE system.
5. OUTPUT - Retrieve selected job output.
6. CONTINUE - Continue interrupted in-process output.
7. DELETE - Delete a selected job or jobs from the RJE system.
8. ALERT - Request notification of selected job completion.
9. STATUS - Retrieve selected job status.
10. BRDCSTR - Retrieve broadcast messages containing system status from the central system.
11. MSGR - Send a message to a work station or to the central operator.

- The user can specify that job output be returned either immediately or on command.
- He can direct job output to himself, to an alternate user, or to the central system output devices. Only the user who submits the job or an alternate specified by him can receive job output remotely.
- The user can request notification of job completion, including an indication of normal or abnormal termination, and other user-supplied information.
- The remote operator can discontinue in-process output and continue it at a later time by command.
- The user can specify form numbers for each output data set. When a change in form number occurs, output is automatically discontinued, and a message is sent to the remote operator who may continue the output when the form requirement is satisfied.
- The central operator, using commands provided him, can supervise the central system and communicate with remote users. The central commands are:

1. START - Begin RJE operation at the central installation.
2. STOP - Cease RJE operation at the central installation.
3. USERID - Add users to or delete users from the system.

4. CENOUT - Cause output from remotely submitted jobs to be written locally.

5. SHOW - Display information pertaining to RJE.

6. MSG - Send a message to a work station.

7. BRDCST - Maintain information in the broadcast data set.

WORK STATION STATES

In describing the Remote Job Entry system, it is convenient to refer to work stations in the following states: inactive, active, and processing. These states reflect the appearances a work station may give to the central system. On the basis of the state of a work station, the central system determines what communication is permitted. While all three states may be found in the RJE system at a given time, a specific work station is in only one state at a time. The movement between states is controlled by the work station through various JECL commands sent to the central system. When one of these commands representing a valid change of state is received, operation proceeds in the new state until another valid change is specified by the work station. Invalid requests are not serviced, and an error message is sent to the work station which made the request.

After startup procedures have been completed at the central system, it is ready to service the work stations. At this time all work stations appear in the inactive state.

INACTIVE

All work stations are placed in the inactive state when the central system is closed down. When a work station is in the inactive state, it is logically detached from the RJE system. The central system assumes that an inactive work station does not want to participate in RJE activities and, consequently, it does not initiate any data transmissions to the station. However, it is conditioned to receive an RJSTART command from an inactive work station. If any other input is received from an inactive work station, it is refused, and an error message is returned to the work station. A work station in an active or processing state becomes inactive by submitting an RJEND command.

ACTIVE

Work stations enter the active state when the central system receives an RJSTART command from an inactive work station or a LOGOFF command from a processing work station. Active work stations are logically attached to the RJE system. The central system can initiate data transmissions to active work stations. These transmissions consist of any work station output that is on the work station output queue. Work station output is any output that is directed to the work station whether or not a valid user is logged on at the work station, for example, immediate job output and source notification messages. Broadcast messages are transmitted to active work stations if requested when the RJSTART command is received.

When the central system receives a valid RJSTART command, the work station is logically attached to the RJE system. When the central system receives a valid LOGOFF command (from a processing station), the current user is detached from the RJE system, but the work station reverts to the active state and remains attached. The central system is conditioned to receive only a LOGON, an RJEND, or a CONTINUE command from an active work station. If any other input is received from an active work station, it is rejected, and an error message is returned to the work station.

PROCESSING

An active work station enters the processing state when the central system receives a valid LOGON command. The LOGON command indicates that a user desires access to the RJE system. RJE input is accepted by the central system only from processing work stations. RJE input consists of job entries and work station commands. In addition, the central system transmits work station output and user output to a processing work station if the work station has no input to submit. User output is that output which is returned only if the user is logged on at the work station.

The central system is conditioned to receive any input from a processing work station. However, if any of those control statements that specify a change of state is received, the work station assumes the new state.

Figure 1 shows the three states and the commands leading to and from these states.

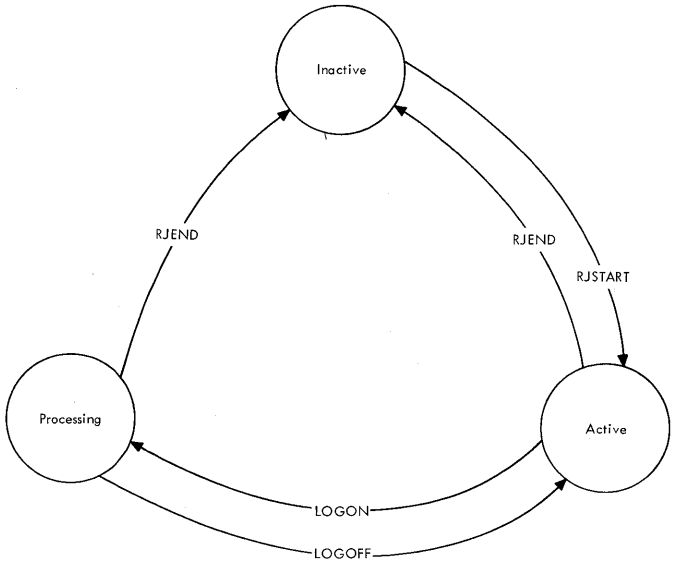


Figure 1. Transition of Work Station States

STARTUP AND CLOSEDOWN

When the central system is in operation, remote work station users may begin and end RJE activities at will. When the central system ceases operation, all work stations are closed down.

CENTRAL STARTUP AND CLOSEDOWN

Central startup and closedown are achieved by the START and STOP commands provided for the central operator. When startup is initiated by the START command, the communication lines are opened and the central system is prepared to service the work stations. When closedown is initiated by the STOP command, a message is sent to the central operator and to active and processing work stations indicating completion of the RJE task.

WORK STATION STARTUP

A work station starts up in the RJE system by identifying itself to the central system with the RJSTART command. If the work station identification (termid) specified on this command is recognized by the central system, the work station is placed in the active state. This procedure ensures that only valid work stations have access to the central system (especially critical on switched network applications). Once active, a user now may gain access to the system from this work station by logging on, or the work station may simply wait for work station output directed to it. Of course, before sending the command to the central system, the work station must be brought on-line, as outlined in the sections of this manual dealing with the various work stations supported by RJE. The procedure for attaching the work station once these procedures are executed is the same for all work stations, that is, submitting the RJSTART command.

WORK STATION CLOSEDOWN

A work station terminates RJE activites (closedown) with the RJEND command. This command initiates logical detachment of the work station from the system. The central system first responds with any pending messages and with the status of all jobs that were submitted from the work station. It then places the work station in an inactive state. When the work station receives the message that the closedown procedures are complete, it is free to be used for local processing. In addition, if the work station is connected to the central system with a switched line, the connection with the central system is broken, and the line is made available for another work station.

USER ACCESS

A user gains access to the RJE system by submitting the LOGON command at an active work station. This procedure insures that only valid users have access to the RJE system. If he is identified as a valid RJE user, he may submit input to the central system or request job output. The period during which a user is actively engaged in remote job entry is a session. A session begins when a valid LOGON command is received and ends with the LOGOFF command. A user may submit input and receive output at any work station in the system. When he is not logged on, a user is associated with the last work station at which he was logged on.

SYSTEM SECURITY

The RJE system is protected from unauthorized access through the combined use of the work station identification in the RJSTART command and the identification and protection key sequence in the LOGON command (see section on Work Station Commands).

Verification of valid work stations occurs at RJSTART time; verification of valid RJE users is established at LOGON

time with the user identification (userid) and protection key.

Output from a remotely submitted job is further protected in that it may be requested only by a recipient named in the Job Entry Definition (JED) for that job, or by the originator at a recognized work station.

INPUT AT THE WORK STATION

The input stream at the remote work station is composed of job entries and work station commands.

JOB ENTRY

The job entry is the primary input of the Remote Job Entry system. It is a combination of the job to be executed at the central system and the optional RJE control statement, that is, the Job Entry Definition statement (JED). This optional statement specifies certain actions to be taken in processing the job by RJE. If the JED is not specified, system options are assumed when the job is received.

The jobname found in the JOB statement identifies the job entry to RJE. This allows the RJE user to request and receive job output and job information by jobname--a name that the user specifies. RJE operation requires individual jobnames. If a job with the same name as a job already in the system is received, the second job is rejected and a message is sent to the user. Once the user has either received the job output or deleted the job he is free to reuse that jobname. Duplicate jobnames can be avoided in the system if users begin their jobnames with their own unique userids.

WORK STATION COMMANDS

The user makes specific requests of the RJE system via work station commands. Work station commands may be entered through the card reader or the printer-keyboard. If the commands are entered through the card reader, they may appear anywhere within the input stream except within a job entry. A detailed description of the work station commands is given in the section describing Job Entry Control Language.

OUTPUT AT THE WORK STATION

Two kinds of output are received at the work station: job output and messages.

JOB OUTPUT

Job output is the result of execution of remotely submitted jobs. Job output includes job management messages and output data sets created by the job. The output data sets to be returned to the user must be specified as SYSOUT. The remote device to which the output is returned is specified by the class in the SYSOUT keyword. Macro instructions used during the RJE assembly process allow the specification of remote SYSOUT classes consistent with those used at the central system. That is, if class A usually represents a central printer, the RJE system is assembled so that class A in a remotely submitted job causes output to be directed to the remote work station printer.

RJE supports output to a remote printer and punch. In addition, RJE provides an exit for remote computers allowing a user-written routine to write output to any available device. Each remotely submitted job can generate a maximum of 24 SYSOUT data sets to be returned to the remote work station. Any data set beyond the 24 maximum is automatically directed to the work station printer.

Note: The SYSOUT designation must be used even though the remote work station is a 2780 or a computer with an operating system that does not support a SYSOUT designation. The RJE program determines the disposition from the SYSOUT parameter on the DD statement.

Job management messages, including diagnostics of job control statements and allocation and deallocation messages, are always returned to the work station. Results of Write-To-Operator macros within a job and of password requests for password data sets are directed to the printer-keyboard of the central system and are not available at the work station unless returned to the work station by the central operator as an RJE message.

During RJE operation, operands of system input data definition statements (DD * and DD DATA statements) appearing in the remote input stream are replaced with information appearing in the RJE catalogued procedure section of this publication. The generated operands appear in the listing of JCL preceding the job output. The appearance of the generated operand is the only distinguishing characteristic between printed output generated from a remotely submitted job and that generated from a job submitted from the central installation.

The following three statements are those that replace the DD * or DD DATA statements of the remote job input stream:

```
//ddname  DD  UNIT=23xx,DISP=(OLD,DELETE),VOLUME=SER=xxxxxx,
//            DSNAME=SYSyyddd.T123456.I0007.jobname.Snnnnnnn
//            SPACE=(80,(cccccc))
```

where:

23xx and VOLUME=SER=xxxxxx are obtained from the RJE procedure;

yyddd is the date the job was submitted;

nnnnnnn is the unique (to this IPL) data set number;

cccccc is the number of SYSIN records spooled to disk by RJE (must be less than 32,767).

Output Control

Output at the work stations also involves a number of options which are specified in the job entry definition statement (JED) and work station commands.

- The output may be directed to the source work station as soon as the job is completed and the work station is available to receive it.
- The output may be left at the central system until the user requests it.
- The output may be directed to an alternate user by the originator.
- Output may be requested at any work station either by the originator or by a user named as the alternate recipient. The recipient who first requests the output receives the only copy of the output.
- The remote user may make multiple copies of his output available to either himself or an alternate by writing his output to a named data set and submitting a job step that executes an OS data set utility program - IEBPTPCH - to copy the output to SYSOUT. The IEBPTPCH program is described in the publication IBM System/360 Operating System Utilities, GC28-6586.
- Notification of job completion may be requested. This notification includes indication of normal or abnormal termination.

Details of JECL specifications for output control are given in the section Job Entry Control Language.

MESSAGES

Messages received at a work station include: responses to input from the work station, diagnostic messages, messages sent by RJE users and the central operator, and broadcast messages maintained by the central operator and sent to a work station upon request. The broadcast messages include any information considered desirable by the installation: closedown of the central system, loss of a central resource, or addition of a central resource, for example.

If a work station has no printer-keyboard (for example, a 2780), these messages appear on the line printer between job outputs. If a work station has a printer-keyboard, a user may request that messages appear on it, rather than on the line printer.

Detailed specifications for messages are given in the section describing Job Entry Control Language.

FORMS REQUIREMENTS

The form number subparameter of the SYSOUT parameter is used to specify special forms requirements. Output to the work station is automatically discontinued and a message is sent to the work station when RJE finds a form number that is different from the form number of the last data set sent to the same work station. This message includes the form number specified for the data set waiting to be sent. RJE then waits until it receives a CONTINUE command from the work station indicating that it is ready to receive the output. The operator at the work station submits this command when the proper forms have been inserted in the output device. When the CONTINUE command is received at the central system, output resumes until another change in form number is found, or the remote operator initiates action to discontinue output at the work station. Since the procedures for discontinuing output are dependent on the type of work station device, they are discussed separately under the operating procedures for each work station.

COMPRESS/EXPAND

This optional feature provides increased system throughput by suppression of blanks during transmission. At RJE assembly time, the user selects which terminals are to use this option by coding the RJETERM macro instruction for the central system. The work station programs for these selected terminals must also include the compress/expand feature. The BOS/BPS Work Station

Program, the 1130 Work Station Program, and the IBM System/360 Model 20 (2020) Work Station Program support the feature.

MULTIPLE RECORD FEATURE

The multiple record feature of the 2780 work station is supported by RJE. It provides increased system throughput by blocking up to seven output records. At RJE assembly time, the user specifies this option in the RJETERM macro instruction for the central system.

SYSTEM MANAGEMENT FACILITIES

RJE supports the system management facilities (SMF) feature of the operating system that is provided to record a history of each job as it is processed and to monitor jobs as they are processed. SMF gathers and records job information that can be used by management programs to report system efficiency, performance, usage and costs. This feature also allows the manager to add installation-written routines that enforce installation standards of identification, priority, resource allocation, and maximum execution time.

REVERSE INTERRUPT LINE CONTROL

RJE uses the binary synchronous communications (BSC) reverse interrupt (RVI) line control character to allow two or more types of supported work stations to be connected to the same switched line. For example, a 2770, a 2780, an 1130, or a System/360 Model 20 or larger may use the same switched line connection.

SYSTEM OVERLOAD

An overload condition results if direct access storage space at the central installation is insufficient to meet the demands of the system. Input already received and acknowledged by RJE is not affected by an overload condition. Any input transmission causing an overload condition is aborted and must be entirely resubmitted at a later time.

In each overload situation, a message is sent to both the central operator and the work station operator indicating the particular resource depleted. If the system continues to be overloaded, the direct access storage space allotted for the resource must be increased to reflect more realistically the peak traffic requirements of the system. An alternate solution may be to reschedule the work load to take advantage of periods of relative inactivity.

The total system input capacity is specified by the central installation and is dependent on the following resources:

- The quantity of SYS1.SYSJOBQE space - specified at OS system generation or during IPL.
- The number of concurrent jobs RJE is to maintain - specified at RJE assembly.
- The quantity of space for remotely submitted SYSIN data - specified in an RJE cataloged procedure referenced in the START command for RJE.

SYS1.SYSJOBQE depletion results when job input submitted both locally and from attached work stations, exceeds the limit specified by the central installation. If this condition continues to occur, the size of the SYS1.SYSJOBQE must be increased to reflect both the local and remote requirements of the system. This will require that SYS1.SYSJOBQE be scratched and reallocated.

An overload condition also occurs when the number of remote jobs resident in the central system exceeds the limit specified when the RJE program was assembled. Remote jobs are resident until the output is removed from the RJE SYSOUT class. This condition is relieved by requesting the output of completed remote jobs or by deleting jobs that are tying up the system. The central operator can do this with the CENOUT command. The RJE user can do this with the OUTPUT and DELETE commands. If the condition continues to occur, the number of remote jobs RJE can maintain must be increased. This requires an RJE assembly.

Depletion of SYSIN space is the final cause of a system overload. In its cataloged RJE procedure, the installation specifies SYSIN data sets on a communication line basis. In this procedure, the installation specifies the maximum space available for any one SYSIN input data set. Specifying the maximum amount of space allocated for one input data set prevents one job from getting all the SYSIN space. This is a system protection feature, and no special action is necessary at the central system if a job exceeds this limit. On the other hand, a regular depletion of space for SYSIN allocation necessitates that more SYSIN space be made available to the system (See the section entitled Cataloged Procedures for RJE).

The additional flexibility and control required by the remote entry are provided in the RJE system by Job Entry Control Language (JECL). JECL is independent of Job Control Language (JCL), allowing system independence for RJE applications and isolation of those control statements needed only for an RJE application. As a result, only JECL statements are added or removed when a user moves between local and remote environments. The job and its scheduling information (in JCL) are the same in either environment except that JCL In-Stream Procedures are not supported in the remote RJE environment. JECL uses the same coding format as that used for Job Control Language statements. For further information on In-Stream Procedures, see the IBM System/360 Operating System Job Control Language Reference, GC28-6704, and the IBM System/360 Operating System: System Programmer's Guide, GC28-6650.

The RJE user identifies himself and his work station to the system with JECL. When the user and the work station are identified as part of the system, the user may request other RJE facilities with additional JECL statements. These other RJE facilities include the ability to:

- Select job output control options.
- Communicate with the central operator.
- Communicate with other RJE users.
- Inquire about status of jobs in system.
- Receive notification of job completion.
- Detach the work station from the system.
- Continue transmission of interrupted output.
- Define RJE processing of a remotely submitted job.

JECL STATEMENTS

Communication between the user and RJE processing programs is accomplished by two types of Job Entry Control statements:

1. Job Entry Definition Statement.
2. Work Station Command Statement.

These control statements aid the RJE processing programs in the servicing of users and the supervision of work stations attached to the RJE system.

THE JOB ENTRY DEFINITION STATEMENT

The Job Entry Definition Statement (called the JED statement) marks the beginning of a job entry. It is the only JECL statement that may be continued on successive cards. With the JED statement, the user specifies disposition of job output, notification at job completion, alternate recipient of the output, and information to be returned with notification. The JED statement is an optional statement. If a job in the input stream is not preceded by a JED statement or the JED statement is in error, RJE system default options are assumed.

THE WORK STATION COMMAND STATEMENTS

For the RJE user, work station command statements provide a convenient means of requesting RJE facilities to aid him in his application. They enable him to request output, determine the status of a job, specify the state of the work station, etc. A thorough discussion of the commands provided and the facilities that they offer is provided in the section on Work Station Commands.

FIELDS IN THE CONTROL STATEMENTS

Control statements submitted at a work station contain two identifying characters (..) and four fields: operation, operand, comment, and sequence. In some of the statements one or more of the fields are blank. Figure 2 shows the fields in each statement.

Statement	Columns 1 & 2	Fields (Columns 4-71)	Columns 73-80
Job Entry Definition	..	JED Operand Comment*	Sequence*
Work Station Command	..	Operation Operand Comment* (Command)	Sequence*

*Optional

Figure 2. Fields in the Control Statements

The operation field specifies the job entry definition statement or, in case of a command statement, the command. It can contain only one of the set of prescribed operations or commands. The operation field need not begin in a specific card column, but it must be preceded and followed by at least one blank.

The operand field contains one or more parameters of information separated by commas. Parameters are described as values for which information must be substituted. The operand field has no fixed length or column requirements but must be preceded and followed by at least one blank.

The comment field can contain any information considered helpful by the person who codes the control statement. It has no fixed length or column requirements but must be separated from the operand field by at least one blank. If the operand field is omitted, a comma followed by at least one blank indicates that comments follow. If the statement has no operand field, no comma is required to separate the operation and comment fields.

The sequence field contains up to eight characters of optional information used for control statement identification. It becomes especially useful in RJE since a number of similar commands may be submitted from the same work station. RJE returns the sequence field in all immediate responses and diagnostics for JECL statements. The sequence field correlates the statement entered with the response received. With the use of the sequence field, therefore, the user can easily determine which statement is addressed by each response. The sequence field is positionally dependent and must be coded in the last eight columns (73-80) of the control statement.

Identifying characters and fields are contained in columns 1 through 71 of the control statement. The total number of characters, including blanks, cannot exceed 71, except in a JED statement. Statement continuation is done automatically by the operating system without coding a nonblank character in column 72.

Programmer's Note: The only control statement that may be continued is the JED statement.

PARAMETERS IN THE OPERAND FIELD

The operand field is made up of two types of parameters: positional and keyword. A positional parameter is characterized by its position in the operand in relation to other parameters, and must be placed first in the operand in a specific order. The absence of a positional parameter is indicated by a comma coded in its place.

A keyword parameter is positionally independent with respect to other keyword parameters and is characterized by a keyword followed by an equal sign and variable information. The variable information in keyword parameters can take the form of a list of several items (subparameters) of information.

A list of subparameters must be enclosed in parentheses unless the list reduces to a single parameter.

DESCRIPTION OF CONTROL STATEMENTS

Several conventions are followed in illustrating the format and coding of Job Entry Control Language:

- Upper case letters, numbers, and punctuation marks must be coded by the programmer exactly as shown. Exceptions to this convention are brackets, [ ]; braces, { }; ellipses, ...; and subscripts. These are never coded.
- Lower case letters and words represent variables for which the programmer must substitute specific information or specific values.
- Items or groups of items within brackets, [ ], are optional; they may be omitted at the programmer's discretion. Any item or group of items not within brackets must be coded.
- Braces, { }, group related items, one of which must be coded.
- Stacked items, enclosed in either brackets or braces, represent alternative items. No more than one of the stacked items may be coded by the programmer.
- If an alternative item is underlined, that item is implied; that is, the RJE system automatically assumes that it is the programmer's choice if none of the items are coded.
- An ellipsis, ..., indicates that the preceding item or group of items can be coded more than once in succession.

FUNCTION OF JED STATEMENT

With the JED statement, the user specifies how his job entry is handled at the central system. The JED statement describes job entry processing through a combination of optional keyword parameters. The choice of these parameters depends upon the RJE application. The JED statement is not required as part of the job entry. If the JED statement is omitted, system default options are assumed. These assumed options are:

1. Immediate output.
2. No notification of job completion.
3. All output returned to the user.

If the JED statement is included but contains errors in syntax, the statement is rejected, but the job is accepted and is processed with the assumed system default options. (The descriptions of the keyword parameters in Figure 3 include the assumptions made by RJE if the parameters are omitted.)

The operand and comment fields can be continued on as many cards as are required to define the job entry. A nonblank character in column 72 indicates that the statement is continued on the next card. A continuation card is identified by the characters (..) in columns 1 and 2. Columns 3 through 15 in the card are blank. A continued operand field must begin in column 16 of the card. A continued comment field can begin in any column past column 15.

ID	Operation	Operand (Keyword Parameters)
..	JED	[OUTPUT=IMMED OUTPUT=(DEFER[,userid])] [,NOTIFY=({SOURCE BOTH}[,'text'])] [,CENTRAL=({stepname.ddname},...) ,CENTRAL=ALL]

Figure 3. Format of the JED Statement

OUTPUT -- SPECIFYING JOB OUTPUT DISPOSITION

The OUTPUT keyword parameter allows the user to specify job output as immediate or deferred. This parameter also allows the user submitting the job to specify another user as a valid recipient of the output. RJE returns immediate job output to the originator of the job as soon as it is completed. RJE returns deferred job output when it is requested on the command of valid recipients. RJE returns deferred job output only to a user who submitted the job or was named as a valid recipient.

Only one copy of job output is available. This copy is returned to the first valid recipient requesting it. The remote user makes multiple copies of his output available to either himself or an alternate by writing his output to a named data set and submitting a job step that executes a utility program (IEBPTPCH) to copy the output to SYSOUT. The IEBPTPCH program is described in the publication IBM System/360 Operating System Utilities, GC28-6586.

If the user omits this keyword in the JED statement, the RJE system assumes OUTPUT=IMMED.

Operation	Operand
JED	[OUTPUT=IMMED OUTPUT=(DEFER[,userid])]

OUTPUT=IMMED
specifies job output as immediate. The user receives this output at the work station where he is logged on. If the user is not logged on when the job is complete, RJE sends the output to the work station where the user was last logged on. If this work station is inactive, the output is held until

either the work station is logically attached or the user logs on at another work station. In addition, if the inactive work station is connected via a switched line, RJE sends a message to the central operator indicating that output is available for the work station. This message allows the central operator to call the work station and inform the operator that there is immediate output available. Thus, the work station need not maintain connection with the central system when there is no traffic over the line. If the work station is connected via a nonswitched line, no message is sent to the central operator.

OUTPUT=DEFER
specifies job output as deferred. The user must retrieve this output by command. It is sent to the work station where the user requests the output. Since no alternate is specified, the job output can only be requested by the user who submitted the job. The work station may or may not be the work station from which RJE received the job. The status of deferred job output in the system is available by command.

OUTPUT=(DEFER,userid)
specifies job output as deferred, and specifies that another RJE user, identified by the userid, is a valid job output recipient. RJE returns this output to the user submitting the job or to the user named in this subparameter. If an invalid userid is specified, the userid subparameter is ignored, and a message indicating the error is sent to the user who submitted the job. The JED statement is processed as though no userid were specified.

NOTIFY -- REQUESTING NOTIFICATION OF JOB COMPLETION

The NOTIFY keyword parameter allows the user to request notification of job completion. In addition, the user may specify up to 25 characters of text, which RJE returns with the notification. The NOTIFY keyword parameter is used in conjunction with the DEFER subparameter in the OUTPUT keyword parameter. Notification includes the jobname and the type of job termination--normal or abnormal. If the user omits this parameter, no notification is sent at job completion. If the JED statement includes OUTPUT=IMMED, RJE ignores the NOTIFY parameter and continues processing the statement.

Operation	Operand
JED	[NOTIFY=({SOURCE / BOTH} [,'text'])]

NOTIFY=SOURCE
indicates that the user originating the job desires notification of job completion. The procedure for notifying the user of job completion is the same as the procedure for sending immediate output, described above in OUTPUT=IMMED.

NOTIFY=BOTH
specifies that the user originating the job desires that both he and an alternate recipient be notified at job completion. He specifies the alternate recipient in the OUTPUT parameter. If an alternate recipient is not specified, only the originator receives notification. No error message is sent. Procedures for notifying the user originating the job are the same as those for sending immediate output, described in OUTPUT=IMMED. An alternate recipient receives notification only when he is logged on after job completion. If the originator requests the output before the alternate recipient logs on, no notification is sent to the alternate.

NOTIFY=(SOURCE,'text')
indicates that the notification at job completion is to include the text that the user has specified as a subparameter. The text is limited to 25 printable characters and blanks, and must be framed in apostrophes. If the text contains apostrophes, they must be paired, and each pair counts as one text character. The text subparameter contains any information that the user considers valuable in the job completion notification.

NOTIFY=(BOTH,'text')
specifies that the user originating the job desires that both he and an alternate recipient, specified in the OUTPUT parameter, be notified at job completion, and that the notification of each user include the information specified in the text subparameter. Notification of each user takes place as described for NOTIFY=BOTH.

Note: The information specified in the text subparameter also is included in the response for any ALERT command associated with this job (see ALERT).

CENTRAL - WRITING ON THE CENTRAL INSTALLATION OUTPUT DEVICES

The CENTRAL keyword parameter allows the user to direct job output data sets to the central installation output writers for processing. These output writers process the output by class in accordance with the central installation's usual SYSOUT conventions. That is, if the user specifies his output as class A (SYSOUT=A), the output is written when an output writer is started for class A at the central system. The user may specify that all output data sets created by the job are to be processed centrally, or that from one to ten output data sets are to be processed centrally and the remaining job output returned to him. Job management messages (allocation, deallocation, statement errors, etc.) are always directed back to the remote user except when the central operator requests the job output to be written at the central system (see the CENOUT command). Once the specified output has been given to the local output writers for processing, it cannot be returned to the user. If the user omits the CENTRAL parameter, all output created by the job is returned to him.

Operation	Operand
JED	[CENTRAL=({stepname.ddname}, ...)] [CENTRAL=ALL]

CENTRAL=stepname.ddname
specifies that the output data set, created in the step named (stepname) and defined by the DD statement named (ddname), is to be processed by the central output writers. The output data set is processed by an output writer according to the class specified in the SYSOUT parameter of the DD statement. If the indicated DD statement is not included in the specified job step, the JED statement is processed as if no reference to the data set were made. An error message is returned, however, to the remote work station for each data set not found in the JCL for the JOB step.

CENTRAL=(stepname.ddname,...,
stepname.ddname)
provides a list of output data sets that are to be processed by the central output writers. Each data set specified in the list must be identified with the name of the step that creates it and the name of the DD statement that defines it. The maximum number of data sets that can be specified in this list is ten.

CENTRAL=ALL
specifies that all output data sets created by the job are to be processed by the central output writers. Job management messages are not given to the central output writers for processing and are always available to the user after job completion except when the central operator requests output to be written at the central system (see the CENOUT command).

Programmer's Note: The subparameter list of the CENTRAL keyword may be continued on as many cards as necessary to complete the list, (see example one in Figure 4).

JED STATEMENT EXAMPLES

The examples explained here are illustrated in Figure 4.

Example One

1. OUTPUT=(DEFER,CHC) specifies job output as deferred. This output is kept until a valid user requests it. It also specifies that a user assigned the userid CHC is a valid recipient of this output. Whoever requests the job output first, the originator or CHC, receives the only copy of the output.

2. NOTIFY=(BOTH,'CALL JONES IF NOT PRESENT') specifies that both the originator and CHC are to be notified when the job completes. The originator receives the notification at his work station even if he is not logged on. CHC receives notification when he is logged on. The notification includes CALL JONES IF NOT PRESENT. The notification is not sent to CHC if the output is requested by the originator before CHC logs on.

3. CENTRAL=(STEP1.STSDS1,STEP2.STSDS2, STEP3.STSDS3) shows that the user desires that three output data sets, STSDS1 created in the first step of the job, STSDS2 created in the second step, and STSDS3 created in the third step, be processed by the central installation output writers. These three data sets are not returned to the user.

4. The sequence field, COSINE01, COSINE02, or COSINE03, is returned in any JED diagnostic message to identify the specific card in error.

Example Two

1. OUTPUT=IMMED specifies the job output as immediate. RJE returns the output to the work station where the user is or was last logged on.

2. NOTIFY=SOURCE is ignored by RJE since the output is specified as immediate. No error message is sent.

3. All job output is returned to the user since the CENTRAL parameter is omitted.

4. The sequence field, SORT001 or SORT002, is returned in any JED diagnostic message to identify the specific card in error.

Example Three

1. CENTRAL=ALL specifies that the central output writers process all output data sets created by the job according to class. These data sets are not available to the user.

2. NOTIFY=SOURCE specifies that the user receives notification of job completion.

3. OUTPUT=DEFER specifies that job output is deferred and returned to the user upon command. In this example only job management messages are available since CENTRAL=ALL is specified.

4. The sequence field MONLRPT is returned in any diagnostic message pertaining to this statement.

Example Four

This JED statement example illustrates possible coding errors:

1. The OUTPUT subparameters are specified in the wrong order. The disposition of output must be specified before specification of an alternate recipient of the output.

2. The text subparameter in the NOTIFY parameter is not framed with apostrophes. Also, the apostrophe contained within the text is not paired, and there is no right-hand parenthesis on the NOTIFY parameter.

3. The second continuation card, SQROOT03, is treated as a comment since operand field continuation is not specified with a trailing comma in the preceding card.

4. On cards SQROOT03 and SQROOT04, a stepname.ddname in the CENTRAL keyword is specified on separate cards.

Example One

```
      .. JED OUTPUT=(DEFER,CHC),                                    *COSINE01
      ..     NOTIFY=(BOTH,'CALL JONES IF NOT PRESENT'),             *COSINE02
      ..     CENTRAL=(STEP1.STSDS1,STEP2.STSDS2,                    *COSINE03
      ..     STEP3.STSDS3)                                           COSINE04
```

Example Two

```
      .. JED OUTPUT=IMMED,                                          *SORT001
      ..     NOTIFY=SOURCE                                           SORT002
```

Example Three

```
      .. JED CENTRAL=ALL,NOTIFY=SOURCE,OUTPUT=DEFER                  MONLRPT
```

Example Four (Incorrect)

```
      .. JED OUTPUT=(ERR,DEFER),                                    *SQROOT01
      ..     NOTIFY=(BOTH,SQUARE ROOT FINISH'D                      *SQROOT02
      ..     CENTRAL=(STEP1.OUTPUT1,STEP2.                          *SQROOT03
      ..     OUTPUT2)                                                SQROOT04
```

Figure 4. JED Statement Examples

Command statements provide a convenient means of requesting RJE system facilities for the remote environment. Work station commands allow users at the remote work stations to communicate with the RJE system and request RJE facilities.

Work station commands are interspersed between job entries in the input stream. They must not be included within a job entry since collection of the job entry stops when a JECL statement is encountered. Work station commands may also be entered from a printer-keyboard if one is available at the work station.

The command statement contains the identifying characters (..) in columns 1 and 2, the command and, in most cases, an operand field. In addition, the sequence field may be used for statement identification. RJE returns this field with all responses and diagnostics pertaining to the statement. Any comments appear after the operand field, separated from it by at least one blank. If the operand field is not present, and comments are desired, the user codes a comma to indicate that the operand field is absent and that the information specified is a comment. The user must follow the comma with at least one blank before his comment. No comma is required if the command has no operand.

Note: A command statement cannot be continued. It must be coded on one card or card image.

FUNCTIONS OF WORK STATION COMMANDS

The commands available to RJE users and operators at remote work stations provide a number of capabilities.

1. Commands used to define the state of the work station:

   RJSTART
   RJEND
   LOGON
   LOGOFF

2. Commands used to manipulate job output:

   OUTPUT
   CONTINUE
   DELETE

3. Commands used to provide job and system information:

   ALERT
   STATUS
   BRDCSTR

4. Command used to communicate among RJE users:

   MSGR

A complete description of the work station commands and their operands follows. These commands are summarized in Figure 5.

ID	Operation	Operand
..	RJSTART	termid [,BRDCST=NO | ,BRDCST=YES] [,CALL=integer]
..	RJEND	(no operand)
..	LOGON	userid,key
..	LOGOFF	(no operand)
..	OUTPUT	[J=jobname | U=userid | *]
..	CONTINUE	[BEGIN | NO]
..	DELETE	[J=jobname]
..	ALERT	[J=jobname | * | /]
..	STATUS	[J=jobname | U=userid | * | T]
..	BRDCSTR	(no operand)
..	MSGR	M='text' [,U=userid] [,T=termid]

Figure 5. Summary of Work Station Commands

RJSTART -- ATTACH A WORK STATION TO THE RJE SYSTEM

The RJSTART command logically attaches a work station to the RJE system. The RJSTART command must be the first statement

received from an inactive work station (one not currently attached to the system). This command identifies the work station to RJE. It also allows the work station to request broadcast messages before continuing RJE processing. Communication proceeds between the central system and the work station when a valid RJSTART command is received. Once the work station is logically attached, it can monitor the RJE system for output directed to it, and users may gain access to the central system by logging on at the work station. If the work station has the Auto Call special feature installed, the user can give a telephone number of the central system as a parameter. If the user codes this parameter, the work station calls the number specified.

In addition, the RJSTART command implies continuation of interrupted or discontinued output on a restart condition. If there was no central closedown in the interim, RJSTART causes resumption of the discontinued output from the point at which the output was discontinued. If there was a central closedown while output was discontinued for the work station, output transmission resumes at the beginning of the interrupted data set.

Operation	Operand
RJSTART	termid[,BRDCST=YES | ,BRDCST=NO] [,CALL=integers]

termid
: specifies the RJE name of the work station that is supplied to RJE by the installation when the program for the central system is assembled. It may consist of one to eight alphameric (alphabetic and numeric) characters, the first of which must be alphabetic. If the termid specified is not recognized as a valid name, RJE rejects the command, and a corrected statement must be submitted.

BRDCST=YES
: specifies that a copy of the broadcast messages is desired before the work station continues RJE processing.

BRDCST=NO
: specifies that a copy of the broadcast messages is not desired at the work station. This option is assumed by RJE if the parameter is omitted.

CALL=integers
: specifies the telephone number of the central system, which the work station is to dial. This parameter is only valid if the work station has the Auto Call feature installed. The user can code a maximum of fifteen digits in this parameter.

Note: The RJSTART command must be the first statement submitted at an inactive work station. If the work station desires to resume RJE activity after it has been logically detached from the system (after an RJEND command or a system failure), it must resubmit the RJSTART command. In a restart condition, the RJSTART also implies a CONTINUE command with no operand (see the CONTINUE command).

RJEND -- DETACH A WORK STATION FROM THE RJE SYSTEM

The RJEND command allows an RJE user to logically detach his work station from the system. When the RJEND command is received by the central system, closedown activities are initiated for the work station. Closedown activities involve transmission of all available messages directed to the work station. No job output is returned to the work station after the RJEND command is received. The last message sent to the work station indicates that the RJEND command was received and that the work station is now logically detached from the system.

If the work station is connected to the central system via a switched connection, the connection is broken. The operator should not take his work station off-line before he has received the message indicating that the RJEND command was accepted, because the central system will note an error condition that will have to be resolved at the next work station startup. No further communication occurs until the work station resumes RJE activity with an RJSTART command.

Operation	Operand
RJEND	(no operand)

LOGON -- BEGIN A SESSION IN RJE

A user at a work station logically attached to the RJE system issues a LOGON command to start his session. The command identifies the user to RJE and allows him access to the system. By checking the userid and key specified in the LOGON command, RJE guarantees that only valid users can submit input or request output from the system. The LOGON command remains in effect until

another LOGON, a LOGOFF, or an RJEND command is issued.

Operation	Operand
LOGON	userid,key

userid
specifies the RJE name assigned to the user by the installation (userid). If the userid specified in this parameter is not valid, RJE rejects the command, and a corrected statement must be submitted.

key
specifies the valid protection key assigned with the userid. If the key specified in this parameter is not the key that was assigned with the userid, the LOGON command is rejected. The RJE system never prints a protection key at a work station.

Note 1: Only two statements other than the LOGON command may follow the RJSTART command: RJEND or CONTINUE.

Note 2: The userid-key pair assignments are specified either at RJE assembly time or dynamically by the central operator with the USERID command.

Programmer's Note: A user cannot be logged on at more than one work station at a time. If a user desires to change work stations, he must log off at his old work station before logging on at the new work station. If a user who is logged on at one work station submits a LOGON command at another work station, the second LOGON command is rejected.

LOGOFF -- END A SESSION

With the LOGOFF command, the user indicates that he has completed his session. After receiving a LOGOFF command, RJE refuses input from the work station until another LOGON command is submitted. However, the operator can continue to monitor the system for output directed to the work station, or he can issue an RJEND command to logically detach the station from the system.

Operation	Operand
LOGOFF	(no operand)

Note: If the central system receives a valid LOGON command from a work station with a session in progress, the central system logs off the current user and logs on the user identified in the LOGON command. If the central system receives an RJEND command from a work station with a session in progress, it logs off the user and logically detaches the work station.

OUTPUT -- REQUEST JOB OUTPUT

Deferred job output is retrieved with the OUTPUT command. If the user is a valid recipient and output is available, RJE returns the output to the user. If the job is not complete when its output is requested, RJE returns a message indicating this. The OUTPUT command must be resubmitted after the job has completed. The OUTPUT command provides three capabilities:

1. The user may request (in a specific request) the deferred output of a specific job in the system.

2. The user may request (in a minor request) all deferred output created by jobs submitted by a specified user and naming him as a valid recipient.

3. The user may request (in a major request) all deferred output naming him as a valid recipient.

If the user is not a valid recipient of the output, an invalid request response is returned. If output is requested for a job that is not in the system or is already enqueued for delivery, notification also is returned to the user.

Operation	Operand
OUTPUT	[J=jobname] [U=userid] [*]

J=jobname
indicates that the request is for the deferred output of the job named in the parameter (specific request). The user receives the output if he originated the job or is named as a valid recipient for the output.

U=userid
indicates that the request is for deferred output from all jobs, submitted by the named user, designating the requesting user as a valid recipient (a minor request). If the user gives his own userid, or omits the operand, he receives all available output from jobs submitted by him.

*
the coded value * (asterisk), indicates that the request is for all deferred output in the system for which the user is a valid recipient (a major request). The user receives all available deferred output of jobs submitted by him and of jobs submitted by other users naming him as a valid recipient.

no operand
if the operand field is left blank, RJE returns to the user all the available deferred output created by jobs that the user, identified in the current LOGON command, has submitted. In effect, RJE assumes U=userid with the requesting user designated as recipient.

Note: A user cannot receive deferred job output from another user's job unless he is named as a valid recipient. A user is automatically a valid recipient of job output if he submits the job.

CONTINUE -- REQUEST DISCONTINUED JOB OUTPUT

The user or operator at a work station specifies the disposition of discontinued output with the CONTINUE command. Output may be discontinued under one of the following conditions:

1. A forms requirement message, indicating a change in the form number specified for the output, is sent to the work station.
2. Operator intervention at the work station causes output to be discontinued.
3. Equipment failure during an output operation causes an interruption in output.

When interrupted output is held for an active work station, no output is returned to the work station until a CONTINUE command is received by the central system. RJE continues to accept input from the work station, however. If the remote operator submits an RJEND command while output is discontinued, continuation of discontinued output is implied when the remote operator submits his next RJSTART command. If there was no central closedown before the RJSTART was received, transmission of the discontinued output data set resumes from the point it was discontinued. If there was a central closedown, the output transmission resumes at the beginning of the interrupted data set upon receipt of the RJSTART command. If the discontinue state was the result of a transmission failure, the remote work station must first send an RJSTART. Any other input will cause the message RJSTART REQUIRED to be sent back to the remote work station and the discontinue state will still exist. Other than this response, no output is returned to the work station until an RJSTART command is received.

If the interrupted output is from a SYSOUT data set, the CONTINUE command provides three capabilities:

1. The user can request the transmission of the entire interrupted output data set.
2. The user can specify that transmission of the data set be resumed with the first record of the SYSOUT block that was being written when the output was discontinued.
3. The user can specify that he does not desire the output data set and can direct RJE to delete it. Output transmission resumes with the next data set created in the job step or with the deallocation messages for that step.

Operation	Operand
CONTINUE	[BEGIN] [NO]

BEGIN
specifies that the user desires transmission of the entire data set.

NO
indicates that the user desires RJE to delete the data set and resume output transmission with the next output data set or deallocation message.

no operand
specifies that transmission of the data set is to be resumed with the first record of the SYSOUT block that was being written when the output was discontinued. With blocked records there is a possibility of duplicate records since transmission is resumed at the beginning of a block rather than with a specific record.

If the interrupted output is a series of BRDCST messages, any one of the above three types of CONTINUE commands will cause the entire series of BRDCST messages to be transmitted from the beginning.

If the interrupted output is anything other than SYSOUT data or BRDCST messages, any one of the above three types of CONTINUE commands will resume transmission with the line of text that was stopped. Attempting to continue allocation or deallocation messages may cause the last several lines to be repeated. The amount of overlap varies from 0 to 5 duplicate lines.

The only time the three options of the CONTINUE command have individual effects is when a SYSOUT data set was discontinued.

DELETE -- REMOVE A JOB FROM THE RJE SYSTEM

With the DELETE command, the user may remove jobs from the RJE system, without receiving a copy of the job output. This command directs RJE to remove from the system all job output and all references to the job. It does not remove named data sets created by the job or output data sets directed to the central installation. The DELETE command is not necessary to remove job output that already has been returned to the user. All references to the job in the RJE system are normally removed after the job output is returned to the user. A job can only be deleted if it is on the input queue, is executing, or has not been placed on an output queue for delivery. The DELETE command provides two capabilities:

1. The user can delete a specific job previously submitted by him.

2. The user can delete all jobs previously submitted by him.

Note: The job is not deleted from the system until the message "IHK107I JOB DELETED jobname userid" is issued. No job with the same jobname can be entered until this message is received.

Operation	Operand
DELETE	[J=jobname]

J=jobname
: specifies the name of the job that the user desires to remove from the system. The command is rejected if the user requesting the removal is not the user who originated the job.

no operand
: specifies that all jobs currently in the system submitted under the userid in the current LOGON command are to be removed from the system. This format is useful for avoiding duplicate jobnames by clearing the system of forgotten jobs. Caution must be exercised when using this optional format. A user should not use this format if he is sharing a userid since it deletes all jobs submitted under the userid.

ALERT -- REQUEST NOTIFICATION OF AVAILABILITY OF DEFERRED OUTPUT

The user issues the ALERT command if he wants to be alerted when deferred job output becomes available for him. The user may request to be alerted:

1. When the output of a specific job is available (specific alert);

2. When output from any job submitted by him is available (minor alert);

3. When any output for which he is a valid recipient is available (major alert).

The immediate response to the command indicates all currently available output of the job, or jobs, involved. If the command involves any job in the system not currently available, the command waits in the system and returns additional responses as job output becomes available. If the command specifies a job that is not in the system, a message indicating that no such job exists is returned to the work station and the command is cancelled.

The response to the ALERT command contains the information necessary to retrieve the output with the OUTPUT command. It also includes any user information specified in the JED NOTIFY parameter. A valid ALERT command remains waiting in the system until:

1. It is cancelled with an ALERT / command issued by that user,

2. An RJEND command is issued at the work station, or until

3. The ALERT command response for a job, specified by jobname in the operand, is sent.

Alert command responses are sent to the work station associated with the user who submitted the command, that is, the work station where that user is or last was logged on. If the work station is logically attached to the system, the response is sent regardless of who is logged on or whether or not anyone is logged on.

Operation	Operand
ALERT	[J=jobname] [*] [/]

J=jobname
: identifies a particular job for which the user desires to be alerted. If the job addressed is in the system but not complete, the request remains pending in the system until the job is completed. If the job requested is not in the system, a message indicating this fact is returned, and the command is rejected.

*
: the coded value * (asterisk) is used if the user wants to be alerted when any job output is available for him. It is especially useful if the user expects job output from other users who have specified him as an alternate recipient. The ALERT * remains pending in the system under the conditions previously described.

/
: the coded value / (slash) indicates that the user desires to cancel all ALERT commands previously issued by him. All impending ALERT commands issued by the user are cancelled when RJE receives the ALERT / command. There is no selective cancelling of ALERT commands.

no operand
: if the operand field is left blank, RJE alerts the user when any job that he has submitted has output available. The command remains pending in the system under the conditions previously described.

Note: The user receives only one alert response for each job regardless of the number of ALERT commands issued by the user (except for specific alert for which he will be notified each time it is submitted). For example, if the user issues an ALERT * and is alerted that two jobs have output available for him, no additional alerts for those two jobs are returned, regardless of the number of subsequent ALERT commands issued by the user. Information about the jobs, however, is always available with the STATUS command.

STATUS -- DETERMINE THE STATUS OF A JOB

The STATUS command allows a user to determine the status of one or more remotely submitted jobs. RJE returns the status of only those jobs, addressed by this command, that are currently in the system and for which the requester is a valid recipient. The STATUS command provides the following capabilities:

1. The user can request the status of a specific job (a specific request).
2. The user can request the status of jobs submitted by a particular user for which he is a valid recipient (a minor request).
3. The user can request the status of all jobs in the system for which he is a valid recipient (a major request).
4. The user can request the status of all jobs that are currently associated with the work station (a terminal request).

The user receives a response for each job that satisfies the command. Each response contains the jobname and an indication of its status:

1. Scheduled (with queue position in its job class).
2. Executing.
3. Complete (normal or abnormal termination).

In addition to these responses, if the command addresses a specific job, one of two responses may be returned:

4. Not in the system.
5. Invalid request (the user is not a valid recipient).

The STATUS command does not wait in the RJE system. RJE returns the status of only those jobs in the system at the time the command is received. It does not automatically return the new status of a job when a change of status occurs. The user, however, may request notification of job completion with the ALERT command.

Operation	Operand
STATUS	[J=jobname] [U=userid] [*] [T]

J=jobname
: indicates that the request is for the status of a specific job identified by the jobname. If the user issuing the

command is not a valid recipient of the job, or if this job is not in the system, the status request is denied. A message is returned to the user indicating the reason.

U=userid
: indicates that the request is for the status of all current jobs submitted by the user identified with the userid for which the requesting user is a valid recipient. If the user specifies his own userid or omits the operand, he receives the status of only his own jobs currently in the system.

*
: the coded value * (asterisk) indicates that the user desires the status of all jobs currently in the system for which he is a valid recipient.

T
: the coded value T is used to receive the status of all jobs in the system currently associated with the work station. A job is associated with a work station if the user who submitted the job is or last was logged on at the work station. This format is useful just before the work station initiates closedown.

no operand
: RJE assumes that the user issuing the command desires the status of all jobs submitted by him. In effect, it assumes U=userid with the requesting user designated.

Note: When a user requests the status of a job submitted to and acknowledged by the RJE system, and the status response specifies that the job is not in the system, one of the following conditions has occurred:

1. If the output was specified as immediate, the output has already been returned to the work station associated with the job.

2. If the output was specified as deferred and an alternate recipient was specified, the alternate has retrieved the copy of job output with an OUTPUT command.

3. If the userid is shared, another individual sharing the userid may have received the output.

4. The job was deleted by the user or by another user sharing his userid.

5. The central operator retrieved the job with a CENOUT command.

BRDCSTR -- REQUEST THE BROADCAST MESSAGES

The remote user requests a copy of the broadcast messages with the BRDCSTR command. RJE responds to this command by returning a copy of the system broadcast messages to the work station. These messages contain information of general interest to the entire RJE system. They may include any information considered desirable by the installation and are sent only on request from a work station. The information might include:

1. The next scheduled RJE closedown at the central system and the various work stations.

2. The next scheduled RJE startup at the central system and various work stations.

3. The installation equipment configuration and its status at the central system and various work stations.

The broadcast messages are created and maintained by the central operator.

Operation	Operand
BRDCSTR	(no operand)

MSGR -- COMMUNICATE WITHIN RJE

The RJE user sends messages to other points in the RJE system with the MSGR command. Messages may be sent to the central operator, to work stations attached to the RJE system, and to RJE users. Messages sent to the central operator are displayed on his printer-keyboard when they are received. Messages are sent to a work station if it is logically attached to the system. If the work station is not active when RJE receives the command, the message is kept in the system until it can be delivered. This facility allows the user to "leave word" if a work station is inactive when the command is received. RJE informs the sender of whether or not the message has been sent. Messages directed to RJE users are sent only to the work station where the user is currently logged on. If the user is not logged on, the command is rejected, and a response informs the sender.

If the user specifies that a message is to be sent to both a user and a work station, RJE first tries to send the message to the specified user. If the user is not currently logged on, the message is sent to the specified work station or remains in the system until it can be sent to the work station.

Message text is limited to 40 characters. The MSGR command cannot be continued. Any messages requiring more than 40 characters of text must be sent by multiple commands.

Operation	Operand
MSGR	M='text'[,U=userid][,T=termid]

M='text'
specifies the message text to be sent. The message text must be framed by apostrophes. The text itself may include as many as 40 printable characters and blanks. Apostrophes contained within the message text must be paired; each pair counts as one text character. If the U and T keyword parameters are omitted, the message is sent to the central operator.

Note: The message text must be entered in uppercase from the remote printer-keyboard.

U=userid
indicates that the message is to be sent to the user specified by the userid. The message is sent to the work station where the specified user is logged on. If he is not currently logged on and the T keyword parameter is not included, or if the userid is not valid, the command is rejected and a response is returned to the sender. If the user specifies his own userid, when RJE receives the command it sends the message to the work station where he is logged on. This format is useful if the user desires to have a message returned to the work station when his input is being sent to the central system. To do this the user places the MSGR command, with the desired message, after his LOGON command.

T=termid
indicates that the message is to be sent to the work station specified by termid. If the message cannot be sent after it is received by the central system, it is kept until it can be delivered. If no space is available in the data set reserved for deferred messages, or if the termid specified does not correspond to a work station in the RJE system, the command is rejected, and a response is returned to the sender. The message is formatted for the central operator or another work station as follows:

RJE MSG { *C* / $userid_1$ } FR $userid_2$ text

C - message by default goes to central

$userid_1$ - the U option is used

$userid_2$ - submitter

WORK STATION COMMAND EXAMPLES

Example One

Operation	Operand
RJSTART	NEWYORK5

The work station named NEWYORK5 is logically connected to the RJE system as an active work station. Broadcast messages are not sent to the work station since they are not requested. The sequence field is not specified and, as a result, does not accompany the response to this command.

Example Two

Operation	Operand	Sequence
LOGON	PPJ,72C	PPJ70710

If userid PPJ and key 72C are valid, user PPJ is logged on and may begin RJE processing. The sequence field PPJ70710 is returned with the response to this command.

Example Three

Operation	Operand	Sequence
OUTPUT		PPJ0020

The user submitting the command receives all available deferred output from jobs submitted by him, or he receives a message indicating that there is no such output available.

The sequence field is returned with the response to identify the command addressed.

Example Four

Operation	Operand
CONTINUE	NO

The transmission of a discontinued data set is not resumed. The data set is deleted, that is, removed from the system. No sequence information is returned since this field is omitted.

Example Five

Operation	Operand
ALERT	*

The user is alerted when any output in the RJE system is available for him. This command waits in the system until an ALERT / or RJEND command is received from the work station. No sequence information is returned since this field is omitted.

Example Six

Operation	Operand
STATUS	J=PPJSINFN

The status of job PPJSINFN is returned to the user. No sequence information is returned with the response.

Example Seven

Operation	Operand
MSGR	M='MOUNT VOL=555555 ON 292'

The message MOUNT VOL=555555 ON 292 is sent to the central operator. The response to this command indicates whether or not the message was delivered. No sequence information is returned since this field is omitted.

Example Eight

Operation	Comment
LOGOFF	USE THIS TO END SESSION

When RJE receives this command, the user of the current session is logged off. The comment contains information the user finds helpful in identifying the purpose and placement of the command. No comma is required to show the absence of the operand field since no operand is associated with the LOGOFF command.

Note: The description of each message includes an operator, user, or programmer response. A more detailed response is included in the publication IBM System/360 Operating System: Messages and Codes, GC28-6631. Refer to this publication before responding to any message or contacting your IBM representative.

IHK100I RJSTART ACCEPTED ssssssss

Explanation: A valid RJSTART command with sequence number (ssssssss) has been received from this work station.

System Action: The work station is logically attached to the system and placed in the active state. Before the RJSTART command is acknowledged, the central system sends any messages awaiting work station startup and any discontinued output. The central system is prepared to accept a LOGON command, a CONTINUE command, an RJEND command, or a request to discontinue output from the work station.

User Response: If a user desires access to the central system, he submits a LOGON command. If no user desires access to the system, the operator may wait for immediate job output and messages directed to the work station. The operator enters the RJEND command to terminate RJE activity at the work station.

IHK101I USER LOGGED ON userid ssssssss

Explanation: The LOGON command with sequence number (ssssssss), submitted by the user assigned the specified userid, has been received and accepted.

System Action: Before the LOGON command is acknowledged, any notify messages waiting for this LOGON are returned. The work station is placed in the processing state giving the user access to the central system.

User Response: The user may submit jobs for execution in the central system and work station commands requesting job output, message transmission, or job information.

IHK102I USER LOGGED OFF userid ssssssss

Explanation: The LOGOFF command with sequence number (ssssssss), submitted by the designated user (userid), has been received and accepted.

System Action: The user's session is terminated, and the work station reverts to the active state. The system accepts only those commands that may follow an RJSTART command, that is, LOGON, CONTINUE, or RJEND.

User Response: Same as to message IHK100I.

IHK103I RJEND ACCEPTED ssssssss

Explanation: An RJEND command with sequence number (ssssssss) has been received from this work station.

System Action: All messages currently available for the work station are sent before the work station is logically detached from the RJE system and placed in the inactive state. If the work station is connected via a switched line, the connection is broken.

User Response: None.

IHK104I NO JOB(S) IN SYSTEM operation

{jobname userid / userid / blank / termid} ssssssss

Explanation: The central system contains no job that meets the specifications of the designated command (operation) with sequence number (ssssssss). The command addresses:

jobname userid - A specific job for user (userid).

userid - All jobs submitted by the specified user, for which the requesting user is a valid recipient.

blank - All jobs in the system for which the requesting user is a valid recipient.

termid - All jobs to be returned to the specified work station.

System Action: The system takes no further action unless the command is a major or minor ALERT. These commands remain in the system until cancelled, and a message is sent when any job satisfying these requests is completed.

User Response: If a jobname is specified the user should ensure that it is correct.

IHK105I JOB(S) NOT COMPLETE operation (jobname) userid ssssssss

Explanation: The job (jobname) that is specified in an OUTPUT or ALERT command with sequence number (ssssssss) submitted by the user (userid), is in the central system but not complete. If the jobname is omitted, an ALERT command was processed for which there were no completed jobs in the system about which the user had not been previously notified.

System Action: If an ALERT command has been submitted the user receives notification when the job is completed.

User Response: If job output was requested, the OUTPUT command must be resubmitted after the job is completed.

IHK106I INVALID RECIPIENT operation jobname userid ssssssss

Explanation: An OUTPUT, ALERT, STATUS, or DELETE command with sequence number (ssssssss) has been submitted by a user (userid) who is not a valid recipient of the specified job (jobname); or in the case of DELETE, the command was submitted by a user who did not submit the job.

System Action: The request is ignored.

User Response: None.

IHK107I JOB DELETED jobname userid ssssssss

Explanation: The job (jobname) specified in a DELETE command with sequence number (ssssssss) submitted by the designated user (userid) has been deleted. If the DELETE command specifies all jobs submitted by this user, a separate message is returned for each job deleted. A job with the same jobname cannot be entered until this message is received.

Note: This message is also returned when RJE cancels a job when a line error interrupts collection of the job.

System Action: All references to the job and all output from the job are removed from the system.

User Response: None.

IHK108I STATUS jobname $userid_1$ $userid_2$

{SCHED (n) / EXECUTING / NORMAL END / ABNORM END / DISK ERROR} ssssssss

Explanation: This is the response to the STATUS command with sequence number (ssssssss). The response provides the status of the job (jobname) submitted by a user ($userid_1$) and naming another user ($userid_2$) as an alternate recipient.

SCHED (n) - The job is scheduled as the nth job on the SYS1.SYSJOBQE.

EXECUTING - The job is executing.

NORMAL END - The job has completed normally.

ABNORM END - The job abended.

DISK ERROR - The job entry position in its input class could not be read from the SYS1.SYSJOBQE because of an I/O error.

System Action: A response is returned for each job in the central system that satisfies the request.

User Response: A DISK ERROR job must be deleted and resubmitted. For other messages no response is required.

IHK109I NOTIFY jobname userid [(text/DISK ERROR)]

Explanation: Job (jobname) has completed normally with deferred output. The user (userid), either the originator or an alternate recipient, has requested

notification either by specifying NOTIFY in the JED statement or by submitting an ALERT command that addresses the job. Text is any information coded by the originator in the JED NOTIFY parameter. Text is replaced by DISK ERROR when the information for the notify message cannot be read.

System Action: None.

User Response: The user may request the job output, either when notified or later, or he may delete it.

IHK110I ABEND NOTIFY jobname userid [text/DISK ERROR]

Explanation: This is the same as message IHK109I except that the job failed in initiation.

IHK111I MSG PENDING STARTUP termid ssssssss

Explanation: The message text specified in a MSGR command with sequence number (ssssssss) was not sent because the work station (termid) to which it was directed was inactive; and if the message was directed to either a user or a work station, the user was not logged on. The message is sent to the specified work station when the station submits an RJSTART command.

System Action: The message is held at the central system until either the work station initiates startup procedures, or the central operator deletes the message.

User Response: None.

IHK112I MSG QUEUED FOR DELIVERY { userid / termid / CENTRAL } ssssssss

Explanation: The message text specified in a MSGR command with sequence number (ssssssss) is waiting for delivery to:

userid - the specified user
termid - the specified work station
CENTRAL - the central operator

System Action: The message is transmitted to the work station as soon as the work station accepts it, or it is displayed on the printer-keyboard at the central system for the central operator.

User Response: None.

IHK113I MSG IGNORED { userid / termid } { INVALID / DISK ERROR } ssssssss

Explanation: The MSGR command with sequence number (ssssssss) cannot be serviced. The intended destination is:

userid - A user who is not logged on.

termid - An inactive work station, and no space is available to keep the message in the central system.

INVALID - If INVALID is included in the response, the message is directed to a userid or termid that is not assigned in the RJE system.

DISK ERROR - The message could not be retained on the message-pending data set for the remote work station.

System Action: The command is ignored.

User Response: The sender may resubmit the command later, or he may specify the user's work station if the message was directed only to a user.

IHK114I MAX JOBS EXCEEDED jobname

Explanation: The job entry (jobname) cannot be accepted because the central system is already maintaining its specified maximum number of jobs.

System Action: The job is rejected. A message indicating the overload condition is sent to the central operator.

User Response: The user may alleviate this condition by requesting or deleting deferred job output. If the condition persists, the user may ask to have the central system reassembled to support more remote jobs. The job refused must be resubmitted.

IHK115I ALERTS CANCELLED userid ssssssss

Explanation: An ALERT command with sequence number (ssssssss) requesting that all waiting alerts for user (userid) be cancelled has been received and accepted.

System Action: All waiting alerts for user (userid) are cancelled.

User Response: None.

IHK116I RJE CLOSED DOWN

Explanation: The central operator has entered a STOP RJE command and is closing down the RJE system.

System Action: Closedown procedures are initiated at the central system for all work stations not already inactive when the STOP command was issued. All RJE work stations are placed in the inactive state.

User Response: None.

IHK117I JOB ACCEPTED jobname userid
{SCHED (n) / EXECUTING / DISK ERROR} {JED / DEFAULT}

Explanation: This is a job receipt acknowledgement message indicating that the job (jobname) submitted by user (userid) is accepted for execution at the central system.

SCHED (n) - The job is scheduled as the nth job in its input class on the SYS1.SYSJOBQE.

EXECUTING - The job is being executed.

JED - A correctly specified JED statement was part of the job entry. The job is handled with those options exercised in the JED statement.

DEFAULT - The JED either was not part of the job entry or was incorrectly specified. As a result, the job is handled with the assumed system default options.

DISK ERROR - The job entry position in its input class could not be read on the SYS1.SYSJOBQE because of an I/O error.

Note: This message format may not apply if your installation alters the acknowledge message. Any information added to the acknowledgement immediately follows this message.

System Action: The system waits for job completion to determine disposition of job output.

User Response: If JED options are desired but an error has caused the JED statement to be ignored, the user must delete the job and resubmit the job entry with a corrected JED statement. If a disk error occurred, try determining the job's status with a STATUS command. If the error persists, delete the job and resubmit it.

IHK118I ALTERNATE IGNORED JED ssssssss

Explanation: An alternate recipient is specified in the JED OUTPUT keyword, but either immediate output is specified (in which case, no userid may be coded), or an invalid userid is coded as an alternate recipient. The sequence number of the JED card was ssssssss.

System Action: This error is ignored, and JED statement processing continues as if no userid were specified in the OUTPUT keyword.

User Response: The JED statement must be corrected and the job entry resubmitted if output is to be made available to an alternate. The previously submitted job must be deleted before the corrected job entry is sent to the central system.

IHK119I JOB WAITING DELIVERY operation jobname userid ssssssss

Explanation: An OUTPUT or DELETE command with sequence number (ssssssss), which addresses the specified job (jobname), cannot be serviced because the job is already waiting for transmission.

System Action: The command is rejected.

User Response: None.

IHK120I BROADCAST MESSAGES {FOLLOW / END}

Explanation: This message (with the word FOLLOW) is sent immediately before the first broadcast message and (with the word END) after the last broadcast message.

System Action: None.

User Response: None.

IHK123I DISCONTINUED-CHANGE FORMS TO xxxx

Explanation: The next output data set requires form number xxxx. The data set has been discontinued. If xxxx contains blanks instead of a form number, the next output data set requires the regularly used forms to be reinserted.

System Action: The data set is discontinued.

User Response: The user inserts the proper form and submits a CONTINUE command.

IHK139I BLOCK SIZE 400 LIMIT EXCEEDED jobname ddname

Explanation: The problem program has created a sysout data set with a block size exceeding 400 bytes. The sysout class was specified as being the user exit at a remote CPU.

System Action: The data set is scratched.

User Response: (a) Block size in the output DCB should be respecified to stay within the limit, or (b) the sysout class should be changed to specify printed or punched output. After one of the above changes is made, resubmit the job.

IHK140I INVALID USERID operation ssssssss

Explanation: The designated command (operation) with sequence number (ssssssss) specifies a userid that is not assigned to a user in the RJE system.

System Action: The command is refused.

User Response: The user corrects the userid and resubmits the command.

IHK141I INVALID PROTECTION KEY LOGON ssssssss

Explanation: A LOGON command with sequence number (ssssssss) specifies a protection key that is not assigned with the coded userid.

System Action: The LOGON command is rejected.

User Response: The user corrects the key and resubmits.

IHK142I INVALID TERMID operation ssssssss

Explanation: The designated command (operation) with sequence number (ssssssss) specifies a termid that is not assigned to a work station in the RJE system, or a termid that is currently being used on another line.

System Action: The command is rejected.

User Response: The user corrects the termid and resubmits the command.

IHK143I INVALID JOBNAME operation ssssssss

Explanation: The designated statement (operation) with sequence number (ssssssss) either fails to specify a jobname or specifies a jobname greater than eight characters.

System Action: The statement is rejected. If it is a JOB card, the job is rejected.

User Response: The user corrects the jobname and resubmits the card or command.

IHK144I DUPLICATE JOBNAME jobname ssssssss

Explanation: The JOB card with sequence number (ssssssss) contains a jobname that is identical to one already in the RJE system.

System Action: The job is refused.

User Response: The user changes the name of the job to a unique name and resubmits it.

IHK145I NO JOB CARD

Explanation: A job was submitted without a JOB card, or the JOB card did not follow directly after a JED card.

System Action: For computer work stations, input is aborted and the message is sent. For 2780 work stations, input is flushed to EOT and the message is sent.

User Response: Examine the input causing the error. Correct the error and resubmit the job.

IHK146I INVALID KEYWORD VALUE operation [keyword] ssssssss

Explanation: An invalid value is specified for a keyword in the statement (operation) with sequence number (ssssssss). If the invalid value appears in the DCB keyword of a DD * or DD DATA statement, SYSIN is displayed as the operation.

System Action: The statement is ignored. If the error is in a JED statement, the job entry is processed with the assumed system default options. If the error is in a SYSIN DCB parameter, the job is automatically deleted.

User Response: If the error is in a SYSIN card, the user corrects the error and resubmits the job. If the statement is a command, the user corrects the error and resubmits the statement. In the case of a JED statement, if assumed options are not acceptable for job entry processing, he deletes the job. The job entry must be resubmitted with the corrected JED statement. The job residing in the central system as a result of the error must be deleted before the job entry is resubmitted.

IHK147I REQD PARAMETER MISSING operation ssssssss

Explanation: A required parameter in the operand field is missing or invalid in the subject statement (operation) with sequence number (ssssssss).

System Action: The statement is ignored.

User Response: The user examines the statement in error, supplies the missing or corrected parameter, and resubmits the command.

IHK148I ILLEGAL DELIMITER operation ssssssss

Explanation: A parameter in the operand field of the statement (operation) with sequence number (ssssssss) is not delimited by a comma or, if it was the last parameter, a blank; or a framing apostrophe is missing for text.

System Action: The statement is ignored. If the error is in a JED statement, the job entry is processed with the assumed system default options.

User Response: If the statement is a command, the user corrects the error and resubmits the statement. If assumed options are not acceptable for job entry processing, he deletes the job. The job entry must be resubmitted with the corrected JED statement. The job residing in the central system as a result of the error must be deleted before the job entry is resubmitted.

IHK149I ILLEGAL CONTINUATION operation ssssssss

Explanation: The statement (operation), with sequence number (ssssssss), that should not have been continued was continued, or a JED statement was improperly continued.

System Action: The statement is ignored. If the error is in a JED statement, the job entry is processed with the assumed system default options.

User Response: If the statement is a command, the user corrects the error and resubmits the statement. If assumed options are not acceptable for job entry processing, he deletes the job. The job entry must be resubmitted with the corrected JED statement. The job residing in the central system as a result of the error must be deleted before the job entry is resubmitted.

IHK150I UNDEFINED KEYWORD operation ssssssss

Explanation: An undefined keyword is specified in the statement (operation) with the sequence number (ssssssss). If the undefined keyword appears in a DD * or DD DATA statement, SYSIN is displayed as the operation.

System Action: The statement is ignored. If the error is in a JED statement, the job entry is processed with the assumed system default options. If the error is in a SYSIN DCB parameter, the job is automatically deleted.

User Response: If the error is in a SYSIN card, the user corrects the error and resubmits the job. If the statement is a command, the user corrects the error and resubmits the statement. If assumed options are not acceptable for job entry processing, he deletes the job. The job entry must be resubmitted with the corrected JED statement. The job residing in the central system as a result of the error must be deleted before the job entry is resubmitted.

IHK151I MULTIPLE USE OF KEYWORD operation ssssssss

Explanation: A keyword is repeated in the statement (operation) with sequence number (ssssssss).

System Action: The statement is ignored. If the error is in a JED statement, the job entry is processed with the assumed system default options.

User Response: If the statement is a command, the user corrects the error and resubmits the statement. If assumed options are not acceptable for job entry processing, he deletes the job. The job entry must be resubmitted with the corrected JED statement. The job residing in the central system as a result of the error must be deleted before the job entry is resubmitted.

IHK152I UNDEFINED OPERATION operation ssssssss

Explanation: The statement (operation) with sequence number (ssssssss) specifies an undefined operation or indicates that there is no blank between the .. and the operation. The first 8 characters of the operation field are returned.

System Action: The statement is ignored. If the error is in an intended JED statement, the job entry is processed with the assumed system default options.

User Response: If the statement is an intended command, the user corrects the error and resubmits. If assumed options are not acceptable for job entry processing, he deletes the job. The job entry must be resubmitted with the corrected JED statement. The job residing in the central system as a result of the error must be deleted before the job entry is resubmitted.

Note: If there is no error in the command format, the message indicates that the remote work station is equipped with the compress/expand option but the central program does not recognize this work station as so equipped. This conflict must be resolved by reassembly of either the remote or central program.

IHK153I CENTRAL DATA SET MISSING jobname { step.ddname / ALL }

Explanation: The DD statement specified in the CENTRAL parameter of the JED card could not be found in the Job Control Language for the job; or, if ALL was specified, there were no output DD statements.

System Action: The job is processed as though no reference was made to the data set.

User Response: Check the JED statement and the JCL. If either is in error, correct and resubmit the job after retrieving job output or deleting the job.

IHK154I NO AVAILABLE OUTPUT userid ssssssss

Explanation: This message appears at the remote terminal when no output is found in the system to satisfy the major, minor, or default OUTPUT request. To satisfy the request, any requested job that is found must be:

1. Complete,
2. Not already enqueued for source or alternate, and
3. One for which the requester is a valid recipient.

System Action: The statement is ignored.

User Response: None.

IHK155I INCORRECT TEXT LENGTH operation ssssssss

Explanation: The text specified in the statement (operation) with sequence number (ssssssss) exceeds the length allowed.

System Action: The statement is ignored.

User Response: Correct the error and resubmit the command.

IHK156A RJSTART REQUIRED

Explanation: Input other than an RJSTART command has been received from an inactive work station. The work station is logically detached from the system because either an error condition caused the central system to detach it or an RJEND command was received.

System Action: The input is rejected.

User Response: The user submits a valid RJSTART to begin or resume RJE operation at the work station.

IHK157A LOGON REQUIRED

Explanation: Input other than a CONTINUE, RJEND, or LOGON command has been received from an active work station.

System Action: The input is rejected.

User Response: If the user has input for transmission to the central system, he must submit a valid LOGON command.

IHK158A LOGON REJECTED userid termid ssssssss

Explanation: A LOGON command with sequence number (ssssssss) has been submitted by a user (userid) already logged on at another work station (termid). A user can be logged on at only one work station at a time.

System Action: The command is ignored. If another user is logged on at the second work station, from which this command is received, he remains logged on.

User Response: The user must log off at the initially indicated work station (termid) before resubmitting the command.

IHK159I LINE ERROR

Explanation: An irrecoverable transmission error has occurred on an input or output operation.

System Action: The work station is logically detached from the system. If an output operation is in progress, the output is discontinued. This message is returned when the next RJSTART command is received from the work station.

User Response: All input transmitted to the central system that has not been acknowledged must be resubmitted.

IHK160I ABNORMAL CENTRAL CLOSEDOWN

Explanation: A system failure, requiring restart procedures at the work station, has occurred at the central installation. This message is returned when the next RJSTART command is received from the work station.

System Action: The system resumes normal operation.

User Response: All input transmitted to the central system that has not been acknowledged must be resubmitted.

IHK161I OUT OF SPACE { SYSIN jobname / SYS1.SYSJOBQE / jobname ddname }

Explanation: An out of space (overload) condition exists in the central system. Either all direct access storage space allocated for the resource SYSIN (SYSIN jobname), or SYS1.SYSJOBQE is currently in use; or if jobname ddname appears, main storage was not available for the SYSOUT buffer area.

System Action: The central operator is informed of the overload condition. Until space becomes available, all input requiring the depleted resource is rejected. If jobname ddname is specified, processing of the job continues as if an end-of-file were reached on the data set. The data set is deleted.

User Response: If the error occurred on SYSIN or SYS1.SYSJOBQE, the user must wait until direct access space becomes available before submitting more input. If the overload condition persists, he may request that more space be allocated to the resource. When main storage is not available for SYSOUT buffers, and the overload condition persists, the program should be rewritten so that the BLKSIZE of the SYSOUT data set is smaller, or more main storage must be allocated to the RJE task to handle the larger SYSOUT blocks.

IHK162I SYSIN LIMIT EXCEEDED jobname

Explanation: The job (jobname) requires a SYSIN data set that exceeds the limit allowed by the procedure referred to at central startup.

System Action: The job is refused, and a message is sent to the central operator.

User Response: The user may divide the SYSIN data for the job into smaller units, or he may request that a procedure allowing larger SYSIN data sets be used at the central system.

IHK163I DISK ERROR

{ BRDCST DIRECTORY (1)
BRDCST MSG (2)
DELAYED MSG DIRECTORY (3)
DELAYED MSG (4)
JED [jobname] (5)
Q MGR (jobname) (6)
(volume serial jobname ddname) (7)
WRITING TABLE ENTRY (8) }

Explanation: An uncorrectable input/output failure has occurred while the program was attempting to write to or read from disk. One of the above messages indicates where the error occurred.

(1), (2) An error occurred while writing to or reading from the BRDCST directory or data set.

System Action: No further broadcast processing is done on the command (BRDCSTR or RJSTART) that triggered the error. Other processing continues normally.

User Response: Broadcast messages should not be requested until the central operator corrects the error.

(3), (4) An error occurred while writing to or reading from the delayed message directory or data set.

System Action: No further delayed message processing is done on the command (MSGR or RJSTART) that triggered the error. Other processing continues normally.

User Response: MSGR to another work station should not be used until the error has been corrected at the central installation.

(5) An error occurred while writing to or reading from the

JED table on disk. The job (jobname) is lost in the event of a read error (when jobname appears in the message, a read error is indicated). Write errors are indicated by no jobname. Discontinued output may be lost in the case of a write error.

System Action: On a read error the job is lost. On a write error, recovery is attempted. The central operator is informed if recovery attempts are not successful. If the write error occurs during discontinue mode, the system generates a dummy RJEND. At the next RJSTART the work station receives the disk error message. The last part of the discontinued output is lost.

User Response: It is possible to receive the output from the lost job, which cannot be deleted until after RJE closedown). To avoid this, jobs should not be submitted with the same jobname until after the next RJE startup.

(6) The OS queue manager has encountered a permanent I/O error on SYS1.SYSJOBQE while honoring a READ or WRITE request on the RJE input or SYSOUT queues.

System Action: One or more of the following may occur:

(a) An EOT aborting input or ending the current output transmission is sent to the work station if the error occurred during normal communication with the work station.

(b) The job identified by jobname is canceled in the operating system and deleted in RJE. In addition, JECL statements following the deleted job and preceding the next job entry are lost if the error occurred while reading the job entry from the RJE input queue.

(c) If the error occurred while reading the output from the RJE SYSOUT queue, the remaining output of the job is lost.

RJE processing continues.

User Response: Resubmit the job if the job was deleted or the output was lost.

Note: If the error message is preceded by a job accepted message with the same jobname as that of the disk error message, the error occurred while reading JECL following that job in the same queue entry. In this case the job need not be resubmitted. The JECL following the job in the input stream not receiving a response must be resubmitted. If the jobname specified in the message is RJETASK, the error occurred while reading a queue entry on the RJE input queue. Only those statements not receiving a response before the error messages need be resubmitted.

(7) A disk error occurred while writing SYSIN data or reading SYSOUT data.

System Action: If the error occurred on SYSIN data, an EOT is sent to the terminal. If the error occurred on SYSOUT data, no further output from the data set is transmitted and processing continues on the remainder of the job.

User Response: Resubmit the job to obtain the missing data set.

(8) An entry in the main storage copy of an RJE control table could not be written to disk.

System Action: Processing continues using the version of the tables in main storage. No subsequent messages are sent.

User Response: The work station should not submit any more jobs and should retrieve all delayed jobs. The central operator must stop RJE and reinitialize the tables before restarting RJE. All jobs remaining in the system after RJE operation has stopped are lost.

The central operator communicates with the RJE system by means of central RJE commands. These commands provide the additional capabilities needed by the central operator to control and maintain the RJE application, and to communicate with RJE users and work stations. If the RJE task is not active when the commands are issued, the commands are not accepted. The restrictions imposed on format and placement of central commands are identical to those for JCL command statements. The central commands are introduced from the printer-keyboard or the system input device. When entered from the system input device, the commands contain the JCL identifier (//) in the first two positions of the command statement.

FUNCTIONS OF CENTRAL COMMANDS

The commands available to the central RJE operator provide a number of capabilities.

1. Commands used to control the RJE application:

   START
   STOP

2. Commands used to maintain the RJE application:

   USERID
   CENOUT
   SHOW

3. Commands used to communicate in the RJE system:

   MSG
   BRDCST

Note: An RJE command statement cannot be continued. It must be coded on one card or card image.

START -- BEGIN RJE SYSTEM PROCESS

The START command is used to start operation of RJE at the central installation.

Operation	Operand
{START / S}	procname[.identifier],,,{FORM / NFMT / NONE}

procname
: specifies the name of the cataloged procedure for Remote Job Entry operation. This procedure name must begin with characters RJE.

identifier
: is a parameter in the START command operand and is optional when RJE is run under an MVT environment. Under MFT it must be specified as P0. In addition, P0 must be defined as a resident reader partition; this may be done either at system generation time or with a DEFINE command prior to starting RJE. Using the DEFINE statement results in the following response and replies.

```
Central Operator:   {n      }
                    {DEFINE }

System Response:    XXIEF802D ENTER
                     DEFINITION

Central Operator:   r xx, 'P0=RDR,END'
```

FORM
: RJE is to execute its Coldstart procedure. This form of the START command must be coded if the operating system has been loaded with the following IPL option since an RJE closedown: 'F' was specified in the Q keyword subparameter list of the SET command. 'F' indicates that the job-queue data set is to be formatted during the IPL. OS formatting of the job-queue data set removes all jobs within the central system including those submitted remotely. The FORM parameter removes all references to jobs in the RJE job table. If FORM is specified, all jobs within the RJE system are deleted regardless of the type of operating system startup.

NFMT
: RJE is to execute its Warmstart procedure. This form is to be coded only if the operating system has been loaded (IPLed) since RJE closed down and the subparameter 'F' of the keyword Q in the SET command has not been specified. If the operator reloads the operating system more than once since RJE closed down, and if, during any of the IPL procedures he specified 'F' in the SET command, then FORM, not NFMT, must be coded on the START statement for RJE. If the operator loads the operating system, specifying

Q=([unitname],F) in the SET command, the RJE job table will retain its references to the jobs deleted by reformatting the job-queue data set. These references can be removed only by specifying FORM.

Note: If the operator has not loaded the operating system since RJE closed down and NFMT is specified, no job output existing prior to closedown can be retrieved during this execution of RJE. To recover the output from the previous execution the operator must reload the operating system (do not specify 'F' in the SET command) and start RJE specifying NFMT.

NONE

The operating system has not been loaded since RJE closed down. This form of the START command can only be used under these conditions.

Note: If NONE is specified on the START statement and the operator had loaded the operating system since RJE closedown, all jobs within the RJE system are deleted. In addition, if the operator specified 'F' in the SET command during the IPL, the RJE job table will retain its references to the deleted jobs. These references can be freed only by stopping RJE and reloading the operating system and specifying FORM in the START command.

STOP -- STOP RJE SYSTEM PROCESS

The STOP command is used to stop operation of RJE at the central installation.

Operation	Operand
{STOP / P}	{procname / identifier}

procname

specifies the name of the cataloged procedure for Remote Job Entry operations. This procedure name is the same as that specified in the START command. This format is used only when the RJE task was started with no identifier parameter.

identifier

is used to STOP the RJE task when it was started with the identifier parameter included in the START command. For MFT, STOP P0 is sufficient.

Note: The identifier used to stop the RJE task must be the same as was specified in the START command.

USERID -- MODIFY THE RJE USER DIRECTORY

The USERID command allows the central operator to modify and maintain the RJE user directory. The USERID command provides the following capabilities:

1. A userid-key pair can be added to the user directory.

2. A userid-key pair can be removed from the user directory.

These facilities are provided dynamically and do not require a reassembly of the RJE program. Each userid in the directory must be unique. If the central operator submits a command to add a userid that is currently contained in the user directory, RJE rejects the command and returns a message indicating that the userid is already contained in the directory. When a userid is removed from the directory, all jobs currently in the system associated with that userid are also removed. Jobs that are executing or are on the input queue are deleted as they are completed. Completed jobs are removed at the next central start-up after IPL.

Operation	Operand
USERID	userid,key,{ADD / DELETE}

userid

specifies the userid (made up of three alphameric characters) to be added or removed from the user directory. If this userid is already in the user directory, RJE rejects the command and informs the operator.

key

specifies the protection key (made up of three alphameric characters) assigned to the userid designated in the user parameter. This key need not be unique, i.e., the same key may be assigned to several userids.

ADD

indicates that the userid and key are to be added to the user directory.

DELETE

specifies that the userid and key are to be deleted from the user directory.

Note: If the addition of a userid and key is desired and no space is available in the user directory, the RJE program must be reassembled to increase the size of the user directory.

CENOUT -- GIVE RJE OUTPUT TO LOCAL OUTPUT WRITERS

The CENOUT command is used to remove job output in the RJE SYSOUT class and to process it with the central installation output writers. This command allows an operator to retrieve output of completed, remotely submitted jobs that cannot be transmitted or have not been requested by an RJE user. The RJE system places the output data sets and system messages in the originally specified SYSOUT class. The disposition of the output is the same as that of any other data for that same SYSOUT class at the central installation.

Operation	Operand
CENOUT	J=jobname

J=jobname
specifies the name of the job whose output is to be handled by the central installation output writers. If the requested job output is not complete or the job is not in the RJE system, the command is rejected and an indication is returned to the operator.

Note: The CENOUT command does not remain in the system. Only output of completed jobs is placed in the originally specified SYSOUT classes. Jobs that are completed after the command has been processed remain in the RJE SYSOUT class.

SHOW -- DISPLAY RJE INFORMATION

The SHOW command is used to request a printer-keyboard display of desired RJE information. The RJE information that may be displayed with this command is:

1. A list of all RJE jobs currently in the central system and the status of each of these jobs. An option is available to retrieve the status of a particular job.

2. A list of the RJE work stations with their state in the system and other associated information. An option is provided to display information concerning a particular work station.

3. A list of the RJE userids and associated protection keys along with the users' last or current work station. An option is provided to display information concerning a particular user.

4. A list of all RJE jobs with deferred output and the valid recipients of this output. The number of normal central closedowns occurring since the job was received is provided. An option is available to display those deferred jobs for which a particular user is a valid recipient.

5. A copy of the broadcast messages currently available in the system.

6. A list of all the messages that are waiting for a work station startup. This list indicates the work station for which each message is pending. An option is provided to list only those messages waiting for a particular work station startup.

7. A list of the current values of all line error accumulators associated with all lines supported by RJE. These error accumulators contain data check, intervention required, and non-text time-out counts, and the number of transmissions for the line since the last RJE central startup. An option is provided to list only the error accumulators for a particular line.

8. A list of work stations and associated users currently using the RJE facilities of the central system.

The information desired is specified with a coded value in the SHOW command operand. Only one parameter may be specified for the operand of each command. If more than one type of available RJE information is wanted, it must be requested with multiple SHOW commands.

Operation	Operand
SHOW	JOBS[,jobname] TERMS[,termid] USERS[,userid] DEFER DEFER,userid BRDCST MSGS MSGS,termid LERB LERB,linename ACTIVE

Values coded in the operand are:

JOBS
request a list of the RJE jobs in the central system and the status of these jobs. The response for each job includes the jobname, source userid,

alternate userid (if applicable), completion status (complete or incomplete), and output disposition (immediate or deferred). If the output is deferred, the response also includes the number of central closedowns occurring since the job was received.

JOBS,jobname
requests the status of a particular RJE job.

TERMS
requests a list of the RJE work stations. The response includes the RJE work station identifier (termid) and the state of the work station -- inactive, active or processing. If the work station is active, the unitname of the communication line being used is included. If the work station is in a processing state, the userid of the user logged on is included in addition to the unit name.

TERMS,termid
requests the state of a particular RJE work station.

USERS
requests a list of all RJE users. The response includes the userid and protection key and indicates whether the user is or is not logged on. If the user has previously logged on, no matter how much time has passed since the logging on and off, the termid of that work station is included. If the user has not logged on before, the termid is omitted in the response. If the user is currently logged on, the unitname of the communication line being used is included in addition to the termid.

USERS,userid
requests the status of a particular RJE user.

DEFER
requests a list of all RJE jobs that have deferred output. The response includes the jobname, source userid, alternate userid (if available), completion status (complete or incomplete), the deferred output disposition, and the number of normal central closedowns since the job was received.

DEFER,userid
requests a list of all RJE jobs with deferred output for which the specified userid is a valid recipient (source or alternate).

BRDCST
requests a copy of the current broadcast messages.

MSGS
requests a copy of all RJE messages that are waiting for work station startup. The work station to which each message is directed is indicated in the list.

MSGS,termid
requests a copy of RJE messages waiting for the specified work station. If the termid specified does not correspond to a work station in the system, the command is rejected.

LERB
requests a list of the current values of all line error accumulators for all the communication lines being used for RJE. The list indicates for each line the three error-counter values (data check, nontext time-out, and intervention required), and the transmission-counter value. These values are cumulative since the last RJE central startup. They are reset to zero at central startup.

LERB,linename
requests the error and transmission counts for a particular line. The linename is the name specified for the line when the central RJE program was assembled. The central operator receives a message containing the three error-counter values and the transmission-counter value for the line designated.

ACTIVE
requests a list of all RJE work stations in the active or processing state along with a list of the users logged on at the processing work stations. The response includes the RJE work station identifier, the state of the work station, and the unitname of the communication line being used. In addition, if the work station is in a processing state, the userid of the user currently logged on that work station is also included in the response.

MSG -- COMMUNICATE WITH RJE USERS

The MSG command is used to send messages to the users and work stations constituting the RJE system. The central operator may selectively route a message to:

1. A specific user currently logged on.
2. A specific work station.

3. A specific user or, if the user is not logged on, a specific work station.

4. All work stations logically attached to the RJE system.

In addition, the MSG command allows removal from the system of those messages that are waiting for work station startup. This option is normally used when communication between the central installation and a work station is not possible due to some failure, or when the data set where these pending messages are kept becomes full.

Operation	Operand
MSG	[U=userid,][T=termid,]M='text' D=termid

U=userid
specifies that the message is to be sent to the user identified by the coded userid. The message is sent to the user if he is logged on. If the user is not logged on and the T keyword is omitted, the message is not sent. A response indicating this condition is returned to the operator. If both the T and U keyword parameters are specified and the user is not logged on, the message is sent to the work station or is held until work station startup.

T=termid
specifies that the message is to be sent to the work station identified by the coded termid. If the work station is inactive the message waits until an RJSTART command is submitted.

M='text'
specifies the text of the message to be sent. The message text must be framed with apostrophes and may include as many as 40 printable characters and blanks. Any apostrophes included as part of the text must be paired, and each pair counts as one text character. If the operator omits the U and T keyword parameters, the message is sent to all work stations logically attached to the RJE system. Work stations in the inactive state when the command is issued do not receive the message.

Note: The message text must be entered in upper case.

D=termid
deletes the pending messages for the work station identified by the coded termid. A copy of these messages can be obtained with a SHOW MSGS, termid command before entering the MSG D=termid command. The message is formatted for the work stations as follows:

RJE MSG [userid] FR*C* text

userid - If the U option is used

BRDCST -- MAINTAIN THE RJE BROADCAST MESSAGES

The BRDCST command is used to maintain the broadcast messages. These messages are kept in a data set (on a direct access device) with provisions for up to 100 broadcast messages. Each broadcast message in the data set is numbered to correspond with a numbered slot. These slots are numbered from 0 to 99 and are either active (containing a message) or inactive (not containing a message). The BRDCST command allows the central operator to:

1. Insert a new message.

2. Add a new message.

3. Change an existing message.

4. Remove an existing message.

5. Collect active messages into the lowest numbered slots available.

6. Clear the data set of all existing messages.

Operation	Operand
BRDCST	nn,'text' 'text' nn DELETE Ann,'text' PACK

nn,'text'
specifies the 'text' (up to and including 40 alphameric characters) to be placed into the slot number nn of the data set. The slot is set to active regardless of the original status of the specified slot.

'text'
specifies that text (up to and including 40 alphameric characters) is to be placed into the lowest numbered inactive slot. If no slots are inactive, the command is refused.

nn
specifies that the text contents of slot number nn be deleted. This is done by merely setting that slot to inactive.

DELETE
requests the deletion of all texts for the BRDCST data set.

Ann,'text'
specifies the insertion of the text into slot number nn. The text (up to and including 40 alphameric characters) is inserted in slot nn if the slot is inactive. If the slot is active, the text is inserted in slot nn after sequentially moving the texts of that slot and of all consecutive active slots into a higher-numbered inactive slot. This preserves the contents and sequential order of all original texts. If there is no higher inactive slot to receive the pushed up texts, this command is rejected. If the command is rejected, the parameter PACK may be used to compress the data set and allow insertion of the message.

PACK
specifies the collection of all active slots at the 00 end of the directory and of all inactive slots at the 99 end. This function may be used to recover from the insert command (see previous paragraph) being refused due to a lack of a higher-numbered inactive slot. The contents and sequential order of all active slots are preserved.

Note: A copy of the broadcast message data set (active messages) may be obtained by the central operator with the SHOW BRDCST command.

Note: The message text must be entered in uppercase.

Note: The description of each message includes an operator, user, or programmer response. A more detailed response is included in the publication IBM System/360 Operating System: Messages and Codes, GC28-6631. Refer to this publication before responding to any message or contacting your IBM representative.

IEE301I jjj CANCEL COMMAND ACCEPTED

Explanation: Job jjj was cancelled in response to a CANCEL command, by the remote job entry (RJE) procedure or by the operating system. If the job was cancelled by the operating system, messages will follow explaining the reason for cancellation.

System Action: All references to the job are deleted from the system.

Operator Response: None.

IEE305I { NO CORE / (blanks) / CSCB USE } COMMAND INVALID

Explanation: NO CORE indicates that main storage was not available to process the central command.

If blanks appear, the operand of the central command was too long, or a framing quote was not found within 62 bytes.

CSCB USE indicates that the maximum number of central commands had been enqueued when another central command was submitted.

System Action: The command is rejected.

Operator Response: When NO CORE or CSCB USE is printed, resubmit the command at a later time. If blanks appear, correct the command and resubmit it.

IEE326I RJE NOT SUPPORTED

Explanation: RJE was not in the system, or they had not yet completed initialization when an RJE central command was submitted.

System Action: The command is rejected.

Operator Response: Resubmit the command after RJE is started and has completed initialization.

IHK000I RJSTART ACCEPTED termid unitname

Explanation: A work station (termid) has logically attached itself to the central system and is using the communications line (unitname).

System Action: Central resources are made available to the work station.

Operator Response: None.

IHK001I { uuu kkk { OFF / OFF termid / ON termid } unitname / NO USERS IN DIRECTORY }

Explanation: This is the response to a SHOW USERS or a SHOW USERS, userid command:

where

uuu
is the assigned userid.

kkk
is the associated protection key.

OFF
indicates the user is currently logged off.

ON
indicates the user is currently logged on.

termid
is the work station where the user was last or is currently logged on.

unitname
is the communication line currently being used by the work station.

NO USERS IN DIRECTORY
indicates there are no entries for that user in the User Directory.

System Action: Reporting continues until the request has been honored.

Operator Response: None.

IHK003I RJEND ACCEPTED termid

Explanation: The work station (termid) has logically detached itself from the central system.

System Action: The work station is logically detached from the central system.

Operator Response: None.

IHK004I NO JOB(S) IN SYSTEM [jobname]

Explanation: A display of remotely submitted jobs resident in the central system has been requested. No remotely submitted jobs are in the central system or a CENOUT or SHOW command for job (jobname) was issued and it was not found in the RJE system.

System Action: None.

Operator Response: None.

IHK005I JOB(S) NOT COMPLETE jobname userid

Explanation: A CENOUT command for a job (jobname) was issued and the job was not complete.

System Action: The request is ignored.

Operator Response: Resubmit the command when the job is completed.

IHK007I JOB DELETED jobname

Explanation: Either a job (jobname) submitted at the central system has placed output in the RJE SYSOUT class, the central operator deleted a user with jobs in the system, or the operator started RJE with FORM specified on the START command after warmstarting the operating system.

System Action: The job and its output are deleted.

Operator Response: The operator should tell the programmer who submitted the job not to use the RJE SYSOUT class if the job deleted was a job submitted at the central installation.

IHK011I MSG PENDING STARTUP {NONE / termid / termid NONE}

Explanation: The operator has requested either a display of messages waiting for a work station startup or transmission of a message to an inactive work station. If a display was requested, the requested messages are displayed. NONE indicates that no messages are pending.

termid NONE
indicates there are no messages waiting for a specified terminal.

System Action: If a display has been requested, reporting continues until all the pending messages requested are displayed. If message transmission has been requested, the message is held until the work station initiates startup procedures, unless the central operator deletes the message.

Operator Response: None.

IHK012I MSG QUEUED FOR DELIVERY {userid / termid / TERMINALS}

Explanation: The message specified in the MSG command is awaiting delivery either to the specified user (userid), to a specified work station (termid), or to all active work stations (TERMINALS).

System Action: The message is transmitted as soon as the work station will accept it.

Operator Response: None.

IHK013I MSG IGNORED {userid / termid / DISK ERROR}

Explanation: The request for message transmission cannot be serviced because:

userid - The message is directed to a user who is not logged on.

termid - The central system has no space to keep a pending message.

DISK ERROR - The message could not be held on the message pending data set for the terminal.

System Action: The request is ignored.

Operator Response: If immediate action is required, the operator may use the telephone. Pending messages for inactive work stations can be displayed and, if necessary, deleted to make room.

IHK014I MAX JOBS EXCEEDED jobname

Explanation: The number of job entries currently maintained by the central system is the maximum specified by the installation. The job entry (jobname) cannot be accepted.

System Action: The job is refused and a message is returned to the remote user submitting it.

Operator Response: If the condition persists, the central system must be reassembled to support more remote jobs. The operator may alleviate the condition by submitting the CENOUT command. This command causes remotely submitted job output to be written at the central installation. If this is done, the user who submitted the job should be notified.

IHK016I RJE CLOSED DOWN

Explanation: The central RJE system has completed closedown procedures.

System Action: RJE operation is terminated until the next startup. All active work stations are notified of the central closedown and are logically detached from the system.

Operator Response: None.

IHK019I JOB WAITING DELIVERY jobname

Explanation: A CENOUT command was issued for a job (jobname) that has immediate output or has already been queued for delivery to the terminal.

System Action: The command is ignored.

Operator Response: None.

IHK024I IPL REQD FOR START RJE

Explanation: The last closedown of RJE was abnormal, but RJE was started with START procname [.identifer]...NONE, indicating that no IPL was performed.

System Action: RJE operation is not initiated.

Operator Response: If there was no IPL since the closedown, an IPL is required. If an IPL was performed, enter a START command with NFMT or FORM as parameters.

IHK025I START RJE REJECTED

Explanation: A START RJE is invalid at this time. No STOP RJE has been processed since the last START RJE.

System Action: The START RJE is not processed.

Operator Response: If the start of another RJE procedure is desired, the active RJE task must be stopped. Then the START command referring to the other RJE procedure may be submitted and processed.

IHK026I CENOUT jobname (class ... class)

Explanation: A request to have the output of the remotely submitted job (jobname) written at the central installation has been accepted. The job output is placed in the listed SYSOUT classes.

System Action: The job output is removed from the RJE SYSOUT class and placed in the indicated SYSOUT classes.

Operator Response: The operator starts output writers for these classes when the output is desired.

IHK027I { termid { I / A unitname / P unitname uuu } / NO ACTIVE WORK STATIONS }

Explanation: This is the response to a SHOW TERMS; SHOW TERMS, termid; or SHOW ACTIVE command

where:

termid
is the RJE work station identifier.

I
indicates the work station is in the inactive state. This never appears in response to SHOW ACTIVE.

A
indicates the work station is in the active state.

P
indicates the work station is in the processing state.

unitname
is the communication line being used by the work station.

uuu
is the userid of the user currently logged on the work station.

NO ACTIVE WORK STATIONS
is displayed in response to a SHOW ACTIVE request when all work stations are in the inactive state.

System Action: Reporting continues until all work stations are displayed.

Operator Response: None.

IHK028I jobname uuu { aaa / N/A } { COMP / INCP } { I / D nnn }

NO DEFERRED OUTPUT uuu

Explanation: This is a response to a SHOW JOBS; SHOW JOBS, jobname; SHOW DEFER; or SHOW DEFER, userid command,

where:

jobname
is the name of the job.

uuu
is the source userid.

aaa
is the alternate userid.

N/A
indicates there is no alternate specified for the output.

COMP
indicates job has completed execution.

INCP
indicates job has not completed execution.

I
indicates job output is immediate. This never appears in response to the SHOW DEFER commands.

D
indicates job output is deferred.

nnn
is the number of normal central closedowns occurring since the job was received.

NO DEFERRED OUTPUT uuu
is displayed in response to a SHOW DEFER request when no deferred output is available.

System Action: Reporting continues until all of the deferred job output addressed by the request is displayed.

Operator Response: None.

IHK030I DELETED FROM USER DIRECTORY userid key

Explanation: The request to delete the indicated userid-key pair from the user directory has been serviced. Deletion of this pair leaves space for another userid-key assignment.

System Action: All jobs submitted by this user are deleted.

Operator Response: None.

IHK031I ADDED TO USER DIRECTORY userid key

Explanation: A request to add the userid-key pair to the user directory has been serviced. The user assigned this userid-key can now gain access to the system.

System Action: The userid-key is placed in the user directory.

Operator Response: None.

IHK032I USER DIRECTORY FULL userid key

Explanation: A request to add the userid-key pair to the user directory cannot be serviced. The user directory already contains the maximum number of RJE users.

System Action: The request is ignored.

Operator Response: The operator might make space available by deleting a userid-key pair no longer being used. If this is not feasible, he may have the central RJE system reassembled to support more users.

IHK033I MSGS DELETED FOR WORK STATION termid

Explanation: A request to delete the messages waiting for work station (termid) startup has been serviced.

System Action: The pending messages are deleted from the central system.

Operator Response: None.

IHK034I MSG CANNOT BE ADDED {BRDCST / DELAYED} termid

Explanation: (BRDCST) A request to add or insert a message into the broadcast message data set could not be serviced. Either the data set was full or, if the message was to be inserted, there were no higher numbered inactive slots available.

(DELAYED) The messages that follow this header could not be added to the delayed message data set when an RJEND statement was processed for the work station (termid) because the data set was full, or because a disk error was detected. This occurs when the RJEND is submitted from the work station or simulated because of an error condition.

System Action: (BRDCST) The request is ignored.

(DELAYED) All messages that could not be added to the data set are printed on the central printer-keyboard.

Operator Response: (BRDCST) If the message was to be inserted, there may be inactive slots above the slot specified. If there are no inactive slots, no message can be added until one slot is made inactive.

(DELAYED) Inform the work station after its next RJSTART or telephone the work station (termid) to give its operator this information.

IHK035I INVALID SLOT NUMBER BRDCST

Explanation: A slot number not within the range of 0-99 was specified on the BRDCST command.

System Action: The command is ignored.

Operator Response: The operator corrects the slot number and resubmits the command.

IHK036I BRDCST {NONE / nn message}

Explanation: A display of the current broadcast messages has been requested. The slot number (nn) is followed by the message text contained in the slot. Only active slots are displayed. NONE indicates that the data set is empty.

System Action: Reporting continues until the contents of all active slots are displayed.

Operator Response: None.

IHK037I INFORM INACTIVE WORK STATION jobname userid termid {N / O}

Explanation: The job (jobname) submitted by the user (userid) at the work station (termid) is completed. Either a notify message (N) or immediate job output (O) is directed to this inactive work station connected via a switched line to the central system.

System Action: The message or output is held at the central system until the work station (termid) submits an RJSTART command or the user (userid) logs on at another work station.

Operator Response: The operator may telephone the work station (termid) and give its operator this information.

IHK038I INVALID LINENAME SHOW

Explanation: A request to display error information for a particular line or line group specifies an invalid linename, or indicates that the DCB for the line is not open.

System Action: The request is ignored.

Operator Response: The operator supplies the correct linename and resubmits the command.

IHK040I INVALID USERID operation

Explanation: The command (operation) specifies a userid that is not contained in the user directory, or, if the command requests addition of a userid to the user directory, the userid is already in the directory.

System Action: The command is ignored.

Operator Response: The operator corrects the userid and resubmits the command.

IHK041I INVALID PROTECTION KEY userid

Explanation: A request to delete a userid-key pair in the user directory cannot be serviced. The key specified in the command does not agree with the key contained in the user directory.

System Action: The command is ignored.

Operator Response: The operator supplies the correct key and resubmits the command.

IHK042I INVALID TERMID operation

Explanation: The command (operation) specifies a termid not assigned to a work station in the RJE system.

System Action: The command is rejected.

Operator Response: The operator corrects the termid and resubmits the command.

IHK047I REQD PARAMETER MISSING operation

Explanation: A required parameter in the operand field is missing or invalid in the statement (operation).

System Action: The command is rejected.

Operator Response: The operator examines the statement in error, corrects the parameter, and resubmits the command.

IHK048I ILLEGAL DELIMITER operation

Explanation: A parameter in the operand field of the command (operation) is not delimited by a comma, or, if it is the last parameter, a blank.

System Action: The command is rejected.

Operator Response: The operator corrects the command and resubmits it.

IHK049I ILLEGAL CONTINUATION operation

Explanation: The command (operation) has continuation indicated with a nonblank character in column 71. Commands may not be continued.

System Action: The command is rejected.

Operator Response: The operator corrects the command and resubmits it.

IHK050I UNDEFINED KEYWORD operation

Explanation: An undefined keyword is included in the command (operation).

System Action: The command is ignored.

Operator Response: The operator corrects the error and resubmits the command.

IHK051I MULTIPLE USE OF KEYWORD operation

Explanation: A keyword is repeated in the command (operation).

System Action: The command is ignored.

Operator Response: The operator corrects the error and resubmits the command.

IHK055I INCORRECT TEXT LENGTH operation

Explanation: The text specified in the command (operation) either exceeds the allowable length or has a length of zero. Message text must be from 1 to 40 characters.

System Action: The command is ignored.

Operator Response: The operator corrects the error and resubmits the command.

IHK060I ABNORMAL CENTRAL CLOSEDOWN

Explanation: Either a data set for SYSIN data was not allocated in the started RJE procedure, or the device on which it was allocated was not direct access. This message is also displayed by RJE at closedown if the OS job scheduler returns with an error or if an RJE subtask abends. In these cases, this message will be preceded by the OS job scheduler message or by the RJE SUBTASK ABENDED message.

System Action: RJE operation is terminated.

Operator Response: Check the procedure referred to by the START command and ensure the proper SYSIN allocation; or try starting another RJE procedure. If this message is associated with an OS job scheduler error message, key the action to the OS job scheduler error. If this message is associated with the RJE SUBTASK ABENDED message, restart RJE.

IHK061I OUT OF SPACE {SYSIN jobname / SYS1.SYSJOBQE / EMITTER WORKAREA}

Explanation: An out of space (overload) condition exists at the central station system. All direct access storage space that is allocated for the resource SYSIN or SYS1.SYSJOBQE is in use. If EMITTER WORKAREA is specified, the emitter could not get the output work area required because main storage was not available when requested.

System Action: The user submitting the input is informed of the condition. Until space becomes available, all input requiring the depleted resource is rejected. When EMITTER WORKAREA is specified, no output to the terminal can occur until the necessary main storage is available. An EOT is sent. The central system waits for more input from the remote work stations. When the EOT is

received following the input, the emitter again tries to obtain main storage for its work area. No jobs are lost, but they are delayed in being returned to the remote work station until sufficient main storage is available.

Operator Response: If the overload condition persists, the operator may request that more space be allocated to the resource.

IHK062I SYSIN LIMIT EXCEEDED jobname

Explanation: The job (jobname) demands a SYSIN data set exceeding that specified in the procedure referred to when the central system was started.

System Action: The job is rejected, and a message is returned to the user submitting the job.

Operator Response: If the job must be processed, the operator, when the central system is restarted, should refer to procedure allowing larger SYSIN data sets.

IHK063I DISK ERROR

WRITING TABLE ENTRY	(1)
ROLLIN TABLES RJE ABORTED	(2)
BRDCST DIRECTORY	(3)
BRDCST MSG	(4)
DELAYED MSG DIRECTORY	(5)
DELAYED MSG	(6)
JED [jobname/PURGE SYSTEM]	(7)
Q MGR RJE ABORTED	(8)
Q MGR (jobname)	(9)
(volume serial jobname ddname)	(10)
IN CLOSEDOWN	(11)
addr,dev,ddname,op,err, trkaddr,accmeth	(12)

Explanation: An uncorrectable input/output failure has occurred while the program was attempting to write to or read from disk. One of the messages above indicates to the central operator (and the user) where the error occurred.

(1) An entry in the main storage copy of an RJE control table could not be written to disk.

System Action: Processing continues using the version of the tables in main storage. No subsequent messages are sent.

Operator Response: The operator should inform the users of the problem. It is recommended that the work stations not submit any more jobs and retrieve all delayed jobs. The operator should STOP RJE and reinitialize the tables before the START RJE. Any jobs remaining in the system after the STOP RJE are lost.

(2) Either an error occurred reading the RJE control tables into main storage, or all the required data sets were not allocated in the RJE procedure referenced by the START command.

System Action: RJE is terminated.

Operator Response: Have the procedure referenced in the START command checked to ensure the required RJE data sets were allocated. If the procedure is correct:

(a) Move the disk pack containing the RJE tables to another drive and attempt to START RJE again.
(b) If the error persists, execute the RJE initialization program (IHKINTAB). The current status of the RJE system will be lost.
(c) If the error still occurs call a customer engineer. In any event, have the customer engineer check the initial drive.

(3),(4) An error occurred while writing to or reading from the BRDCST directory or data set.

System Action: No further broadcast processing is done on the command (BRDCST, BRDCSTR, RJSTART, SHOW) that detected the error. Other processing continues normally.

Operator Response: The central operator should enter SHOW MSGS, then STOP RJE. Before the next START RJE, the broadcast-message

data sets should be reinitialized (IHKCDBMI). All old messages are lost.

(5),(6) An error occurred while writing to or reading from the delayed message directory or data set.

System Action: No further processing is done on the command (SHOW MSGS, MSG, MSGR) that triggered the error. If the error was incurred while processing RJSTART, all processing continues except the reading of delayed messages. If the error occurred during processing of RJEND, the messages are written to the central console, and processing continues.

Operator Response: The central operator should SHOW BRDCST, then STOP RJE. Before the next START RJE, the broadcast-message data sets should be reinitialized (IHKCDBMI). All old messages are lost.

(7) An error occurred while writing to or reading from the JED table on disk. The job (jobname) is lost in the event of a read error. Write errors are indicated by no jobname. PURGE SYSTEM indicates no recovery could be made from a write error.

System Action: On a read error, the job is lost and the submitter is notified. On a write error, recovery is attempted; the submitter is notified only if no recovery could be made. PURGE SYSTEM indicates no recovery could be made.

Operator Response: In the event of a read error, the operator may scratch those data sets associated with the jobname indicated in the message, after RJE has closed down. Otherwise, they will be deleted at the next operating system warmstart. If the system could not recover from a write error, the operator should inform the work stations that all output should be requested. He should STOP RJE and reinitialize the RJE control tables before START RJE.

(8) The OS queue manager routine has encountered a permanent I/O error on SYS1.SYSJOBQE.

System Action: RJE operation is terminated.

Operator Response: To attempt recovery without losing jobs in the system, reload the operating system without reformatting the queues. If this is unsuccessful, reload the operating system and reformat queues. If the disk error persists call a customer engineer.

(9) The OS queue manager has encountered a permanent I/O error on SYS1.SYSJOBQE on a READ or WRITE request of the RJE input or SYSOUT queues.

System Action: One or more of the following may occur:

(a) An EOT aborting input or ending the current output transmission is sent to the work station, if the error occurred during normal communication with the work station.

(b) The job identified by jobname is canceled in the operating system and deleted in RJE. In addition, JECL statements following the deleted job and preceding the next job entry are lost if the error occurred while reading the job entry from the RJE input queue.

(c) If the error occurred while reading the output from the RJE SYSOUT queue, the remaining output of the job is lost.

RJE processing continues.

Operator Response: Continue operation unless the disk error persists. Reformat queues at next IPL. If the error persists after reloading, call a customer engineer.

(10) A disk error occurred while writing SYSIN data or reading SYSOUT data.

System Action: If the error occurred on SYSIN data, an EOT is sent to the remote terminal, and an attempt is made to send the disk error message. The job is deleted. If the error occurred on SYSOUT data, no further output from the data set is transmitted, and the terminal receives this message. Processing continues with the remainder of the job.

Operator Response: If the error persists, STOP RJE. The error may be corrected by changing the disk pack or drive.

(11) During RJE closedown procedures, an ECB cannot be unchained from the OS queue manager.

System Action: The closedown procedure continues.

Operator Response: Before the next START RJE reload the operating system without reformatting the queues.

(12) An error occurred while making access to the RJE tables. The following information is provided:

addr - device address

dev - device type

ddname - name on DD card for RJE table being accessed

op - type of operation being attempted

err - error description

trkaddr - actual track address (7 byte hex address in the form of bbcchhr where:

bb represents the bin number

cc represents the cylinder number

hh represents the head number

r represents the record number)

accmeth - access method being used.

IHK064I LINE XXX NOT OPERATIONAL

Explanation: The control unit for this line is not operational.

System Action: The line is not serviced during this period of RJE activity. Communication proceeds with work stations via existing, operational communication lines. An attempt is made to service the line the next time an RJE procedure that refers to the line is started.

Operator Response: Notify customer engineer of problem.

IHK065I UNABLE TO OPEN DDNAME=xxxxxxxx

Explanation: The DDNAME for the line specified in the RJE assembly cannot be found in the RJE procedure.

System Action: The line is not serviced for this and all subsequent RJE startups that refer to this RJE procedure. Communication with the work stations proceeds over existing, operational communication lines.

Operator Response: Notify system programmer of error in the procedure.

IHK066I termid NOW RESPONDING TO POLLING

Explanation: The identified work station (termid) attached via a multidrop line has resumed responding to polling.

System Action: None.

Operator Response: None.

IHK067I termid NOT RESPONDING TO POLLING

Explanation: The identified work station (termid) attached via a multidrop line has failed to respond to polling.

System Action: None.

Operator Response: Have the system programmer responsible for the RJE assembly make sure that the polling characters were correctly specified for the work station.

IHK068I RJE SUBTASK ABENDED

Explanation: An RJE subtask has terminated abnormally.

System Action: RJE operation is terminated.

Operator Response: Restart RJE operation.

The generation of an RJE system for the central system consists of two steps:

1. Generation of the operating system with the options required to make RJE available in the system.
2. An RJE assembly and linkage-edit step in which the specific RJE facilities desired are included in the system. Once the general RJE capabilities have been made available with one operating system generation, any number of different RJE systems can be built using the assembly and linkage-edit step.

OPERATING SYSTEM GENERATION CONSIDERATIONS

To incorporate an RJE capability into his operating system, the user, when he generates his system, must include OPTIONS=RJE as a parameter in the SCHEDULR macro instruction, and ACSMETH=BTAM,BDAM in the DATAMGT macro instruction. When OPTIONS=RJE and ACSMETH=BTAM,BDAM are specified, the necessary RJE and BTAM modules are copied from the MODLIB onto the TELCMLIB (nonresident RJE modules are copied to LINKLIB, with the exception of the module IHKCDINI, which is copied to the TELCMLIB to be linkage edited with the resident modules). These modules are then available for later assembly and linkage editing of the central RJE system program.

The level of expected printer-keyboard activity must be reflected in the WTOBFRS keyword in the SCHEDULR system generation macro instruction. This parameter is much more critical in RJE. If system WTO buffers are unavailable when RJE tries to display a message on the printer-keyboard, the RJE task is placed in a WAIT state. This condition can result in work station timeouts; the RJE task is prevented from servicing the communications lines until buffers become available. Twice the number of lines is a good rule of thumb for determining the number of buffers needed for RJE operation.

In addition, the following system generation, macros, and options are required for generation of a system supporting RJE.

- IOCONTRL. One macro is required to describe each telecommunications control unit (2701 or 2703).
- IODEVICE. One macro is required for each communications line.
- TELCMLIB. This must be specified to include RJE modules and the telecommunications subroutine library.
- SCHEDULR. This macro must be specified to define the first MCS console device to be used in RJE operation if the multiple console support option of the operating system is to be present.
- SECONSLE. This macro must be specified to define additional MCS devices after the SCHEDULR macro has defined the first console device.
- PROCLIB. This macro must be specified for inclusion of a procedure library.
- ASSEMBLR. This must be specified so that the RJE macros can be assembled.
- EDITOR. This must be specified so that the assembled RJE macros can be linkage edited.
- MACLIB. This must be specified to allow the assembler to expand the RJE macros.

Complete descriptions of these macros, their formats, and operating system generation procedures are found in the publication IBM System/360 Operating System: System Generation, GC28-6554.

SPECIFYING THE RJE SYSTEM

The particular RJE system is specified by the user through four RJE assembly macro instructions:

1. RJETERM. One macro instruction is required for each supported work station.
2. RJELINE. One macro instruction is required for each communication line supported.
3. RJEUSER. One macro instruction is required to indicate the number of valid users of the RJE system and their identifications (userids).
4. RJETABL. One macro instruction is required to specify general information such as desired user exits, device association for SYSOUT data, and maximum number of job entries that may reside in the central system at a given time.

With these RJE macros, the user specifies an RJE system to meet his particular data processing requirements and defines the telecommunications network to be supported. The RJE program for the central installation is produced by linkage editing of object modules, resulting from the assembly of these RJE macros, with preassembled modules on TELCMLIB, and with preassembled user routines.

Figure 6 shows the flow of data through the RJE assembly and linkage-edit step. The OS Assembler translates the RJE macros and creates the modules that tailor the system to the particular application. This step also produces linkages to the preassembled modules, common to all RJE systems, and to the desired user exits.

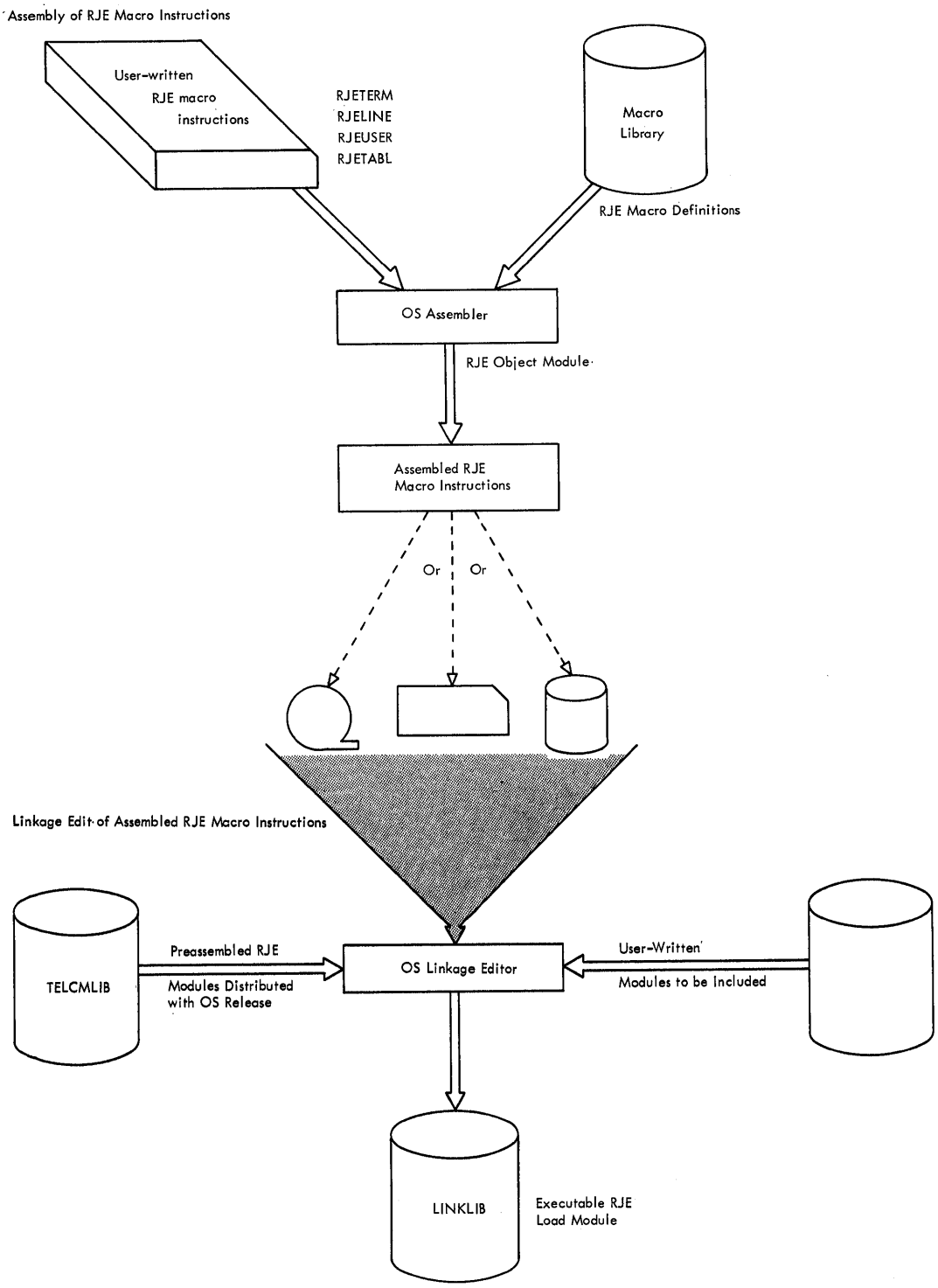


Figure 6. RJE Assembly and Linkage Edit

The object modules produced by the Assembler are edited by the OS Linkage Editor. This editing resolves the linkages created in the first step and produces the executable RJE program ready for use. The linkage editor output (the RJE load module) must be placed in the SYS1.LINKLIB when the RJE generation process is complete.

RJE ASSEMBLY MACRO INSTRUCTIONS

The contents of the RJE system to be generated are specified by the RJE macro instructions. The coding conventions and formats of the macros are the same as those for normal assembly macro instructions.

Note: Erroneous assemblies may result if extraneous cards have been inserted into the macro instruction deck or if an END statement has been omitted as the last card in the macro deck.

Figure 7 provides a summary of RJE macro instructions.

Name	Operation	Operand
name	RJELINE	DDLINE=ddname ,DDSYSIN=ddname [,RLN=1 / ,RLN=integer] [,MSGQEB=4 / ,MSGQEB=integer] [,JOBQEB=10 / ,JOBQEB=integer] [,LERB=([integer1 (255)],[integer2 (10)],[integer3 (5)],[integer4 (5)])] [,ID=(type,{chars,termid},...)] [,MODE=([IBC][A/B][A/B])] [,IDVER=(integer,chars)] [,CP=MVT / ,CP=MFT] [,ONLNT=NO / ,ONLNT=YES] [,MODEM=STANDARD / ,MODEM=CC3977 / ,MODEM=PTT]
name	RJETERM	[TYPE=2780 / TYPE=CPU / TYPE=1130 / TYPE=2020 / TYPE=2770] [,PACK=NO / ,PACK=YES] [,PUNCH=YES / ,PUNCH=NO] [,FEATURE=NONE / ,FEATURE=2780MR / ,FEATURE=2770EB] [,PRTSZ=120 / ,PRTSZ=132 / ,PRTSZ=144] [,ID=chars]
[name]	RJEUSER	integer[,{userid,key},...]
[name]	RJETABL	JOB=integer ,SYSPRT=char ,SYSPCH=char ,SYSUSER=char ,SYSRJE=char [,JOBCARD=routine name] [,JOBACK=routine name] [,COMMERR=routine name] [,BUFNO=1 / ,BUFNO=integer]

Figure 7. Summary of RJE Macro Instructions

RJELINE - DESCRIPTION OF THE COMMUNICATIONS LINE

The RJELINE macro instruction designates characteristics that are required by RJE to service the communications line and attached work stations. One macro is specified for each line that RJE must support. The RJELINE macros must appear first in the macro deck. In addition, when line groups are used, they must be grouped by relative line numbers in ascending order. Line group denotes a logical grouping of communication lines. This grouping is done by concatenation of DD statements in the cataloged procedure, or with the UNITNAME macro during system generation. If lines are to be grouped, three conditions must be met:

1. All line connections must be the same, either switched or nonswitched.
2. All work stations within the line group must be of the same type.
3. All lines must be attached to the same type of control unit.

```
Name | Operation | Operand
-----+-----------+---------------------------------------
name | RJELINE   | DDLINE=ddname
     |           | ,DDSYSIN=ddname
     |           |
     |           | [,RLN=1       ]
     |           | [,RLN=integer ]
     |           |
     |           | [,MSGQEB=4       ]
     |           | [,MSGQEB=integer ]
     |           |
     |           | [,JOBQEB=10      ]
     |           | [,JOBQEB=integer ]
     |           |
     |           | [,LERB=( [integer1],
     |           |          [  255   ]
     |           |
     |           |          [integer2],
     |           |          [   10   ]
     |           |
     |           |          [integer3],
     |           |          [   5    ]
     |           |
     |           |          [integer4]) ]
     |           |          [   5    ]
     |           | [,ID=(type,{chars,
     |           |               termid},...)]
     |           |
     |           | [,MODE=([IBC] [,A] [,A] )]
     |           |               [ B] [ B]
     |           |
     |           | [,IDVER=(integer,chars)]
     |           |
     |           | [,CP=MVT] [,ONLNT=NO ]
     |           | [,CP=MFT] [,ONLNT=YES]
     |           |
     |           | [,MODEM=STANDARD]
     |           | [,MODEM=CC3977  ]
     |           | [,MODEM=PTT     ]
```

Additional explanation of line groups is provided in the publication IBM System/360 Operating System: Basic Telecommunications Access Method, GC30-2004. Information supplied by this macro provides:

1. Access to line information specified at system generation.
2. Identification of line groups, to avoid a need for additional control blocks.
3. Threshold values for error counters that cause an error message to be displayed to the central operator when any of the values is reached.
4. The polling list for multidrop lines, giving the polling characters of the work stations.
5. A description of optional features available on the communications control unit to which the line is attached.
6. The OS control program under which RJE is to operate.

Name Field

name
: specifies the name of the line. This name is used as a parameter in the SHOW command to request error information about the line.

Operand Field

DDLINE=ddname
: is the name specified in the DD statement defining the line (or line group). The DD statement defining the line must be included in the cataloged procedure required for RJE (see Cataloged Procedures for RJE).

  Note: Except in the case of line groups, the ddname must be unique.

DDSYSIN=ddname
: is the name of the DD statement defining the SYSIN data set for the line. This DD statement must also be part of the cataloged procedure for RJE.

RLN=1
RLN=integer
: specifies the relative line number of this line within the line group. If this keyword parameter is omitted, RLN=1 is assumed.

MSGQEB=4
MSGQEB=integer
: specifies the number of messages that can be queued for a work station at any given time.

JOBQEB=10
JOBQEB=integer
: specifies the number of jobs that can be queued for a work station at any given time.

Note: It is recommended that the number of QEB's specified must be greater than or equal to the number of jobs being submitted on any given line at any given time in the system.

LERB=([integer$_1$/255],[integer$_2$/10],[integer$_3$/5],[integer$_4$/5])
specifies the various threshold values. If an error threshold is reached before the transmission threshold, a message containing line error information is displayed to the central operator. If no error counter reaches its threshold value before this number of transmissions have occurred, the current values of all counters are added to their respective accumulators, and the counters are reset to zero. These accumulator values may be displayed with the command: SHOW LERB, linename (see Central Commands). The allowable values are integers 1-255 inclusive. The underlined value is assumed for any parameter omitted.

Integer$_1$ -- transmission threshold
Integer$_2$ -- data check threshold
Integer$_3$ -- lost data threshold
Integer$_4$ -- nontext time-out threshold

ID=(type,{chars,termid},...)
specifies the type of work stations attached to the RJE system via a multipoint line. This parameter must be present for multipoint lines and must be omitted for other line connections. In addition, the keyword subparameter list supplies the polling character(s)[1] and identification of each work station attached to the line.

type is replaced with one of the following values:

2770 - if the attached work stations are IBM 2770 Data Communication Systems.
2780 - if the attached work stations are IBM 2780 Data Transmission Terminals.
1130 - if the attached work stations are IBM 1130 Computing Systems.
2020 - if the attached work stations are IBM System/360 Model 20 Computing Systems.
INTMX - for a multipoint line, INTMX must be specified if different types of remote work stations are to be connected on the same multipoint line. For example, if 2770s, 2780s, 1130s, and 2020s are mixed on the same line, INTMX must be specified.

chars is replaced with the EBCDIC hexadecimal equivalent of the polling character(s)[1] for the work station.

termid is replaced with the name specified in the RJETERM macro describing the work station.

Note: One pair of chars and termid values is required in the subparameter list for each work station on the line. Priority may be given to a multidropped work station by repeating its paired chars and termid values in the subparameter list.

If INTMX is specified, each chars field within the ID parameter must be the same length. For example, if 2770s, 2020s, and 2780s are mixed on the same line, SYN characters (hex 32) must be added, left justified, to each chars field so that all chars fields are equal in length.

Example:

```
ID=(INTMX,C1C1F0,RJETERM1,3232A1,RJETERM2,32C1F6,RJETE1
```

where: RJETERM1 is the name of the RJETERM macro instruction defining the 2770; RJETERM2, the name of the RJETERM macro instruction defining the 2020; and RJETERM3, the name of the RJETERM macro instruction defining the 2780.

F0 is the standard input device selection character for 2770s.

F6 is the standard input device selection character for 2780s.

MODE=([IBC][,A/B][,A/B])
IBC (Intermediate Block Check) specifies that the transmission control unit will recognize the intermediate block-check character and perform block checking without turning the line around. If this suboperand is omitted, intermediate block checking is not performed. The parameter IBC is required for 2770 and 2780, is optional for CPU, and must be omitted if 1130 or 2020 is specified in the RJETERM macro.

A
specifies that communications are to be through the Dual Communications Interface A of the 2701

---

[1]The 2780 has two polling characters, and the 1130 and the Model 20 have one.

Data Adapter Unit.

B
specifies that communications are to be through the Dual Communications Interface B of the 2701 Data Adapter Unit. The 2701 must have the dual interface feature in order to code B. If this suboperand is omitted, A is assumed.

A
specifies that transmission will be in code A for 2701 Data Adapter Unit Dual Code Feature.

B
specifies that transmission will be in code B for 2701 Data Adapter Unit Dual Code Feature.

If this suboperand is omitted, A is assumed. The code selected must be in EBCDIC.

Programmer's Note: If the transmission control unit is a 2703, the last two suboperands must be omitted. [A/B][,A/B]

IDVER=(integer,chars)

integer
specifies the number of characters specified in the chars field that follows.

chars
specifies the identification verification characters (in hexadecimal representation of device code). The chars field must include an ENQ character (in hexadecimal) as the last character of the field. This operand is used only for switched line connections.

Example:

IDVER=(3,E6E62D)

where: 3 indicates the number of characters to follow.

E6E6 represents the two identification verification characters for a 2770.

2D is the hexadecimal representation of the ENQ character.

CP=MVT
specifies the RJE system is to operate in an MVT system. The MVT system is assumed if the CP keyword is omitted.

CP=MFT
specifies the RJE system is to operate in an MFT system.

ONLNT=NO
ONLNT=YES
specifies whether the option ERROPT=T is set in the BTAM DCB macro instruction for RJE. If the parameter ONLNT=YES is specified, ERROPT=T is set and the BTAM on-line test facility is included in the central program. This allows on-line test to be invoked without discontinuing RJE at the central computer. For information on using the on-line test feature see IBM System/360 Operating System Basic Telecommunications Access Method, GC30-2004. If the parameter is omitted, on-line test is not included.

MODEM=STANDARD
MODEM=CC3977
MODEM=PTT
specifies the type of data set to perform the modulation-demodulation and control functions necessary to provide compatability between remote work stations and the central installation.

STANDARD specifies that a standard data set (not a World Trade data set) is present. If this operand is specified, the line connection to the central system can be either switched or nonswitched. If the MODEM parameter is omitted, a standard data set is assumed.

CC3977 specifies that a World Trade IBM 3977 Continuous Carrier data set is present. If this operand is specified, the line connection to the central system must be on a nonswitched line.

PTT specifies that the data set present is not capable of providing for the central system an answering tone. If this operand is specified, the answering tone is provided by the central system to indicate to the calling operator that he should switch to data mode for transmitting data. The line connection to the central system must be on a switched line.

```
┌─────┬─────────┬──────────────────────────┐
│Name │Operation│Operand                   │
├─────┼─────────┼──────────────────────────┤
│LINE2│RJELINE  │DDLINE=LINEGRP4,RLN=2,    │
│     │         │LERB=(,,10),DDSYSIN=      │
│     │         │              INPUT42,    │
│     │         │ID=(1130,E8,NYC,E7,LA,E8, │
│     │         │              NYC,E9,CHI) │
└─────┴─────────┴──────────────────────────┘
```

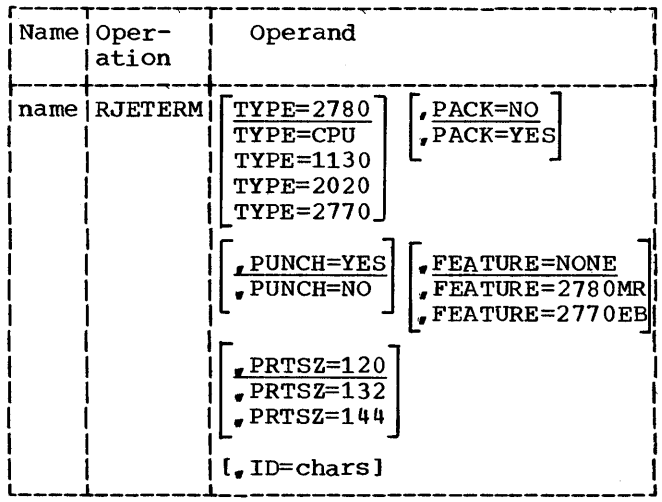
Figure 8. Example of RJELINE Macro Instruction

Example: Figure 8 shows the RJELINE macro instruction describing a multidrop line, named LINE2, with three attached 1130 work

stations. The line is defined by DD statement LINEGRP4 and is the second line defined in the line group. The SYSIN data set is defined with DD statement INPUT42. The installation desires that an error message be displayed to the operator if 10 lost data errors occur before 255 transmissions. The other assumed threshold values are satisfactory. The attached work stations are named LA, NYC, and CHI and have the respective polling characters X, Y, and Z. Priority is to be given to work station NYC. The assumed operating environment is MVT.

RJETERM - DESCRIBE A WORK STATION

The RJETERM macro is used to describe each work station to the RJE system. One macro instruction must be specified for each work station to be supported by RJE.



Name Field

name
: assigns the RJE symbolic name to the work station. This name, called the termid, identifies the work station to RJE. The work station is referred to by the termid rather than by its machine address. The termid is used in logically attaching the work station to the RJE system, in routing messages to the work station, and in retrieving information for the work station.

Operand Field

TYPE=2780
TYPE=CPU
TYPE=1130
TYPE=2020
TYPE=2770
: identifies the type work station as:

(1) An IBM Data Transmission Terminal (TYPE=2780).

(2) An IBM System/360 Computing System (TYPE=CPU).

(3) An IBM 1130 Computing System (TYPE=1130).

(4) An IBM System/360 Model 20 Computing System (TYPE=2020).

(5) An IBM 2770 Data Communication System (TYPE=2770).

If this parameter is omitted, the work station is assumed to be a 2780.

Note: On a switched line connection, either an 1130, a Model 20, or a System/360 Computing System may be specified as TYPE=CPU, and hence, may use the same line. On a multipoint line, either a Model 20 or 1130 computing system may be specified as TYPE=1130 and may use the same line.

PUNCH=YES
PUNCH=NO
: specifies whether a card punch is available at the work station. If the parameter is omitted, a card punch is assumed.

PRTSZ=120
PRTSZ=132
PRTSZ=144
: specifies the length of the print line at the work station. A print line of 120 characters is assumed if the parameter is omitted. For TYPE=2770, 120 should be specified unless the expanded buffer feature is present. With this feature, either 120 or 132 is valid. For TYPE=2780, only 120 and 144 are valid.

Note: The actual printer line size in all cases is 132 characters. In order to use the full 132-character print line, the expanded buffer feature must be present. If this feature is not present, only 120-character output lines are supported.

ID=chars
: if specified, indicates that the work station is connected to the RJE system via a multipoint line. The ID keyword value is the EBCDIC hexadecimal equivalent of the addressing character for the work station. For example, if the addressing character is the letter A, the ID keyword is coded as ID=C1 since C1 is the EBCDIC hexadecimal equivalent of A. Valid addressing characters for 2780 work stations are alphabetic. This keyword is not coded if the work station is connected via a point-to-point or switched line.

For the 2770 work stations, 11 must be specified for the primary output device.

Example:

```
ID=818111
```

where 8181 represents the 2770 double addressing characters and 11, the primary output device.

PACK=NO
PACK=YES
specifies whether or not the work station uses the compress/expand option. If the parameter is omitted, NO is assumed.

Note: Compress/expand compatibility between the central system and the remote work station is required. If the option is selected for a work station at the central system, the work station program must also contain the feature.

FEATURE=NONE
FEATURE=2780MR
FEATURE=2770EB
identifies a 2780 work station with the multiple record feature, or a 2770 work station with the expanded buffer feature. If the parameter is omitted, NONE is assumed.

Examples: The RJETERM macro is coded for an IBM 2780 Data Transmission Terminal, Model 2 (punch and printer) with a 120-character print line connected via a switched line. The termid, that is, the name that identifies the work station to the RJE system, is RALEIGH.

```
|RALEIGH|RJETERM|no operand required |
```

If the same work station is connected via a multidrop line instead of a switched line, and its addressing character is the letter A, the macro is coded:

```
|RALEIGH|RJETERM|       ID=C1        |
```

If the work station is an IBM System/360 Model 30 with an attached printer having a 132-character print line, and the termid is to be Atlanta, the programmer would code:

```
|ATLANTA|RJETERM| TYPE=CPU,PRTSZ=132 |
```

RJEUSER - DEFINE THE USER DIRECTORY

The RJEUSER macro allows each installation to tailor the RJE user directory to its own needs. When the central system is assembled, each installation must indicate the maximum number of users with access to the RJE system. In addition, RJE user identification (userid) and protection (key) assignments may be made at this time. If the userid and key assignments are incomplete, the central operator can add to them dynamically by command if space is available in the directory. A new assembly is not necessary to add users unless the directory is full. If a projected figure is used, rather than one which satisfies only immediate requirements, unnecessary RJE assemblies can be avoided.

```
|Name   |Operation|Operand                  |
|[name]|RJEUSER  |integer                  |
|       |         |[,{userid,key},...]      |
```

Operand Field
integer
specifies the maximum number of userid-protection key assignments to be made. This number should be the projected number of such assignments for the system. The integer value specified must be from 1 to 999 inclusive.

userid,key
designates the user identification (userid) and protection (key) assigned. The userid and key are specified as a pair and are entered in the user directory during the macro expansion. These must be three characters each and the userid must begin with an alphabetic character.

Programmer's Note: The userid and protection key must contain only alphameric characters. These are A-Z, 0-9, $, #, and @. Also, each must be three characters long.

Example: The projected number of userid-key assignments for the system is 20, but only 5 userid-key pairs have been specified. The following macro may be specified.

```
|RJEUSER|20,HYE,123,AND,12$,LOW,
|       |1@#,PDQ,444,LRM,111
```

RJETABL - FURNISH EXIT, SYSOUT, AND REMOTE JOB INFORMATION

The RJETABL macro is used to specify:

1. The maximum number of remote jobs that may reside in the central system at a given time;
2. The SYSOUT class assignments for remote job output and the class reserved for RJE at the central installation;
3. Whether the provided user exits are desired.

The macro creates the necessary control blocks to handle the remote jobs and provides the desired exits.

Name	Operation	Operand
[name]	RJETABL	JOB=integer ,SYSPRT=char ,SYSPCH=char ,SYSUSER=char ,SYSRJE=char [,JOBCARD=routine name] [,JOBACK=routine name] [,COMMERR=routine name] [,BUFNO=1 ,BUFNO=integer]

Operand Field

JOB=integer
specifies the maximum number of remote jobs that may reside in the central system concurrently. When this value is reached, no more remote jobs are accepted until other remote jobs are removed from the system. The integer value specified must be from 1 to 999 inclusive.

SYSPRT=char
identifies a SYSOUT class for printed output at the central installation. All SYSOUT data sets of remotely submitted jobs must use this character for printed output.

SYSPCH=char
identifies a SYSOUT class for punched output at the central installation. All SYSOUT data sets of remotely submitted jobs must use this character for punched output.

SYSUSER=char
identifies the SYSOUT class for output to be passed to a user-written output routine for processing. If the work station supports a user-written output routine, it receives all output in this data set for processing. If the work station supports the user exit, but the option is not exercised, or the work station does not support a user exit, (e.g., the 2780) output identified with this output class is printed at the remote work station.

SYSRJE=char
identifies the SYSOUT class assigned to RJE at the central installation. This class must be reserved for the use of RJE only. If locally submitted jobs place output in this class, the output is deleted. It is recommended that the user assign the RJE SYSOUT class in the range of 0-9.

Programmer's Note: If a user specifies SYSOUT data sets other than those for printed, punched or user-exit output, the data set returned to the work station is printed. If user-exit output is returned to a work station with no user exit, the output is printed.

JOBCARD=routine name
is the name of the user-written routine that examines a remotely submitted JOB statement, including continuation cards. This routine name identifies the entry point of the routine given control when a JOB statement is received.

JOBACK=routine name
is the name of the user-written routine that may examine and modify the job acknowledgment message. This routine name identifies the entry point of the routine given control before the job acknowledgment is sent.

COMMERR=routine name
is the name of the user's routine that examines communications errors encountered during RJE operation. The routine name identifies the entry point of the routine given control after the error is found.

BUFNO=1
BUFNO=integer
specifies the maximum number of central commands that may be queued for processing at one time. If this value is exceeded, all additional central commands are rejected and must be resubmitted after the pending commands are processed. The integer specified must be from 1 to 100 inclusive. If this parameter is omitted 1 is assumed.

Central command queuing is desirable for installations entering multiple RJE central commands from the card reader, for example, to initialize a broadcast data set.

GENERATION OF THE RJE LOAD MODULE AND INITIALIZE PROGRAM

After the completion of stage 2 of operating system generation, the user must execute the necessary assemblies and link edits to create the RJE resident load module, IHKRJBGN, and the program that initializes the RJE control tables, IHKINTAB. (The program that initializes the broadcast-message data sets, IHKCDBMI, does not depend upon the RJE macro definitions and was prepared for execution at system generation time.)

Four steps are required to accomplish the above. One additional step is required for each of the three user exits to be included in the system. Figure 9 shows the JCL and linkage editor control cards required for these steps. Following is a description of each step.

Note: Erroneous assemblies may result if extraneous cards have been inserted into the macro instruction deck or if an END statement has been omitted as the last card in the macro deck.

STEP 1 - assembles the RJE macros and places the object module produced (IHKAARJE) in a temporary data set (RJETEMP) from which it will be link edited to SYS1.TELCMLIB in a later step.

STEP 2 - is necessary if the JOBCARD user exit is to be included. The user-written routine is assembled and placed in RJETEMP with the name specified in the RJETABL macro in STEP 1.

STEP 3 - is necessary if the JOBACK user exit is to be included. The user-written routine is assembled and placed in RJETEMP with the name specified in the RJETABL macro in STEP 1.

STEP 4 - is necessary if the COMMERR user exit is to be included. The user-written routine is assembled and placed in RJETEMP with the name specified in the RJETABL macro in STEP 1.

STEP 5 - linkage editing of four modules created in the preceding steps from RJETEMP to SYS1.TELCMLIB is accomplished.

Note: The following labels will be flagged as unresolved at the end of this step,

IHKPOST1
IHKPOST2
IHKABLSD
IHKBGNIN

and the names assigned to the user exits if any are included. If the compress/expand feature is present, the labels IHKCHPCK and IHKCHUPK will also be flagged as unresolved. These unresolved linkages do not affect the generation of the RJE system.

STEP 6 - (At this point all modules needed in this step are on SYS1.TELCMLIB.) This step link edits all preassembled RJE resident modules and the output of STEPS 1, 2, 3, and 4 to create the RJE resident load module, IHKRJBGN, and places it on SYS1.LINKLIB. The linkage of all resident modules is triggered by including (by use of the INCLUDE card) the RJE modules IHKAARJE and IHKABLST. The module IHKAARJE, generated from the RJE assembly macros, contains external references by which the linkage editor includes all user-exit routines. The preassembled resident module IHKABLST contains external references by which all other preassembled resident modules are also included. NCAL must not be specified.

STEP 7 - creates the program for initializing the RJE control tables. IHKAARJE and IHKCDINI are included from SYS1.TELCMLIB. The resulting program is placed on SYS1.LINKLIB and named IHKINTAB with entry point IHKCDINI. NCAL must be specified.

Note: The following labels will be flagged as unresolved at the end of this step:

IHKPOST1
IHKPOST2
IHKABLSD
IHKBGNIN

and the names assigned to the user exits if any are included. If the compress/expand feature is present, the labels IHKCHPCK and IHKCHUPK will also be flagged as unresolved. These unresolved linkages do not affect the operation of the initialize program.

Note: If any one of the RJE macro specifications is changed after the link-edits have been completed, STEPS 1, 5, 6, and 7 must be redone. If any of the user-exit routines is changed, the step(s) involved (i.e., 2, 3, 4) plus steps 5 and 6 must be redone.

SAMPLE JCL		
//RJEASLE	JOB	(JOB card parameters)
//STEP1	EXEC	ASMFC
//ASM.SYSPUNCH	DD	DSNAME=RJETEMP(IHKAARJE),DISP=(NEW,KEEP)
//		SPACE=(TRK,(10,1,2)),UNIT=23xx,VOLUME=SER=xxxxxx
//ASM.SYSIN	DD	*
RJE macro statements		
/*		
//STEP2	EXEC	ASMFC
//ASM.SYSPUNCH	DD	DSNAME=RJETEMP(name of user-exit routine),
//		DISP=OLD,VOLUME=REF=*.STEP1.SYSPUNCH
//ASM.SYSIN	DD	*
input for user-exit routine		
/*		
//STEP3 format as in STEP2 for second user-exit routine		
/*		
//STEP4 format as in STEP2 for third user-exit routine		
/*		
//STEP5	EXEC	PGM=LINKEDIT,PARM=(XREF,LIST,DC,NCAL,LET)
//SYSLMOD	DD	DSNAME=SYS1.TELCMLIB,DISP=OLD
//SYSLIB	DD	DSNAME=RJETEMP,DISP=(OLD,DELETE),UNIT=23xx,
//		VOLUME=SER=xxxxxx
//SYSUT1	DD	SPACE=(TRK,(10,10)),UNIT=SYSDA
//SYSPRINT	DD	SYSOUT=A
//SYSLIN	DD	*
	INCLUDE SYSLIB(IHKAARJE)	
	NAME	IHKAARJE(R)
	INCLUDE SYSLIB(name of first user exit)	
	NAME	name of first user exit(R)

Figure 9. Sample Job Control Language (Part 1 of 2)

```
                    INCLUDE SYSLIB(name of second user exit)
                    NAME       name of second user exit(R)
                    INCLUDE SYSLIB(name of third user exit)
                    NAME       name of third user exit(R)
 /*
 //STEP6        |  EXEC   |   PGM=LINKEDIT,PARM=(XREF,LIST,DC)
 //SYSLMOD      |  DD     |   DSNAME=SYS1.LINKLIB,DISP=OLD
 //SYSLIB       |  DD     |   DSNAME=SYS1.TELCMLIB,DISP=OLD
 //SYSUT1       |  DD     |   SPACE=(TRK,(40,10)),UNIT=SYSDA
 //SYSPRINT     |  DD     |   SYSOUT=A
 //SYSLIN       |  DD     |   *
                    INCLUDE SYSLIB(IHKAARJE)
                    INCLUDE SYSLIB(IHKABLST)
                    ENTRY      IHKRJBGN
                    NAME       IHKRJBGN(R)
 /*
 //STEP7        |  EXEC   |   PGM=LINKEDIT,PARM=(XREF,LIST,DC,NCAL,LET)
 //SYSLIB       |  DD     |   DSNAME=SYS1.TELCMLIB,DISP=OLD
 //SYSLMOD      |  DD     |   DSNAME=SYS1.LINKLIB,DISP=OLD
 //SYSUT1       |  DD     |   SPACE=(TRK,(10,10)),UNIT=SYSDA
 //SYSPRINT     |  DD     |   SYSOUT=A
 //SYSLIN       |  DD     |   *
                    INCLUDE SYSLIB(IHKAARJE)
                    INCLUDE SYSLIB(IHKCDINI)
                    ENTRY      IHKCDINI
                    NAME       IHKINTAB(R)
 /*
```

Notes:

1. The SPACE parameter for the SYSPUNCH data set in STEP1 is more than adequate for assembled RJE macros. This parameter should be altered as necessary to provide sufficient space for the user-written routines.

2. This seven-step job requires 120 records on SYS1.SYSJOBQE reserved for the initiator. If a smaller amount was specified at system generation (60 records is the default), the number should be changed with an R 00,',120' response to the message IEF423A SPECIFY JOB QUEUE PARAMETERS at IPL.

Figure 9. Sample Job Control Language (Part 2 of 2)

INITIALIZE RJE TABLE AND MESSAGE DATA SETS

This utility program prepares a new and initialized copy of the RJE control tables and/or the broadcast-message data sets on disk.

There are 2 groups of RJE data sets requiring initialization.

Group 1 contains the RJE control tables.

These are:

SYS1.IHKFSTB	Fastable (jobs)
SYS1.IHKJEDTB	Jed table (jobs extended)
SYS1.IHKUDRTB	User directory
SYS1.IHKTDRTB	Terminal directory

Group 2 contains the BRDCST and MSG texts and their directories.

These are:

SYS1.IHKTXTTB	BRDCST-MSG texts
SYS1.IHKMSGSL	MSG directory
SYS1.IHKBRDSL	BRDCST directory

Before the RJE system is used, both groups of data sets must be initialized. After both data sets have been initialized, it is possible to reinitialize either group independent of the other. This allows changing the size of the control tables in Group 1 without altering the Group 2 tables (the Group 2 table size is fixed) or moving either of the tables to a different position on the DASD. See Note, in the section Cataloged Procedures for RJE.

Depending upon the requirements, the utility includes any or all of the following:

STEP 1
- a) a SCRATCH for the data sets involved.
- b) an UNCATLG for each data set if necessary.

STEP 2 - initialization of the control tables data sets.

STEP 3 - initialization of broadcast-message data sets.

SCRATCHING THE DATA SETS

IEHPROGM, with the SCRATCH statement, is used to scratch the old data sets when reinitializing. It is not necessary at initial creation of the data sets. For additional requirements to use IEHPROGM see IBM System/360 Operating System: Utilities, GC28-6586

Name	Operation	Operand
[name]	SCRATCH	DSNAME=name, VOL=23xx=serial number, PURGE

Group 1 and/or 2 may be scratched.

UNCATALOGING THE DATA SETS

IEHPROGM, with the UNCATLG statement, is used to uncatalog data sets. This is used only when the volume is being changed for either group of data sets. The data sets must be scratched before reinitialization.

Name	Operation	Operand
[name]	UNCATLG	DSNAME=name

INITIALIZING THE RJE CONTROL TABLES

IHKINTAB is used to initialize the control tables. In addition to the EXEC statement, the input stream for IHKINTAB includes:

- A DD statement named SYSABEND specifying an output device in case of an abnormal end.
- A DD statement for each of the four data sets, containing the tables, in the following form:

//ddname	DD	DSNAME=name,DISP=(NEW,CATLG),
//		SPACE=(a,(b,c)),UNIT=23xx
//		VOLUME=SER=xxxxxx,DCB=(DSORG=DA)

ddname=IHKFSTDD,IHKJEDDD,IHKUDRDD,IHKTDRDD

SPACE(a,(b,c))

a)	SYS1.IHKFSTB	a=24	
	SYS1.IHKJEDTB	a=98	
	SYS1.IHKUDRTB	a=18	
	SYS1.IHKTDRTB	a=76	
b)	SYS1.IHKFSTB	see JOB=integer	b=integer+1
	SYS1.IHKJEDTB	see JOB=integer	b=integer+1
	SYS1.IHKUDRTB	see maxuser-integer	b=integer
	SYS1.IHKTDRTB	see RJETERM	b=no. of RJETERMs
c)	c=5		

INITIALIZING THE BROADCAST-MESSAGE DATA SETS

IHKCDBMI is used to initialize the broadcast and message data sets. In addition to the EXEC statement, the input stream for IHKCDBMI includes:

- A DD statement named SYSABEND specifying an output device in case of an abnormal end of job.
- A DD statement for each of the three data sets associated with the broadcast messages and delayed messages as described below:

//IHKTXTDD	DD	DSNAME=SYS1.IHKTXTTB,DISP=(NEW,CATLG),
//		SPACE=(60,(251,20)),UNIT=xxxx,
//		VOLUME=SER=xxxxxx,DCB=(DSORG=DA)
//IHKMSGDD	DD	DSNAME=SYS1.IHKMSGSL,DISP=(NEW,CATLG),
//		SPACE=(750,(1,1)),UNIT=xxxx,
//		VOLUME=SER=xxxxxx
//IHKBRDDD	DD	DSNAME=SYS1.IHKBRDSL,DISP=(NEW,CATLG),
//		SPACE=(400,(1,1)),UNIT=xxxx,
//		VOLUME=SER=xxxxxx

Note: A change in the size of the data set is made by a change in the macro definition of IHKAARJE. A change is necessary to alter the provision for number of jobs, users, terminals, or lines in the system.

If any change is made to decrease the number of terminals, or if the order of terminals as specified in the RJETERM macros is changed, IHKCDBMI should be executed. Otherwise, delayed messages existing prior to the RJE assembly may be sent to the wrong terminal.

Caution: When IHKCDBMI is executed, all delayed messages and broadcast messages are purged.

SAMPLE CODING FORM			
1.	//JOB1	JOB	
2.	//STEP1	EXEC	PGM=IEHPROGM
3.	//SYSPRINT	DD	SYSOUT=A
4.	//DD1	DD	VOLUME=SER=111111,DISP=OLD,UNIT=2311
5.	//SYSIN	DD	*
6.		SCRATCH	DSNAME=SYS1.IHKFSTB,VOL=2311=111111,PURGE
7.		SCRATCH	DSNAME=SYS1.IHKJEDTB,VOL=2311=111111,PURGE
8.		SCRATCH	DSNAME=SYS1.IHKUDRTB,VOL=2311=111111,PURGE
9.		SCRATCH	DSNAME=SYS1.IHKTDRTB,VOL=2311=111111,PURGE
10.		SCRATCH	DSNAME=SYS1.IHKTXTTB,VOL=2311=111111,PURGE
11.		SCRATCH	DSNAME=SYS1.IHKMSGSL,VOL=2311=111111,PURGE
12.		SCRATCH	DSNAME=SYS1.IHKBRDSL,VOL=2311=111111,PURGE
13.	/*		
14.	//STEP2	EXEC	PGM=IHKINTAB
15.	//SYSABEND	DD	SYSOUT=A
16.	//IHKFSTDD	DD	DSNAME=SYS1.IHKFSTB,DISP=(NEW,CATLG),
17.	//		SPACE=(24,(11,5)),UNIT=2311,
18.	//		VOLUME=SER=111111,DCB=DSORG=DA
19.	//IHKJEDDD	DD	DSNAME=SYS1.IHKJEDTB,DISP=(NEW,CATLG),
20.	//		SPACE=(98,(11,5)),UNIT=2311,
21.	//		VOLUME=SER=111111,DCB=DSORG=DA
22.	//IHKUDRDD	DD	DSNAME=SYS1.IHKUDRTB,DISP=(NEW,CATLG),
23.	//		SPACE=(18,(15,5)),UNIT=2311,
24.	//		VOLUME=SER=111111,DCB=DSORG=DA
25.	//IHKTDRDD	DD	DSNAME=SYS1.IHKTDRTB,DISP=(NEW,CATLG),
26.	//		SPACE=(76,(15,5)),UNIT=2311,
27.	//		VOLUME=SER=111111,DCB=DSORG=DA
28.	//STEP3	EXEC	PGM=IHKCDBMI
29.	//SYSABEND	DD	SYSOUT=A
30.	//IHKTXTDD	DD	DSNAME=SYS1.IHKTXTTB,DISP=(NEW,CATLG),
31.	//		SPACE=(60,(251,20)),UNIT=2311,
32.	//		VOLUME=SER=111111,DCB=DSORG=DA

SAMPLE CODING FORM (Continued)			
33.	//IHKMSGDD	DD	DSNAME=SYS1.IHKMSGSL,DISP=(NEW,CATLG),
34.	//		SPACE=(750,(1,1)),UNIT=2311,
35.	//		VOLUME=SER=111111
36.	//IHKBRDDD	DD	DSNAME=SYS1.IHKBRDSL,DISP=(NEW,CATLG),
37.	//		SPACE=(400,(1,1)),UNIT=2311,
38.	//		VOLUME=SER=111111

INITIALIZATION OF ALL DATA SETS ON SAME UNIT

STATEMENT

1. Job card
2. Execute Utility program (IEHPROGM) from library
3. Define output device for output messages
4. Indicate permanently mounted volume
5. Begin input stream

6-9. Scratch RJE control tables data sets

10-12. Scratch broadcast-message data sets

13. End of SYSIN
14. Execute program to initialize RJE Control Tables data sets
15. Define output device for abnormal end output

16-27. DD statements defining RJE control tables data sets. (Allocation for 10 jobs in the system at a time, 15 users, and 15 terminals)

28. Execute program to initialize broadcast-message data sets
29. Define output device for abnormal end output

30-38. DD statements defining broadcast-message data sets.

CATALOGED PROCEDURES FOR RJE

RJE operation requires one or more procedures cataloged in SYS1.PROCLIB. One of these procedures must be referred to when the RJE task is started and stopped at the central system. This procedure contains those JCL statements required by the operating system and the central RJE system. The name of the procedures must begin with the characters RJE.

Example: Figure 10 shows a procedure illustrating the following statements and the descriptions keyed to them.

In the first statement, RJE names the procedure and is used as the procedure name on the START command at startup. IHKRJBGN must be specified as the program name on all RJE procedures. (See Appendix B for algorithm to determine size of the RJE region.)

Default options for the OS job scheduler invoked by RJE may be specified in the PARM field of the EXEC statement. If default options are not specified in the PARM field, RJE will supply a default value (in parentheses). The default options for the OS job scheduler are positional parameters within the PARM field; that is, all options must be specified prior to the one that is to be changed. In this example, SYSDA has been changed to 2311.

(1) Parameter options - One-byte field specifies whether account numbers or programmer names are required on JOB statements (C'0'):

- C'0' - account numbers or programmer names not required.
- C'1' - fail all jobs that do not specify a programmer's name.
- C'2' - fail all jobs that do not specify an account number.
- C'3' - fail all jobs that do not specify an account number and programmer name.

(2) Default priority - Priority assigned to a job when it is not specified on the JOB statement (C'00').

(3) Default time limit (C'999').

(4) Default SYSOUT primary quantity - Number of tracks to be assigned to system output data sets when no other specification is made (C'030').

(5) Default SYSOUT secondary quantity (C'010').

(6) Interpreting priority - Dispatching priority assigned to this OS job scheduler while interpreting a job (C'249').

Note: For efficient operation of RJE, this value must not exceed 249.

(7) Default region size - Size of the region that will be requested for a step when no region size specification is made in the EXEC statement (C'050').

(8) Command authorization - Specifies disposition of commands (OS commands and RJE central commands - not RJE work station commands) read from this input stream. All commands will be ignored regardless of value specified (C'3').

C'0' - Execute the command
C'1' - Display the command and execute it
C'2' - Display the command, but do not execute it until advised by operator.
C'3' - Ignore the command

(9) Label Processing - (C'2'):

C'0' - Bypassed label processing (BLP) will be treated as no label.
C'1' - BLP will be treated as bypass label.
C'2' - Request instructions from operator.

(10) Default SYSOUT device name - Name of the unit to be used for system output data sets if no UNIT parameter was specified in a system output DD statement (CL8'SYSDA').

Note: If the SYSOUT device name is to be overridden, all 8 characters (including necessary blanks) must be specified.

(11) Command authorization for Multiple Console Support (MCS) - four hexadecimal numbers from 0000 to E000 indicating which operator command groups are to be executed if read from this input stream. This parameter is valid only for systems with the MCS option (X'E000').

(12) Default MSGLEVEL value - specifies the MSGLEVEL value if no value is specified on the JOB statement. Unless there is a MSGLEVEL=entry in the JOB statement, job control statements and allocation/termination messages are recorded in the system output data set according to the value of this parameter (X'00').

For further information on the PARM field for an OS reader procedure, see the IBM System/360 Operating System: System Programmer's Guide publication, GC28-6550.

In Figure 10, statements 1 through 4 are required by the routine that initiates system tasks and must be coded as shown.

Statements 5 through 11 are required for RJE direct access storage tables and must be coded as shown.

Statements 12 through 15 are the DD statements for the SYSIN data sets. This procedure assumes a four line network. One SYSIN DD statement is included for each line. The VOLUME and UNIT parameter on all of the SYSIN DD statements must be specified the same for each data set and must match the VOLUME and UNIT parameter on the IEFDATA DD statement. The space for any one SYSIN data set is controlled by the value of the secondary allocation parameter in the SPACE parameter (20 in this example). The system provides the secondary allocation fifteen times. Depending upon the requirements of the installation, the secondary allocation parameter may be increased or decreased. Hence, the maximum allowable space for one SYSIN data set is limited to the primary space allocation plus fifteen times the secondary allocation. The block size must be 80, 160, 240, 320, or 400 bytes (400 in this example). If no block size is specified, 80 is assumed. The block size in the RJE cataloged procedure may be overridden by the DCB parameter on the SYSIN DD card. No other subparameter is valid for the DCB parameter. The name specified for the DD statement must be the name designated in the RJELINE assembly macro. The DISP parameter is coded as shown.

Note: When two or more volumes have been specified for SYSIN data sets and the VTOC runs out of space, RJE will not attempt to allocate space on more than one volume. Since resulting conditions may be unpredictable, never specify more than one volume for SYSIN data sets.

During RJE operation, operands of system input data definition statements (DD * and DD DATA statements) appearing in the remote input stream are replaced with information appearing in the RJE catalogued procedure

section of this publication. The generated operands appear in the listing of JCL preceding the job output. The appearance of the generated operand is the only distinguishing characteristic between printed output generated from a remotely submitted job and that generated from a job submitted from the central installation.

The following three statements are those that replace the DD * or DD DATA statements of the remote job input stream:

```
//ddname  DD  UNIT=23xx,DISP=(OLD,DELETE),VOLUME=SER=xxxxxx,
//            DSNAME=SYSyyddd.T123456.I0007.jobname.Snnnnnnn,
//            SPACE=(80,(cccccc))
```

where:

23xx and VOLUME=SER=xxxxxx are obtained from the RJE procedure;

yyddd is the date the job was submitted;

nnnnnnn is the unique (to this IPL) data set number; and

cccccc is the number of SYSIN records spooled to disk by RJE (must be less than 32,767).

Statements 16 and 17 are the DD statements for the lines. This example describes two line groups, each including two lines. The UNIT parameter contains the physical address of the lines.

Note: The user must be aware of the significance of specifying blocked SYSIN data in the RJE procedure, and must make sure that the BLKSIZE and LRECL parameters in the data control block (DCB) of his problem program are consistent with the SYSIN blocking. The simplest way to assure this is to omit these parameters from the DCB of the program. The Queued Sequential Access Method (QSAM) will pick up these parameters from the data set header and deblock the data. If the program is using the Basic Sequential Access Method (BSAM), the program must check the BLKSIZE and LRECL in the DCB after OPEN and must do its own deblocking.

1.	//RJE	EXEC	PGM=IHKRJBGN,REGION=80K,
	//		PARM='00099903001024905032231 1 E00000'
2.	//IEFRDER	DD	DUMMY
3.	//IEFDATA	DD	UNIT=23XX,VOLUME=SER=XXXXXX,
	//		SPACE=(80,(500,500),RLSE,CONTIG),
	//		DCB=(BUFNO=2,LRECL=80,BLKSIZE=80,RECFM=F,BUFL=80)
4.	//IEFPDSI	DD	DSNAME=SYS1.PROCLIB,DISP=SHR
5.	//IHKFSTDD	DD	DSNAME=SYS1.IHKFSTB,DISP=OLD,DCB=DSORG=DA
6.	//IHKJEDDD	DD	DSNAME=SYS1.IHKJEDTB,DISP=OLD,DCB=DSORG=DA
7.	//IHKUDRDD	DD	DSNAME=SYS1.IHKUDRTB,DISP=OLD,DCB=DSORG=DA
8.	//IHKTDRDD	DD	DSNAME=SYS1.IHKTDRTB,DISP=OLD,DCB=DSORG=DA
9.	//IHKTXTDD	DD	DSNAME=SYS1.IHKTXTTB,DISP=OLD,DCB=DSORG=DA
10.	//IHKMSGDD	DD	DSNAME=SYS1.IHKMSGSL,DISP=OLD
11.	//IHKBRDDD	DD	DSNAME=SYS1.IHKBRDSL,DISP=OLD
12.	//DUMDD1	DD	DISP=(OLD,KEEP),
	//		VOLUME=SER=XXXXXX,SPACE=(TRK,(5,20)),
	//		UNIT=23XX,DCB=BLKSIZE=400

Figure 10. Example of RJE Catalogued Procedure (Part 1 of 2)

```
| 13. | //DUMDD2   | DD | DISP=(OLD,KEEP),                                    |
|     | //         |    | VOLUME=SER=XXXXXX,SPACE=(TRK,(5,20)),               |
|     | //         |    | UNIT=23XX,DCB=BLKSIZE=400                           |
| 14. | //DUMDD3   | DD | VOLUME=SER=XXXXXX,SPACE=(TRK,(5,20)),               |
|     | //         |    | UNIT=23XX,DCB=BLKSIZE=400                           |
| 15. | //DUMDD4   | DD | VOLUME=SER=XXXXXX,SPACE=(TRK,(5,20)),               |
|     | //         |    | UNIT=23XX,DCB=BLKSIZE=400[,SEP=DUMDD3]              |
| 16. | //CPUGRP   | DD | UNIT=0BA                                            |
|     | //         | DD | UNIT=0BB                                            |
| 17. | //A2780GRP | DD | UNIT=0CA                                            |
|     | //         | DD | UNIT=0CB                                            |
```

Figure 10. Example of RJE Cataloged Procedure (Part 2 of 2)

USER EXITS

RJE provides three exits in the central system allowing the user to insert special processing routines. These routines must save registers when they are entered. The address of an 18-word save area for this purpose is passed in register 13. When the routines finish processing they restore the registers to their entry values and return control to the address in register 14.

JOBCARD EXIT

The JOBCARD user exit allows a user-written program to examine each remotely submitted JOB statement and to alter its operand field. Neither the jobname nor the operation field can be changed. The address of the JOB card is passed to the user routine in register 1. JOB continuation cards are passed to the user routine in the same way by subsequent entries. Control must be returned to the system before further processing of the job entry. The user exit is passed a //null statement if job statement continuation is expected but not received. In order for the JOBCARD user exit routine to receive continuation cards for the JOB card, the continuation must be indicated by coding a nonblank character in column 72.

COMMERR EXIT

The COMMERR user exit allows a user-written program to assume control after RJE has unsuccessfully exhausted its retries following a line error. When the user gets control via the exit, register 1 contains the address of the Data Event Control Block (DECB) associated with the line in error. The user may issue any BTAM macro (except OPEN and CLOSE) in this exit. The associated WAIT macro instruction, however, degrades the performance of the RJE system. The user-written routine also can interrogate the BTAM line error block and take appropriate action. If a multidropped work station is permanently in error, CHGNTRY macro instructions may be issued to skip that work station in the polling and addressing lists. If entries are skipped, they are restored to the list when the central system is restarted with the START command. Control returns to the system after the error is examined and desired action is taken.

JOBACK EXIT

The JOBACK user exit allows a user-written program to examine and alter the text of the RJE job acknowledgment message (message IHK117I) before it is sent to the user. This routine also may construct its own message containing up to 59 characters. The additional message is sent following the RJE constructed acknowledgment. The text address of the RJE constructed message is passed to the routine in register 1. The JOBACK routine must provide its own 59-byte buffer to construct an additional message. If no additional message is constructed, the routine returns control to the system with a nonzero return code in register 1. If an additional message is constructed by the routine, the address of the message is passed in register 1 with a zero return code in register 15 when control returns to the system.

OPERATOR AWARENESS

A BTAM system-to-operator message is displayed for the central operator whenever an irrecoverable communication error occurs. In addition, error counts for each line are displayed for the central operator. For each line, BTAM keeps an error count for data check, for intervention required, and for nontext time-out. BTAM also records the number of transmissions occurring on the line. The user may specify threshold values for these counters when the RJE support is assembled. If any one of the three error counters reaches its threshold count before the transmission threshold count is reached, a message is displayed for the central operator. This message identifies the line and gives all three error counts and the transmission count. After the message is displayed, the error counts and the transmission count are added to accumulators, and the counters reset to zero. The central operator may display the value of the accumulators at any time with the SHOW LERB command. The accumulators for one line or for every supported line may be requested. These accumulators are reset to zero each time the central system starts up.

Note: If the transmission count reaches its threshold count before any error count, the counters are added to the accumulators and reset to zero. No message is displayed.

ERROR RECOVERY PROCEDURES

When BTAM has exhausted its error retries at the central system, a permanent line error exists. BTAM posts the error to RJE and displays a message to the central operator. At an IBM System/360 work station, when a permanent line error exists, a message is displayed for the remote operator; at a 2780, an alarm is sounded.

The remote operator procedures required after an irrecoverable error depend upon the remote work station and are described in detail in the sections on the individual work stations. In general they involve resubmitting only that portion of the remote input stream for which the central system has not returned a written acknowledgment.

Note: RJE does not inhibit any facility provided for error recovery in IBM Binary Synchronous Communications System.

SYSTEM RESTART

A restart condition results when an irrecoverable error occurs at the central system requiring the supervisor to be reloaded (i.e., the reIPL of the operating system).

The RJE system records each complete logical element (either a job entry or a work station command, see Figure 11) when it is received and returns a response acknowledging its receipt. After an uncorrectable error, all acknowledged logical elements will be recovered by the central system. When the work station restarts the user must resubmit only the unacknowledged input.

It is possible for an uncorrectable error to occur after a group of logical elements are received, but before the acknowledgments are sent. To handle this, the central system returns any pending acknowledgments when RJE is restarted, and the work station becomes active. Following the acknowledgments, a message indicating that a restart occurred at the central system and that work station restart procedures are required, is sent. By checking the acknowledgments at restart time, the work station user determines what input must be resubmitted. Any remote jobs that are executing (as opposed to waiting) when the failure occurs are processed at restart time, the same as locally submitted jobs. That is, the remaining portion of the job is processed in the flush mode, and all output, including the diagnostics associated with the flush mode processing, as well as any valid output generated before the failure, is returned to the remote work station.

```
┌──────────────────────────────────────────┐
|..          RJSTART                       |
|..          LOGON          (commands)     |
|..          OUTPUT                        |
|..          JED                           |
|//NAME      JOB                           |
|//STEP      EXEC                          |
|//DD1       DD                            |
|//DD2       DD             (job entry)    |
|//SYSIN     DD *                          |
|            .                             |
|            .                             |
|            .                             |
|..          LOGOFF         (command)      |
└──────────────────────────────────────────┘
```

Figure 11. Logical Elements of an Input Stream

CENTRAL RESTART PROCEDURE

The procedure followed to restart RJE at the central system includes three steps:

1. The condition causing the error is corrected;
2. The operator reloads the supervisor (i.e., reIPLs the operating system);
3. The operator issues the START command for RJE (see the section entitled Central Commands).

These three steps restart the RJE support in the central system. RJE provides the necessary information to the work stations to ensure that no information is lost.

Because RJE creates the SYSIN data sets, device classes for these data sets cannot be changed before a warmstart is performed. If device classes are changed, the results are unpredictable.

WORK STATION RESTART PROCEDURE

The restart procedure is initiated at a work station by submitting an RJSTART command. After the work station has received all pending responses, the operator resubmits only that input for which he has not received a response.

The work station restart procedure after a central system failure is similar to the restart procedure after an irrecoverable line error. The primary difference is that after a system failure, an in-process output data set is written from the beginning rather than from the last valid block. The procedures for specific work stations are described in the sections on remote work stations.

The IBM System/360 may serve as an RJE supported work station. The IBM System/360 BOS/BPS Remote Job Entry Work Station Program is supplied to implement this function. This program operates in conjunction with the central system and observes the required RJE communication conventions. Either BOS or BPS may be used as a supervisor.

Input submitted at the work station is transmitted to the central system. All JECL statements are sequence checked to reduce unproductive transmissions. Output directed to the work station is routed to a specified output device or passed to a user-written output routine via the user exit provided. The operator has the ability to interrupt receipt of output.

MACHINE AND DEVICE REQUIREMENTS

A System/360 used as a work station requires at least 16K bytes of main storage and, in addition to the minimum configuration required by the BOS or BPS supervisor, a line printer, a card punch, and a 1052 printer-keyboard are required also. The System/360 must be connected to a communication line via an IBM 2701 Data Adapter Unit with Synchronous Data Adapter, Type II, equipped for EBCDIC transparent operation. The dual communication interface special feature is supported. A user-written output routine is required for output operations on any other output device. To support Remote Job Entry operation with a user-written routine, a System/360 with at least 24K bytes of main storage is required.

COMMUNICATION CONSIDERATIONS

The System/360 work station communicates with the central system by point-to-point contention over either a switched or non-switched communications line. The 2701 Data Adapter Unit provides the actual attachment of the work station to the line. All transmissions between the central system and a remote System/360 are in EBCDIC transparency. Communication with the central system proceeds in three modes: monitor, receive, and transmit.

Monitor mode is entered from either transmit or receive mode. In the monitor mode, the work station is waiting for input from the line, card reader, or printer-keyboard.

Receive mode is entered when there is output available for the work station. In receive mode, the work station reads output from the line. It continues reading from the line until it receives an end-of-data indication from the central system or until the operator discontinues the output. When the end-of-data indication is received or the operator intervenes to discontinue the output, the station enters the monitor mode.

Transmit mode is entered at work station startup and when there is input available at the work station. In transmit mode, the work station writes to the line. It continues writing to the line until it sends a complete job entry or encounters a logical end-of-file in the input stream. When a logical end-of-file indication is received from the card reader, or a complete job entry is transmitted, monitor mode is entered to test for available output from the central system. If output is available, it is received at this time.

Transmit mode will be reentered after receiving an EOT from the central system if receive mode was entered after transmission of a complete job entry. If receive mode was entered by an end-of-file indication, operator intervention is required to reenter transmit mode.

INPUT AT THE WORK STATION

Input is accepted from the card reader or a 1052 printer-keyboard; in addition, input can be provided from tape or disk in conjunction with a user-written routine. Acceptable input consists of job entries and work station commands. Work station commands other than the RJSTART command may be entered by either the card reader or the printer-keyboard. The RJSTART command must always be entered at the card reader. However, a correction of a previously entered command may be entered by either the card reader or the printer-keyboard. The only acceptable entries from the printer-keyboard are work station commands, other than RJSTART, and corrections to statements in error. A correction made at the printer-keyboard will replace the statement in error. However, if an error is caused by omission of a statement, the omitted statement may be entered from the printer-keyboard, but the statement which is replaced by this correction will be lost. Therefore, if an error is caused by omission of a statement, it is necessary to

correct it from the card reader. If the input is to be read by a device other than the card reader, a user-written exit routine must be provided. A special RJE control card (.. DATA) controls this user-exit facility. This new JECL card may be placed in the card input stream to permit the user to read input alternately from the card reader, from tape, or from disk (the disk must be set up for BOS). Data must be provided to RJE by the user-written routine in 80-character records. After reading this input to end-of-file, the RJE program resumes reading from the card reader.

A user may log on at the printer-keyboard, enter commands and log off without affecting the user logged on at the card reader. A user logged on at the card reader is logged off by the central system when another user logs on at the printer-keyboard. The printer-keyboard LOGON command prevails until an end-of-file indication (space EOB) is submitted from the printer-keyboard. The work station program then retransmits the LOGON command that was submitted at the card reader, thereby logging off the printer-keyboard user. Only one user can be logged on at a terminal at a given time. The following special rules govern the handling of this feature:

- A user may LOGON at the printer-keyboard and transmit a job stream only if there is no user logged on at the card reader.
- A user may LOGOFF at the printer-keyboard only if he logged on at the printer-keyboard.
- An invalid LOGON statement results in an error message sent from the central system (see Messages Sent to the Work Stations) and an RJE work station message, 6005. If the command was submitted from the card reader, a corrected statement must be submitted from the card reader.

The operator can request that all JECL statements entered through the card reader be displayed prior to transmission. They are displayed on either the printer-keyboard or the line printer. The facility and device are selected with the User Program Switch Indicators (UPSI). Specification of this and other facilities requested in this manner is described later (see UPSI Specification).

Note: Any message text must be entered in uppercase from the remote printer-keyboard.

SEQUENCE CHECKING

All JECL statements are sequence checked and displayed (according to the display option chosen at program loading time) prior to their transmission. This sequence check ensures the proper relationship of RJSTART, LOGON, and LOGOFF commands to the other input. In a valid sequence of input from the card reader:

1. The RJSTART command must be the first statement submitted in the input stream at work station startup.
2. The LOGON command, CONTINUE command, RJEND command, or null statement may follow an RJSTART command in the input stream.
3. The LOGON command follows the RJSTART command if the user desires access to the central system. Any valid combination of work station commands and job entries may follow the LOGON command.

Incorrect sequence results in a requirement to correct or bypass the statement in error. The operations specified in each JECL statement are checked for validity. An invalid operation at this point also results in a requirement to correct or bypass the statement. With the exception of the termid parameter of the RJSTART statement, the operands of the JECL cards are not checked. Errors encountered in the input stream are displayed to the operator if the display option is selected.

During any reading from tape or from disk, it is impossible to correct a sequence error, and input is bypassed to the next logical element (i.e., a JECL or JOB statement).

OUTPUT TO THE WORK STATION

Output directed to the work station is either job output or messages. Job output is directed to the printer, the punch, or a user-written output routine. Each job output data set received is directed to the device associated with the SYSOUT class specified in its DD statement. SYSOUT classes are assigned to devices when the central system is assembled. Output data sets not specified as one of the classes assigned for printed, punched, or user-exit output are printed at the work station. Data sets not defined as SYSOUT are written at the central installation.

Carriage control for printer output may be specified by a control character as the

first byte of each record. Either machine code or ASA control characters are allowed. If no control characters are specified for the data set, the output is single spaced with a skip to channel 1 when channel 12 is sensed in the carriage control tape. Stacker select for punched output may also be specified with a control character as the first byte of each record. Either machine code or ASA control characters are acceptable. If no control characters are specified, stacker 1 is selected.

If the output is to be written by a device other than the printer or the punch, a user exit is provided. Output data sets are passed to the user-written output routine for processing if they are identified by the SYSOUT class assigned for user exits. Physical records of up to 400 bytes are passed to the user-written routine. Messages are directed to either the 1052 printer-keyboard or the line printer. The message device is selected with the UPSI card.

Note: If punched output is to be sent to a 1442 card read punch, all punched output should be specified as deferred to prevent any possibility of punching into input cards.

COMPRESS/EXPAND

This optional feature, operating in conjunction with the same feature at the central computer, provides increased system throughput by suppression of blanks during transmission. At RJE work station assembly time, the user specifies whether he wishes to use the facility. The same specification (PACK=YES or PACK=NO) must be used in the work station program macro instruction as is used in the associated RJETERM macro instruction for the central RJE program.

OPERATING PROCEDURES

WORK STATION STARTUP

To start RJE operation, the operator loads the RJE Work Station Program. The operator should follow the program-loading procedures for his system. The first data card must be the RJSTART command. For detailed program-loading procedures see IBM System/360 Basic Operating System: Control Programs and Assembler Operating Guide, GC24-3450, or IBM System/360 Basic Programming Support: Basic Tape System Operating Guide, GC24-3391. The RJSTART command may be followed either by input to be sent to the central system or by an end-of-file indicator. If the work station is connected to the central system over a switched line with manual dial, a message is displayed when the operator is to call the central system. If the work station has the Auto Call special feature installed, this phone number is coded as a parameter on the RJSTART command. When contact is made with the central system, the RJSTART command is transmitted. With the acknowledgment of this command, the operator receives all pending messages and immediate job output directed to users at the work station. A user may gain access to the central system by submitting a LOGON command, or may monitor for output from the central system. The only statements which may follow the RJSTART command are:

1. The LOGON command to allow user access
2. The CONTINUE command to specify disposition of discontinued output
3. The RJEND command to terminate RJE activity of the work station
4. The null statement to indicate a temporary end-of-card input.

UPSI SPECIFICATION

The user indicates the operating options that he desires by setting bits 0-2 in the UPSI card. These options include:

1. The device on which JECL and corrected statements are to be displayed,
2. The device on which message output is to be displayed.

The desired options are specified by the bit settings:

1. If bit 0 is set on (1), JECL and corrected statements are displayed on the line printer.
2. If bit 1 is set on (1), JECL and corrected statements are displayed on the printer-keyboard.
3. If bit 2 is set on (1), messages are displayed on the printer-keyboard. If bit 2 is not set on (0) messages appear on the line printer.

Note: If neither bit 0 nor bit 1 is set on, there is no display of JECL and corrected statements. If both bit 0 and bit 1 are set on, JECL and corrected statements are displayed on the line printer.

The UPSI card for the work station program is coded in the following manner:

```
// UPSI  nnn
```

where nnn are the bits 0-2 required for the operation of the work station program. For a complete explanation of the UPSI card, refer to BOS or BPS Programmer's Guide.

THE NULL STATEMENT

The null statement is provided for the System/360 work station to indicate end-of-file on the card reader. It must be the last card of an input stream. When this statement is read, the card reader is effectively closed, but communications are still maintained with the central system.

Operator intervention is required to resume input from the card reader after the null statement has been read (see Printer-Keyboard Procedures).

The null statement is coded with the identifying characters (..) in columns 1 and 2 and all remaining columns blank. This statement has no effect on a user's session. If a user is logged on when a null statement is read, he remains logged on.

PRINTER-KEYBOARD PROCEDURES

There are five control functions initiated by the operator from the printer-keyboard: discontinuing output, signifying card reader input, signifying printer-keyboard input, signifying end-of-file on the card reader after an error, and resuming output to the printer or punch after an error. These functions are initiated by the operator pressing the request key on the printer-keyboard and replying with a non-numeric reply to the request message (0702A). When the message 6999A appears, the operator enters the appropriate reply to initiate the function he desires (see RJE Messages, for replies to the 6999A message). This reply may be either an uppercase or lowercase letter code.

If the operator has indicated printer-keyboard input, after receiving the 6999 message, he enters the desired commands with an EOB at the end of each command. After entering the last command, a blank and an EOB must be entered to signify end of input.

DISCONTINUING OUTPUT

Output can be discontinued by operator intervention. An intervention request is made by pressing the request key on the 1052 printer-keyboard and entering a non-numeric reply to the request message (0702A). When the operator intervention message (6999A) is displayed, the operator responds by entering a D to discontinue output. Once output is discontinued, no other output is transmitted to the work station until the disposition of the discontinued output is specified by the CONTINUE command.

CONTINUING OUTPUT

Disposition of discontinued output is specified with the CONTINUE command (see CONTINUE). Output is discontinued if:

1. The remote operator requests discontinuation.
2. A change in form number is found at the central system.
3. An irrecoverable error occurs during an output operation.

If conditions one or two occur, the disposition of the output is specified with the CONTINUE command. Condition three requires error recovery procedures.

ERROR RECOVERY PROCEDURES

At a System/360 work station, facilities are provided to recover from both communication errors and local device errors. Operator intervention may be necessary to correct the condition causing the error. If the error cannot be corrected in an allowable interval, the central system logically detaches the work station from the RJE system. In addition, if the work station is connected over a switched line, the central system breaks the connection.

In the case of a local I/O device error, with the exception of the card reader, normal BOS/BPS messages inform the operator of the need for intervention. The operator's reply to the message indicates how the error is to be corrected.

If an error occurs on the card reader, a message (6012) is issued to inform the operator that intervention is required. Communications are maintained with the central system. To resume card reader input, the operator communications procedures should be follwed (see Printer-Keyboard Procedures). If the problem cannot be corrected, operator communication procedures should be initiated to close the card reader (see Printer-Keyboard Procedures).

If an error occurs on the printer or the punch, a message (6014 or 6015, respectively) is issued to inform the operator that intervention is required. Communications with the central system are maintained. When output is discontinued because of the error condition, and when input is sent

(reply A or B to the 6014 or 6015 message), RJE modifies the UPSI bits to specify the printer-keyboard as the output device. This allows more input to be submitted while the printer and punch are inoperative. If the UPSI bits already specify the printer-keyboard, the bits are not modified. After the printer or punch error is corrected, the user resumes the output by sending a .. CONTINUE command from the card reader or the printer-keyboard. The .. CONTINUE statement resets the changed UPSI bits as they were originally set in the UPSI card (see Printer-Keyboard Procedures).

Irrecoverable communication errors result when communication is lost with the central system because of either line errors or a central failure. In either case, the work station is logically detached by the central system and restart procedures are necessary. The response received when restart procedures are executed indicates whether the error was due to a line error or to a central failure.

To terminate RJE operation because of an error, the operator must reply with an 8 to any message except those issued by the work station program (those starting with a 6). On messages issued by the work station program, he must reply with a 1 and manually disconnect the adapter. If no message is issued, the operator should press the request key on the printer-keyboard and reply 8 to the request message.

RESTART PROCEDURES

Restart procedures involve regaining communication with the central system and submitting an RJSTART command. If the error occurs during an output operation, output automatically resumes either where it was interrupted (after a line error) or at the beginning of the job (after a central failure).

If the error occurs during an input operation, all unacknowledged input must be resubmitted.

6000A RJSTART Command Required

Explanation: An error has occurred that has caused loss of communication with the central system. The line has been closed, and an RJSTART command must be submitted from the card reader to reestablish communications.

System Action: The system waits for the reply.

Operator Response: The operator must enter a valid RJSTART command through the card reader in order to resume processing. The following reply is the only valid response to this message:

A - The RJSTART command has been entered into the card reader.

6001A RJSTART Command Invalid

Explanation: The RJSTART command submitted is invalid.

System Action: The system waits for the reply.

Operator Response: The operator must enter a valid RJSTART command in order to resume processing. The operator enters one of the following letter codes to indicate how he desires to correct the error:

A - The error is to be corrected from the card reader.
B - The error is to be corrected from the printer-keyboard.

On a switched line the operator has approximately three minutes to enter a reply.

6002 or 6002A LOGON, RJEND, or CONTINUE Required

Explanation: Input submitted was either in error or out of sequence. A LOGON, RJEND, or CONTINUE command is required. The LOGON command is required if input is available for transmission to the central system. The RJEND terminates RJE activity at the work station. The CONTINUE command is entered if output was discontinued. If immediately followed by the 6006 message, see 6006 message explanation; there is no reply for this situation.

System Action: The system waits for a reply from the printer-keyboard, or, if the message does not require a reply, for input from the printer-keyboard.

Operator Response: If the message requires a reply, the operator enters one of the following codes to indicate the corrective action taken:

A - The error is to be corrected from the card reader.
B - The error is to be corrected from the printer-keyboard.
C - Bypass input in card reader until a LOGON, RJEND, or CONTINUE command is found.

If the message does not require a reply, the operator may enter the correction through the printer-keyboard followed by an EOB or enter a space EOB to indicate that the command is to be ignored. On a switched line, the operator has approximately three minutes to enter the reply.

6003A Invalid JED Continuation, JED-JOB Sequence, or No JOB Card

Explanation: This message indicates that a statement other than a continuation card follows a continued JED statement, a JOB card does not follow a JED statement, or there is no JOB card.

System Action: The system waits for a reply from the printer-keyboard, or, if the message does not require a reply, for input from the printer-keyboard.

Operator Response: The operator enters one of the three codes to indicate the corrective action taken:

A - The error is to be corrected from the card reader.
B - The error is to be corrected from the printer-keyboard.
C - Bypass the job associated with the error in the card reader until a JECL or JOB statement is found.

On a switched line the operator has approximately three minutes to enter the reply.

6004 or 6004A Invalid JECL Operation

Explanation: This message indicates that a JECL statement with an undefined operation has been submitted. If the operator can recognize the intended operation, he should correct it; if he cannot, he should have the statement bypassed.

System Action: The system waits for a reply from the printer-keyboard, or, if no reply is required, for input from the printer-keyboard.

Operator Response: If the message requires a reply, the operator enters one of three codes to indicate the corrective action taken:

A - The error is to be corrected from the card reader.

B - The error is to be corrected from the printer-keyboard.

C - Bypass input in the card reader until the next JECL or JOB statement is found.

If the message does not require a reply, the operator may enter the correction through the printer-keyboard followed by an EOB or enter a space EOB to indicate that the command is to be ignored. On a switched line the operator has approximately three minutes to enter the reply.

6005 Central System has Aborted Input

Explanation: The central system has aborted input from the work station and may have sent a message explaining why the input was aborted. (For details on messages received, see Messages Sent to Work Stations.)

System Action: The system waits for input from the line, or for the operator to initiate input from the card reader or printer-keyboard.

Operator Response: The operator inspects the message and takes the indicated action. To resume input the operator must follow the procedures under Printer-Keyboard Procedures.

Note: Input is aborted when compress/expand incompatibility exists between the central and the remote work station programs. If no explanatory message precedes, the central program expected compressed input and the work station transmitted input that was not compressed. If an UNDEFINED OPERATION message precedes, the central system expected input that was not compressed while the work station transmitted compressed input. The conflict must be resolved before input will be accepted.

6006 Input Error on Tape or Disk

Explanation: This message is always preceded by the 6002, 6003, or 6004 message.

1. If preceded by the 6002 message, a LOGON, an RJEND, or a CONTINUE command is required.
2. If preceded by the 6003 message, there is a JED or JOB card error.
3. If preceded by the 6004 message, there is an invalid JECL operation.

System Action:

1. If preceded by the 6002 message, the system bypasses input on tape or disk until the next LOGON, RJEND, or CONTINUE statement.
2. If preceded by the 6003 or 6004 message, the system bypasses input on tape or disk until the next JOB card or JECL statement is found.

Operator Response: None.

6010 Dial

Explanation: This message is issued on manually dialed lines at the time the operator may start dialing the number.

System Action: When the number has been dialed, the system opens the line.

Operator Response: The operator dials the number.

6011A Open Failure

Explanation: The attempt to open the line has failed.

System Action: The system waits for the reply.

Operator Response: The operator enters one of the following codes to indicate the action desired:

5 - Retry the OPEN.

0 or 1 - Cancel the program.

6012 Intervention Required on Card Reader

Explanation: An error has occurred on the card reader that required operator intervention.

System Action: The system waits for operator communications to be initiated.

Operator Response: The operator corrects the problem on the card reader, if possible, and initiates operator communications procedures to resume card reader input (see Printer-Keyboard Procedures). If it is not possible to correct the problem, operator communication procedures must be initiated to signify end-of-file (..null card) on the card reader (see Printer-Keyboard Procedures).

On a switched line, these actions must be accomplished within approximately three (3) minutes in order to maintain communications with the central system.

6013 I/O Error in Input from Tape or Disk

Explanation: An I/O error has occurred while reading input from tape or disk.

System Action: The system bypasses input stream to the next JECL or // JOB card and continues reading from the card reader.

Operator Response: None.

6014 Intervention Required on Printer

Explanation: An error that requires operator intervention has occurred on the printer.

System Action: The system waits for operator communications to be initiated.

Operator Response: The operator corrects the problem on the printer, if possible, and initiates operator communications procedures to resume output to the printer (see Printer-Keyboard Procedures). If it is not possible to correct the problem, the operator can send more input from the printer-keyboard or from the card reader (see Printer-Keyboard Procedures). The operator must enter one of the following codes within approximately three minutes on a switched line connection; there is no time limit for a nonswitched line:

A or a - Stop output, display JCL and RJE work station messages on the printer-keyboard and send input from the card reader.

B or b - Stop output, display JCL and RJE work station messages on the printer-keyboard and send input from the printer-keyboard.

P or p - Ready the printer and resume output (no CONTINUE command is needed, since output resumes automatically).

6015 Intervention Required on Punch

Explanation: An error that requires operator intervention has occurred on the punch.

System Action: The system waits for operator communications to be initiated.

Operator Response: The operator corrects the problem on the punch, if possible, and initiates operator communications procedures to resume output to the punch (see Printer-Keyboard Procedures). If it is not possible to correct the problem, the operator can send more input from the printer-keyboard or from the card reader (see Printer-Keyboard

Procedures). The operator must enter one of the following responses within approximately three minutes on a switched line connection; there is no time limit for a nonswitched line:

A or a - Stop output and send input from the card reader.

B or b - Stop output and send input from the printer-keyboard.

P or p - Ready the punch and resume output (no CONTINUE needed).

After discontinuing the output and sending the input (reply A or B to the 6014 or 6015 message), the user can resume the output by sending a .. CONTINUE command from the card reader or the printer-keyboard. The .. CONTINUE statement resets the UPSI bits as they were originally set in the UPSI card.

6999A Operator Intervention Request Recognized

Explanation: This message is displayed when a request for operator intervention can be serviced.

System Action: The system waits for a reply.

Operator Response: The operator enters one of the following codes, within approximately 21 seconds on a switched line, to indicate the type of intervention desired:

A - Input is available at the card reader.

B - Commands are to be submitted from the printer-keyboard.

D - Discontinue receiving output (this includes job output and messages).

E - Generate end-of-file on the card reader. This response is accepted only when intervention on the card reader (6012) has been issued.

N - Ignore the request.

P - Generate .. CONTINUE command to resume output after I/O error on printer or punch (only permitted after a 6014 or 6015 message).

Note: After a 6012 message has been issued, A and E are the only valid replies to this message. When the E reply is used, and the reader error occurred in the middle of an OS job, the job should be deleted by submitting a DELETE command at the printer-keyboard. This will avoid execution of a partial job.

After a 6014 or 6015 message has been issued, A, B, or P are the only valid replies.

6999 Proceed

Explanation: This message is displayed as a result of a B reply to the 6999A message. The work station is ready to receive commands from the printer-keyboard.

System Action: The system waits for input from the printer-keyboard.

Operator Response: The operator enters the desired commands by pressing the EOB button after each command. After entering the last command, he enters a space and an EOB to indicate that he has finished using the printer-keyboard. On a switched line the operator has approximately three minutes to enter each command.

GENERATING THE RJE WORK STATION PROGRAM

THE RJE ASSEMBLY MACRO INSTRUCTION

The Remote Job Entry Work Station Program for a System/360 is constructed by an assembly and linkage edit of the RJE macro instruction. The assembly of the RJE macro results in an object module. This object module is then linkage edited with the user-written output routine if the user exit is used. The linkage edit step creates the executable load module that is loaded into main storage for execution as is done in any other problem program. Figures 12 and 13 illustrate this process.

Programmer's Note: In assembly of the RJE macro, the user must supply an END card with the transfer address of IHKDBSRT as in the following example:

```
END IHKDBSRT
```

If a user-exit routine (for either input or output operations) is to be included, the END card of the source deck of the user-exit routine must not have a transfer address in the operand field.

Operation	Operand
RJE	TERMID=termid
	[,UEXIT=YES] [,DISK=YES]
	[,UEXIT=NO] [,DISK=NO]
	[,UEXITIN=YES]
	[,UEXITIN=NO]
	[,PRT=120] [,PCH=20]
	[,PRT=132] [,PCH=40]
	[,PRT=144] [,PCH=42]
	[,RDR=01] [,PACK=YES]
	[,RDR=20] [,PACK=NO]
	[,RDR=40]
	[,RDR=42]
	[,DIAL=NO]
	[,DIAL=MAN]
	[,DIAL=AUTO]
	[,INTRFC=A] [,CODE=A]
	[,INTRFC=B] [,CODE=B]

TERMID=termid
: specifies the RJE name of the work station. This name must be the same name that was specified for the work station when the central system was created. It is used as a standard when this parameter is checked in the RJSTART command. It is the only parameter required if the remaining parameters are correct as assumed.

UEXIT=YES
UEXIT=NO
: UEXIT=YES indicates that a user-written output routine, labeled IHKDBUEX, is to be included in the RJE work station program. A System/360 having more than 16K bytes of main storage is required if a user-written output routine is included. If the UEXIT=NO keyword is coded or the parameter is omitted, the exit is not provided.

UEXITIN=YES
UEXITIN=NO
: UEXITIN=YES indicates that a user-written input routine is to be included in the RJE work station program. A System/360 having more than 16K bytes of main storage is required if a user-written input routine is included. If YES is specified, the user must supply a routine that uses a label, IHKUXIN, defined by RJE as an entry point. For the YES operand, RJE recognizes the JECL statement

```
.. DATA {BOS} {,'user information'.
        {BPS} {
```

The ID, BOS or BPS identifies the card as a valid BOS/BPS JECL statement, and either ID is acceptable to the BOS/BPS Work Station Program. If the UEXITIN=NO keyword is coded or the parameter is omitted, the exit is not provided.

Note: The .. DATA card will not be recognized when it is between a // DD DATA card and a /* card.

DISK=YES
DISK=NO
: indicates whether the configuration of the work station is disk-resident (BOS) or not disk-resident (BPS) or BOS card supervisor. If the parameter is omitted, a disk-resident system is assumed.

PRT=120
PRT=132
PRT=144
: specifies the maximum number of print positions available on the line printer. If this parameter is omitted, a print line of 132 characters is assumed.

PCH=20
PCH=40
PCH=42
indicates the type of punch available at the work station:

20 specifies an IBM 2520 Card Read Punch or Card Punch.

40 specifies an IBM 2540 Card Read Punch.

42 specifies an IBM 1442 Card Read Punch.

If the parameter is omitted, a 2540 Card Read Punch is assumed.

RDR=01
RDR=20
RDR=40
RDR=42
indicates the type of card reader available at the work station:

01 specifies an IBM 2501 Card Reader.

20 specifies an IBM 2520 Card Read Punch.

40 specifies an IBM 2540 Card Read Punch.

42 specifies an IBM 1442 Card Read Punch.

If this parameter is omitted, a 2540 Card Read Punch is assumed.

PACK=YES
PACK=NO
PACK=YES indicates that the user wants to use the compress/expand capability. Data records will be compressed before transmission, and punched and printed output compressed by the central system will be expanded by the remote work station. User exit data and message output remains in expanded format. A System/360 having more than 16K bytes of main storage is required if the compress/expand option is used.

If PACK=YES is specified for the work station program, PACK=YES must also be specified in the RJETERM macro instruction identifying this work station in the central program. Similarly, if PACK=NO is specified for the work station program, PACK=NO must be specified in RJETERM.

DIAL=NO
DIAL=MAN
DIAL=AUTO
specifies the type of communication line used by the work station:

NO specifies point-to-point contention communication over a non-switched line.

MAN specifies point-to-point contention over a switched line with manual dialing.

AUTO specifies point-to-point contention over a switched line with the Auto Call special feature installed on the 2701.

If this parameter is omitted, DIAL=NO is assumed.

INTRFC=A
INTRFC=B
specifies which interface provided by the 2701 is to be used when the Dual Interface feature is installed. If the parameter is omitted, INTRFC=A is assumed.

CODE=A
CODE=B
specifies which code is EBCDIC when the dual-code feature is installed on the 2701. If this parameter is omitted, CODE=A is assumed.

USER-EXIT INTERFACE

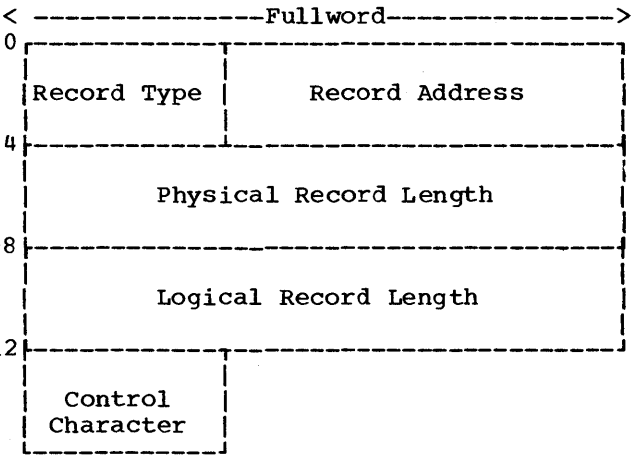
Output User-Exit Routine

Physical records are passed to a user-written output routine via an exit. This output routine need not save registers upon entry. The user must set up addressability for his routine and save any information he requires for subsequent entries. The entry point of the routine must be named IHKUSR. This routine receives control whenever output is available for it. The following information is passed to the user's routine:

Register 1 contains the address of a parameter list.

Register 14 contains the return address.

Register 1 contains the address of the parameter list that describes the output passed to the routine. This parameter is aligned on a fullword boundary. The format of this parameter list is:



Record Type: A one-byte code in hexadecimal representation indicating the type of record.

F1 - Fixed blocked records
F2 - Fixed unblocked records
F3 - Variable blocked records
F4 - Variable unblocked records
F5 - Undefined records
00 - End of File
FF - End of Job

Record Address: The address of the physical record passed to the routine.

Physical Record Length: The length (a binary value) of the physical record passed via the user exit.

Logical Record Length: The length (a binary value) of the logical records when fixed length records are passed via the user exit.

Control Character: A one-byte code (hexadecimal representation) indicating the type of control characters.

F1 - Machine code control characters
F2 - ASA control characters
F3 - No control characters

Note: The logical record field should be ignored with variable and undefined record types.

Input User-Exit Routine

Logical records are passed from a user-written input routine via an exit. This input routine is not required to save registers upon entry, but it must establish addressability and save any information needed for subsequent entries. The entry point for this routine must be named IHKUXIN. This routine receives control when a .. DATA card is read.

Register 1 contains the address of the .. DATA card.

Register 14 contains the return address.

When the user returns to RJE, one of the following conditions occurs:

1. A normal return is indicated by a zero return code in register 15. Register 1 contains the address of an 80-character logical record.

2. An I/O error that prevents further continuation is indicated by an eight (8) return code in register 15. Register 1 is not significant.

3. The end of .. DATA input is indicated by a four (4) return code in register 15.

Note: All statements that are acceptable through the card reader are acceptable through the user exit except the .. null statement.

The form of the .. DATA statement is as follows, with one or more blanks separating each operand.

ID	Operation	Operand
..	DATA	{BOS},'user information' {BPS}

When a .. DATA card is read, control is given to the user. The address of the card is in register 1 to allow the user to test the 'user information' field. The user does not need to save registers, but he must establish addressability for his routine and save any information needed in subsequent entries.

When the user returns to RJE, he indicates:

a. a normal return by placing zero in register 15. Register 1 contains the address of an 80-byte logical record.

b. end of .. DATA input by placing a four (4) in register 15.

c. an I/O error by placing an eight (8) in register 15.

An invalid ID, BOS or BPS, causes the 6004A message, which will be reissued until it is corrected by a valid JECL card. After an abort EOT message (6005), the system will wait for input from the line, the card reader, or the printer-keyboard.

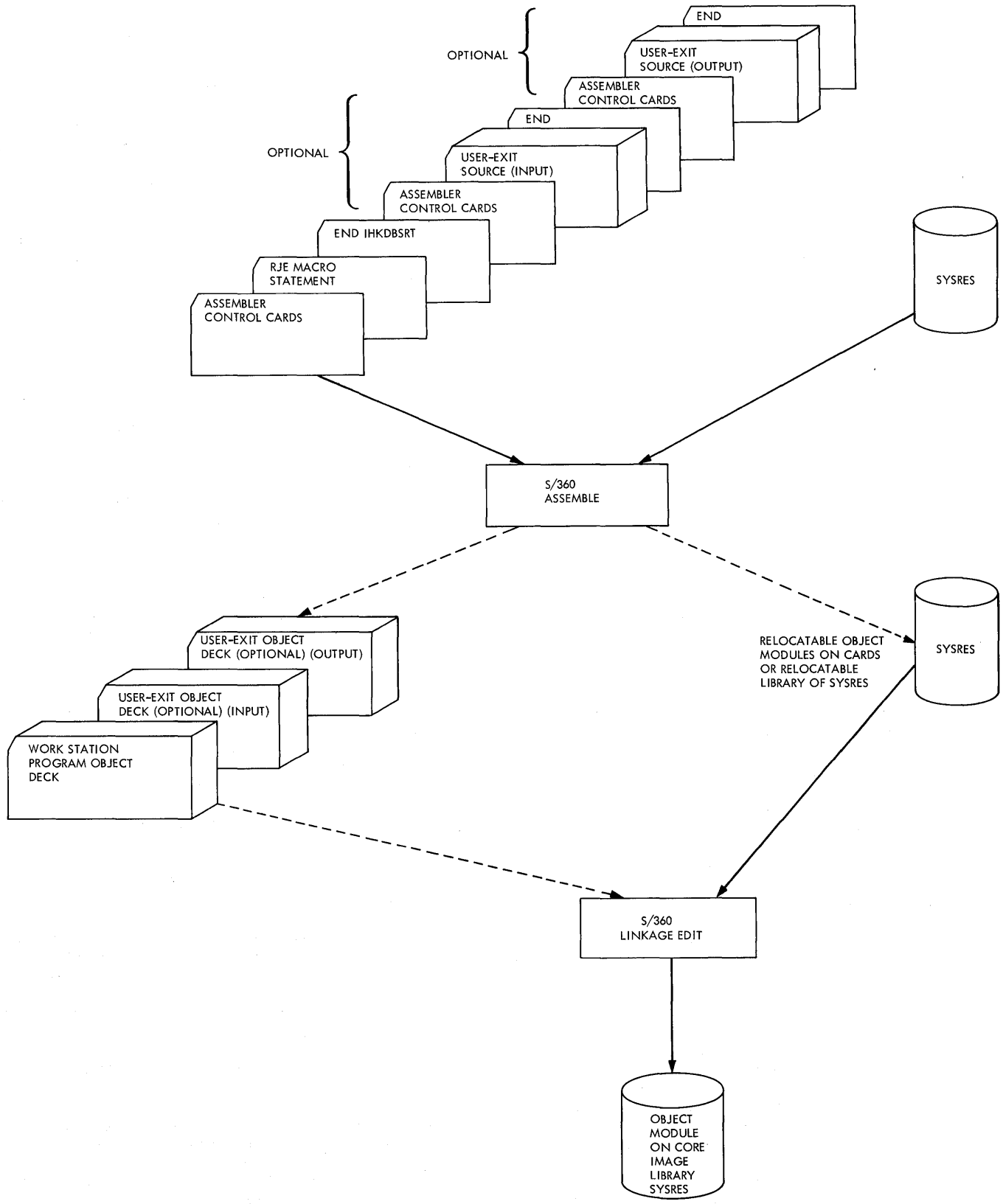


Figure 12. BOS System Generation

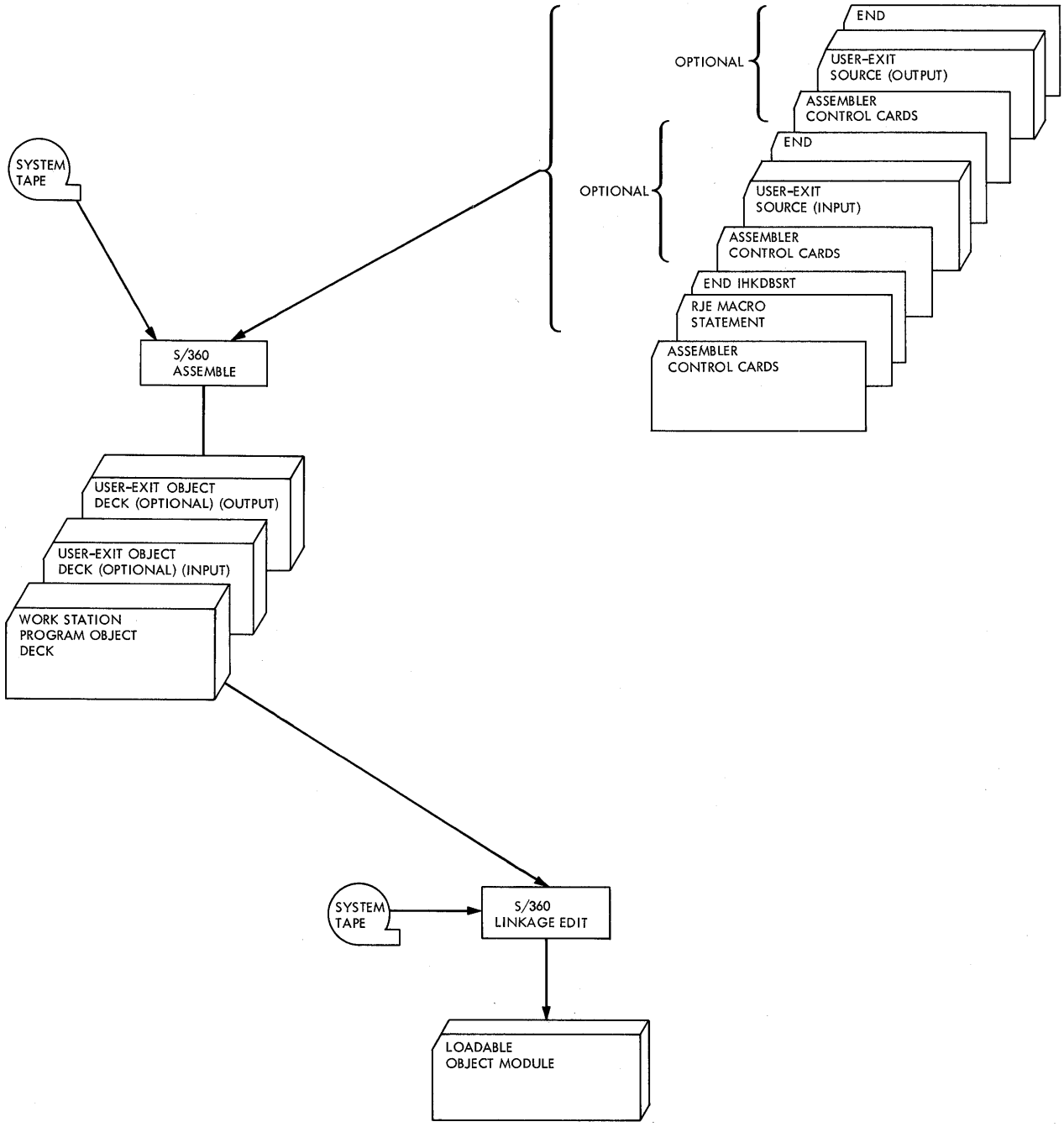


Figure 13. BPS System Generation

If the user returns an error code (8 in register 15), RJE will:

a. set discontinue mode.

b. display message (6013) without reply to indicate error return.

c. read from card reader.

d. bypass to the next JECL or // JOB statement.

If a sequence error is detected in .. DATA input delivered from the user-written routine, RJE will:

a. display the normal sequence error message without reply.

b. display a new message (6006) indicating .. DATA input error.

c. simulate a 'C' response procedure; that is, input is bypassed to the next logical element (i.e., a JOB or JECL statement).

d. read input from the card reader if an EOF is returned when bypassing user input.

All statements that are valid for the card reader are valid for the input user exit with the exception of the .. null statement, which will be displayed and ignored.

Note: Delays (e.g., extensive I/O) in the user-written routine effect the overall throughput of the system and should be avoided.

SUPERVISOR ASSEMBLY CONSIDERATIONS

Operation of the RJE support at a remote System/360 work station depends upon the following parameters specified in the macro instructions for generating a supervisor:

1. SUPVR Macro Instruction
   CR=YES
   indicates that operator-initiated communication is used with the 1052 printer-keyboard.

2. IOCFG Macro Instruction
   DVE=n
   n must be specified as at least 2 for RJE operation.

   BSC=YES
   must be specified to include binary synchronous communication interrupt handling and error recovery routines in the assembled supervisor.

   BTAB=n
   n must be at least 1 for RJE operation.

3. SYMUN Macro Instruction
   Since the device assignments are fixed for RJE operation, symbolic units may be assigned at system generation so that no ASSGN cards will be required when the Job Control cards are submitted for RJE operation. The following assignments are used:

   SYS001
   must be assigned to the card reader used for RJE input.

   SYS002
   must be assigned to the card punch used for RJE punched output.

   SYS003
   must be assigned to the line printer used for RJE printed output.

   SYS004
   must be assigned to the 2701 Synchronous Data Adapter used for RJE communication.

   SYSLOG
   must be assigned to the 1052 printer-keyboard.

For a complete explanation of procedures involved in generating a supervisor, refer to IBM System/360 Basic Operating System: System Generation and Maintenance, GC24-5060; IBM System/360 Basic Programming Support: Programmer's Guide, GC24-3354; and IBM System/360 Basic Programming Support: System Generation and Maintenance, GC24-5061.

The IBM 2770 Data Communication System consists of a 2772 Multipurpose Control Unit and a range of input/output devices from which may be selected those required to meet the requirements of a given application. The IBM 2770 Data Communication System with an IBM 2772 Multipurpose Control Unit (hereafter called a 2770) may be used as a Remote Job Entry (RJE) work station. It provides input and output capability over common carrier communications lines via binary synchronous communications (BSC) procedures. It can be connected to a central System/360 by a switched or nonswitched, point-to-point contention line, or a nonswitched multipoint line. On switched point-to-point lines or nonswitched multipoint lines, the 2770 may be intermixed with the IBM 2780 Data Transmission Terminal, the IBM 1130 Computing System, and the IBM System/360 Model 20 or larger. The following features are required:

1. EBCDIC Transmission Code.
2. EBCDIC Transparency.
3. Print line (either 120-character or 132-character).
4. A card reader input device.
5. A printer for output.
6. A punch unit for output.

In addition, the 2770 multipoint line control and expanded buffer special features are supported as optional features. The printer-keyboard is not supported for RJE operation. The other input/output devices available for the 2770 (except those listed above) are also not supported for RJE operation. The card reader, the printer and the punch are the only devices supported by RJE, and all are mandatory for RJE operation.

Both the IBM 2213 Model 1 and Model 2 printers are supported by RJE. The Model 1 does not have the vertical forms control feature, as the Model 2 has, and therefore is not as suitable for output operations.

2770 JOB SELECT SWITCH SETTINGS

For RJE operations, the following job select switches must be set or jumpered (prewired by the customer engineer when a system is installed). The printer supported for RJE should be specified as output device number 1 and the punch unit should be specified as output device number 2.

1. Card reader input device select.
2. Printer output device select.
3. Punch output device select.
4. Line mode.
5. Auto Answer inhibit.
6. Transparency switch.

Note: Once these switches are set, they must remain set for the duration of the RJE processing. After the work station becomes inactive, they may be reset as desired.

OPERATING PROCEDURES

SENDING INPUT

After supplying power to the 2770 according to the procedures outlined in the IBM 2770 Data Communication System manual (GA27-3013), an RJSTART card is placed in the card reader. If no further input is to be sent and output is expected, the RJSTART card should be the only card in the card reader. If additional input is to be sent, a LOGON card and the additional input follow the RJSTART. If punched output is expected, the card punch must be in a ready state and must contain blank cards.

If the connection is via a switched line, the number may be dialed at this time. After the line connection is made, the START key must be pressed to transmit the data.

The card reader sends all the cards before performing line turnaround to look for output from the central system.

RECEIVING OUTPUT

Output to the 2770 will be directed to either the printer or punch. The printer and the punch should be in a ready state at all times to avoid the unnecessary delay of having the transmission discontinued and of having to submit a CONTINUE command to resume transmission.

DISCONTINUING OUTPUT

Output in progress may be discontinued at any time by pressing the TERMINAL RESET key (on the 2772). After output has been dis-

continued, the central system will accept input, but no output will be sent until a CONTINUE command is received. The CONTINUE command provides three options so that discontinued output may be either:

- Restarted from the beginning of the data set.
- Continued with the SYSOUT block containing the last block transmitted.
- Deleted by the options specified in the CONTINUE command.

SPECIAL FORMS OUTPUT

Output requiring special forms or cards is automatically discontinued by the central system before it is transmitted, and a message giving the required form or card number is sent from the central system to the 2770.

PRINTER

For printed output, the required forms must be placed in the printer, and a CONTINUE command must be transmitted from the card reader. When this CONTINUE is received, the central system transmits the output.

PUNCH

For punched output, the required blank cards must be placed in the card punch hopper. If the punch is not ready, output is discontinued, and a CONTINUE command must be issued to continue transmitting.

PREPARING MORE INPUT

While output is being written on the printer, the operator may load and ready the card reader to send more input. Since the work station is already in the active or processing state, (see the section States of Work Stations), no RJSTART command is submitted. Unless the work station is in the inactive state, or unless the work station is in the processing state and a new user desires access to the system, no LOGON command is required. When the output to the printer is finished, the 2770 may send input.

RJE no longer automatically disconnects a switched line connection three minutes after all job input has been submitted because the disconnect sequence transmitted from the central installation is not recognized. The user has the responsibility for disconnecting the work station from the RJE system. If he wishes to remain connected, he does nothing, even if he has completed submitting jobs, in order to continue input operations. Otherwise, the user must submit an RJEND statement at the end of his input to allow the 2770 to be disconnected from the system. After the RJEND ACCEPTED message is received, the data set phone must be manually hung up to physically break the connection.

In general, the detection of any permanent line I/O error at the central system will cause the terminal to be disconnected. When this happens, the line connection must be reestablished (for a switched line) and the RJSTART and LOGON commands must be resubmitted along with the last unacknowledged input. A line error message will be returned along with the RJSTART accepted message. Other errors and their associated recovery procedures are described below.

ERROR RECOVERY PROCEDURES

FAILURE DURING INPUT

When the card reader fails (jams, etc.), the condition should be corrected and the card reader and printer brought to ready status. Recovery must be made within approximately three minutes for input to be resumed according to the error recovery procedures defined in the 2770 component description manual. If the time required to ready the reader exceeds three minutes on a switched line, an RJSTART and a LOGON command are required to resume input operations, and all unacknowledged input must be resubmitted (assuming one job submitted at a time). When more than one job is being processed, only the jobs from the point of failure and the entire job in which the failure occurred must be resubmitted. If the Auto Answer feature is present and active on a switched line, the line will be disconnected within 21 seconds, not 3 minutes, if recovery is not made within that time. For this reason, the Auto Answer feature should normally be off while running RJE.

FAILURE WHILE RECEIVING OUTPUT

Unit Failure

When the printer or punch fails, the condition should be corrected. On a switched line, if the problem can be corrected and the 2770 can be brought to ready status within three minutes, a CONTINUE command may be transmitted, and the output will resume according to the option specified in the CONTINUE command. If recovery requires more than three minutes, the connection must be reestablished, and an RJSTART command must be transmitted.

The interrupted data set can then be transmitted from the point of interruption. On a nonswitched line, there is no time limit, and the output may be requested via a CONTINUE command.

Unit Not Ready

If the central system tries to transmit to a device that is not in ready status, the audible alarm sounds, and the TERM ADDRESSED light comes on. Follow the procedures outlined under Unit Failure for recovery procedures.

Central Failure

If the central system fails while output is in progress, the terminal is placed in the inactive status. When the central system comes back on line, an RJSTART command must be submitted. The message ABNORMAL CENTRAL CLOSEDOWN is returned with the RJSTART acknowledgment message. Following these messages, output that was in progress at the time of the failure is resumed from the beginning; it may or may not be the first output to be received after communications are reestablished.

TESTING THE RJE SYSTEM

If it is desirable to test the system to check that transmissions are being received, a message may be sent to the sending work station. If it is returned, the system is in working order (i.e., the user may send himself a message, and if he receives it on the printer, the system is working properly).

RECOMMENDED OPERATING SUGGESTIONS

To minimize the recovery effort in case of an error, the following procedures are recommended to the 2770 operator:

1. The RJSTART and LOGON commands may be submitted separately to insure that they are correct.

2. Job input streams should be limited to a few jobs in order to limit the number that must be resubmitted in case of an input error that requires the central system to flush the entire input stream.

3. Remote Job Entry operations on the 2770 must be in "transmit transparency" mode at all times.

4. If output is expected, it is recommended that the output devices be ready at all times. If while receiving output, the user finds it urgent to submit more input, the output should be discontinued, then the input can be submitted. After submitting the input, the output can be retrieved by submitting a CONTINUE command with the desired option.

The IBM 2780 Data Transmission Terminal (Model 1 or 2) is a supported work station in the RJE system. It provides input and output capability over common carrier communication lines via binary synchronous communications procedures. Model 1 supports card input and printer output. Model 2 supports card input, printed output, and punched output. The special features required for either model of the 2780 used for RJE processing are the following:

1. EBCDIC Transmission Code.
2. EBCDIC Transparency.
3. Print Line (either 120-character or 144-character).
4. Automatic Turnaround (Model 2 only).
5. Extended (Enquiry-ENQ) Retry Transmission.
6. Operator Intervention.

In addition, the following special features are supported, but not required:

1. Multipoint Line Control.
2. Multiple Record Transmission.

For a description of the various switches, lights, and controls, the user is referred to IBM 2780 Data Transmission Terminal -- Component Description, GA27-3005.

OPERATING PROCEDURES

Normal Operation

Sending Input

After powering up the 2780 according to procedures in the 2780 manual, an RJSTART card is placed in the card reader. If no further input is to be sent and punched output is expected, blank cards are placed behind the RJSTART card to trigger the Auto Turnaround feature. If no punched output is expected, no cards follow the RJSTART. If additional input is to be sent, a LOGON card and the additional input follow the RJSTART.

When the input has been placed in the reader, the mode switch is placed in the "transmit transparent" position, and if there are no blank cards following the input data (no punched output is expected), the EOF button must be pressed. If punched output is expected, the Auto Turnaround feature must be activated by pressing the Auto Turnaround button (the button will light when active). If the connection is via a switched line, the number must be dialed at this time. After the line connection is made, the start key must be pressed to transmit the data.

The 2780 sends all the cards in the reader before performing line turnaround to look for output from the central system. The audible alarm will be triggered either by reading a blank card (by the Auto Turnaround feature on the Model 2) or by reading the last card if the EOF key has been pressed. This alarm will sound until it is turned off either by receiving output from the central system or by operator intervention. If line turnaround is triggered by running out of cards (implies no Auto Turnaround), only the printer will be ready to receive output.

Receiving Output

When the 2780 receives an EOT after receiving a complete transmission, the audible alarm sounds unless the reader is in ready status. The alarm is turned off when the 2780 receives an ENQ from the central system signifying more output, or when the operator presses the stop key causing the 2780 to drop ready status. The start keys for the printer and reader/punch must be pressed to return the 2780 to ready status.

Discontinuing Output

Output in progress may be discontinued at any time by pressing the stop key (on the reader/punch). After output has been discontinued, the central system will accept input, but no output will be sent until a CONTINUE command is received. The CONTINUE command allows three options so that discontinued output may be either:

1. restarted from the beginning of the data set,
2. continued with the SYSOUT block containing the last block transmitted, or
3. deleted by the options specified in the CONTINUE command.

Special Forms Output

Output requiring special forms or cards is automatically discontinued by the central system before it is transmitted, and a message giving the required form or card number is sent from the central system to the 2780.

Printer

For printed output, the required forms must be placed in the printer and a CONTINUE command must be transmitted from the 2780 reader. Upon receipt of this command the central system transmits the output.

Punch

For punched output, the required blank cards must be placed in the hopper (if Auto Turnaround is to be triggered). If Auto Turnaround is not active, a CONTINUE statement should be submitted to trigger the Auto Turnaround feature. After the CONTINUE command is received, the central system transmits the output to the punch. If the punch is not ready, output is discontinued, and a CONTINUE command is issued to continue transmitting. There can be no punched output if the Auto Turnaround feature is not active. If there is no punch at the 2780, output that has been designated to be punched will be printed on the printer.

Preparing More Input

While output is being written on the printer, the operator may load and ready the reader to send more input (unless Auto Turnaround is active). Since the work station is already in the active or processing state (see States of Work Stations), no RJSTART command is submitted. Unless the work station is in the inactive state, or unless the work station is in the processing state and a new user desires access to the system, no LOGON command is required. When the output to the printer is finished, the 2780 may send input. If the output is being received at the punch (or the printer, if Auto Turnaround is active), the operator must wait until the output has been completed. Then, after removing the punched output (if any) and blank cards, the operator may reload and prepare the reader to transmit input. On a switched line the reader must be readied within approximately three minutes to prevent the central system from disconnecting the line.

Error Recovery Procedures

In general the detection of any permanent line I/O error at the central system will cause the terminal to be disconnected. When this happens, the line connection must be reestablished (for a switched line) and the RJSTART and LOGON commands must be resubmitted along with the last unacknowledged input. A line error message will be returned along with the RJSTART accepted message. Other errors and their associated recovery procedures are described below.

Failure During Input

When the 2780 card reader fails (jams, etc.), the condition should be corrected and the card reader and printer brought to ready status. On a switched line recovery must be made within approximately three minutes for input to be resumed according to the error recovery procedures defined in the 2780 manual. If the time required to ready the reader exceeds three minutes on a switched line, an RJSTART and a LOGON command are required to resume input operations, and all unacknowledged input must be resubmitted. If the Auto Answer feature is present and active on a switched line, the line will be disconnected within 21 seconds, not three minutes, if recovery is not made within that time. For this reason, the Auto Answer feature should normally be off while operating RJE.

Time-Outs

RJE no longer automatically disconnects a switched line connection three minutes after all job input has been submitted because the 2780 does not recognize the disconnect sequence transmitted from the central installation. The user has the responsibility for disconnecting the work station from the RJE system. If he wishes to remain connected, he does nothing, even if he has completed submitting jobs, to continue input operations. Otherwise, the user must submit an RJEND statement at the end of his input to allow the 2780 to be disconnected from the system. After the RJEND ACCEPTED message is received, the data set phone must be manually hung up to physically break the connection. If the Auto Answer feature is active for the work station, the time limit for switched line connection recovery is 21 seconds. For this reason, Auto Answer should normally be off while operating RJE.

Carriage Control Limitation

The range of carriage control functions for the 2780 is less than that provided for local printers. Specifically, the 2780 does not provide skips past channel 8, nor space suppression. When using the 2780 for remote output, these carriage control functions should be avoided. If they are

requested, they will result in a write and single space operation.

Failure While Receiving Output

Unit Failure

When the printer or punch fails, the condition should be corrected. On a switched line, if the problem can be corrected and the 2780 can be brought to ready status within three minutes, a CONTINUE command may be transmitted, and the output will resume according to the option specified in the CONTINUE command. If recovery requires more than three minutes, the connection must be reestablished and an RJSTART command must be transmitted. The interrupted data set can then be transmitted from the point of interruption. On a nonswitched line there is no time limit, and the output may be requested via a CONTINUE command.

Note: If punched output is to be received, blank cards must follow the CONTINUE command to trigger the Auto Turnaround feature.

Unit Not Ready

If the central system tries to transmit to a device that is not in ready status, the audible alarm sounds, and the TERM ADDRESSED light comes on. Follow the procedures outlined under Unit Failure for recovery procedures.

Central Failure

If the central system fails while output is in progress, the terminal is placed in an inactive status. When the central system comes back on line, submit an RJSTART command. The message ABNORMAL CENTRAL CLOSEDOWN is returned with the RJSTART acknowledgment message. After these messages, output that was in progress at the time of the failure is resumed from the beginning. If a remotely submitted job of a higher priority than the partially returned job completes after the central system is reactivated, but before RJE is restarted, immediate output from the higher priority job will be returned before the interrupted output is transmitted.

Testing the RJE System

If it is desirable to test the system to check that transmissions are being received, a message may be sent to the sending work station. If it is returned, the system is in working order (i.e., the user may send himself a message, and if he receives it on the printer, the system is working properly).

Recommended Operating Suggestions

To minimize the recovery effort in case of an error, the following procedures are recommended to the 2780 operator:

1. The RJSTART and LOGON commands may be submitted separately to insure that they are correct.

2. Job input streams should be limited to a few jobs in order to reduce the number that must be resubmitted in case of an input error that requires the central system to flush the entire input stream.

3. Remote Job Entry operations on the 2780 are in "transmit transparency" mode at all times.

4. For a 2780 work station on a switched line to be disconnected from the RJE system after normal operation has completed, an RJEND statement should be submitted immediately after all input has been entered. After the RJEND ACCEPTED message is received, the data set phone must be manually hung up to physically break the connection.

5. If punched output is expected, it is recommended that the Auto Turnaround feature be triggered by blank cards and then that the user wait for the output. The end of output is signalled by the audible alarm, and at this time more input may be submitted if desired. If it is urgent that more input be submitted, discontinue output. Then the desired input can be submitted. The Auto Turnaround feature must be used to get punched output.

6. Unless it is certain that no punched output is going to be sent, the following steps should be performed before submitting input:

   a. Press the STOP button.
   b. Press the NPRO button (to flush cards).
   c. Set mode switch to OFFLINE and back to TSM TRSP (to drop ready status on the printer and the punch).
   d. Ready the printer.
   e. Place the input cards and blank cards in the hopper.
   f. Press the Auto Turnaround and the START buttons, respectively.

7. If it is certain that no punched output is expected (always the case for a Model 1), follow steps a through d, above, and then place the input cards

in the hopper, press the End-of-File and START buttons, respectively.

8. For expected punched output, when Auto Turnaround has not been used, place blank cards in the hopper, and press the Auto Turnaround and START buttons to ready the punch for the output that is to be received.

9. Unattended 2780 operation on a switched or multipoint line is not recommended. On a switched line, the operator must correct an input failure (card jam, etc.) within three minutes or the entire job must be resubmitted. Although no recovery time limit exists for work station failures on a multipoint line, the line remains logically attached to the work station until the error is corrected. During this period other work stations on the line are denied access to the system.

The IBM 1130 Computing System with the IBM-supplied RJE program is a supported work station. The 1130 RJE program operates under the supervision of the 1130 Disk Monitor System Version 2, and observes the required RJE communication conventions. Input submitted at the work station is transmitted to the central system. Output directed to the work station is routed to a specified output device or to a user-written routine. The operator has the ability to interrupt receipt of output.

MACHINE AND DEVICE REQUIREMENTS

The RJE program for an 1130 work station requires an 1131 CPU, including a console printer-keyboard, with a single disk storage drive and at least 8K words of main storage. The minimum configuration consists of a card reader, a card punch, and a line printer with a 120-character print line. The 1130 System must be connected to a 1200-2400 bit-per-second line via a Synchronous Communications Adapter in binary mode.

A user-written routine may specify output on any available output device. An 1130 system with 16K words of main storage is required to support a user-written routine. Data directed to the user-exit is stored on disk and can be processed by another user program after RJE is terminated.

COMPRESS/EXPAND

If the compress/expand option is specified for the work station, blank characters will be suppressed from data transmitted across the communication line. It is necessary to have compatibility between the central and the remote programs in using the compress/expand feature. This feature requires 16K words of main storage if the 1132 printer is used and 8K words if the 1403 printer is used.

COMMUNICATION CONSIDERATIONS

The 1130 RJE Work Station Program provides the standard RJE communications interface to the RJE communications network using SCAT2 and SCAT3 binary synchronous communications subroutines to provide the following capabilities:

1. Point-to-point contention operation on leased lines.
2. Point-to-point operation on switched networks.
3. Multipoint operation with the 1130 system as a tributary station.

All data transmissions between the central processor and a remote 1130 are in EBCDIC transparent mode except headings, which are transmitted in normal (non-transparent) mode. Communication with the central processor proceeds in three modes: monitor, receive, and transmit.

Monitor mode is entered from either transmit or receive mode. In monitor mode, the work station waits for input from the line, card reader, or console keyboard.

Receive mode is entered when output is available for the work station. In receive mode, the terminal reads output from the line until it receives an end-of-data indication from the central system or until the operator discontinues the output. When an end-of-data indication is received or the operator intervenes to discontinue the output, the work station enters monitor mode.

Transmit mode is entered at work station startup and when input is available at the work station. In transmit mode, the work station writes to the line. It continues writing to the line until it has encountered a logical end-of-file (null statement or RJEND command) in the input stream.

If monitor mode is entered from transmit mode with a logical end-of-file indication, transmit mode is not entered again until operator intervention indicates that more input is available.

COMMUNICATION CONSIDERATIONS FOR SWITCHED LINES

If a switched communication line is inactive for a period of approximately 21 seconds, the central RJE program disconnects the line. This can be caused by three situations:

1. The remote RJE program cannot maintain the connection when an error on an output device is not corrected within the specified time.

2. The remote RJE program cannot maintain the connection when a user-written routine fails to return control within the specified time.

3. The remote RJE program is waiting for an operator response. When requested to reply to some RJE messages, the operator must enter his response within the specified time. In some cases, the operator has approximately three minutes to reply (see Operator Messages section for detailed information).

INPUT AT THE WORK STATION

Input is accepted from the card reader, the console keyboard, and from one or more disk storage units.

Job entries and work station commands are acceptable input from the card reader. No JECL statements are sequence checked. The first statement at work station startup must be an RJSTART command submitted from the card reader.

The only valid input from the console keyboard is work station commands. Input is accepted from the console keyboard between jobs (only in a point-to-point line configuration) from the card reader when the operator has indicated that he has such input to submit. The 1130 Work Station Program checks this input for the JECL identifier (.. followed by at least one blank) only.

Input is also accepted from one or more disk storage units. A special 1130 RJE control card (.. DATA) is defined to control this function. This control card may be placed in the card input stream or on disk. It contains information allowing the RJE program to read input alternately from the card reader and from disk. Data to be read from disk must be stored there prior to RJE processing. This data must be stored in 80-character records in 8-bit packed code format (eight records per sector), in consecutive sectors. After reading this input to end of file, the RJE program resumes reading from the card reader.

Note: If a user is logged on at the card reader or disk and another LOGON command is submitted from the console keyboard, all pending input at the card reader and/or from disk will be submitted under the new LOGON userid. To prevent this, the last LOGON command, which was submitted from the card reader, must be submitted as the last command from the console keyboard.

OUTPUT TO THE WORK STATION

Output to the work station consists of job output and messages. Job output, consisting of SYSOUT data sets created by the job, is directed to the printer, the punch, or a user-exit routine. Each job output data set is directed to the device associated with the SYSOUT class specified in the DD statement for the output data set. RJE system messages are directed to the console printer or the line printer.

Carriage control for printer output may be specified by a control character as the first byte of each record. Either machine code or ASA control characters are allowed. If characters not recognized by the equipment or no control characters are specified, the output is single-spaced with a skip to channel 1 when channel 12 is sensed in the carriage control tape.

Stacker Select, for punched output, if available may be specified by a control character as the first byte of each record. Either ASA or machine code control characters are accepted. If characters not recognized by the hardware or no characters are specified, stacker 1 is selected.

The 1130 RJE Remote Work Station Program includes a user-exit routine, which accepts output data sets directed to it and writes them on disk in an area reserved by the user. This routine may be replaced by another user-written routine to process data directed to the user-exit and to write output to any available device.

If no user-written routine is present, the RJE program writes user-exit data sets consecutively on disk, each data set beginning at a sector boundary. However, if the RJE program is reloaded, data sets previously written on disk are unprotected and may be destroyed since any additional user-exit data sets are written beginning at the first sector of the reserved area.

The primary output device for messages is the console printer. The secondary device is the line printer. The operator selects the line printer as the message device by turning on console switch 0.

Note: Data directed to disk may be referenced later by a .. DATA statement. To be able to do this, the user must define his data set as fixed blocked or unblocked with a logical record length of 80 bytes and no control characters.

OPERATING PROCEDURES

Work Station Startup

To start RJE operation, the operator loads the 1130 RJE Work Station Program.

The operator should follow the program-loading procedures for the system. The first data card must be the RJSTART command. For detailed program-loading procedures see IBM 1130 Disk Monitor System, Version 2, Programming and Operator's Guide, GC26-3717.

The RJSTART command may be followed either by input to be sent to the central system or by an end-of-file indicator (e.g., a null statement for the card reader). If the work station is connected to the central system over a switched line, a message is displayed indicating when the operator is to call the central system. When contact is made with the central system, the RJSTART command and all other commands, if any, before the first job entry (the OS job with or without the JED card) or before the end-of-file indicator, are transmitted. The work station is logically attached to the RJE system with the acknowledgment of the RJSTART command. The operator receives all pending messages and immediate job output directed to users at the work station. All pending input, if any, is transmitted or the work station program monitors the line for output from the central system. The sequence of events is system dependent.

The Null Statement

The null statement is provided for the 1130 station to indicate end of file on the card reader. It must be the last card of an input stream. When this statement is read, the card reader is effectively closed, but communication is still maintained with the central system.

Operator intervention is required to resume input from the card reader after the null statement has been read.

The null statement is coded with the identifying characters (..) in columns 1 and 2 and with all remaining columns blank. This statement has no effect on a user's session. If a user is logged on when a null statement is read, he remains logged on.

Console Keyboard Procedures

There are four control functions initiated by the operator from the console keyboard: indicating card reader input, indicating console keyboard input, discontinuing output, and initiating an abnormal closedown.

These functions are initiated by the operator pressing the PROGRAM STOP and PROGRAM START keys on the console. When the message

'J90 OCR=' (Operator Communication Request)

appears, the operator enters the appropriate reply to initiate the function he desires (see 1130 RJE Messages for replies to the 'J90 OCR=' message).

If the operator has indicated console keyboard input, a message J93 PROCEED will be displayed and the KEYBOARD SELECT light is turned on, at the time when the program can service keyboard input. The operator enters the desired commands with an EOF at the end of each command. After entering the last command, an EOF must be entered to indicate end of keyboard input, but the KEYBOARD SELECT light must be on when it is pressed.

An abnormal closedown is initiated by replying with a T to the 'J90 OCR=' message. This reply causes the work station program to be terminated and the contents of main storage to be written on the printer. The central system logically detaches and disconnects the work station, if it is connected over a switched line.

The work station is also logically detached from the central system, on a leased or multipoint line, if a line operation is in progress when the operator requests the termination, or when the central system tries to contact the work station, the program has not been reloaded and the line was idle when the request was made.

Note: The console keyboard procedure may not be used if the console keyboard is already in use. If it is being used, the message is not printed. However, the PROGRAM START key must be pressed in order to continue processing.

Discontinuing Output

Output can be discontinued by operator intervention. The operator uses the console keyboard procedure to initiate the request and responds by entering a D to discontinue output.

Output is also discontinued by the 1130 RJE Work Station Program when no user-written routine is present for output directed to the user exit, and when one of the following three errors occurs:

1. No area is reserved for user-exit output.
2. The area is exhausted.
3. A permanent disk write error occurs.

Once output is discontinued, no other output is transmitted to the work station until the disposition of the discontinued output is specified by the CONTINUE command.

Continuing Output

Disposition of discontinued output is specified with the CONTINUE command. Output is discontinued if the following conditions occur:

1. The remote operator requests discontinuation.
2. A change in form number is found at the central system.
3. The remote program requests discontinuation (see Discontinuing Output).
4. An irrecoverable error occurs during an output operation.

If conditions one, two or three occur, the disposition of the output is specified with the CONTINUE command. Condition four requires error recovery procedures.

Error Recovery Procedures

At an 1130 work station, facilities are provided to recover from both communication errors and local device errors. Operator intervention may be necessary to correct the condition causing the error. If the error cannot be corrected in an allowable interval, the central system logically detaches the work station from the RJE system. In addition, if the work station is connected over a switched line, the central system breaks the connection.

In the case of a local I/O device error, a message is always issued except for forms check on the console printer. This error causes the FORMS CHECK light to go on, and the operator tells the system to try again by turning on console switch 1. The communications on the line are maintained only if the error is corrected within approximately 21 seconds.

An error on an I/O device other than the console keyboard is always followed by a message describing what type of error has occurred. The explanations for the messages and for the actions to be taken by the program after the operator's reply are described in the 1130 RJE Error Messages section.

Restart Procedures

Restart procedures involve regaining communication with the central system and submitting an RJSTART command. If the error occurs during an output operation, output automatically resumes either where it was interrupted (after a line error) or at the beginning of the job (after a central failure).

If output is written to disk at the time of a line error and it is not a central failure, the operator should discontinue the output and submit a CONTINUE command with the BEGIN operand.

If the output was written to the punch or the printer at the time of a line error, and if it was not a central failure, a duplication of the last transmission block may occur when the program is restarted. The printer will skip to a new page when RJE is restarted if the data set being printed is without control characters.

If the error occurs during an input operation, all unacknowledged input must be resubmitted. Furthermore, a line error in the middle of a job implies that the whole job must be resubmitted from the beginning. Before the job can be transmitted again with the same jobname, the old job, that which was partially sent to the central system, must be deleted. Unless the error occurs in the middle of reading JECL, RJE deletes the job. For errors that occur in JECL, the operator must delete the job.

OPERATOR MESSAGES

The first digit of the messages has the following meaning:

0 - Error during generation.
1 - Error in the initializing part of RJE.
2 - Error, during the processing of the RJE program, that requires no operator reply.
5 - Error, during the processing of the RJE program, that requires a reply from the operator.
9 - Non-error message.

1130 RJE ERROR MESSAGES

J01 INVALID CARD

Explanation: This message is issued during work station program generation. The card containing the work station information is invalid or contains invalid information. (See Generating the 1130 Work Station Program.)

System Action: The system enters a wait state.

Operator Response: The operator must enter a valid card and press the PROGRAM START key.

J10 INVALID PRINTER

Explanation: Information from the Disk Monitor System indicates that the principal print device is not an 1132 printer or a 1403 printer.

System Action: The system exits to the Disk Monitor Supervisor.

Operator Response: He may reload the RJE program after assigning either an 1132 printer or a 1403 printer as the principal print device.

J11 INVALID READER

Explanation: Information from the Disk Monitor System indicates that the principal I/O device for the system is not a 1442 card reader or a 2501 card reader.

System Action: The system exits to the Disk Monitor Supervisor.

Operator Response: He may reload the RJE program after assigning either a 1442 card reader or a 2501 card reader as the principal I/O device.

J12 LOGICAL DRIVE x NOT IN SYSTEM

Explanation: The area on disk reserved for user-exit data is on a logical disk drive that is not present in this RJE run. The logical disk drive asked for replaces x in the message.

System Action: The system exits to the Disk Monitor Supervisor.

Operator Response: He may reload the RJE program after having changed the user-exit parameters or after having introduced the requested logical disk drive.

J13 TOO MANY EQUATES

Explanation: The number of subroutines equated by the user and the RJE work station program in the current job is more than ten.

System Action: The system exits to the Disk Monitor Supervisor.

Operator Response: The operator may reload the RJE program with a fewer number of subroutines specified in the EQUAT record.

Note: The RJE work station program internally requires the number of EQUAT records as follows:

- Compress/Expand feature - 2 pairs;
- 2501 Card Reader - 2 pairs;
- 1132 Printer - 1 pair.

J14 DISK ERROR OCR=

Explanation: A permanent error has been encountered while attempting to read data from disk during the initializing part of the RJE program.

System Action: The system continues according to the operator response.

Operator Response: The operator must enter one of the following codes:

T - Terminate RJE processing by exiting to the Disk Monitor and dumping main storage.

X - Exit to the Disk Monitor.

J20 RJSTART MISSING

Explanation: The requirement for an RJSTART command was not satisfied.

System Action: The system waits for operator action.

Operator Response: The operator must enter an RJSTART command through the card reader and press the PROGRAM START key in order to resume processing.

J21 .. DATA INVALID

Explanation: A .. DATA statement contains invalid parameters.

System Action: The system maintains the line operations.

Operator Response: To continue RJE processing, the operator must use the Operator Communication Request facility (see J90 OCR=).

Note: This message is also issued if the logical disk drive referred to is not present.

J22 INVALID INPUT

Explanation: The input entered from the console keyboard does not start with the JECL identifier (..) followed by at least one blank.

System Action: The system waits for more input from the console keyboard.

Operator Response: The operator must enter a work station command or press EOF.

J23 INPUT ABORTED BY CENTRAL

Explanation: The central system has aborted input from the work station and will send a message explaining why the input was aborted. (For details on messages received, see Messages Sent to Work Stations.)

System Action: The system waits for input from the line.

Operator Response: When the message is received from the central system, the operator inspects the message and takes the indicated action. To resume input the operator must follow the procedures listed under Console Keyboard Procedures.

Note: Input is aborted when compress/expand incompatibility exists between the central and the remote work station programs. If no explanatory message follows, the central program expected compressed input and the work station transmitted input that was not compressed. If an UNDEFINED OPERATION message follows, the central system expected input that was not compressed while the work station transmitted compressed input. The conflict must be resolved before input will be accepted.

J51 LINE ERROR OCR=

Explanation: An irrecoverable error has been encountered while reading or writing on the communication line, or the line cannot be opened.

System Action: The RJE program closes the communication line if it is open and waits for an operator response.

Operator Response: The operator must reply by entering one of the following codes from the console keyboard.

A - Input is available at the card reader. If this option is selected, the first card in the card reader must be an RJSTART command.
On a switched line, the line must be disconnected before the restart is tried. If this is not done automatically, it must be done by the operator. He must dial again when the message J91 ESTABLISH LINE CONNECTION is issued.

X - Exit to the Disk Monitor.

T - Terminate RJE processing by exiting to the Disk Monitor and dumping main storage.

J52 DISK ERROR INPUT OCR=

Explanation: A permanent error has been encountered while attempting to read input from disk. This message is issued only if a user's disk input is being read at the time the error occurs.

System Action: Reading of the input data file(s) and card reader input is discontinued. Any available output from the central system is accepted after the operator response has been entered. The system continues according to the operator's response.

Operator Response: The operator must enter one of the following codes. The response must be entered within approximately three minutes on a switched line.

A - Input is available at the card reader.

B - Commands are to be read from the console keyboard.

C - Available output is accepted. (Any pending keyboard input is processed first.)

T - Terminate processing by exiting to the Disk Monitor and dumping main storage.

J53 DISK ERROR OUTPUT OCR=

Explanation: A permanent error has been encountered while attempting to write data on disk. This message is issued only if user-exit data is being written on disk by the IBM supplied user-exit routine.

System Action: Output from the central system is discontinued. The system continues as directed by the operator response.

Operator Response: The operator must enter one of the following codes. For switched lines, the response must be entered within approximately three minutes.

A - Input is available at the card reader. (Any pending keyboard input is processed first.)

B - Commands are to be read from the console keyboard.

C - Any pending input is processed. If no pending input exists, the system will maintain the line operations.

T - Terminate processing by exiting to the Disk Monitor and dumping main storage.

J54 DISK ERROR OCR=

Explanation: A permanent error has been encountered while attempting to read RJE constants or error messages from disk. If this message appears, an RJE error message may be missing.

System Action: The system continues according to the operator response.

Operator Response: The operator must enter one of the following codes:

X - Exit to the Disk Monitor.

T - Terminate processing by exiting to the Disk Monitor and dumping main storage.

J55 END OF DISK AREA OCR=

Explanation: The user has failed to reserve space or has reserved too little space on disk for user-exit output data sets.

System Action: Output from the central system is discontinued. The system continues as directed by the operator response.

Operator Response: The operator must enter one of the following codes. For switched lines, the response must be entered within approximately three minutes.

A - Input is available at the card reader. (Any pending keyboard input is processed first.)

B - Commands are to be read from the console keyboard.

C - Any pending input is processed. If no pending input exists, the system will maintain the line operations.

T - Terminate processing by exiting to the Disk Monitor and dumping main storage.

J56 CARD READER ERROR OCR=

Explanation: An error that requires operator intervention has occurred on the card reader.

System Action: The system waits for the operator's reply.

Operator Response: The operator must enter one of the following codes. The response must be entered within approximately three minutes on a switched line.

A - The operator has corrected the problem and the program will resume card reader input.

E - The operator could not correct the problem. The program assumes reading and end-of-file (.. null card) indication on the card reader.

J57 CARD PUNCH ERROR OCR=

Explanation: An error that requires operator intervention has occurred on the card punch.

System Action: The system waits for the operator reply.

Operator Response: The operator must enter one of the following codes, within approximately three minutes on a switched line connection.

D - The operator could not correct the problem. Output from the central system is discontinued and a .. CONTINUE command must be transmitted to resume output.

P - The operator has corrected the problem and the program will resume card punch output.

J58 PRINTER ERROR OCR=

Explanation: An error that requires operator intervention has occurred on the printer. This error message will appear if the print line exceeds 120 characters.

System Action: The system waits for operator reply.

Operator Response: The operator must enter one of the following codes, which must be entered within three minutes on a switched line.

D - The operator could not correct the error. Output from the central system is discontinued and a .. CONTINUE command must be transmitted to resume output operation.

P - The operator has corrected the error and the program will resume printer output. If the record length exceeds 120 characters, the records will be truncated.

J59 PREOPERATIVE ERROR CODE XXXX OCR=

Explanation: A pre-operative error has occurred in the user-exit routine; or a logical disk drive that is ready during the loading of the work station program and used in the processing of the preceding job has been referred to and found to be not ready. The pre-operative error code as defined in Appendix A, IBM 1130 Disk Monitor System, Version 2, Programming and Operator's Guide, GC26-3717, replaces XXXX.

System Action: The system waits for the operator reply.

Operator Response: The operator must enter one of the following codes within approximately 21 seconds on a switched line connection.

C - The operator has corrected the error and the program will retry the operation.

T - Exit to the Disk Monitor Supervisor requesting a terminating dump of the contents of main storage written on the printer.

X - Exit to the Disk Monitor Supervisor without writing the contents of main storage on the printer.

1130 RJE MESSAGES

J90 OCR= Operator communication request recognized

Explanation: The RJE program is ready to service an operator request. The operator indicates that he wants to communicate with

the 1130 RJE Work Station Program by pressing the PROGRAM STOP key and then the PROGRAM START key.

System Action: The system waits for the reply.

Operator Response: The operator enters one of the following codes. The response must be entered within approximately 21 seconds for switched lines and also within the same limit for leased and multipoint lines, if a line operation is in progress.

A - Input is available at the card reader.
B - Commands are to be read from the console keyboard.
D - Discontinue receiving output.
N - Ignore the request.
T - Terminate processing by exiting to the disk monitor and dumping main storage.

J91 ESTABLISH LINE CONNECTION

Explanation: This message is displayed only at an 1130 work station on a switched line. The operator is to establish a connection with the central system.

System Action: The system continues to check for a completed connection. When the connection is established, the system resumes processing.

Operator Response: The operator must perform the dial-up procedure to establish the connection with the central system.

J92 DATA rrrr0c0f TO DISK AT xaaa, bbbb

Explanation: This message is received only when no user-written routine is present. The RJE program is writing user-exit data to disk. The message codes have the following meanings:

rrrr - The logical record length in hexadecimal for fixed length records.

c - The type of control characters used; c may have the following values:

0 - No control characters are used.
1 - System/360 machine code control characters are used.
2 - ASA control characters are used.

f - The OS record format; f may have the following values:

1 - Fixed unblocked records
2 - Fixed blocked records
3 - Variable unblocked records
4 - Variable blocked records
5 - Undefined records

x - The logical disk drive number.

aaa - The sector address in hexadecimal.

bbbb - The length of the data set in blocks where there are 40 packed EBCDIC characters per block (16 blocks per sector). The last block need not be filled.

System Action: The user-exit data set is written on disk. The disk block length information part of the message is written when the data set is completed; therefore, if a line error or a disk error occurs before the whole data set is received, this portion of the message remains blank.

Operator Response: None.

J93 PROCEED

Explanation: This message is displayed as a result of a B reply to an 'J90 OCR=' message. The work station is ready to receive commands from the console keyboard.

System Action: The KEYBOARD SELECT light is turned on and the program waits for input from the console keyboard.

Operator Response: The operator enters the desired commands with an EOF after each command. After entering the last command, he enters another EOF to indicate that he has finished using the console keyboard. On a switched line, the operator has approximately three minutes to enter each command.

J94 PUNCHED OUTPUT Nonblank card at punch station

Explanation: A SYSOUT data set is to be punched on a 1442 model 6 or model 7 card read punch unit, which is also used to read card input, and a nonblank card is at the punch station.

System Action: The system waits for operator action.

Operator Response: The operator may load blank cards in the punch and then presses any character key or the space bar to resume processing. If he wants the output to be punched in the prepunched cards already in the punch unit, he simply presses any character key or the space bar as indicated above.

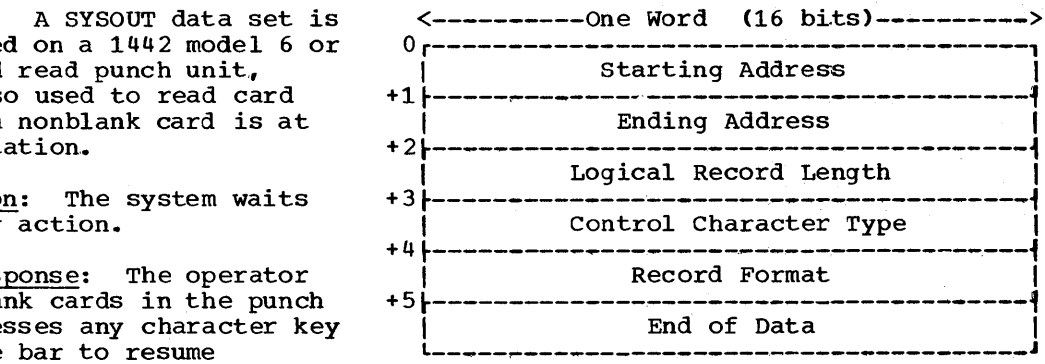
The operator must take action within approximately three minutes to maintain line communication. If this time limit is exceeded, a line error will occur. The RJE program is restarted according to the description under J51 LINE ERROR OCR= . The punched output will come if an RJSTART command, a null statement and the blank cards to be punched (in this mentioned order) are put in the card reader, and the operator replies A to the line error message.

Note: If punched output is to be sent to a 1442 card read punch, that is also used for reading, all punched output should be specified as deferred.

USER EXIT INTERFACE

The RJE program passes physical records to the user-written output routine. The user's routine must save index registers 1 and 3 for the RJE support. The user must name the routine entry point UEXIT and must store this routine in the User Area after deleting the resident module with the same name prior to RJE processing. The parameter UEXIT=USER must be specified in the RJE generation program.

The user-exit routine receives control when output becomes available for processing. Upon entry, the return address is stored in the first word of the routine. Register 1 contains the address of a parameter list describing the output passed to the routine. This parameter list, aligned on an even word boundary, has the following format:



Starting Address: The address of the block of data received from the central system. This address has the following format: the 15 high-order bits contain the main storage address and the low-order bit gives the halfword, where 0 means high and 1 means low.

Ending Address: The ending address+1 of the block of data received from the central system. The ending address is given in the same format as the starting address above.

Logical Record Length: The length of logical records when fixed length records are passed.

Control Character Type: The type of control characters being used.
0 - No control character
1 - System/360 machine code
2 - ASA code

OS Record Format: The code indicating the record type.
1 - Fixed unblocked
2 - Fixed blocked
3 - Variable unblocked
4 - Variable blocked
5 - Undefined

End of Data: If zero, indicates end of data. The data is packed two characters per 1130 word. The blocks start on a word boundary, but may end in the middle of a word if they contain an odd number of characters.

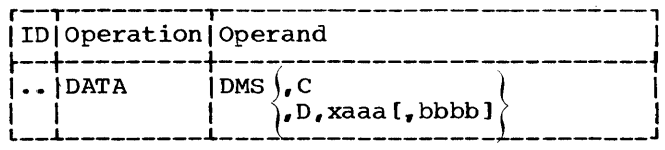
The user-written routine must use the same I/O routines as the 1130 RJE program for printer, punch, console keyboard, and disk. DISKZ is used for disk I/O. (See the IBM 1130 Disk Monitor System, Version 2, Programming and Operator's Guide, GC26-3717, for additional device information.)

Note: The user-written routine must return control to RJE within approximately 21 seconds in order to maintain the communication line connection. If the user

exceeds this time limit, the central RJE program logically detaches the work station and also disconnects the work station if it is attached on a switched line.

JECL FOR THE 1130 WORK STATION

JECL statements used for the 1130 work station are the same as those described under Job Entry Control Language, with one addition. The additional statement allows the user to alternate the source of his input between disk input and card input. The format of this statement is:



..
: is the JECL identifier and must be in columns one and two.

DATA
: must be preceded and followed by at least one blank.

DMS
: identifies the card as an 1130 JECL statement.

C
: indicates that input follows on cards.

D
: indicates that input follows on disk:

x
: is the logical disk drive number,

aaa
: is the sector address,

bbbb
: is a hexadecimal number specifying the length of the disk data file in blocks where there are two blocks per 80-character record (16 blocks per sector).

If D is specified, the disk number and the sector address are required, but the block count is optional. When the block count is not specified, the user must indicate the end of data on disk by using a .. DATA statement to transfer reading of data to the card reader or to another disk area. The optional block count for disk data causes the RJE program to read data from disk until the specified number of blocks has been read, unless the end-of-data indication is encountered first. If the RJE program reads the specified number of blocks without detecting end-of-data, reading from disk terminates and reading continues from the card reader.

Data on disk must start at the beginning of a sector and continue on consecutive sectors if necessary. Each sector must contain eight 80-character records in 8-bit code, but the last sector need not be filled.

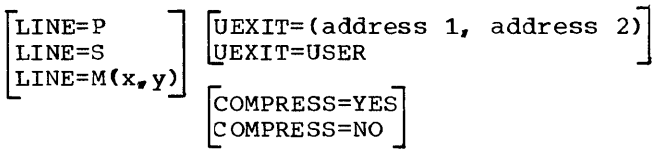
The .. DATA card is not recognized between a // DD DATA card and the corresponding /* in an OS job.

Note: The .. DATA statement is the only JECL statement that is not intersystem compatible when used on other work stations.

GENERATING THE 1130 WORK STATION PROGRAM

The object modules for the Remote Work Station Program reside in the user area on disk. The 1130 Work Station Program is loaded by an XEQ control card.

The user describes the work station configuration by executing the program named RJE00 once. This program reads in one data card, supplied by the user, which contains parameters describing line configuration and space reserved for data output on disk, if any. If a parameter is specified, the parameter name and equal sign must be used as shown in the explanation below. The parameters may be in any order, and if more than one of them is specified, they must be separated by a comma. The default for LINE parameter is the LINE indication that was specified in the previous job (the first time through, the default is LINE=P). The default for the COMPRESS parameter is the COMPRESS indication that was specified in the previous job (the first time, the default is COMPRESS=NO).



LINE=P
LINE=S
LINE=M(x,y)
: specifies the type of line connection used by the work station.

P
: specifies point-to-point communication over a nonswitched line.

S
: specifies point-to-point communication over a switched line.

M(x,y)
: specifies a multipoint line where:

x
: is the polling character;

y
: is the selection character.

If this parameter is omitted, the line information will not be changed.

UEXIT=(address 1, address 2)

address 1 is the starting address on disk reserved for storing data directed to user exit.
address 2 is the ending address of the area reserved on disk for storing data directed to the user exit.
Addresses must be in the form xaaa where:
x
is the logical disk drive number,
aaa
is the sector number.

The area specified must be reserved by the user prior to RJE processing.

UEXIT=USER
specifies that the IBM-supplied user-exit routine is being replaced by a routine written by the user.

The default is no area reserved on disk for user-exit data.

COMPRESS=YES
COMPRESS=NO
specifies whether or not this remote program is to compress and expand data transmissions. If this parameter is omitted, the information will not be changed from the previous job.

RJE00 stores the information found in the parameters, in an area on disk reserved for common constants. Once RJE00 has been executed, it need not be executed again unless the original information changes.

The final step in preparing the system for processing is the execution of the RJE program. This program uses the information stored on disk by RJE00 and the information in the Disk Monitor System that specifies principal I/O devices to load the modules, residing in the system library, corresponding to the user's configuration. Note that the console printer cannot be the principal print device.

Example 1: Entering Work Station Information

```
// JOB
// XEQ RJE00
   LINE=M(A,B),UEXIT=(21B0,22B0),COMPRESS=
     YES
```

The first two cards are the control cards needed to load the program that processes the information in the third card. This card specifies that the RJE work station is on a multipoint line, that its polling character is A, and its selection character B, and that it will compress input to the central program and expand output from the central program. The LINE, UEXIT, and COMPRESS parameters must be on the same card. For storing of data that is directed to the user exit, the user has reserved an area on disk drive 2 starting at sector 1B0 and ending with sector 2B0.

Example 2: Executing the RJE Program

```
// JOB
// XEQ RJE
.. RJSTART
     JECL statements and OS job
.. RJEND
```

The first two cards are used by the Disk Monitor System to load and start execution of the RJE Work Station Program. After these cards, the JECL statements and the OS jobs follow in the proper sequence. An RJSTART command must be the first card.

The IBM Model 20 work station with its RJE program is supported by the Remote Job Entry facility of the IBM System/360 Operating System. The remote Model 20 operates with a central System/360, Model 40 or above, using the Binary Synchronous Communications (BSC) facility. A user can submit a job at the remote work station for processing by the central system, and can arrange for the resulting output to be retained on the peripheral devices at the central installation or to be returned to either himself or a specified alternate user who may be at a different work station.

MACHINE AND DEVICE REQUIREMENTS

The Model 20 work station program is available for card programming support (CPS) and for tape and disk programming systems (TPS and DPS). The work station program can be generated by means of the RJE macro instruction. Under each system the basic input/output configuration supported includes a card reader, a card punch, and a line printer. Jobs are read from the card reader, and output data sets obtained after processing can be directed to either the card punch or the printer. Only the basic configuration is available under CPS, but under TPS and DPS the following additional facilities may be used:

1. Under TPS, a user may read in part of his input job stream from tape, and may also arrange for output data sets to be placed on tape.

2. Under DPS, a user may read in part of his input from tape or disk, and can arrange for output data sets to be placed on either the tape or disk. Furthermore, a printer-keyboard can be incorporated in the configuration to provide the operator with a central control point during the RJE session.

COMMUNICATION CONSIDERATIONS

The IBM System/360 Model 20 work station is fitted with a Binary Synchronous Communications Adapter (BSCA), and provides the standard RJE communications interface to the RJE communications network using existing BSCA programming support for transmitting and receiving data. Data is transmitted in EBCDIC using the transparency feature of BSCA. Each EBCDIC character transmitted is treated as a bit pattern and any significance it may have as a control character is ignored.

The work station program has two user exit interfaces that allow the user to include his own routines at system generation time, one for editing input records, and one for editing or rerouting output records.

Note: No I/O operations can be requested in the user-written routines.

The telecommunications line configurations supported by the RJE Model 20 work station program are:

1. Point-to-point (contention) operation on a nonswitched line.

2. Point-to-point (contention) operation on a switched line.

3. Centralized multipoint operation on a nonswitched line.

INPUT AT THE WORK STATION

Input is accepted from the card reader and from one or more tape or disk storage devices and under DPS, messages can be entered from the printer-keyboard. OS jobs and work station commands are acceptable input from the card reader. The first statement at work station startup must be an RJSTART command submitted from the card reader. Normally, the program stops reading input with every JOB or JED statement, except for a multipoint program that only checks for output from the central system at the first JOB or JED statement.

In addition to the work station commands that are used by all RJE work stations, the Model 20 has two more, a null command and a DATA command. The null command generates an end-of-file (EOF) indication for the job input stream. The DATA command is used to switch from one input device to another when jobs are submitted from different devices or from one data set to another.

Normal Model 20 utility programs may be used for creating RJE input data sets on tape or disk, or for transferring output data sets from tape or disk to punched cards or a line printer. To accomplish these two functions, the data set must not contain a /* delimiter record (such a record is legitimate data in RJE, but some Model 20 utilities interpret it as an end-

of-data indication) or control characters, and must have a record format acceptable to the Model 20 utility programs. If these three conditions are not met, a special RJE utility program named RJEUT may be used in place of the other Model 20 utility programs. RJEUT modules reside in the macro library and can be generated by means of the RJEUT macro instruction. Input for the program, during the building of input data sets on tape or disk, must be in punched card form.

OUTPUT TO THE WORK STATION

Output to the work station consists of job output and messages. Job output data sets may be either routed through a SYSOUT output stream by specifying a valid SYSOUT class in the SYSOUT parameter of the JCL data definition (DD) statement, or written to devices at the central system by specifying the UNIT and VOLUME parameters on the DD statement. Only output specified as a SYSOUT class can be returned to the work station and be controlled by the JED statement and the work station commands.

Job management messages, including diagnostics of job control statements and allocation and deallocation messages, are returned to the work station printer unless the central operator requests all output to be retained at the central system by using the CENOUT command, which overrides both a SYSOUT specification and a JED statement.

RJE messages are received at the work station to indicate line and I/O errors or to pass on job or system information. If the work station does not have a printer-keyboard, messages sent by the central installation are displayed on the printer between output data sets, and messages originating from the work station program are displayed in code form in the E-S-T-R registers of the Model 20 CPU console. If a printer-keyboard is available, all messages are displayed on this device.

Job input streams are:

1. Basic system (CPS, TPS, DPS):
   - Card reader.
   - Card punch (optional).
   - Line printer.
2. Additional tape or disk I/O facility (TPS, DPS).
3. Additional printer-keyboard facility (DPS only).

See the IBM System/360 Model 20 Remote Job Entry Work Station publication, GC33-4003, for further description of the job input streams.

OPERATING PROCEDURES

Work Station Startup

RJE operation varies according to the I/O facilities available to each user. For detailed descriptions of each system configuration and its particular operating procedures see the IBM System/360 Model 20 RJE Work Station publication, GC33-4003. The following discussion is a general description of the startup procedures that apply to all three configuration types.

For work station startup, contact with the central system must be established by submitting an RJSTART card, which must be the first card of the input deck (or the first card of the first job of the input deck if a large number of jobs are to be submitted or if the jobs are to be submitted in groups at intervals).

In a switched line configuration, the central system must be dialed for the work station to begin operation. If the Auto Call feature is available, the telephone number of the central system must be coded as a parameter in the RJSTART command and the system makes the connection automatically. When no Auto Call feature is available, the operator must dial the central system himself. After contact is made with the central system, the RJSTART ACCEPTED messages is received on the work station printer (see the Starting Up the Work Station section in the Model 20 RJE Work Station publication, GC33-4003, for loading instructions).

Whenever an OS job is received at the central system, an acceptance message is sent back to the work station.

The Null Statement

The null command is provided by the RJE Model 20 work station program as an end-of-file indication for job input and is used whenever required to monitor the central system for output. The command is coded with the identifying characters .. in card columns 1 and 2. There is no operation code nor are there any parameters in the card operand field. The null command causes an end-of-transmission (EOT) character to be sent to the central system and resets the card input indicator in the work station program. The Model 20 work station program enters receive mode and waits for output from the central system. Input from the card reader is resumed when

the operator indicates that further input is available.

Note: This command is not actually transmitted to the central system (unless it is intended as data in the input stream and has been placed between a // DD DATA and a /* delimiter card).

Continuing Output

Output is discontinued by the Model 20 work station program for operator intervention, equipment failure, or incorrect forms in the line printer.

To resume operations after output has been discontinued, the operator must submit a CONTINUE command and press the START key on the CPU after taking the appropriate recovery procedures described below:

1. Forms other than those specified for the output data set are present in the printer, indicated by the message IHK123I DISCONTINUED-CHANGE FORMS TO xxxx. This condition can be corrected by placing the proper forms in the printer and submitting a CONTINUE command at the card reader. The command can be placed at any convenient point between job entries; the central system can continue receiving input but does not send back output until it receives the CONTINUE command.

   Note: Input switches are not set off when the CONTINUE command is submitted. The work station program continues to read input following the CONTINUE command. If the operator wishes to recover discontinued output immediately, he must place a null command behind the CONTINUE command.

2. Equipment Failure. The corrective action for this condition depends on the type of failure that has occurred. For a detailed discussion of the standard procedures for recovering from output device errors, see the IBM Model 20 RJE Work Station publication, GC33-4003. For corrective actions to be used, see the Model 20 Operator Messages section of this manual.

3. Intervention by the operator at the work station. Output operations after operator intervention can be resumed by submitting a CONTINUE command. For corrective actions that can be used, see the Model 20 Operator Messages section of this manual.

   Note: Complete details about the CONTINUE command are available in the Controlling the Output section of the IBM Model 20 RJE Work Station publication, GC33-4003.

Work Station Closedown

When the central system receives an RJEND command, the central system acknowledges receipt of this command by returning to the work station the RJEND ACCEPTED message, along with any other messages that may be pending. On receipt of the RJEND ACCEPTED message, the RJE Model 20 program has finished processing; the work station is closed down and is available for local operations.

ERROR RECOVERY PROCEDURES

The procedures described here are general and do not apply to all situations. For instance, some tape and disk I/O errors require special action, which is indicated in a work station program error message. If a printer-keyboard is incorporated in the system, message codes are displayed on the printer-keyboard rather than in the E-S-T-R registers where they are usually displayed.

Input/Output Device Errors

If an input device error occurs during execution of the Model 20 work station program, a halt occurs and the normal Model 20 IOCS error code is displayed in the E-S-T-R registers on the CPU console. The operator should correct the error and press the START key on the Model 20 console. The RJE program attempts to reestablish connection with the central system, but if it is unsuccessful, a new halt occurs. This halt is identified by a different code indicating that the work station has been disconnected from the central system, and the operator must restart the RJE program (see the Restart Procedure section that follows).

If an output device error occurs in a system with no printer-keyboard, the operator must reload the cards in the card reader, placing a CONTINUE command first, to resume receiving output.

If an output device error occurs in a system with a printer-keyboard, the operator keys in the CONTINUE command from the printer-keyboard (the message code 05A1 -- Enter Command from the Printer-Keyboard -- will be displayed on the printer keyboard). When he has keyed in the command, he must press the EOT key to resume operations.

When the work station resumes operation after a CPU halt for an output device error, any central system output data in the RJE output buffers will be printed,

punched, or sent to the user-exit device. To ensure that no data is lost, some of the data received may be duplicated.

In a switched system, the operator must correct an error within three minutes or the work station connection to the central system will be broken. In a multipoint system, error recovery time is 21 seconds; in a nonswitched point-to-point system, there is no time limit.

Note: If an irrecoverable tape or disk output device error occurs early in an RJE session, it is recommended that an RJEND command be submitted to close down the work station while the error is being corrected. If the error occurs late in the RJE session, it may be more practical to delete the job concerned and process all remaining jobs, or reroute job output to the card punch or the printer by changing the RJE program switch indicator. If output is rerouted, any data that was specified to be sent to the user-exit routine is sent to the printer or the punch. If it is not rerouted, all further tape and disk output is deleted.

Communication Errors

Irrecoverable communication errors occur when contact is lost with the central system because of either line errors or a central system failure. Restart procedures are needed for error recovery.

If a line error occurs, the message code 05E0 is displayed in the E-S-T-R registers. A message may also be received from the central system as soon as restart procedures have been completed.

If the error is caused by a central system breakdown, this fact cannot be known until the work station is restarted.

Restart Procedures

A restart involves reestablishing contact with the central system and the procedure is as follows:

1. Submit a new RJSTART card, together with any other JECL statements needed and any part of the input data that needs to be resubmitted.

2. If the system does not have a printer-keyboard, perform the following operations:

   a. Set DATA switch 1 on the Model 20 CPU console to any nonzero position and press the START key.

   b. Reset DATA switch 1 to zero.

3. If the system has a printer-keyboard, enter an A (or a) at the keyboard.

4. If the system operates on a switched line and does not have the Auto Call feature, the operator must contact the central system by dialing (see the Work Station Startup section).

Note: If the central system has not been closed down beforehand, an RJSTART command submitted in a restart situation implies a CONTINUE command with no operands. Thus, if the work station has been disconnected from the central system while output was being returned, transmission of the discontinued output data set is resumed, upon restart, from the point at which it was discontinued. If the central installation has been closed down in the interim period between disconnection and restart, output transmission resumes at the beginning of the data set.

MODEL 20 RJE OPERATOR MESSAGES

Communication is made with the work station operator by means of a four-digit code. If a printer-keyboard is included in the installation, the code is printed on this printer along with a prefix M (M-05A0, for example). If there is no printer-keyboard included, the code is displayed (without a prefix) in the E-S-T-R registers on the CPU console. For the IOCS codes that are received at the work station and at the central system, see the TPS operation procedures manual, GC24-9009, or the DPS operating procedures manual, GC33-6004.

0501 Message: BSCA or associated modem not ready.

Explanation: The BSCA or the associated modem is not ready.

System Action: The system halts.

Operator Response:

1. Check that the power to the modem is on and that the connection to the BSCA has been made properly.

2. If the Auto Call feature is present, check that the receiver is on the hook and power is switched on to the Auto Call unit.

3. If both the BSCA READY and the DATA SET READY lights are on, enter any nonzero value into byte X"CE" to retry the rejected operation. If the 0501 halt then occurs once more, press

START on the CPU console to proceed to the 05E0 halt and perform the operator response specified in this message code section.

4. If either or both the BSCA READY and DATA SET READY lights are off, press START to proceed to the 05E0 halt.

0510 Message: Establish line connection (switched line only).

Explanation: The operator needs to dial the central system to establish connection.

System Action: The system halts.

Operator Response:

1. Press START on CPU.
2. Set up the address displayed in the E-S-T-R registers in the Address Register switches.
3. Press START and dial the central system.
4. If there is no answer, press STOP on the CPU. Enter FF in the Data Register switches and press START on the CPU. The RJE program goes to the 0510 halt again and the calling procedure may be repeated.

05A0 Message: Operator Request Acknowledgment (printer-keyboard only).

Explanation: The operator has pressed the INTERRUPT REQUEST key.

System Action: The system prepares to receive a reply. The printer-keyboard PROCEED light is on.

Operator Response: Enter one of the following characters at the printer-keyboard and follow it with an EOT.

A or a - Card reader input pending.

B or b - Printer-keyboard input pending.

D or d - Discontinue central system input.

T or t - Terminate RJE abnormally.

N or n - Ignore this request.

E0 or e0- Do not use either the user-exit routine for input or the user-exit routine for output.

E1 or e1- If specified, use the user-exit routine for input; do not use the user-exit routine for output.

E2 or e2- If specified, use the user-exit routine for output; do not use the user-exit routine for input.

E3 or e3- If specified, use both of the user exit routines, one for input and one for output.

U0 or u0- Route the output designated for the user-exit routine to the device specified by the OUTPT parameter in the RJE statement.

U1 or u1- Reroute the user-exit data to the printer.

U2 or u2- Reroute the user-exit data to the punch.

U3 or u3- Delete the output data.

05A1 Message: Enter Command from the Printer-Keyboard.

Explanation: The operator has earlier replied B (or b) to the 05A0 code or an output error has occurred.

System Action: The system prepares to read commands from the printer-keyboard and transmit them to the central system.

Operator Response: Key in the commands. When completed, stop the printer-keyboard input by entering an EOT in the first line position (The extra EOT is not to be entered following a JED statement).

05B0 Message: RJSTART Invalid or Missing.

Explanation: An RJSTART command was not the first card in the card reader at work station startup or the RJSTART was invalid.

System Action: The system prepares to read the RJSTART again from the card reader, halts, and displays the code.

Operator Response: Place a correct RJSTART command in the card reader and press the CPU console START key.

05B1 Message: Invalid JECL statement (printer-keyboard only).

Explanation: One of the following three situations has occurred:

1. A statement that begins with .. (blank) but that has an invalid operation code has been read.
2. A continuation card did not begin in column 16.
3. A statement not beginning with .. (blank) has been entered at the printer-keyboard.

System Action: The system displays the record and prepares to read the corrected statement from the printer-keyboard; the PROCEED light is on.

Operator Response: Correct the command at the printer-keyboard.

05B2 Message: Invalid DATA Command.

Explanation: An invalid DATA command has been found in the input stream.

System Action: One of the following occurs:

1. If no printer-keyboard is attached, the command is displayed on the line printer and the RJE program prepares to read the correction from the card reader.
2. If a printer-keyboard is attached, the incorrect command is displayed on the printer-keyboard and the RJE program prepares to read in the correct command from the printer-keyboard; the PROCEED light is on.

Operator Response: If no printer-keyboard is attached:

1. Remove all cards from the card hopper.
2. Place the corrected DATA command in the card reader, followed by all cards that were originally placed after the old DATA command.
3. If the input file is on tape, rewind the tape reel.
4. Press the START keys on both the card reader and the CPU console.

If a printer-keyboard is attached, enter the correct command at the printer-keyboard.

05B3 Message: Data Set on DATA Command Not Found in Data File.

Explanation: The name on the DATA command does not correspond to any name field in the referenced data file.

System Action: If no printer-keyboard is attached, the system prepares to read the DATA switches on the CPU console. If a printer-keyboard is attached, the system prepares to read the operator response from the printer-keyboard; the PROCEED light is on.

Operator Response: If no printer-keyboard is attached:

1. If the error is in the DATA command, set DATA switch 1 to non-zero and press START. Reset the DATA switch to zero; the program will go to the 05B2 halt.
2. If the input file is on tape, the operator may retry the operation by pressing START (possibly after changing the tape).

   If a printer-keyboard is attached, enter one of the following responses and follow it with an EOT.

   D or d - Display the command by going to the 05B2 halt.

   R or r - Retry the operation on a tape file (possibly after changing the tape).

05C0 Message: Tape Read Error.

Explanation: A tape read error has been detected by the RJE program while reading an input tape file.

System Action: The system resets all program switches and indicators to the restart values and prepares to read an RJSTART command from the card reader. A restart is required because the tape error recovery procedure is so long that connection

with the central system will be lost.

Operator Response: Rewind the tape and perform the standard restart procedures.

05C1 Message: Disk Read Error.

Explanation: A disk read error has been detected by the RJE program while reading an input data set from disk.

System Action: If no printer-keyboard is attached, the system halts and waits for operator action. If a printer-keyboard is attached, the system displays the disk error block, the CCW, and the count area, and prepares to read a character from the printer-keyboard; the PROCEED light is on.

Operator Response:

1. If no printer-keyboard is attached:

   a. Run the cards out of the card reader and reload the cards. This causes the disk data set to be skipped when processing is continued from the card reader.

   b. Press the START key, thus displaying the address of the error block in the E-S-T-R registers.

   c. Dump the error information for later analysis.

   d. Resume operation from the card reader by pressing START once more.

2. If a printer-keyboard is attached:

   a. Reload the cards in the card reader.

   b. Enter A (or a) to start reading from the card reader or B (or b) to read from the printer-keyboard.

05C2 Message: Disk Write Error.

Explanation: A disk write error has been detected while writing to an output data set on disk.

System Action: No more input is received from the central system until a CONTINUE or an RJSTART command has been submitted; no more output to disk will be accepted. If no printer-keyboard is attached, the system halts and displays the error code. If a printer-keyboard is attached, the disk error block, the CCW, and the count area are displayed; the PROCEED light comes on and the program waits for operator action.

Operator Response:

1. If no printer-keyboard is attached:

   a. Reload the cards in the card reader.

   b. Press the START key to display the address of the error block in the E-S-T-R registers.

   c. Dump the error information.

   d. Set DATA switch 1 to zero and press START to resume sending input to the central system (no further output will be received from the central system); or

      Set DATA switch 1 to:

      1 - to reroute user-exit data to the printer.

      2 - to reroute user-exit data to the punch.

      3 - to delete user-exit data.

      Enter a CONTINUE command and press START to resume operations; reset DATA switch 1 to zero.

2. If a printer-keyboard is attached:

   a. Reload the cards in the card reader.

   b. If you wish to read input from cards, enter first the character A (or a) and follow it with:

      0 - to resume operations with no more output.

      1 - to resume operations with user-exit data going to the line printer.

2 - to resume operations with user-exit data going to the punch.

3 - to resume operations and delete user-exit data.

Conclude with an EOT.

c. If you wish to read JECL statements next from the printer-keyboard, rather than from the card reader, enter B (or b) and follow it with a digit with the same meaning as above, concluding with an EOT.

05D0 Message: End of Volume (tape).

Explanation: An End of Volume condition has been detected while writing on tape.

System Action: The system rewinds the tape and halts. The interrupted data set is retransmitted.

Operator Response: Replace the tape and press the START key.

05D1 Message: End of Last Extent (disk).

Explanation: An End of File condition has been detected while writing on disk.

System Action: No more input is received from the central system until a CONTINUE or an RJSTART command has been submitted; no more output to disk will be accepted. If there is no printer-keyboard, the system halts and displays the code. If there is a printer-keyboard, the PROCEED light comes on and the program waits for operator action.

Operator Response: Same as that for the 05C2 message code, if a printer-keyboard is attached. If a printer-keyboard is not attached, the disk error block address is not displayed when the CPU START key is pressed.

05D2 Message: Load Blank Cards.

Explanation: The system has found nonblank cards installed when directing output to the card punch. This message is applicable only to the IBM 2420 Card Read-Punch when both reading and punching cards.

System Action: The system waits for the CPU console START key to be pressed.

Operator Response: Load blank cards and press the START key.

05E0 Message: Line Error.

Explanation: Connection with the central system cannot be started or has been broken.

System Action: The system resets the program indicators and switches to the restart values and prepares to read an RJSTART command from the card reader. The next card will be the card at the read station. If there is a printer-keyboard attached, the error statistics are dumped on the printer-keyboard and the system halts with the PROCEED light on.

Operator Response:

1. If no printer-keyboard is attached:

   a. If a retry is to be made:

      1) Press the START key to display the address of the BSCA IOCS error statistics field (24 bytes long). Dump this for later analysis if desired.

      2) Reload the cards (implies a restart condition because the original RJSTART command will be resubmitted).

      3) Perform standard restart procedures.

   b. If exiting from RJE, press the START key with the DATA switches set on zero.

2. If a printer-keyboard is attached:

   a. If a retry is to be made:

      1) Reload the cards (implies a restart condition).

      2) Perform standard restart procedures.

   b. If exiting from RJE, enter T (or t) and follow it with an EOT.

05E1 Message: Input Aborted By the Central System.

Explanation: The central system did not accept the input because of an error in the input stream or a central system error.

System Action: The system resets all input indicators and starts reading output (messages that explain the reason for the abort). If there is no printer-keyboard, the system prepares to read from the card reader as in message code 05C1. If there is a printer-keyboard, the system halts with the PROCEED light on.

Operator Response:

1. If no printer-keyboard is attached:

   a. Press the START key on the CPU console.

   b. Take action according to the message received from the central system.

2. If a printer-keyboard is attached:

   Reload the cards and enter:

   a. A(or a) to resume operations from the card reader, or

   b. B(or b) to start reading from the printer-keyboard.

05EF Message: End of RJE.

Explanation: RJEND has been acknowledged by the central system.

System Action: The system halts.

Operator Response: This message is always received under CPS at the end of an RJE session and requires no operator action. When it is received under DPS and TPS, it may be necessary to reload the monitor.

USER EXIT INTERFACE

The RJE Model 20 work station program provides two interfaces that enable the user to add his own intermediate handling routines for job input (i.e., OS jobs) and output. In the calling sequences for user-exit routines the work station program refers to entry point names &EXITIN and &EXITOUT. These are symbolic parameters, and the user may specify any entry point names that he wishes for his routines as long as he defines them in the RJE macro statement during generation of the work station program.

Note: When output data is directed to the user exit, the central system transmits all records in their original, unpacked format, even when PACK=YES has been specified in the RJE parameter at system generation time.

For further user exit information and examples, see the Writing the User Exit Routines section of the Model 20 RJE Work Station publication, GC30-4003.

Input User-Exit Routine

For an input user-exit routine, the user must:

1. Save and restore all registers that he plans to use;

2. Establish addressability according to standard linkage conventions;

3. Be aware that the Model 20 RJE work station program makes available every input record, including any JCL and JECL statement in the input stream.

Each input record is 80 bytes long. The address of the next record to be processed by the exit routine is passed in register 9 and the routine is called by the sequence:

```
BAS   14,&EXITIN
DC    X'00'
```

The DC instruction represents a return code. After a record has been processed, the user may overlay the DC instruction, by dynamic indexing, with either a hexadecimal 81 or 01, depending on how he wants the work station program to handle the record when it regains control. The DC values and their meanings are as follows:

- 00 - the work station program checks and transmits the record as usual.
- 01 - the work station program processes the current record as normal, but before reading the next record, adds another record specified by the user.
- 81 - the work station program deletes the record.

Output User-Exit Routine

For an output user-exit routine the user must:

1. Save and restore the registers that he plans to use;

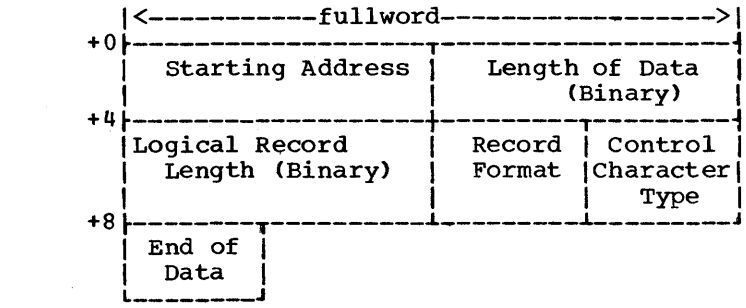
2. Establish addressability according to standard linkage conventions.

After receiving each output data set from the central system, the Model 20 work station program passes control to the user-exit output routine. The register content on entry to the user-exit routine is:

register 14 - return address in the work station program.

register 9 - address of a parameter list describing the output data set.

The output data sets are transmitted in blocks, each of which has a maximum length of 400 bytes. This block and the logical record it contains are specified in a parameter list, which is aligned on a halfword boundary, that has the following format:



Starting Address: The starting address of the transmission block received from the central system.

Length of Data: The length (in binary) of the transmission block.

Logical Record Length: The length (in binary) of each logical record when fixed length records are passed.

Record Format: The type of record transmitted, indicated by a one-byte hexadecimal code:

F1 - Fixed unblocked.
F2 - Fixed blocked.
F3 - Variable unblocked.
F4 - Variable blocked.
F5 - Undefined.

Control Character Type: The type of printer-punch control characters being used, indicated by a one-byte hexadecimal code:

F1 - System/360 machine code.
F2 - USASI.
F3 - No control characters.

End of Data: If this is zero, the end of the user-exit data set is indicated.

Output data may be edited in the line buffer, if it is not expanded to more than 417 bytes. The data received from the central system may be up to 400 bytes long and is framed by two work areas, one 8 bytes long and the other 9 bytes long. The 8-byte work area immediately precedes the data starting address; the 9-byte area follows the output data and begins in byte 400 after the starting address. If it is not possible to edit the data within 417 bytes, the user must specify a work area of sufficient size and transfer the data into it.

After editing data and before returning control to the Model 20 program, the user must:

1. Change the starting address in the parameter list so that it points to the first character of the edited data;

2. Change the length of the data parameter to the length of the edited data;

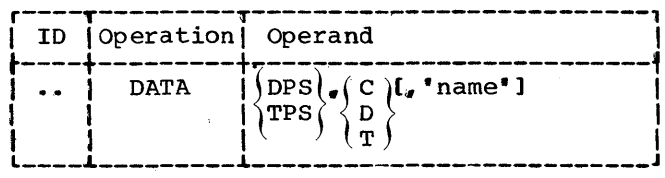
3. Change all other parameters that were invalidated by the editing of the original data.

Note: The logical record length, record format, and control character type parameters are set by RJE when the first block of a data set is received. They are not updated or reset for each subsequent block.

See the Model 20 RJE Work Station publication, GC33-4003, for additional information.

JECL FOR THE MODEL 20 WORK STATION

JECL statements used for the Model 20 work station are the same as those described in the Job Entry Control Language section of this publication, with one addition. The additional statement allows the user to alternate the source of his input between tape or disk input and card input. The format of this statement is as follows:



..
Is the JECL identifier and must be coded in columns one and two.

DATA
Must be preceded and followed by at least one blank.

DPS
TPS
Identifies the card as a Model 20 JECL statement.

C
Indicates that input follows on cards.

D
Indicates that input follows from disk.

T
Indicates that input follows from tape.

'name'
Is an optional parameter that refers to the name field of the data set identifier record. If T,'name' is coded, the work station program searches for a tape data set in which the first eight bytes of the first record contain the same characters as 'name'. For D, 'name', the work station searches for a disk data set with the same characters as 'name' in byte positions 240 through 247 of a particular sector on the disk. If only a T or a D is specified, input reading starts at the beginning of the next data set on the tape or disk, respectively. The 'name' parameter must be enclosed by apostrophes. Any apostrophes within the name must be coded twice; the duplicates are read by the program as one character.

Note: The DATA command is not actually transmitted to the central system (unless it is intended as data in the input stream and has been placed between a // DD DATA card and a /* delimiter).

GENERATING THE MODEL 20 WORK STATION PROGRAM

IBM provides the user with a library containing the complete package of RJE routines written in source language. For the Tape and Disk Programming Systems (TPS and DPS), the RJE routines are located in the macro library of the system tape or disk; for Card Programming Support (CPS), they are in the RJE routine card library.

For CPS, the CTL and RJE statements are required by the RJE Card Generator, an IBM-supplied program that selects statements from the RJE routine library to get the appropriate source deck from the routine library (see the Generating the Work Station Program section of the Model 20 RJE publication, GC33-4003, for further details).

For TPS and DPS, the input for assembly of the RJE routines consists of the RJE macro instruction and appropriate job control cards; output may be either punched into cards or placed on tape (under DPS it will also be written in the relocatable area on the system disk pack). For further information see the Generating the Work Station Program section of the Model 20 RJE publication, GC33-4003.

THE CTL STATEMENT

The format and explanation of the CTL RJE control card is summarized in Figure 14.

Card Columns	Card Punch	Punch Explanation
1-5	//CTL	Constant values
6	blank	Constant
7		Read/punch devices attached during generation:
	1	2501/1442
	2	2501/2520
	3	2501/2560 (2)
	4	2520/1442
	5	2520
	6	2560 (1)/2560 (2)
8	,	Constant
9		Storage available during generation and execution:
	1	8K
	2	12K
	3	16K
10		Constant
11	blank	A normal run to generate a source deck according to the RJE statement submitted; a listing of comments and the coding generated is produced along with the source deck.
	1	A run to print a listing of RJE routines and comments according to the RJE statement submitted; no source deck is produced.
	0	A run to print a listing of the entire RJE Routine Library; no RJE statement is submitted and no source deck is produced.
12	,	Constant
13	Any	A run to produce a new RJE Routine Library deck less the comment cards; no RJE statement is submitted and no source deck is produced. Column 11 must be blank.

Figure 14. Format of RJE CTL Control Card

THE RJE STATEMENT

The format of the RJE statement and the parameters in the general field for TPS, DPS, and CPS are as follows. The operation code, RJE, cannot begin in card column 1 and must be followed by at least one blank. The TERMID keyword operand must agree with that specified in the RJETERM and RJELINE macro instructions in the central RJE system.

Operation	Operand	
RJE	TERMID=termid	
	[,PRTLINE=120] [,PRTLINE=132] [,PRTLINE=144]	[,MSG=CONSOLE] [,MSG=PRINTER]
	[,RDR=READ01] [,RDR=CRP20] [,RDR=MFCM2]	[,PCH=CRP20] [,PCH=PUNCH20] [,PCH=PUNCH42] [,PCH=MFCM1] [,PCH=NO]
	[,INPT=TAPE] [,INPT=DISK] [,INPT=BOTH] [,INPT=NO]	[,OUTPT=PRINTER] [,OUTPT=PUNCH20] [,OUTPT=PUNCH42] [,OUTPT=MFCM1] [,OUTPT=MFCM2] [,OUTPT=CRP20] [,OUTPT=TAPE] [,OUTPT=DISK]
	[,IDRCD=YES] [,IDRCD=NO]	[,EXITIN=name] [,EXITOUT=name]
	[,CONFIG=PTP] [,CONFIG=MPT] [,CONFIG=SW]	[,AUTCALL=YES] [,AUTCALL=NO]
	[,PACK=YES] [,PACK=NO]	
	[,HISPEED=NO] [,HISPEED=BRST] [,HISPEED=TSHARE]	[,OVERLAP=NO] [,RWC=NO] [,RWC=YES]
END	RJGO*	

*For TPS and DPS only, specifying the entry point for the Model 20 work station program.

TERMID=termid
: Specifies the terminal identification of the work station and must be coded on the RJSTART command submitted at work station startup. This is the only parameter required if the remaining default parameters are correct as specified above for the system.

PRTLINE=120
PRTLINE=132
PRTLINE=144
: Specifies the maximum number of print positions available on the line printer. If this parameter is omitted, a print line of 120 characters is assumed.

MSG=CONSOLE
MSG=PRINTER
: Specifies whether or not the work station has a printer-keyboard attached. MSG=CONSOLE indicates that a printer-keyboard is attached (only valid for DPS). JECL statements may be submitted or corrected at the printer-keyboard. All central system messages and work station error messages are displayed at the printer-keyboard. MSG=PRINTER indicates that no printer-keyboard is attached to the work station. Messages from the central system are displayed on the line printer and work station error codes are displayed in the E-S-T-R registers. If this parameter is omitted, the line printer is assumed.

RDR=READ01
RDR-CRP20
RDR=MFCM2
: Specifies the input device. READ01 indicates the 2501 card reader, CRP20 the 2520 card read-punch unit, and MFCM2 the 2560 secondary feed unit. If this parameter is omitted, the 2560 secondary feed unit is assumed.

PCH=CRP20
PCH=PUNCH20
PCH=PUNCH42
PCH=MFCM1
PCH=NO
: Specifies the card output device. CRP20 indicates the 2520 card read-punch unit, PUNCH20 the 2520 card punch, PUNCH42 the 1442-5 card punch, and MFCM1 the 2560 primary feed unit. If NO is coded, the PCH=NO parameter should be specified in the central program. If this parameter is omitted, the 2560 primary feed unit is assumed.

  Note: The same feed on the 2560 cannot be used for both reading (RDR) and punching (PCH or OUTPT) of cards.

INPT=TAPE
INPT=DISK
INPT=BOTH
INPT=NO
: Specifies an alternate input device, besides the card reader, that may be used. TAPE indicates tape input, DISK disk input, and BOTH tape and disk input. NO indicates card reader input only. If this parameter is omitted, card reader input only is assumed.

Note: Disk input may not be specified under TPS or CPS, and tape input is not permitted under CPS.

OUTPT=PRINTER
OUTPT=PUNCH20
OUTPT=PUNCH42
OUTPT=MFCM1
OUTPT=MFCM2
OUTPT=CRP20
OUTPT=TAPE
OUTPT=DISK
Specifies the destination of data sets directed to a user exit. PRINTER indicates the line printer, PUNCH20 the 2520 card punch, PUNCH42 the 1442-5 card punch, MFCM1 the 2560 primary feed unit, MFCM2 the 2560 secondary feed, CRP20 the 2520 card read-punch, TAPE a tape unit, and DISK a disk unit. If this parameter is omitted, the line printer is assumed.

Note: The tape and disk routines will be loaded into main storage only if they are explicitly specified. Although the user may change this designation in his EXITOUT routine at execution time, tape or disk cannot be specified then unless tape or disk is specified here.

If RDR=CRP20 and OUTPT=CRP20 have been specified, then PCH=CRP20 must be specified.

Specifying a card punch other than that designated as PCH will cause a second card output IOCS to be loaded. IF PCH=NO is specified, a card punch cannot be used for output. Disk output may not be specified under TPS or CPS, and tape output is not permitted under CPS.

IDRCD=YES
IDRCD=NO
Specifies whether or not an identifier is to be included in each data set stored on tape. This identifier contains information needed for dumping the data set to card punch or printer using the RJEUT utility program. If this parameter is omitted, no identifier is included in the data sets.

Note: IDRCD=YES is meaningful only if OUTPT=TAPE has been specified.

EXITIN=name
Specifies the entry point of the user-specified routine used for editing input records moved between an input device and a line buffer. For CPS, the name parameter must not exceed four characters. For DPS and TPS, it must not exceed eight characters.

EXITOUT=name
Specifies the entry point of the user-exit routine used for editing output data moved from a line buffer to an output device; the destination of the data may be changed by this routine (see OUTPT parameter). For CPS, the name parameter must not exceed four characters. For DPS and TPS, it must not exceed eight characters.

CONFIG=PTP
CONFIG=MPT
CONFIG=SW
Specifies the communication configuration to be used. PTP indicates a point-to-point operation on a non-switched line, MPT a tributary work station on a multipoint line, and SW a switched network. If this parameter is omitted, point-to-point operation is assumed.

PACK=YES
PACK=NO
Specifies whether or not the work station uses the compress/expand option to allow the central system to suppress blanks in output records to be sent to the line printer or the card punch, and to permit the work station to replace the blanks in the records upon receipt. Compress/expand compatibility between the central system and the remote work station is required. For the Model 20, the central system will pack only that output that is directed to the line printer or to the card punch. If this parameter is omitted, the compress/expand option is assumed to be not present.

Note: The PACK keyword operand must agree with that specified in the RJE-TERM macro instruction for the central RJE system.

AUTCALL=YES
AUTCALL=NO
Specifies whether or not the Auto Call feature is to be used in RJE. AUTCALL=YES is valid only when CONFIG=SW is specified. If this parameter is omitted, it is assumed that the Auto Call feature is not present.

HISPEED=NO
HISPEED=BRST
HISPEED=TSHARE
Specifies the line speed or mode for RJE operations. HISPEED=BRST indicates that the binary synchronous adapter is working in burst mode. There is no overlap between I/O and line operations. HISPEED=TSHARE indicates that only a Model 20, Submodel 5, is being used. This model is capable of overlapping high speed (above 4800 baud)

line operations with local I/O device operations. HISPEED=BRST or TSHARE may be specified only for a PTP nonswitched line configuration. If this parameter is omitted, the work station is assumed neither to be in burst mode nor to have the overlap feature.

OVERLAP=NO
OVERLAP=NO may be used to save main storage (but with degraded performance). Single buffering techniques are used and there is no overlap between I/O and line operations.

Note: When HISPEED=BRST is specified, OVERLAP=NO is generated by default and need not be specified by the user.

RWC=NO
RWC=YES
Specifies whether or not the READ/COMPUTE WRITE/COMPUTE overlap feature, causing all tape and disk files to be processed in overlap mode, is available. If this parameter is omitted, the feature is assumed to be unavailable.

Note: For DPS, if RWC=YES, a Monitor with the RWC feature must be used to process files in overlap mode; for CPS, this parameter is ignored.

THE RJEUT UTILITY PROGRAM

The RJEUT program is a multipurpose program that:

1. Before an RJE session at the Model 20, permits the user to create input data sets on tape or disk suitable for the RJE work station program. Source data must be on punched cards.

2. At the end of an RJE session, allows the user to dump tape or disk output data sets to the card punch or line printer.

3. Allows the user to dump format details of tape or disk output data sets.

All data sets created by RJEUT will contain identification records and only such data sets can be dumped by RJEUT.

For information on generating and using the RJEUT utility program see the Generating the Utility Program section of the Model 20 RJE Work Station publication, GC33-4003. Also included in this publication are examples of programs using RJEUT.

An example of a Remote Job Entry job stream, submitted from a remote work station, with messages and output as they may appear on both remote and central printers, and on printer-keyboards follows. In this example, the remote program has been set up so that RJE messages are printed on the remote printer-keyboard. Also, the central program includes a JOBACK user-exit routine, which builds a message to follow the JOBACK message built by RJE.

User RTP submits items 1-6 at the card reader. As they are read, they are displayed on his printer-keyboard. While the cards are being read and transmitted to the central installation, the responses to the commands begin to appear on the remote printer-keyboard. Since BRDCST=YES is specified on the RJSTART command (1), any active broadcast messages are returned to the work station with the RJSTART accepted message. The 01B in this message at the central printer-keyboard is the communication line number. The LOGON accepted message follows (2).

As soon as the central RJE system receives the two jobs, it returns job accepted messages with the user-built messages (3), (4). After job D12 starts, the central operator enters a SHOW JOBS command (7) and learns that there are two jobs in the RJE system, neither of which is complete. After the D12 ENDED message appears at the central printer-keyboard, the output is transmitted to the remote work station. The JED option specified is CENTRAL=ALL (3), so that only the JCL and scheduler messages are returned to the remote printer. The output from both the link edit and go steps appears on the central printer.

The initial response to the ALERT command (5) shows that the job D16 is not complete. With the completion of the job, the second ALERT response (the notification message) is displayed. Notice that this happens after D16 ENDED appears at the central printer-keyboard.

Now user POK submits items 8-12 and logs on (8). The ALERT (9) submitted by POK gets an immediate response since D16 is already complete. The OUTPUT command (10) does not cause the output from D16 to be returned because POK is the alternate user rather than the source. POK then receives a notice that his alerts have been canceled as a result of the ALERT / (11). The STATUS command indicates that D16 completed normally (12), so POK submits an OUTPUT * (13) and receives the job output (13) at the remote printer.

Then POK submits an RJEND (14), thus logging off and placing the work station in an inactive state.

Note: The T's shown in the example represent optional sequence numbers, up to eight alphameric characters, contained in columns 73-80 of each card in the job stream.

CENTRAL PRINTER KEYBOARD

REMOTE PRINTER

CENTRAL PRINTER

(1)
IHK000I RJSTART ACCEPTED RALEIGH 01B

(3)
IEF403I D12 STARTED

(7)
SHOW JOBS
IHK028I D12 RTP N/A INCP I
IHK028I D16 RTP POK INCP D 000
(3)
IEF404I D12 ENDED
(4)
IEF403I D16 STARTED

(3)
//D12 JOB MSGLEVEL=1,REGION=100K
--JECL and allocation messages--

(3)
----output from link edit step----
----output from go step----

(4)
IEF404I D16 ENDED

(13)
//D16 JOB MSGLEVEL=1,REGION=100K
--JCL and allocation messages--
----output from link edit step----
--JCL and allocation messages--
----output from go step----

(14)
IHK003I RJEND ACCEPTED RALEIGH

REMOTE CARD READER INPUT

```
(1)
. . RJSTART RALEIGH,BRDCST=YES   T1
(2)
. . LOGON RTP,XYZ                T2
```

```
(3)
. . JED CENTRAL=ALL              T3
//D12 JOB MSGLEVEL=1,REGION=100K
//   EXEC LKEDG
//LKED.SYSIN DD *
--object modules--
/*
//GO.DATAOUT DD SYSOUT=A
//GO.SYSIN DD *
--data--
/*
(4)
. . JED OUTPUT=(DEFER,POK)       T4
//D16 JOB MSGLEVEL=1,REGION=100K
//   EXEC LKEDG
//LKED.SYSIN DD *
--data--
/*
```

```
(5)
. . ALERT D16                    T5

(6)
. . LOGOFF                       T6
```

```
(8)
. . LOGON POK,ABC
(9)
. . ALERT *
```

```
(10)
. . OUTPUT
```

```
(11)
. . ALERT /

(12)
. . STATUS U=RTP
```

```
(13)
. . OUTPUT *

(14)
. . RJEND
```

REMOTE PRINTER-KEYBOARD

```
(1)
IHK120I BROADCAST MESSAGES FOLLOW
--broadcast message - if there are any--
IHK120I BROADCAST MESSAGES END
--delayed messages - if there are any--
IHK100I RJSTART ACCEPTED T1
(2)
IHK101I USER LOGGED ON RTP T2
```

```
(3)
IHK117I JOB ACCEPTED D12 RTP EXECUTING JED
***THIS MESSAGE BUILT BY JOBACK USER EXIT
(4)
IHK117I JOB ACCEPTED D16 RTP EXECUTING JED
***THIS MESSAGE BUILT BY JOBACK USER EXIT
```

```
(5)
IHK105I JOB(S) NOT COMPLETE ALERT RTP
        D16 T5

(6)
IHK102I USER LOGGED OFF RTP T6
```

```
(5)
IHK109I NOTIFY D16 RTP

(8)
IHK101I USER LOGGED ON POK
```

```
(9)
 IHK109I NOTIFY D16 POK
```

```
(10)
IHK154I NOT AVAILABLE OUTPUT POK
```

```
(11)
IHK115I ALERTS CANCELLED POK
(12)
IHK108I STATUS D16 RTP NORMAL END
```

```
(14)
IHK103I RJEND ACCEPTED
```

NOTES

CORE REQUIREMENTS

(1) RJE Region

Dynamic Storage Requirements:

RJE region (MVT) or partition (MFT)

$$46596+408A+1516B+76C+24D+18E+72G+16H+(13+10X_1)I+(13+9X_2)J+K+L+O+P+Q+R+S+T+64U+8V+[(624+N_1)+(624+N_2)+...+(624+N_n)]^1$$

where

A
is the number of line groups.

B
is the number of lines.

C
is the number of terminals.

D
is the number of jobs.

E
is the number of users.

G
is
(a) the number of completed remote jobs that can be in the central RJE system using MFT.
(b) zero if MVT is being used.

H
is the number of dial lines.

X_1
is the total number of 2780 terminals connected on a multipoint lines.

X_2
is the total number of 1130 terminals connected on multipoint lines.

I
is the number of multipoint lines for 2780s.

J
is the number of multipoint lines for 1130s.

K
is
(a) 8192 if RJE is used in an MVT configuration with IEFVHA in the link pack area or 40,960 if IEFVHA is not in the link pack area.
(b) 30720 if RJE is used in a 30K design MFT configuration or 45056 in a 44K design MFT.

L
is
(a) 320 if a RAM or link pack area is specified.
(b) 1112 if a RAM or link pack area is not specified.

O
is
(a) zero if BTAM is included in RAM or link pack.
(b) 5000 if BTAM is not included in RAM or link pack.

P
is
(a) zero in MVT if IEFQMSSS, IEFQMDQ2, IEFQDELE are included in link pack, 6000 if not included.
(b) 6000 if RJE is used in an MFT configuration.

Q
is
(a) zero if the JOBACK user exit is not included.
(b) the size of the user exit including dynamic work areas if the JOBACK user exit is included.

R
is
(a) zero if the JOBCARD user exit is not included.
(b) the size of the user exit including dynamic work areas if the JOBCARD user exit is included.

S
is
(a) zero if the COMMERR user exit is not included.
(b) the size of the user exit including dynamic work areas if the COMMERR user exit is included.

T
is
(a) zero if the compress/expand facility is not included.
(b) 832 if the compress/expand facility is included.

---

[1]The sum within the brackets must be raised to the next multiple of 2K and the entire total raised to the next multiple of 2K for MVT environments.

U
is the total number of MSGQEBs specified in the RJELINE macro instructions.

= 256 if the default number (4) is used.

V
is the total number of JOBQEBs specified in the RJELINE macro instructions.

= 80 if the default number (10) is used.

N_1 to N_n
are the block sizes of the SYSOUT data sets for each line simultaneously sending output.

The number of members of the series $[(624+N_1)+(624+N_2)+...(624+N_n)]$ is determined by the maximum number of lines simultaneously sending output.

In installations expecting to run RJE concurrently with local readers, it is desirable to load IEFVHA in the link pack area to allow its sharing among the multiple readers. If little concurrent usage of multiple readers is expected, IEFVHA should not be included in the link pack area. This will make the additional 32K available when the STOP RJE command is issued.

(2) System Queue Area (MVT)

The size of the system queue area for RJE can be calculated with the following algorithm:

SQA=3568+92A+100B+80C+144D+48E+96F

where

A = number of line groups - from RJELINE macros.

B = number of lines - from RJELINE macros.

C = number of nonresident RJE modules that are active at one time (assume 1 or 2 as an average).

D = number of access method modules that are active at one time (4 is the maximum for BTAM and they are usually all active; assume an average of 1 or 2 for BSAM.

E = number of completed remote jobs residing in the central system (the maximum value for E is the number of jobs the RJE system will support).

F = number of queued RJE central commands that are specified in the RJETABL macro.

(3) System Queue Area (MFT)

The size of the system queue area for RJE can be calculated with the following algorithm:

SQA=96A

where A=number of queued RJE central commands that are specified in the RJETABL macro.

DIRECT ACCESS REQUIREMENTS

(1) 2311 Disk Storage Drive

The number of tracks in the requirements for direct access space on the IBM 2311 Disk Storage Drive is calculated by use of the following algorithm:

$$\left[\frac{J}{42}\right]+\left[\frac{J}{22}\right]+\left[\frac{U}{46}\right]+\left[\frac{W}{22}\right]+ 11$$

where

J = number of jobs in system.

U = number of users.

W = number of work stations.

[] indicates raising the result to the next highest integer.

(2) 2314 Direct Access Storage Facility

Track requirements for direct access storage space in the IBM 2314 Storage Facility are calculated using the following algorithm:

$$\left[\frac{J}{58}\right]+\left[\frac{J}{36}\right]+\left[\frac{U}{62}\right]+\left[\frac{W}{31}\right]+ 8$$

The symbols used are explained above.

The ability of the RJE system to provide proper service to each line in the system is dependent upon the number of lines attached and concurrently operating.

The maximum number of lines that can be properly supported depends on many variables including CPU size, line speed, job mix, channel and disk arm contention, etc.

Although this number is difficult to predict, the system does provide clues that the optimum performance point for any particular configuration has been passed. These clues are in the form of the following messages at the central console:

```
IEA0001   I/O ERR, XXX, 02, 0D00,
                              0000V91000000

IEA0001   I/O ERR, XXX, 01, 0D00,
                              0000V08000000
```

where

XXX
is the line address.

When these messages occur at the central CPU, the remote work station associated with line XXX is logically disconnected from the system and an RJSTART is required to resume communication. This has the effect of temporarily reducing the load on the system and allowing it to service the remaining lines properly.

Insofar as the specific machine configuration allows, observance of certain guidelines insures optimum performance from the system. Particularly if the messages described above appear, any or all of the following options should be incorporated into the system:

- SYS1.LINKLIB, SYS1.SVCLIB, SYS1.SYSJOBQE as well as any other highly utilized data sets (e.g., SYS1.FORTLIB in a primarily FORTRAN shop) are placed on separate devices and separate channels.
- SYSIN blocking of 400 characters per block is specified in the RJE procedure.
- Priority Queuing is specified in the system generation IODEVICE macro for DASDs containing highly utilized RJE data sets (including SYS1.LINKLIB, SYS1.SVCLIB, and SYS1.SYSJOBQE).
- The compress/expand feature is available for operations on CPU work stations.
- The 2780 blocking facility is automatically provided by the RJE system.

Maximum use of the resident SVC option is made. This option is requested by including TRSVC in the RESIDNT keyword subparameter list on the SUPRVSOR system generation macro. Transient SVCs used by RJE not in the standard list are:

SVC 22	IGC0002B
SVC 23	IGC0002C
SVC 27	IGC0002G
SVC 29	IGC0002I
SVC 32	IGC0003B
SVC 35	IGC0003E
SVC 64	IGC0006D

Maximum use of the link pack (MVT) or RAM option is made. This option is requested by including RENTCODE(MVT) or ACSMETH(MFT) in the RESIDNT keyword subparameter list on the SUPRVSOR system generation macro. Including those reentrant modules of the job scheduler (IEFVHA) and queue manager in link pack if they are active tasks while RJE is in the system, results in overall reduction of main storage usage. Modules used by RJE that could be placed in the MVT link pack area are:

IEFQDELE
IEFQMDQ2
IEFQMSSS
IEFVHA.

The use of the link pack, RAM resident SVC, and BLDL options is described in the publication IBM System/360 Operating System: System Programmer's Guide, GC28-6550.

Specifying FETCH=PCI and OVERLAY=ADVANCED in the CTRLPROG macro and DESIGN=44K in the SCHEDULR macro will greatly enhance RJE performance in an MFT system. In any event FETCH=PCI should be specified for RJE operation in the MFT system. It is not necessary to specify these in MVT because they are assumed to be as indicated above.

In addition, common access methods used by other programs that operate while RJE is in the system may be placed in link pack or in RAM. The access method modules used by RJE that are not in the standard list are the following:

BTAM	IGG019MA
	IGG019MB
	IGG019MS

Placing frequently used nonresident modules used by RJE in the BLDL option is requested by specifying BLDLTAB in the RESIDNT keyword subparameter list in the SUPRVSOR system generation macro instruction. The names of frequently used RJE modules are the following:

IEFLOCDQ	IHKCHUMB
IHKCAOSR	IHKCHUMC
IHKCARJN	IHKCHUMD
IHKCBLGN	IHKCHUME
IHKCBRJS	IHKCHUMF
IHKCDBIN	IHKCHUMG
IHKCDBTW	IHKCHUMH
IHKCDBTX	IHKCHUMI:
IHKCDMDQ	IHKCHUMJ
IHKCDMEQ	IHKCHUM1
IHKCDMSH	IHKCHUM2
IHKCDRMV	IHKCHUM3
IHKCFQOP	IHKCHUM4
IHKCFSTB	IHKCHUM5
IHKCGDT2	IHKCHUM6
IHKCHJPR	IHKCHUM7
IHKCHNDJ	IHKCHUM8
IHKCHUMA	IHKCHUM9

BSAM - Basic Sequential Access Method
BSC - Binary Synchronous Communication
BTAM - Basic Telecommunications Access Method

CCW - Channel Command Word
CPU - Central Processing Unit

DASD - Direct Access Storage Device
DCB - Data Control Block
DEB - Data Extent Block
DECB - Data Event Control Block

ECB - Event Control Block
EOB - End of Block
EOD - End of Data
EODAD - End-of-Data Address
EOF - End of File
EOT - End of Transmission

ID - Identification
I/O - Input/Output

JCL - Job Control Language
JECL - Job Entry Control Language
JED - Job Entry Definition

MCS - Multiple Console Support feature of the IBM System/360 Operating System
MFT - Multiprogramming with a Fixed Number of Tasks
MVT - Multiprogramming with a Variable Number of Tasks

OS - IBM System/360 Operating System

RJE - Remote Job Entry
RVI - Reverse Interrupt Line Control Character

SMF - System Management Facilities Feature of the IBM System/360 Operating System

TCU - Transmission Control Unit
Termid - Terminal Identification
TTR - Relative Track and Record Number

UDIR - User Directory
Userid - User Identification

NOTES

Indexes to systems reference library manuals are consolidated in the publication IBM System/360 Operating System: Systems Reference Library Master Index, GC28-6644. For additional information about any subject listed below, refer to other publications listed for the same subject in the Master Index.

READER'S COMMENT FORM

IBM System/360 Operating System
Remote Job Entry

GC30-2006-4

- How did you use this publication?

  As a reference source ☐
  As a classroom text ☐
  As a self-study text ☐

- Based on your own experience, rate this publication . . .

As a reference source:	Very Good	Good	Fair	Poor	Very Poor
As a text:	Very Good	Good	Fair	Poor	Very Poor

- What is your occupation?

- We would appreciate your other comments; please give specific page and line references where appropriate. If you wish a reply, be sure to include your name and address.

- Thank you for your cooperation. No postage necessary if mailed in the U.S.A.

YOUR COMMENTS, PLEASE . . .

This publication is one of a series that serves as a reference source for systems analysts, programmers, and operators of IBM systems. Your answers to the questions on the back of this form, together with your comments, help us produce better publications for your use. Each reply is carefully reviewed by the persons responsible for writing and publishing this material. All comments and suggestions become the property of IBM.

Please note: Requests for copies of publications and for assistance in using your IBM system should be directed to your IBM representative or to the IBM sales office serving your locality.

Fold Fold

FIRST CLASS
PERMIT NO. 569
RESEARCH TRIANGLE PARK
NORTH CAROLINA

BUSINESS REPLY MAIL
NO POSTAGE STAMP NECESSARY IF MAILED IN U. S. A.

POSTAGE WILL BE PAID BY . . .

IBM Corporation
P. O. Box 12275
Research Triangle Park
North Carolina 27709

Attention: Publications Center, Dept. E01

Fold Fold

Cut Along Line

IBM System/360 OS RJE (S360-36) Printed in U.S.A. GC30-2006-4

IBM®

International Business Machines Corporation
Data Processing Division
112 East Post Road, White Plains, N.Y. 10601
[USA Only]

IBM World Trade Corporation
821 United Nations Plaza, New York, New York 10017
[International]

International Business Machines Corporation
Data Processing Division
112 East Post Road, White Plains, N.Y. 10601
[USA Only]

IBM World Trade Corporation
821 United Nations Plaza, New York, New York 10017
[International]

IBM **Technical Newsletter**

File Number S360-36

Re: Order No. GC30-2006-4

This Newsletter No. GN30-2543

Date September 15, 1970

Previous Newsletter Nos. None

IBM SYSTEM/360 OPERATING SYSTEM
REMOTE JOB ENTRY

This Technical Newsletter provides replacement pages for the IBM System/360 Operating System Remote Job Entry SRL, GC30-2006-4. These replacement pages remain in effect for subsequent releases unless specifically altered. Pages to be inserted and/or removed are listed below.

51,52

A change to the text or a small change to an illustration is indicated by a vertical line to the left of the change.

Summary of Ammendments

This Technical Newsletter adds for the RJE central operator messages information made available by the release of the Conversational Remote Job Entry (CRJE) program.

Note: Please file this cover letter at the back of the publication to provide a record of changes.

IBM Corporation, Publications Center, Dept. E01, P.O. Box 12275, Research Triangle Park, N.C. 27709

PRINTED IN U.S.A.

Note: The description of each message includes an operator, user, or programmer response. A more detailed response is included in the publication IBM System/360 Operating System: Messages and Codes, GC28-6631. Refer to this publication before responding to any message or contacting your IBM representative.

IEE301I jjj CANCEL COMMAND ACCEPTED

Explanation: Job jjj was cancelled in response to a CANCEL command, by the remote job entry (RJE) or conversational remote job entry (CRJE) procedure or by the operating system. If the job was cancelled by the operating system, messages will follow explaining the reason for cancellation.

System Action: All references to the job are deleted from the system.

Operator Response: None.

IEE305I {NO CORE / (blanks) / CSCB USE} COMMAND INVALID

Explanation: NO CORE indicates that main storage was not available to process the central command.

If blanks appear, the operand of the central command was too long, or a framing quote was not found within 62 bytes.

CSCB USE indicates that the maximum number of central commands had been enqueued when another central command was submitted.

System Action: The command is rejected.

Operator Response: When NO CORE or CSCB USE is printed, resubmit the command at a later time. If blanks appear, correct the command and resubmit it.

IEE326I {CRJE / RJE/CRJE} NOT SUPPORTED

Explanation: RJE or CRJE was not in the system, or CRJE alone was not in the system, or they had not yet completed initialization when an RJE or CRJE central command was submitted.

System Action: The command is rejected.

Operator Response: Resubmit the command after RJE or CRJE is started and has completed initialization.

IHK000I RJSTART ACCEPTED termid unitname

Explanation: A work station (termid) has logically attached itself to the central system and is using the communications line (unitname).

System Action: Central resources are made available to the work station.

Operator Response: None.

IHK001I { uuu kkk {OFF / OFF termid / ON termid} unitname / NO USERS IN DIRECTORY }

Explanation: This is the response to a SHOW USERS or a SHOW USERS, userid command:

where

uuu
is the assigned userid.

kkk
is the associated protection key.

OFF
indicates the user is currently logged off.

ON
indicates the user is currently logged on.

termid
is the work station where the user was last or is currently logged on.

unitname
is the communication line currently being used by the work station.

NO USERS IN DIRECTORY
indicates there are no entries for that user in the User Directory.

System Action: Reporting continues until the request has been honored.

Operator Response: None.

IHK003I RJEND ACCEPTED termid

Explanation: The work station (termid) has logically detached itself from the central system.

System Action: The work station is logically detached from the central system.

Operator Response: None.

IHK004I NO JOB(S) IN SYSTEM [jobname]

Explanation: A display of remotely submitted jobs resident in the central system has been requested. No remotely submitted jobs are in the central system or a CENOUT or SHOW command for job (jobname) was issued and it was not found in the RJE system.

System Action: None.

Operator Response: None.

IHK005I JOB(S) NOT COMPLETE jobname userid

Explanation: A CENOUT command for a job (jobname) was issued and the job was not complete.

System Action: The request is ignored.

Operator Response: Resubmit the command when the job is completed.

IHK007I JOB DELETED jobname

Explanation: Either a job (jobname) submitted at the central system has placed output in the RJE SYSOUT class, the central operator deleted a user with jobs in the system, or the operator started RJE with FORM specified on the START command after warmstarting the operating system.

System Action: The job and its output are deleted.

Operator Response: The operator should tell the programmer who submitted the job not to use the RJE SYSOUT class if the job deleted was a job submitted at the central installation.

IHK011I MSG PENDING STARTUP {NONE / termid / termid NONE}

Explanation: The operator has requested either a display of messages waiting for a work station startup or transmission of a message to an inactive work station. If a display was requested, the requested messages are displayed. NONE indicates that no messages are pending.

termid NONE
indicates there are no messages waiting for a specified terminal.

System Action: If a display has been requested, reporting continues until all the pending messages requested are displayed. If message transmission has been requested, the message is held until the work station initiates startup procedures, unless the central operator deletes the message.

Operator Response: None.

IHK012I MSG QUEUED FOR DELIVERY {userid / termid / TERMINALS}

Explanation: The message specified in the MSG command is awaiting delivery either to the specified user (userid), to a specified work station (termid) or to all active work stations (TERMINALS).

System Action: The message is transmitted as soon as the work station will accept it.

IBM **Technical Newsletter**

File Number S360-36

Re: Order No. GC30-2006-4

This Newsletter No. GN30-2547

Date February 15, 1971

Previous Newsletter Nos.
GN30-2543

IBM SYSTEM/360 OPERATING SYSTEM
REMOTE JOB ENTRY

This Technical Newsletter, a part of OS Release 20, provides replacement pages for the IBM System/360 Operating System Remote Job Entry SRL, GC30-2006-4. These replacement pages remain in effect for subsequent versions and releases unless specifically altered. Pages to be inserted and/or removed are:

Cover-4
9-12
19,20
37-40
40.1 (added)
41,42
55-62
62.1,62.2 (added)
63-68
71,72
77,78
93,94
97-102
102.1 (added)
103,104
141-Back Cover

A change to the text or a small change to an illustration is indicated by a vertical line to the left of the change.

Summary of Amendments

This Technical Newsletter adds information that reflects maintenance changes made to RJE for OS Release 20.

Note: Please file this cover letter at the back of the publication to provide a record of changes.

IBM Corporation, Publications Center, Dept. E01, P.O. Box 12275, Research Triangle Park, N.C. 27709

PRINTED IN U.S.A.

File No. S360-36
Order No. GC30-2006-4

OS

IBM Systems Reference Library

IBM System/360 Operating System

Remote Job Entry

Program Number 360S-RC-536

This publication is designed to present the general concepts and facilities of Remote Job Entry (RJE). RJE allows users at remote locations to submit jobs over communications lines to an IBM System/360. It is available to users with either multiprogramming version of the IBM System/360 Operating System: multiprogramming with a variable number of tasks (MVT) or multiprogramming with a fixed number of tasks (MFT).

Information on the capabilities and uses of RJE, on the operating environments, and on work station states and activities is included for the systems programmer and operator. The Job Entry Control Language is introduced and explained. The Job Entry Definition Statement, work station commands, messages sent to work stations, and central commands are discussed in terms of their functions, and how the user employs them in his RJE application.

A discussion of RJE generation includes the necessary macro instructions. Communication Serviceability Facilities, such as error recovery procedures, and system restart procedures, are discussed separately as well as with the work stations.

Information about the IBM 2770 Data Communication System with the IBM 2772 Multipurpose Control Unit is included in this publication with descriptions of the input/output devices and RJE functions that are available.

A discussion of programming information for the 2780 Data Transmission Terminal and for the 1130 Computing System is included.

Fifth Edition (June 1970)

This is a major revision of, and obsoletes, C30-2006-2 and Technical Newsletters N30-2521, N30-2522, and N30-2530. The publication IBM System/360 Operating System: Remote Job Entry, Planning for IBM 2770 RJE Support, GC30-2015-0, is also obsoleted by the inclusion of RJE 2770 information in this edition. Changes to the text, and small changes to illustrations, are indicated by a vertical line to the left of the change; changed or added illustrations are denoted by the bullet symbol (•) to the left of the caption.

This edition applies to Release 20 of IBM System/360 Operating System, and to all subsequent releases until otherwise indicated in new editions or Technical Newsletters. Changes are continually made to the specifications herein; before using this publication in connection with the operation of IBM systems, consult the latest IBM System/360 SRL Newsletter, GN20-0360, for the editions that are applicable and current.

Requests for copies of IBM publications should be made to your IBM representative or to the IBM branch office serving your locality.

A form is provided at the back of this publication for reader's comments. If the form has been removed, comments may be addressed to IBM Corporation, Publications Center, P.O. Box 12275, Research Triangle Park, North Carolina 27709

PREFACE

Remote Job Entry (RJE) extends operating system facilities to remote users. This publication describes the facilities provided by RJE, the use of these facilities and the creation of an RJE system. A brief description of the related telecommunications systems is included. Operating procedures are defined for the central installation and the various work stations. This publication also introduces Job Entry Control Language (JECL) with which a user requests, controls, and maintains RJE facilities in the system.

The RJE user should be familiar with the concepts and terminology introduced in:

IBM System/360 Operating System:

- Concepts and Facilities, GC28-6535
- Job Control Language User's Guide, GC28-6703
- Job Control Language Reference, GC28-6704

The installation programmer responsible for the creation and maintenance of the central RJE system also should be familiar with:

IBM System/360 Operating System:

- System Generation, GC28-6554
- Basic Telecommunications Access Method, GC30-2004
- System Programmer's Guide, GC28-6550

Publications relevant to programming and operation of remote work stations are:

IBM System/360 Work Station

IBM System/360 Basic Operating System:

- System Generation and Maintenance, GC24-5060
- Programmer's Guide, GC24-3372
- Operating Guide, GC24-3450
- Operator Messages, GC24-5024
- Assembler With Input/Output Macros, GC24-3361

IBM System/360 Basic Programming Support:

- Programmer's Guide, GC24-3354
- Operating Guide - Basic Tape System (8K), GC24-3391
- System Generation and Maintenance, GC24-5061
- Assembler With Input/Output Macros, GC24-3355

IBM 2770 Data Communication System

- System Components, IBM 2770 Data Communication System, GA27-3013
- IBM 2770 System Summary, GA27-3014

IBM 2780 Data Transmission Terminal Work Station

- IBM 2780 Data Transmission Terminal Component Description, GA27-3005

IBM 1130 Computing System Work Station

- IBM 1130 Functional Characteristics, GA26-5881
- IBM 1130 Disk Monitor System, Version 2, Programming and Operator's Guide, GC26-3717

IBM System/360 Model 20 Work Station

IBM System/360 Model 20:

- Remote Job Entry Work Station, GC33-4003
- Functional Characteristics, GA26-5847
- Operator's Guide, G229-2137
- Input/Output Control System for the Binary Synchronous Communications Adapter Operating Procedures, GC33-4002
- Tape Programming System Operating Procedures, GC24-9009
- Disk Programming System Operating Procedures, GC33-6004

The Remote Job Entry (RJE) facility of the operating system (OS) provides, for an IBM System/360 with attached communication lines, an efficient and convenient method of entering jobs submitted from remote work stations into the job stream. Once a job has been entered into the job stream by RJE, execution of the job proceeds under the supervision of the operating system job management routines. All data sets created by the job are handled by the operating system data management routines. Output data sets that have been created by remotely submitted jobs and that are to be returned to the remote user are placed in a separate output class. These data sets are removed from this output class and returned to the remote user under the direction of the RJE program. This type of operation provides a remote user with the same batch-computing facility that is available at the central installation.

The capability to accept input automatically from remote stations greatly increases the need for strong system discipline. For example, if a job requiring data sets at the central installation is to be submitted, the volume containing the data set involved must be available for prompt mounting. Otherwise, the system job flow can be upset or interrupted. A job requiring a large amount of main storage also can cause a system problem since processing is delayed until main storage is available.

The Remote Job Entry system provides several facilities to assist installation managers in controlling access to the system, to regulate job flow, and to provide information on system status. User exits (to examine JOB cards, for instance), the broadcast facility, remote and central messages, and the Job Entry Control Language are provided for orderly and efficient system control.

RJE not only provides a means for efficient operation of computing facilities by equipment centralization, but also gives substantial computing power on a demand basis to locations not requiring it on a regular basis. In addition, it allows sharing of a common body of information within a company by widely separated organizational units having related requirements.

RJE provides fast turnaround of computer requirements for people in all parts of a company by placing the computer facilities close to the source of input with high-speed communication lines.

EQUIPMENT AT THE CENTRAL COMPUTING SYSTEM

Remote Job Entry operation is possible either with an IBM System/360, having at least 512K bytes of main storage, which uses the operating system providing multiprogramming with a variable number of tasks (MVT), or with an IBM System/360, having at least 256K bytes of main storage, which uses the improved operating system providing multiprogramming with a fixed number of tasks (MFT). The only additions to the minimum requirements for both MVT and MFT are:

- An IBM 2701 Data Adapter Unit with Synchronous Data Adapter - Type II, an IBM 2703 Transmission Control Unit, with the binary synchronous features, or a World Trade Binary Synchronous Communications Adapter, equipped for EBCDIC code and full transparency operation. The dual communications interface feature is supported on the 2701.

- Direct access storage space for RJE tables is typically less than one IBM 2311 Direct Access Storage Device (DASD). Exact requirements depend on the number of jobs, users, and work stations supported by the system, and the direct access device used (see Appendix B).

- Direct access space for SYSIN data from remotely submitted jobs. The space required is dependent on the SYSIN requirements for the installations.

For example, a system allowing up to 100 active remote jobs, 10 work stations, and 30 users would require 18 tracks of 2311 DASD storage for RJE tables plus the additional SYSIN requirements.

REMOTE WORK STATIONS SUPPORTED

Any of the following devices can serve as work stations in the RJE system.

IBM SYSTEM/360

An IBM System/360, 16K or larger, may be used as an RJE work station. It can be connected to the central System/360 via a switched or nonswitched, point-to-point contention, communications line through an IBM 2701 Data Adapter Unit with Synchronous Data Adapter, Type II with EBCDIC transparency, or through a World Trade Binary Synchronous Communications Adapter that is supported for OS BTAM operation.

The following I/O units are required for RJE operation:

- Card reader and card punch, or a card read punch.
- Printer.
- 1052 Printer-Keyboard.

RJE also supports the following special features on the 2701:

- Auto Call.
- Dual Communications Interface.

IBM 2770 DATA COMMUNICATION SYSTEM

The IBM 2770 Data Communication System with the 2772 Multipurpose Control Unit (hereafter called a 2770) may be used as a Remote Job Entry (RJE) work station. It can be connected to a central System/360 by a switched or nonswitched, point-to-point contention line, or a nonswitched multipoint line. On switched point-to-point lines or nonswitched multipoint lines, the 2770 may be intermixed with the IBM 2780 Data Transmission Terminal, the IBM 1130 Computing System, and the IBM System/360 Model 20 or larger. The following features are required:

- EBCDIC Transparency.
- A Card Reader.
- A Printer.
- EBCDIC Transmission Code.
- Print Line (either 120-character or 132-character).

In addition, a punch unit, 2770 Multipoint Line Control, and Expanded Buffer special features are supported. The printer-keyboard is not a supported I/O device for RJE operation. The other input/output devices available for the 2770 (except those listed above) are also not supported by RJE. The card reader, the printer, and the punch are the only devices supported by RJE and the card reader and the printer are mandatory for RJE operation.

IBM 2780 DATA TRANSMISSION TERMINAL

The IBM 2780 Data Transmission Terminal (Model 1 or 2) may be used as an RJE work station. It can be connected to the central System/360 by a switched or nonswitched point-to-point contention line, or a nonswitched multipoint line. The following special features are required:

- EBCDIC Transmission Code.
- EBCDIC Transparency.
- Print Line (either 120-character or 144-character).
- Auto Turnaround (only required on Model 2).
- Extended (Enquiry-ENQ) Retry Transmission.

In addition, the following 2780 special features are supported:

- Multipoint Line Control.
- Multiple Record Transmission for printed output.
- Operator Intervention

Note: If the Operator Intervention feature is not present, the 2780 does not recognize an RVI character and does not exhaust all card input from the card hopper before sending an EOT to cause mode turnaround from input to output.

IBM 1130 COMPUTING SYSTEM

An IBM 1130 Computing System may also be used as an RJE work station. The 1130 work station requires an 1131 CPU (Central Processing Unit), including a console printer-keyboard, with a single disk storage drive and at least 8K words of main storage. The system is connected to a 1200-2400 bit-per-second line via a Synchronous Communications Adapter in binary mode. The line may be a switched or a nonswitched, point-to-point line or a nonswitched multipoint line.

The following I/O units are required for RJE operation:

- Card reader and card punch, or a card read-punch.
- Line printer with 120-character print line.

The following special features are supported:

- One or more disk storage drives for input.
- One disk storage drive for output.

IBM SYSTEM/360 MODEL 20

RJE facilities are available for the IBM System/360 Model 20 under Card Programming Support (CPS), the Tape Programming System (TPS) and the Disk Programming System (DPS); the Model 20 work station can be connected to the central System/360 by a 600-50,000 bit-per-second switched or non-switched, point-to-point (contention) line or nonswitched multipoint line. Line speed over 4800 bits per second is available only in PTP.

The minimum system requirements under CPS, TPS and DPS are:

- An IBM 2020 Central Processing Unit (submodels 2, 4 and 5) with 12K bytes of main storage.
- A card reader.
- A printer.
- An IBM Binary Synchronous Communications Adapter (Feature No. 2074 for submodel 5 and 2720 for submodels 2 and 4 for the World Trade supported adapter, and Feature No. 2074 only for all submodels for the domestically supported adapter) with EBCDIC and Full Transparency Text Mode Features.

The following additional features are supported:

- A card punch (may be required for generating the program).
- Under TPS, tape input and output.
- Under DPS, both tape and disk input and output.
- Under DPS, an IBM 2152 Printer-Keyboard.

RJE TELECOMMUNICATIONS CONCEPTS AND TERMINOLOGY

This section describes the basic characteristics and operational concepts of the Remote Job Entry telecommunications system: what it is, how its sections are related, how communication proceeds, and how control is maintained. A number of commonly used terms are defined.

The RJE system is, in effect, a specific application of a computer-based telecommunications system. The particular telecommunications system used for Remote Job Entry is characterized by a number of work stations that are connected to a central processor by one or more communication lines operating in half-duplex mode. A half-duplex line is a line over which data can flow in either direction, but in only one direction at a time.

The RJE program uses the OS Basic Telecommunications Access Method (BTAM) to control the communication lines and communicate with the work stations. Work station is used as a general term to represent interconnected equipment at the remote location having both input and output capability. Work stations are usually separated from the central processor by a distance sufficient to require common carrier facilities to accomplish communication with the central processor. The system, however, may include work stations attached to the central location by local lines. Regardless of location, all supported work stations are classified as "remote" since they are attached to the central system by an IBM 2701 or 2703 transmission control unit.

TELECOMMUNICATIONS NETWORKS

A telecommunications system may utilize a nonswitched network, a switched network, or a combination of the two.

A nonswitched network consists of a number of private or leased lines that connect the computer to one or more work stations. The computer and work stations are physically connected; that is, the circuits making up the communication lines are continuously established for predetermined time periods during which data may be transmitted over them. The lines that comprise a nonswitched network are known variously as private, leased, or dedicated lines. These lines are usually furnished by a common carrier on a contract basis between specified locations for a continuous period or for regularly recurring periods at stated hours for the exclusive use of one customer.

A switched network allows many work stations to communicate with the computer without requiring dedicated communication connections. The computer and the several work stations are connected by access lines to the common-carrier exchanges serving their respective locations. A complete and continuous data path is established between computer and work station only for the period of time in which transmission takes place. The connection is established by dialing the telephone number of the unit at the other end. In this case, line refers to a discrete data path between the telecommunications control unit and the common carrier exchange. The service provided by the common carrier is usually on a time-used basis.

Some communication networks have characteristics typical of both switched and nonswitched networks. In this publication, the term switched network refers to any network in which a direct physical connection between computer and work station must be established by dialing in order for data transmission to occur. The term nonswitched network refers to a network in which the communication lines linking computer and work station are continuously established, thus requiring no dialing.

NETWORK CONTROL

Initial contact between the central system and the remote work stations in an RJE system may occur in two ways, dependent on the type of line connection between them. The connections possible are multipoint (on nonswitched lines) and point-to-point contention (on both switched and nonswitched lines). The RJE system permits communication using either type of connection.

If a work station is connected via a multipoint line, data is sent and received under control of the central system. In order to send data, the work station must be polled by the central system. In order to receive data, the work station must be selected by the central system. Polling is an invitation to a work station to transmit data to the central system. Once a work station has accepted this invitation (through recognition of its polling characters), it may use the line to send data.

Program, the 1130 Work Station Program, and the IBM System/360 Model 20 (2020) Work Station Program support the feature.

MULTIPLE RECORD FEATURE

The optional multiple record feature of the 2780 work station is supported by RJE for printed output. It provides increased system throughput by blocking up to seven output records. At RJE assembly time, the user specifies this option in the RJETERM macro instruction for the central system.

SYSTEM MANAGEMENT FACILITIES

RJE supports the system management facilities (SMF) feature of the operating system that is provided to record a history of each job as it is processed and to monitor jobs as they are processed. SMF gathers and records job information that can be used by management programs to report system efficiency, performance, usage and costs. This feature also allows the manager to add installation-written routines that enforce installation standards of identification, priority, resource allocation, and maximum execution time.

REVERSE INTERRUPT LINE CONTROL

RJE uses the binary synchronous communications (BSC) reverse interrupt (RVI) line control character to allow two or more types of supported work stations to be connected to the same switched line. For example, a 2770, a 2780, an 1130, or a System/360 Model 20 or larger may use the same switched line connection.

SYSTEM OVERLOAD

An overload condition results if direct access storage space at the central installation is insufficient to meet the demands of the system. Input already received and acknowledged by RJE is not affected by an overload condition. Any input transmission causing an overload condition is aborted and must be entirely resubmitted at a later time.

In each overload situation, a message is sent to both the central operator and the work station operator indicating the particular resource depleted. If the system continues to be overloaded, the direct access storage space allotted for the resource must be increased to reflect more realistically the peak traffic requirements of the system. An alternate solution may be to reschedule the work load to take advantage of periods of relative inactivity.

The total system input capacity is specified by the central installation and is dependent on the following resources:

- The quantity of SYS1.SYSJOBQE space - specified at OS system generation or during IPL.
- The number of concurrent jobs RJE is to maintain - specified at RJE assembly.
- The quantity of space for remotely submitted SYSIN data - specified in an RJE cataloged procedure referenced in the START command for RJE.

SYS1.SYSJOBQE depletion results when job input submitted both locally and from attached work stations, exceeds the limit specified by the central installation. If this condition continues to occur, the size of the SYS1.SYSJOBQE must be increased to reflect both the local and remote requirements of the system. This will require that SYS1.SYSJOBQE be scratched and reallocated.

An overload condition also occurs when the number of remote jobs resident in the central system exceeds the limit specified when the RJE program was assembled. Remote jobs are resident until the output is removed from the RJE SYSOUT class. This condition is relieved by requesting the output of completed remote jobs or by deleting jobs that are tying up the system. The central operator can do this with the CENOUT command. The RJE user can do this with the OUTPUT and DELETE commands. If the condition continues to occur, the number of remote jobs RJE can maintain must be increased. This requires an RJE assembly.

Depletion of SYSIN space is the final cause of a system overload. In its cataloged RJE procedure, the installation specifies SYSIN data sets on a communication line basis. In this procedure, the installation specifies the maximum space available for any one SYSIN input data set. Specifying the maximum amount of space allocated for one input data set prevents one job from getting all the SYSIN space. This is a system protection feature, and no special action is necessary at the central system if a job exceeds this limit. On the other hand, a regular depletion of space for SYSIN allocation necessitates that more SYSIN space be made available to the system (See the section entitled Cataloged Procedures for RJE).

JOB ENTRY CONTROL LANGUAGE

The additional flexibility and control required by the remote entry are provided in the RJE system by Job Entry Control Language (JECL). JECL is independent of Job Control Language (JCL), allowing system independence for RJE applications and isolation of those control statements needed only for an RJE application. As a result, only JECL statements are added or removed when a user moves between local and remote environments. The job and its scheduling information (in JCL) are the same in either environment except that JCL In-Stream Procedures are not supported in the remote RJE environment. JECL uses the same coding format as that used for Job Control Language statements. For further information on In-Stream Procedures, see the IBM System/360 Operating System Job Control Language Reference, GC28-6704, and the IBM System/360 Operating System: System Programmer's Guide, GC28-6650.

The RJE user identifies himself and his work station to the system with JECL. When the user and the work station are identified as part of the system, the user may request other RJE facilities with additional JECL statements. These other RJE facilities include the ability to:

- Select job output control options.
- Communicate with the central operator.
- Communicate with other RJE users.
- Inquire about status of jobs in system.
- Receive notification of job completion.
- Detach the work station from the system.
- Continue transmission of interrupted output.
- Define RJE processing of a remotely submitted job.

JECL STATEMENTS

Communication between the user and RJE processing programs is accomplished by two types of Job Entry Control statements:

1. Job Entry Definition Statement.
2. Work Station Command Statement.

These control statements aid the RJE processing programs in the servicing of users and the supervision of work stations attached to the RJE system.

THE JOB ENTRY DEFINITION STATEMENT

The Job Entry Definition Statement (called the JED statement) marks the beginning of a job entry. It is the only JECL statement that may be continued on successive cards. With the JED statement, the user specifies disposition of job output, notification at job completion, alternate recipient of the output, and information to be returned with notification. The JED statement is an optional statement. If a job in the input stream is not preceded by a JED statement or the JED statement is in error, RJE system default options are assumed.

THE WORK STATION COMMAND STATEMENTS

For the RJE user, work station command statements provide a convenient means of requesting RJE facilities to aid him in his application. They enable him to request output, determine the status of a job, specify the state of the work station, etc. A thorough discussion of the commands provided and the facilities that they offer is provided in the section on Work Station Commands.

FIELDS IN THE CONTROL STATEMENTS

Control statements submitted at a work station contain two identifying characters (..) and four fields: operation, operand, comment, and sequence. In some of the statements one or more of the fields are blank. Figure 2 shows the fields in each statement.

Statement	Columns 1 & 2	Fields (Columns 4-71)	Columns 73-80
Job Entry Definition	..	JED Operand Comment*	Sequence*
Work Station Command	..	Operation Operand Comment* (Command)	Sequence*

*Optional

Figure 2. Fields in the Control Statements

notification either by specifying NOTIFY in the JED statement or by submitting an ALERT command that addresses the job. Text is any information coded by the originator in the JED NOTIFY parameter. Text is replaced by DISK ERROR when the information for the notify message cannot be read.

System Action: None.

User Response: The user may request the job output, either when notified or later, or he may delete it.

IHK110I ABEND NOTIFY jobname userid [text/DISK ERROR]

Explanation: This is the same as message IHK109I except that the job failed in initiation.

IHK111I MSG PENDING STARTUP termid ssssssss

Explanation: The message text specified in a MSGR command with sequence number (ssssssss) was not sent because the work station (termid) to which it was directed was inactive; and if the message was directed to either a user or a work station, the user was not logged on. The message is sent to the specified work station when the station submits an RJSTART command.

System Action: The message is held at the central system until either the work station initiates startup procedures, or the central operator deletes the message.

User Response: None.

IHK112I MSG QUEUED FOR DELIVERY {userid / termid / CENTRAL} ssssssss

Explanation: The message text specified in a MSGR command with sequence number (ssssssss) is waiting for delivery to:

userid - the specified user
termid - the specified work station
CENTRAL - the central operator

System Action: The message is transmitted to the work station as soon as the work station accepts it, or it is displayed on the printer-keyboard at the central system for the central operator.

User Response: None.

IHK113I MSG IGNORED {userid / termid} {INVALID / DISK ERROR} ssssssss

Explanation: The MSGR command with sequence number (ssssssss) cannot be serviced. The intended destination is:

userid - A user who is not logged on.

termid - An inactive work station, and no space is available to keep the message in the central system.

INVALID - If INVALID is included in the response, the message is directed to a userid or termid that is not assigned in the RJE system.

DISK ERROR - The message could not be retained on the message-pending data set for the remote work station.

System Action: The command is ignored.

User Response: The sender may resubmit the command later, or he may specify the user's work station if the message was directed only to a user.

IHK114I MAX JOBS EXCEEDED jobname

Explanation: The job entry (jobname) cannot be accepted because the central system is already maintaining its specified maximum number of jobs.

System Action: The job is rejected. A message indicating the overload condition is sent to the central operator.

User Response: The user may alleviate this condition by requesting or deleting deferred job output. If the condition persists, the user may ask to have the central system reassembled to support more remote jobs. The job refused must be resubmitted.

IHK115I ALERTS CANCELLED userid ssssssss

Explanation: An ALERT command with sequence number (ssssssss) requesting that all waiting alerts for user (userid) be cancelled has been received and accepted.

System Action: All waiting alerts for user (userid) are cancelled.

User Response: None.

IHK116I RJE CLOSED DOWN

Explanation: The central operator has entered a STOP RJE command and is closing down the RJE system.

System Action: Closedown procedures are initiated at the central system for all work stations not already inactive when the STOP command was issued. All RJE work stations are placed in the inactive state.

User Response: None.

IHK117I JOB ACCEPTED jobname userid { SCHED (n) / EXECUTING / DISK ERROR } { JED / DEFAULT }

Explanation: This is a job receipt acknowledgement message indicating that the job (jobname) submitted by user (userid) is accepted for execution at the central system.

SCHED (n) - The job is scheduled as the nth job in its input class on the SYS1.SYSJOBQE.

EXECUTING - The job is being executed.

JED - A correctly specified JED statement was part of the job entry. The job is handled with those options exercised in the JED statement.

DEFAULT - The JED either was not part of the job entry or was incorrectly specified. As a result, the job is handled with the assumed system default options.

DISK ERROR - The job entry position in its input class could not be read on the SYS1.SYSJOBQE because of an I/O error.

Note: This message format may not apply if your installation alters the acknowledge message. Any information added to the acknowledgement immediately follows this message.

System Action: The system waits for job completion to determine disposition of job output.

User Response: If JED options are desired but an error has caused the JED statement to be ignored, the user must delete the job and resubmit the job entry with a corrected JED statement. If a disk error occurred, try determining the job's status with a STATUS command. If the error persists, delete the job and resubmit it.

IHK118I ALTERNATE IGNORED JED ssssssss

Explanation: An alternate recipient is specified in the JED OUTPUT keyword, but either immediate output is specified (in which case, no userid may be coded), or an invalid userid is coded as an alternate recipient. The sequence number of the JED card was ssssssss.

System Action: This error is ignored, and JED statement processing continues as if no userid were specified in the OUTPUT keyword.

User Response: Probable user error. The JED statement must be corrected and the job entry resubmitted if output is to be made available to an alternate. The previously submitted job must be deleted before the corrected job entry is sent to the central system. If the problem persists, have the JED statement available before calling IBM for programming support.

IHK119I JOB WAITING DELIVERY operation jobname userid ssssssss

Explanation: An OUTPUT or DELETE command with sequence number (ssssssss), which addresses the specified job (jobname), cannot be serviced because the job is already waiting for transmission.

System Action: The command is rejected.

User Response: None.

IHK120I BROADCAST MESSAGES {FOLLOW / END}

Explanation: This message (with the word FOLLOW) is sent immediately before the first broadcast message and (with the word END) after the last broadcast message.

System Action: None.

User Response: None.

IHK123I DISCONTINUED-CHANGE FORMS TO xxxx

Explanation: The next output data set requires form number xxxx. The data set has been discontinued. If xxxx contains blanks instead of a form number, the next output data set requires the regularly used forms to be reinserted.

System Action: The data set is discontinued.

User Response: The user inserts the proper form and submits a CONTINUE command.

IHK139I BLOCK SIZE 400 LIMIT EXCEEDED jobname ddname

Explanation: The problem program has created a sysout data set with a block size exceeding 400 bytes. The sysout class was specified as being the user exit at a remote CPU.

System Action: The data set is scratched.

User Response: (a) Block size in the output DCB should be respecified to stay within the limit, or (b) the sysout class should be changed to specify printed or punched output. After one of the above changes is made, resubmit the job.

IHK140I INVALID USERID operation ssssssss

Explanation: The designated command (operation) with sequence number (ssssssss) specifies a userid that is not assigned to a user in the RJE system.

System Action: The command is refused.

User Response: Probable user error. The user corrects the userid and resubmits the command. If the problem recurs, have the assembly listings of RJE available before calling IBM for programming support.

IHK141I INVALID PROTECTION KEY LOGON ssssssss

Explanation: A LOGON command with sequence number (ssssssss) specifies a protection key that is not assigned with the coded userid.

System Action: The LOGON command is rejected.

User Response: Probable user error. The user corrects the key and resubmits the job. If the problem recurs, have the assembly listings of RJE available before calling IBM for programming support.

IHK142I INVALID TERMID operation ssssssss

Explanation: The designated command (operation) with sequence number (ssssssss) specifies a termid that is not assigned to a work station in the RJE system, or a termid that is currently being used on another line.

System Action: The command is rejected.

User Response: Probable user error. The user corrects the termid and resubmits the command. If the problem recurs, have the assembly listings of RJE available before calling IBM for programming support.

IHK143I INVALID JOBNAME operation ssssssss

Explanation: The designated statement (operation) with sequence number (ssssssss) either fails to specify a jobname or specifies a jobname greater than eight characters.

System Action: The statement is rejected. If it is a JOB card, the job is rejected.

User Response: Probable user error. The user corrects the jobname and resubmits the card or

command. If the problem recurs, have the job stream and all output available before calling IBM for programming support.

IHK144I DUPLICATE JOBNAME jobname ssssssss

Explanation: The JOB card with sequence number (ssssssss) contains a jobname that is identical to one already in the RJE system.

System Action: The job is refused.

User Response: Probable user error. The user changes the name of the job to a unique name and resubmits it. If the problem recurs, have the job stream and all output available before calling IBM for programming support.

IHK145I NO JOB CARD

Explanation: A job was submitted without a JOB card, or the JOB card did not follow directly after a JED card.

System Action: For computer work stations, input is aborted and the message is sent. For 2780 work stations, input is flushed to EOT and the message is sent.

User Response: Probable user error. Examine the input causing the error. Correct the error and resubmit the job. If the problem recurs, have the job stream and all output available before calling IBM for programming support.

IHK146I INVALID KEYWORD VALUE operation [keyword] ssssssss

Explanation: An invalid value is specified for a keyword in the statement (operation) with sequence number (ssssssss). If the invalid value appears in the DCB keyword of a DD * or DD DATA statement, SYSIN is displayed as the operation.

System Action: The statement is ignored. If the error is in a JED statement, the job entry is processed with the assumed system default options. If the error is in a SYSIN DCB parameter, the job is automatically deleted.

User Response: Probable user error. If the error is in a SYSIN card, the user corrects the error and resubmits the job. If the statement is a command, the user corrects the error and resubmits the statement. In the case of a JED statement, if assumed options are not acceptable for job entry processing, he deletes the job. The job entry must be resubmitted with the corrected JED statement. The job residing in the central system as a result of the error must be deleted before the job entry is resubmitted. If the problem recurs, have the job stream and all output available before calling IBM for programming support.

IHK147I REQD PARAMETER MISSING operation ssssssss

Explanation: A required parameter in the operand field is missing or invalid in the subject statement (operation) with sequence number (ssssssss).

System Action: The statement is ignored.

User Response: Probable user error. The user examines the statement in error, supplies the missing or corrected parameter, and resubmits the command. If the problem recurs, have the job stream and all output available before calling IBM for programming support.

IHK148I ILLEGAL DELIMITER operation ssssssss

Explanation: A parameter in the operand field of the statement (operation) with sequence number (ssssssss) is not delimited by a comma or, if it was the last parameter, a blank; or a framing apostrophe is missing for text.

System Action: The statement is ignored. If the error is in a JED statement, the job entry is

processed with the assumed system default options.

User Response: If the statement is a command, the user corrects the error and resubmits the statement. If assumed options are not acceptable for job entry processing, he deletes the job. The job entry must be resubmitted with the corrected JED statement. The job residing in the central system as a result of the error must be deleted before the job entry is resubmitted.

IHK149I ILLEGAL CONTINUATION operation ssssssss

Explanation: The statement (operation), with sequence number (ssssssss), that should not have been continued was continued, or a JED statement was improperly continued.

System Action: The statement is ignored. If the error is in a JED statement, the job entry is processed with the assumed system default options.

User Response: If the statement is a command, the user corrects the error and resubmits the statement. If assumed options are not acceptable for job entry processing, he deletes the job. The job entry must be resubmitted with the corrected JED statement. The job residing in the central system as a result of the error must be deleted before the job entry is resubmitted.

IHK150I UNDEFINED KEYWORD operation ssssssss

Explanation: An undefined keyword is specified in the statement (operation) with the sequence number (ssssssss). If the undefined keyword appears in a DD * or DD DATA statement, SYSIN is displayed as the operation.

System Action: The statement is ignored. If the error is in a JED statement, the job entry is processed with the assumed system default options. If the error is in a SYSIN DCB parameter, the job is automatically deleted.

User Response: If the error is in a SYSIN card, the user corrects the error and resubmits the job. If the statement is a command, the user corrects the error and resubmits the statement. If assumed options are not acceptable for job entry processing, he deletes the job. The job entry must be resubmitted with the corrected JED statement. The job residing in the central system as a result of the error must be deleted before the job entry is resubmitted.

IHK151I MULTIPLE USE OF KEYWORD operation ssssssss

Explanation: A keyword is repeated in the statement (operation) with sequence number (ssssssss).

System Action: The statement is ignored. If the error is in a JED statement, the job entry is processed with the assumed system default options.

User Response: If the statement is a command, the user corrects the error and resubmits the statement. If assumed options are not acceptable for job entry processing, he deletes the job. The job entry must be resubmitted with the corrected JED statement. The job residing in the central system as a result of the error must be deleted before the job entry is resubmitted.

IHK152I UNDEFINED OPERATION operation ssssssss

Explanation: The statement (operation) with sequence number (ssssssss) specifies an undefined operation or indicates that there is no blank between the .. and the operation. The first 8 characters of the operation field are returned.

System Action: The statement is ignored. If the error is in an intended JED statement, the job entry is processed with the assumed system default options.

User Response: If the statement is an intended command, the user corrects the error and resubmits. If assumed options are not acceptable for job entry processing, he deletes the job. The job entry must be resubmitted with the corrected JED statement. The job residing in the central system as a result of the error must be deleted before the job entry is resubmitted.

Note: If there is no error in the command format, the message indicates that the remote work station is equipped with the compress/expand option but the central program does not recognize this work station as so equipped. This conflict must be resolved by reassembly of either the remote or central program.

IHK153I CENTRAL DATA SET MISSING jobname { step.ddname / ALL }

Explanation: The DD statement specified in the CENTRAL parameter of the JED card could not be found in the Job Control Language for the job; or, if ALL was specified, there were no output DD statements.

System Action: The job is processed as though no reference was made to the data set.

User Response: Check the JED statement and the JCL. If either is in error, correct and resubmit the job after retrieving job output or deleting the job.

IHK154I NO AVAILABLE OUTPUT userid ssssssss

Explanation: This message appears at the remote terminal when no output is found in the system to satisfy the major, minor, or default OUTPUT request. To satisfy the request, any requested job that is found must be:

1. Complete,
2. Not already enqueued for source or alternate, and
3. One for which the requester is a valid recipient.

System Action: The statement is ignored.

User Response: None.

IHK155I INCORRECT TEXT LENGTH operation ssssssss

Explanation: The text specified in the statement (operation) with sequence number (ssssssss) exceeds the length allowed.

System Action: The statement is ignored.

User Response: Probable user error. Correct the error and resubmit the command. If the problem recurs, have the job stream and all output available before calling IBM for programming support.

IHK156A RJSTART REQUIRED

Explanation: Input other than an RJSTART command has been received from an inactive work station. The work station is logically detached from the system because either an error condition caused the central system to detach it or an RJEND command was received.

System Action: The input is rejected.

User Response: The user submits a valid RJSTART to begin or resume RJE operation at the work station.

IHK157A LOGON REQUIRED

Explanation: Input other than a CONTINUE, RJEND, or LOGON command has been received from an active work station.

System Action: The input is rejected.

User Response: If the user has input for transmission to the central system, he must submit a valid LOGON command.

IHK158A LOGON REJECTED userid termid ssssssss

Explanation: A LOGON command with sequence number (ssssssss) has been submitted by a user (userid) already logged on at another work station (termid). A user can be logged on at only one work station at a time.

System Action: The command is ignored. If another user is logged on at the second work station, from which this command is received, he remains logged on.

User Response: The user must log off at the initially indicated work station (termid) before resubmitting the command.

IHK159I LINE ERROR

Explanation: An irrecoverable transmission error has occurred on an input or output operation.

System Action: The work station is logically detached from the system. If an output operation is in progress, the output is discontinued. This message is returned when the next RJSTART command is received from the work station.

User Response: All input transmitted to the central system that has not been acknowledged must be resubmitted.

Operator Response: None.

IHK030I DELETED FROM USER DIRECTORY userid key

Explanation: The request to delete the indicated userid-key pair from the user directory has been serviced. Deletion of this pair leaves space for another userid-key assignment.

System Action: All jobs submitted by this user are deleted.

Operator Response: None.

IHK031I ADDED TO USER DIRECTORY userid key

Explanation: A request to add the userid-key pair to the user directory has been serviced. The user assigned this userid-key can now gain access to the system.

System Action: The userid-key is placed in the user directory.

Operator Response: None.

IHK032I USER DIRECTORY FULL userid key

Explanation: A request to add the userid-key pair to the user directory cannot be serviced. The user directory already contains the maximum number of RJE users.

System Action: The request is ignored.

Operator Response: The operator might make space available by deleting a userid-key pair no longer being used. If this is not feasible, he may have the central RJE system reassembled to support more users.

IHK033I MSGS DELETED FOR WORK STATION termid

Explanation: A request to delete the messages waiting for work station (termid) startup has been serviced.

System Action: The pending messages are deleted from the central system.

Operator Response: None.

IHK034I MSG CANNOT BE ADDED {BRDCST / DELAYED} termid

Explanation: (BRDCST) A request to add or insert a message into the broadcast message data set could not be serviced. Either the data set was full or, if the message was to be inserted, there were no higher numbered inactive slots available.

(DELAYED) The messages that follow this header could not be added to the delayed message data set when an RJEND statement was processed for the work station (termid) because the data set was full, or because a disk error was detected. This occurs when the RJEND is submitted from the work station or simulated because of an error condition.

System Action: (BRDCST) The request is ignored.

(DELAYED) All messages that could not be added to the data set are printed on the central printer-keyboard.

Operator Response: (BRDCST) If the message was to be inserted, there may be inactive slots above the slot specified. If there are no inactive slots, no message can be added until one slot is made inactive.

(DELAYED) Inform the work station after its next RJSTART or telephone the work station (termid) to give its operator this information.

IHK035I INVALID SLOT NUMBER BRDCST

Explanation: A slot number not within the range of 0-99 was specified on the BRDCST command.

System Action: The command is ignored.

Operator Response: Probable user error. Correct the slot number and resubmit the command. If the problem recurs, have the master

console sheet available before calling IBM for programming support.

IHK036I BRDCST{NONE / nn message}

Explanation: A display of the current broadcast messages has been requested. The slot number (nn) is followed by the message text contained in the slot. Only active slots are displayed. NONE indicates that the data set is empty.

System Action: Reporting continues until the contents of all active slots are displayed.

Operator Response: None.

IHK037I INFORM INACTIVE WORK STATION jobname userid termid{N / O}

Explanation: The job (jobname) submitted by the user (userid) at the work station (termid) is completed. Either a notify message (N) or immediate job output (O) is directed to this inactive work station connected via a switched line to the central system.

System Action: The message or output is held at the central system until the work station (termid) submits an RJSTART command or the user (userid) logs on at another work station.

Operator Response: The operator may telephone the work station (termid) and give its operator this information.

IHK038I INVALID LINENAME SHOW

Explanation: A request to display error information for a particular line or line group specifies an invalid linename, or indicates that the DCB for the line is not open.

System Action: The request is ignored.

Operator Response: Probable user error. The operator supplies the correct linename and resubmits the command. If the problem recurs, do the following before calling IBM for programming support:

1. Have the master console sheet available.
2. Have the assembly listings of RJE available.

IHK040I INVALID USERID operation

Explanation: The command (operation) specifies a userid that is not contained in the user directory, or, if the command requests addition of a userid to the user directory, the userid is already in the directory.

System Action: The command is ignored.

Operator Response: Probable user error. The operator corrects the userid and resubmits the command. If the problem recurs, do the following before calling IBM for programming support:

1. Have the assembly listings of RJE available.
2. Execute the stand-alone program IMDSADMP with the TYPE=HI option to produce a storage dump to tape. If a tape is not available, execute the stand-alone program IMDSADMP with the TYPE=LO option to produce a storage dump to a printer.
3. Execute IMDPRDMP with the GO option after restarting the system. The input to IMDPRDMP is the dump tape from IMDSADMP. Save the dump output.

IHK041I INVALID PROTECTION KEY userid

Explanation: A request to delete a userid-key pair in the user directory cannot be serviced. The key specified in the command does not agree with the key contained in the user directory.

System Action: The command is ignored.

Operator Response: Probable user error. The operator supplies the correct key and resubmits the command. If the problem recurs, do the following before calling IBM for programming support:

1. Have the master console sheet available.
2. Have the assembly listings of RJE available.
3. Execute the stand-alone program IMDSADMP with the TYPE=HI option to produce a storage dump to tape. If a tape is not available, execute the stand-alone program IMDSADMP with the TYPE=LO option to produce a storage dump to a printer.
4. Execute IMDPRDMP with the GO option after restarting the system. The input to IMDPRDMP is the dump tape from IMDSADMP. Save the dump output.

IHK042I INVALID TERMID operation

Explanation: The command (operation) specifies a termid not assigned to a work station in the RJE system.

System Action: The command is rejected.

Operator Response: Probable user error. The operator corrects the termid and resubmits the command. If the problem recurs, do the following before calling IBM for programming support:

1. Have the master console sheet available.
2. Have the assembly listings of RJE available.

IHK047I REQD PARAMETER MISSING operation

Explanation: A required parameter in the operand field is missing or invalid in the statement (operation).

System Action: The command is rejected.

Operator Response: Probable user error. The operator examines the statement in error, corrects the parameter, and resubmits the command. If the problem recurs, have the master console sheet available before calling IBM for programming support.

IHK048I ILLEGAL DELIMITER operation

Explanation: A parameter in the operand field of the command (operation) is not delimited by a comma, or, if it is the last parameter, a blank.

System Action: The command is rejected.

Operator Response: Probable user error. The operator corrects the command and resubmits it. If the problem recurs, have the master console sheet available before calling IBM for programming support.

IHK049I ILLEGAL CONTINUATION operation

Explanation: The command (operation) has continuation indicated with a nonblank character in column 71. Commands may not be continued.

System Action: The command is rejected.

Operator Response: Probable user error. The operator corrects the command and resubmits it. If the problem recurs, have the master console sheet available before calling IBM for programming support.

IHK050I UNDEFINED KEYWORD operation

Explanation: An undefined keyword is included in the command (operation).

System Action: The command is ignored.

Operator Response: Probable user error. The operator corrects the error and resubmits the command. If the problem recurs, have the master console sheet available before calling IBM for programming support.

IHK051I MULTIPLE USE OF KEYWORD operation

Explanation: A keyword is repeated in the command (operation).

System Action: The command is ignored.

Operator Response: Probable user error. The operator corrects the error and resubmits the command. If the problem recurs, have the master console sheet available before calling IBM for programming support.

IHK055I INCORRECT TEXT LENGTH operation

Explanation: The text specified in the command (operation) either exceeds the allowable length or has a length of zero. Message text must be from 1 to 40 characters.

System Action: The command is ignored.

Operator Response: Probable User Error. The operator corrects the error and resubmits the command. If the problem recurs, have the master console sheet available before calling IBM for programming support.

IHK060I ABNORMAL CENTRAL CLOSEDOWN

Explanation: Either a data set for SYSIN data was not allocated in the started RJE procedure, or the device on which it was allocated was not direct access. This message is also displayed by RJE at closedown if the OS job scheduler returns with an error or if an RJE subtask abends. In these cases, this message will be preceded by the OS job scheduler message or by the RJE SUBTASK ABENDED message.

System Action: RJE operation is terminated.

Operator Response: Check the procedure referred to by the START command and ensure the proper SYSIN allocation; or try starting another RJE procedure. If this message is associated with an OS job scheduler error message, key the action to the OS job scheduler error. If this message is associated with the RJE SUBTASK ABENDED message, restart RJE.

IHK061I OUT OF SPACE { SYSIN jobname / SYS1.SYSJOBQE / EMITTER WORKAREA }

Explanation: An out of space (overload) condition exists at the central station system. All direct access storage space that is allocated for the resource SYSIN or SYS1.SYSJOBQE is in use. If EMITTER WORKAREA is specified, the emitter could not get the output work area required because main storage was not available when requested.

System Action: The user submitting the input is informed of the condition. Until space becomes available, all input requiring the depleted resource is rejected. When EMITTER WORKAREA is specified, no output to the terminal can occur until the necessary main storage is available. An EOT is sent. The central system waits for more input from the remote work stations. When the EOT is received following the input, the emitter again tries to obtain main storage for its work area. No jobs are lost, but they are delayed in being returned to the remote work station until sufficient main storage is available.

Operator Response: If the overload condition persists, the operator may request that more space be allocated to the resource.

IHK062I SYSIN LIMIT EXCEEDED jobname

Explanation: The job (jobname) demands a SYSIN data set exceeding that specified in the procedure referred to when the central system was started.

System Action: The job is rejected, and a message is returned to the user submitting the job.

Operator Response: If the job must be processed, the operator, when the central system is restarted, should refer to procedure allowing larger SYSIN data sets.

IHK063I DISK ERROR

WRITING TABLE ENTRY	(1)
ROLLIN TABLES RJE ABORTED	(2)
BRDCST DIRECTORY	(3)
BRDCST MSG	(4)
DELAYED MSG DIRECTORY	(5)
DELAYED MSG	(6)
JED [jobname/PURGE SYSTEM]	(7)
Q MGR RJE ABORTED	(8)
Q MGR (jobname)	(9)
(volume serial jobname ddname)	(10)
IN CLOSEDOWN	(11)
addr,dev,ddname,op,err, trkaddr,accmeth	(12)

Explanation: An uncorrectable input/output failure has occurred while the program was attempting to write to or read from disk. One of the messages above indicates to the central operator (and the user) where the error occurred.

(1) An entry in the main storage copy of an RJE control table could not be written to disk.

System Action: Processing continues using the version of the tables in main storage. No subsequent messages are sent.

Operator Response: The operator should inform the users of the problem. It is recommended that the work stations not submit any more jobs and retrieve all delayed jobs. The operator should STOP RJE and reinitialize the tables before the START RJE. Any jobs remaining in the system after the STOP RJE are lost.

(2) Either an error occurred reading the RJE control tables into main storage, or all the required data sets were not allocated in the RJE procedure referenced by the START command.

System Action: RJE is terminated.

Operator Response: Have the procedure referenced in the START command checked to ensure the required RJE data sets were allocated. If the procedure is correct:

(a) Move the disk pack containing the RJE tables to another drive and attempt to START RJE again.

(b) If the error persists, execute the RJE initialization program (IHKINTAB). The current status of the RJE system will be lost.

(c) If the problem recurs, do the following before calling IBM for hardware support:

1. Execute the IFCEREP0 program with the PARM=(N) operand in the EXEC statement.

2. Have the IFCEREP0 output available.

(3),(4) An error occurred while writing to or reading from the BRDCST directory or data set.

System Action: No further broadcast processing is done on the command (BRDCST, BRDCSTR, RJSTART, SHOW) that detected the error. Other processing continues normally.

Operator Response: The central operator should enter SHOW MSGS, then STOP RJE. Before the next START RJE, the broadcast-message data sets should be reinitialized (IHKCDBMI). All old messages are lost.

(5),(6) An error occurred while writing to or reading from the delayed message directory or data set.

System Action: No further processing is done on the command (SHOW MSGS, MSG, MSGR) that triggered the error. If the error was incurred while processing RJSTART, all processing continues except the reading of delayed messages. If the error occurred during processing of RJEND, the messages are written to the central console, and processing continues.

Operator Response: The central operator should SHOW BRDCST, then STOP RJE. Before the next START RJE, the broadcast-message data sets should be reinitialized (IHKCDBMI). All old messages are lost.

(7) An error occurred while writing to or reading from the JED table on disk. The job (jobname) is lost in the event of a read error. Write errors are indicated by no jobname. PURGE SYSTEM indicates no recovery could be made from a write error.

System Action: On a read error, the job is lost and the submitter is notified. On a write error, recovery is attempted; the submitter is notified only if no recovery could be made. PURGE SYSTEM indicates no recovery could be made.

Operator Response: In the event of a read error, the operator may scratch those data sets associated with the jobname indicated in the message, after RJE has closed down. Otherwise, they will be deleted at the next operating system warmstart. If the system could not recover from a write error, the operator should inform the work stations that all output should be requested. He should stop RJE and reinitialize the RJE control tables before restarting RJE.

(8) The OS queue manager routine has encountered a permanent I/O error on SYS1.SYSJOBQE.

System Action: RJE operation is terminated.

Operator Response: To attempt recovery without losing jobs in the system, reload the operating system without reformatting the queues. If this is unsuccessful, reload the operating system and reformat queues. If the problem recurs, do the following before calling IBM for programming support:

1. Before reformatting the job queue, execute the IMCJQDMP service aid program to produce a formatted copy of the contents of the SYS1.SYSJOBQE data set.
2. Have the IMCJQDMP output available.

(9) The OS queue manager has encountered a permanent I/O error on SYS1.SYSJOBQE on a READ or WRITE request of the RJE input or SYSOUT queues.

System Action: One or more of the following may occur:

(a) An EOT aborting input or ending the current output transmission is sent to the work station, if the error occurred during normal communication with the work station.

(b) The job identified by jobname is canceled in the operating system and deleted in RJE. In addition, JECL statements following the deleted job and preceding the next job entry are lost if the error occurred while reading the job entry from the RJE input queue.

(c) If the error occurred while reading the output from the RJE SYSOUT queue, the remaining output of the job is lost.

RJE processing continues.

Operator Response: Continue operation unless the disk error persists. Reformat queues at the next IPL. If the problem recurs, do the following before calling IBM for programming support:

1. Before reformatting the job queue, execute the IMCJQDMP service aid program to produce a formatted copy of the contents of the SYS1.SYSJOBQE data set.
2. Have the IMCJQDMP output available.

(10) A disk error occurred while writing SYSIN data or reading SYSOUT data.

System Action: If the error occurred on SYSIN data, an EOT is sent to the remote terminal, and an attempt is made to send the disk error message. The job is deleted. If the error occurred on SYSOUT data, no further output from the data set is transmitted, and the terminal receives this

message. Processing continues with the remainder of the job.

Operator Response: If the error persists, stop RJE. The error may be corrected by changing the disk pack or drive.

(11) During RJE closedown procedures, an ECB cannot be unchained from the OS queue manager.

System Action: The closedown procedure continues.

Operator Response: Before submitting the next START RJE command reload the operating system without reformatting the queues.

(12) An error occurred while making access to the RJE tables. The following information is provided:

addr - device address

dev - device type

ddname - name on DD card for RJE table being accessed

op - type of operation being attempted

err - error description

trkaddr - actual track address (7 byte hex address in the form of bbcchhr where:

bb represents the bin number

cc represents the cylinder number

hh represents the head number

r represents the record number)

accmeth - access method being used.

IHK064I LINE XXX NOT OPERATIONAL

Explanation: The control unit for this line is not operational.

System Action: The line is not serviced during this period of RJE activity. Communication proceeds with work stations via existing, operational communication lines. An attempt is made to service the line the next time an RJE procedure that refers to the line is started.

Operator Response: Before calling IBM for hardware support, check to see if the control unit is operational.

IHK065I UNABLE TO OPEN DDNAME=xxxxxxxx

Explanation: The DDNAME for the line specified in the RJE assembly cannot be found in the RJE procedure.

System Action: The line is not serviced for this and all subsequent RJE startups that refer to this RJE procedure. Communication with the work stations proceeds over existing, operational communication lines.

Operator Response: Notify system programmer of error in the procedure.

IHK066I termid NOW RESPONDING TO POLLING

Explanation: The identified work station (termid) attached via a multidrop line has resumed responding to polling.

System Action: None.

Operator Response: None.

IHK067I termid NOT RESPONDING TO POLLING

Explanation: The identified work station (termid) attached via a

multidrop line has failed to respond to polling.

System Action: None.

Operator Response: Have the system programmer responsible for the RJE assembly make sure that the polling characters were correctly specified for the work station. If the problem recurs, do the following before calling IBM for programming support.

1. Have the master console sheet available.
2. Have the assembly listings of RJE available.

IHK068I RJE SUBTASK ABENDED

Explanation: An RJE subtask has terminated abnormally.

System Action: RJE operation is terminated.

Operator Response: Restart RJE operation.

The generation of an RJE system for the central system consists of two steps:

1. Generation of the operating system with the options required to make RJE available in the system.
2. An RJE assembly and linkage-edit step in which the specific RJE facilities desired are included in the system. Once the general RJE capabilities have been made available with one operating system generation, any number of different RJE systems can be built using the assembly and linkage-edit step.

OPERATING SYSTEM GENERATION CONSIDERATIONS

To incorporate an RJE capability into his operating system, the user, when he generates his system, must include OPTIONS=RJE as a parameter in the SCHEDULR macro instruction, and ACSMETH=BTAM,BDAM in the DATAMGT macro instruction. When OPTIONS=RJE and ACSMETH=BTAM,BDAM are specified, the necessary RJE and BTAM modules are copied from the MODLIB onto the TELCMLIB (nonresident RJE modules are copied to LINKLIB, with the exception of the module IHKCDINI, which is copied to the TELCMLIB to be linkage edited with the resident modules). These modules are then available for later assembly and linkage editing of the central RJE system program.

The level of expected printer-keyboard activity must be reflected in the WTOBFRS keyword in the SCHEDULR system generation macro instruction. This parameter is much more critical in RJE. If system WTO buffers are unavailable when RJE tries to display a message on the printer-keyboard, the RJE task is placed in a WAIT state. This condition can result in work station timeouts; the RJE task is prevented from servicing the communications lines until buffers become available. Twice the number of lines is a good rule of thumb for determining the number of buffers needed for RJE operation.

In addition, the following system generation macros and options are required for generation of a system supporting RJE.

- IOCONTRL. One macro is required to describe each telecommunications control unit (2701 or 2703).
- IODEVICE. One macro is required for each communications line. For the remote System/360 Model 20 or the remote System/360 Model 30 and higher on a binary synchronous line connection; either 2020, S360, BSC1, BSC2, or BSC3 may be coded in the UNIT operand of the IODEVICE macro at system generation time.
- TELCMLIB. This must be specified to include RJE modules and the telecommunications subroutine library.
- SCHEDULR. This macro must be specified to define the first MCS console device to be used in RJE operation if the multiple console support option of the operating system is to be present.
- SECONSLE. This macro must be specified to define additional MCS devices after the SCHEDULR macro has defined the first console device.
- PROCLIB. This macro must be specified for inclusion of a procedure library.
- ASSEMBLR. This must be specified so that the RJE macros can be assembled.
- EDITOR. This must be specified so that the assembled RJE macros can be linkage edited.
- MACLIB. This must be specified to allow the assembler to expand the RJE macros.

Complete descriptions of these macros, their formats, and operating system generation procedures are found in the publication IBM System/360 Operating System: System Generation, GC28-6554.

SPECIFYING THE RJE SYSTEM

The particular RJE system is specified by the user through four RJE assembly macro instructions:

1. RJETERM. One macro instruction is required for each supported work station.
2. RJELINE. One macro instruction is required for each communication line supported.
3. RJEUSER. One macro instruction is required to indicate the number of valid users of the RJE system and their identifications (userids).
4. RJETABL. One macro instruction is required to specify general information such as desired user exits, device association for SYSOUT data, and maximum number of job entries that may reside in the central system at a given time.

With these RJE macros, the user specifies an RJE system to meet his particular data processing requirements and defines

the telecommunications network to be supported. The RJE program for the central installation is produced by linkage editing of object modules, resulting from the assembly of these RJE macros, with preassembled modules on TELCMLIB, and with preassembled user routines.

Figure 6 shows the flow of data through the RJE assembly and linkage-edit step. The OS Assembler translates the RJE macros and creates the modules that tailor the system to the particular application. This step also produces linkages to the preassembled modules, common to all RJE systems, and to the desired user exits.

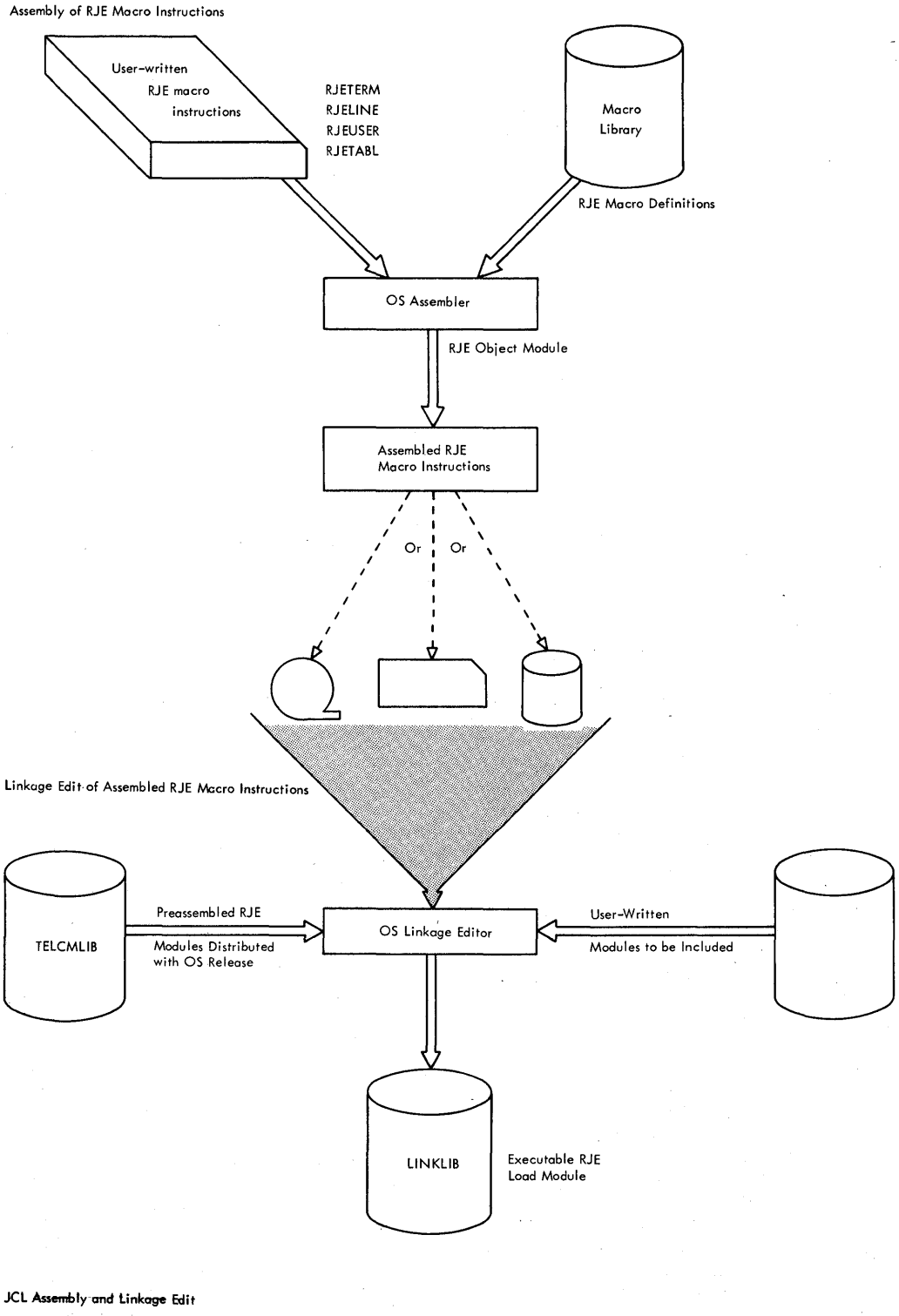


Figure 6. RJE Assembly and Linkage Edit

The object modules produced by the Assembler are edited by the OS Linkage Editor. This editing resolves the linkages created in the first step and produces the executable RJE program ready for use. The linkage editor output (the RJE load module) must be placed in the SYS1.LINKLIB when the RJE generation process is complete.

RJE ASSEMBLY MACRO INSTRUCTIONS

The contents of the RJE system to be generated are specified by the RJE macro instructions. The coding conventions and formats of the macros are the same as those for normal assembly macro instructions.

Note: Erroneous assemblies may result if extraneous cards have been inserted into the macro instruction deck or if an END statement has been omitted as the last card in the macro deck.

Figure 7 provides a summary of RJE macro instructions.

Name	Operation	Operand
name	RJELINE	DDLINE=ddname ,DDSYSIN=ddname [,RLN=1 / ,RLN=integer] [,MSGQEB=4 / ,MSGQEB=integer] [,JOBQEB=10 / ,JOBQEB=integer] [,LERB=([integer1 (255)] [,integer2 (10)] [,integer3 (5)] [,integer4 (5)])] [,ID=(type,{chars,termid},...)] [,MODE=([IBC] [A/B] [A/B])] [,IDVER=(integer,chars)] [,CP=MVT / ,CP=MFT] [,ONLNT=NO / ,ONLNT=YES] [,MODEM=STANDARD / ,MODEM=CC3977 / ,MODEM=PTT]
name	RJETERM	[TYPE=2780 / TYPE=CPU / TYPE=1130 / TYPE=2020 / TYPE=2770] [,PACK=NO / ,PACK=YES] [,PUNCH=YES / ,PUNCH=NO] [,FEATURE=NONE / ,FEATURE=2780MR / ,FEATURE=2770EB] [,PRTSZ=120 / ,PRTSZ=132 / ,PRTSZ=144] [,ID=chars]
[name]	RJEUSER	integer[,{userid,key},...]
[name]	RJETABL	JOB=integer ,SYSPRT=char ,SYSPCH=char ,SYSUSER=char ,SYSRJE=char [,JOBCARD=routine name] [,JOBACK=routine name] [,COMMERR=routine name] [,BUFNO=1 / ,BUFNO=integer]

Figure 7. Summary of RJE Macro Instructions

RJELINE - DESCRIPTION OF THE COMMUNICATIONS LINE

The RJELINE macro instruction designates characteristics that are required by RJE to service the communications line and attached work stations. One macro is specified for each line that RJE must support. The RJELINE macros must appear first in the macro deck. In addition, when line groups are used, they must be grouped by relative line numbers in ascending order. Line group denotes a logical grouping of communication lines. This grouping is done by concatenation of DD statements in the cataloged procedure, or with the UNITNAME macro during system generation. If lines are to be grouped, three conditions must be met:

1. All line connections must be the same, either switched or nonswitched.
2. All work stations within the line group must be of the same type.
3. All lines must be attached to the same type of control unit.

Name	Operation	Operand
name	RJELINE	DDLINE=ddname ,DDSYSIN=ddname [,RLN=1] [,RLN=integer] [,MSGQEB=4] [,MSGQEB=integer] [,JOBQEB=10] [,JOBQEB=integer] [,LERB=([integer$_1$ (255)] [,integer$_2$ (10)] [,integer$_3$ (5)] [,integer$_4$ (5)])] [,ID=(type,{chars, termid},...)] [,MODE=([IBC][,A (B)][,A (B)])] [,IDVER=(integer,chars)] [,CP=MVT][,ONLNT=NO] [,CP=MFT][,ONLNT=YES] [,MODEM=STANDARD] [,MODEM=CC3977] [,MODEM=PTT]

Additional explanation of line groups is provided in the publication IBM System/360 Operating System: Basic Telecommunications Access Method, GC30-2004. Information supplied by this macro provides:

1. Access to line information specified at system generation.
2. Identification of line groups, to avoid a need for additional control blocks.
3. Threshold values for error counters that cause an error message to be displayed to the central operator when any of the values is reached.
4. The polling list for multidrop lines, giving the polling characters of the work stations.
5. A description of optional features available on the communications control unit to which the line is attached.
6. The OS control program under which RJE is to operate.

Name Field

name
: specifies the name of the line. This name is used as a parameter in the SHOW command to request error information about the line.

Operand Field

DDLINE=ddname
: is the name specified in the DD statement defining the line (or line group). The DD statement defining the line must be included in the cataloged procedure required for RJE (see Cataloged Procedures for RJE).

  Note: Except in the case of line groups, the ddname must be unique.

DDSYSIN=ddname
: is the name of the DD statement defining the SYSIN data set for the line. This DD statement must also be part of the cataloged procedure for RJE.

RLN=1
RLN=integer
: specifies the relative line number of this line within the line group. If this keyword parameter is omitted, RLN=1 is assumed.

MSGQEB=4
MSGQEB=integer
: specifies the number of messages that can be queued for a work station at any given time.

JOBQEB=10
JOBQEB=integer
: specifies the number of jobs that can be queued for a work station at any given time.

Note: It is recommended that the number of QEBs specified must be greater than or equal to the number of jobs being submitted on any given line at any given time in the system.

LERB=([integer$_1$ 255] [,integer$_2$ 10] [,integer$_3$ 5] [,integer$_4$ 5])
specifies the various threshold values. If an error threshold is reached before the transmission threshold, a message containing line error information is displayed to the central operator. If no error counter reaches its threshold value before this number of transmissions have occurred, the current values of all counters are added to their respective accumulators, and the counters are reset to zero. These accumulator values may be displayed with the command: SHOW LERB, linename (see Central Commands). The allowable values are integers 1-255 inclusive. The underlined value is assumed for any parameter omitted.

Integer$_1$ -- transmission threshold
Integer$_2$ -- data check threshold
Integer$_3$ -- lost data threshold
Integer$_4$ -- nontext time-out threshold

ID=(type,{chars,termid},...)
specifies the type of work stations attached to the RJE system via a multipoint line. This parameter must be present for multipoint lines and must be omitted for other line connections. In addition, the keyword subparameter list supplies the polling character(s)[1] and identification of each work station attached to the line.

type is replaced with one of the following values:

2770 - if the attached work stations are IBM 2770 Data Communication Systems.
2780 - if the attached work stations are IBM 2780 Data Transmission Terminals.
1130 - if the attached work stations are IBM 1130 Computing Systems.
2020 - if the attached work stations are IBM System/360 Model 20 Computing Systems.
INTMX - for a multipoint line, INTMX must be specified if different types of remote work stations are to be connected on the same multipoint line. For example, if 2770s, 2780s, 1130s, and 2020s are mixed on the same line, INTMX must be specified.

chars is replaced with the EBCDIC hexadecimal equivalent of the polling character(s)[1] for the work station.

termid is replaced with the name specified in the RJETERM macro describing the work station.

Note: One pair of chars and termid values is required in the subparameter list for each work station on the line. Priority may be given to a multidropped work station by repeating its paired chars and termid values in the subparameter list.

If INTMX is specified, each chars field within the ID parameter must be the same length. For example, if 2770s, 2020s, and 2780s are mixed on the same line, SYN characters (hex 32) must be added, left justified, to each chars field so that all chars fields are equal in length.

Example:

```
ID=(INTMX,C1C1F0,RJETERM1,3232A1,RJETERM2,32C1F6,RJETERM3)
```

where: RJETERM1 is the name of the RJETERM macro instruction defining the 2770; RJETERM2, the name of the RJETERM macro instruction defining the 2020; and RJETERM3, the name of the RJETERM macro instruction defining the 2780.

F0 is the standard input device selection character for 2770s.

F6 is the standard input device selection character for 2780s.

MODE=([IBC][,A][,A])
IBC (Intermediate Block Check) specifies that the transmission control unit will recognize the intermediate block-check character and perform block checking without turning the line around. If this suboperand is omitted, intermediate block checking is not performed. The parameter IBC is required for 2770 and 2780, and is optional if CPU, 1130, or 2020 is specified in the RJETERM macro.

A
specifies that communications are to be through the Dual Communications Interface A of the 2701

---

[1]The 2780 has two polling characters, and the 1130 and the Model 20 have one.

Data Adapter Unit.

B
: specifies that communications are to be through the Dual Communications Interface B of the 2701 Data Adapter Unit. The 2701 must have the dual interface feature in order to code B. If this suboperand is omitted, A is assumed.

A
: specifies that transmission will be in code A for 2701 Data Adapter Unit Dual Code Feature.

B
: specifies that transmission will be in code B for 2701 Data Adapter Unit Dual Code Feature.

If this suboperand is omitted, A is assumed. The code selected must be in EBCDIC.

Programmer's Note: If the transmission control unit is a 2703, the last two suboperands [A/B][,A/B] must be omitted.

IDVER=(integer,chars)

integer
: specifies the number of characters specified in the chars field that follows.

chars
: specifies the identification verification characters (in hexadecimal representation of device code). The chars field must include an ENQ character (in hexadecimal) as the last character of the field. This operand is used only for switched line connections.

Example:

IDVER=(3,E6E62D)

where: 3 indicates the number of characters to follow.

E6E6 represents the two identification verification characters for a 2770.

2D is the hexadecimal representation of the ENQ character.

CP=MVT
: specifies the RJE system is to operate in an MVT system. The MVT system is assumed if the CP keyword is omitted.

CP=MFT
: specifies the RJE system is to operate in an MFT system.

ONLNT=NO
ONLNT=YES
: specifies whether the option ERROPT=T is set in the BTAM DCB macro instruction for RJE. If the parameter ONLNT=YES is specified, ERROPT=T is set and the BTAM on-line test facility is included in the central program. This allows on-line test to be invoked without discontinuing RJE at the central computer. For information on using the on-line test feature see IBM System/360 Operating System Basic Telecommunications Access Method, GC30-2004. If the parameter is omitted, on-line test is not included.

MODEM=STANDARD
MODEM=CC3977
MODEM=PTT
: specifies the type of data set to perform the modulation-demodulation and control functions necessary to provide compatability between remote work stations and the central installation.

STANDARD specifies that a standard data set (not a World Trade data set) is present. If this operand is specified, the line connection to the central system can be either switched or nonswitched. If the MODEM parameter is omitted, a standard data set is assumed.

CC3977 specifies that a World Trade IBM 3977 Continuous Carrier data set is present. If this operand is specified, the line connection to the central system must be on a nonswitched line.

PTT specifies that the data set present is not capable of providing for the central system an answering tone. If this operand is specified, the answering tone is provided by the central system to indicate to the calling operator that he should switch to data mode for transmitting data. The line connection to the central system must be on a switched line.

```
|Name |Operation|Operand                          |
|-----|---------|---------------------------------|
|LINE2|RJELINE  |DDLINE=LINEGRP4,RLN=2,           |
|     |         |LERB=(,,10),DDSYSIN=             |
|     |         |              INPUT42,           |
|     |         |ID=(1130,E8,NYC,E7,LA,E8,        |
|     |         |              NYC,E9,CHI)        |
```

Figure 8. Example of RJELINE Macro Instruction

Example: Figure 8 shows the RJELINE macro instruction describing a multidrop line, named LINE2, with three attached 1130 work

stations. The line is defined by DD statement LINEGRP4 and is the second line defined in the line group. The SYSIN data set is defined with DD statement INPUT42. The installation desires that an error message be displayed to the operator if 10 lost data errors occur before 255 transmissions. The other assumed threshold values are satisfactory. The attached work stations are named LA, NYC, and CHI and have the respective polling characters X, Y, and Z. Priority is to be given to work station NYC. The assumed operating environment is MVT.

RJETERM - DESCRIBE A WORK STATION

The RJETERM macro is used to describe each work station to the RJE system. One macro instruction must be specified for each work station to be supported by RJE.

```
┌─────┬────────┬──────────────────────────────┐
│Name │Oper-   │  Operand                     │
│     │ation   │                              │
├─────┼────────┼──────────────────────────────┤
│name │RJETERM │[TYPE=2780]  [,PACK=NO]       │
│     │        │ TYPE=CPU    ,PACK=YES]       │
│     │        │ TYPE=1130                    │
│     │        │ TYPE=2020                    │
│     │        │ TYPE=2770]                   │
│     │        │                              │
│     │        │[,PUNCH=YES] [,FEATURE=NONE ] │
│     │        │ ,PUNCH=NO ] [,FEATURE=2780MR]│
│     │        │             ,FEATURE=2770EB] │
│     │        │                              │
│     │        │[,PRTSZ=120]                  │
│     │        │ ,PRTSZ=132                   │
│     │        │ ,PRTSZ=144]                  │
│     │        │                              │
│     │        │[,ID=chars]                   │
└─────┴────────┴──────────────────────────────┘
```

Name Field

name

assigns the RJE symbolic name to the work station. This name, called the termid, identifies the work station to RJE. The work station is referred to by the termid rather than by its machine address. The termid is used in logically attaching the work station to the RJE system, in routing messages to the work station, and in retrieving information for the work station.

Operand Field

TYPE=2780
TYPE=CPU
TYPE=1130
TYPE=2020
TYPE=2770

identifies the type work station as:

(1) An IBM Data Transmission Terminal (TYPE=2780).

(2) An IBM System/360 Computing System (TYPE=CPU).

(3) An IBM 1130 Computing System (TYPE=1130).

(4) An IBM System/360 Model 20 Computing System (TYPE=2020).

(5) An IBM 2770 Data Communication System (TYPE=2770).

If this parameter is omitted, the work station is assumed to be a 2780.

Note: On a switched line connection, either an 1130, a Model 20, or a System/360 Computing System may be specified as TYPE=CPU, and hence, may use the same line. On a multipoint line, either a Model 20 or 1130 computing system may be specified as TYPE=1130 and may use the same line.

PUNCH=YES
PUNCH=NO

specifies whether a card punch is available at the work station. If the parameter is omitted, a card punch is assumed.

PRTSZ=120
PRTSZ=132
PRTSZ=144

specifies the length of the print line at the work station. A print line of 120 characters is assumed if the parameter is omitted. For TYPE=2770, 120 should be specified unless the expanded buffer feature is present. With this feature, either 120 or 132 is valid. For TYPE=2780, only 120 and 144 are valid.

Note: For the 2770, in order to use the full 132-character print line, the expanded buffer feature must be present. If this feature is not present, only 120-character output lines are supported.

ID=chars

if specified, indicates that the work station is connected to the RJE system via a multipoint line. The ID keyword value is the EBCDIC hexadecimal equivalent of the addressing character for the work station. For example, if the addressing character is the letter A, the ID keyword is coded as ID=C1 since C1 is the EBCDIC hexadecimal equivalent of A. Valid addressing characters for 2780 work stations are alphabetic. This keyword is not coded if the work station is connected via a point-to-point or switched line.

GENERATION OF THE RJE LOAD MODULE AND INITIALIZE PROGRAM

After the completion of stage 2 of operating system generation, the user must execute the necessary assemblies and link edits to create the RJE resident load module, IHKRJBGN, and the program that initializes the RJE control tables, IHKINTAB. (The program that initializes the broadcast-message data sets, IHKCDBMI, does not depend upon the RJE macro definitions and was prepared for execution at system generation time.)

Four steps are required to accomplish the above. One additional step is required for each of the three user exits to be included in the system. Figure 9 shows the JCL and linkage editor control cards required for these steps. Following is a description of each step.

Note: Erroneous assemblies may result if extraneous cards have been inserted into the macro instruction deck or if an END statement has been omitted as the last card in the macro deck.

STEP1 - assembles the RJE macros and places the object module produced (IHKAARJE) in a temporary data set (RJETEMP) from which it will be linkage edited to SYS1.TELCMLIB in a later step.

STEP2 - is necessary if the JOBCARD user exit is to be included. The user-written routine is assembled and placed in RJETEMP with the name specified in the RJETABL macro in STEP1.

STEP3 - is necessary if the JOBACK user exit is to be included. The user-written routine is assembled and placed in RJETEMP with the name specified in the RJETABL macro in STEP1.

STEP4 - is necessary if the COMMERR user exit is to be included. The user-written routine is assembled and placed in RJETEMP with the name specified in the RJETABL macro in STEP1.

STEP5 - linkage editing of four modules created in the preceding steps from RJETEMP to SYS1.TELCMLIB is accomplished.

Note: The following labels will be flagged as unresolved at the end of this step,

IHKPOST1
IHKPOST2
IHKABLSD
IHKBGNIN

and the names assigned to the user exits if any are included. If the compress/expand feature is present, the labels IHKCHPCK and IHKCHUPK will also be flagged as unresolved. These unresolved linkages do not affect the generation of the RJE system.

STEP6 - (At this point all modules needed in this step are on SYS1.TELCMLIB.) This step link edits all preassembled RJE resident modules and the output of STEP1, STEP2, STEP3, and STEP4 to create the RJE resident load module, IHKRJBGN, and places it on SYS1.LINKLIB . The linkage of all resident modules is triggered by including (by use of the INCLUDE card) the RJE modules IHKAARJE and IHKABLST. The module IHKAARJE, generated from the RJE assembly macros, contains external references by which the linkage editor includes all user-exit routines. The preassembled resident module IHKABLST contains external references by which all other preassembled resident modules are also included. NCAL must not be specified.

STEP7 - creates the program for initializing the RJE control tables. IHKAARJE and IHKCDINI are included from SYS1.TELCMLIB. The resulting program is placed on SYS1.LINKLIB and named IHKINTAB with entry point IHKCDINI. NCAL must be specified.

Note: The following labels will be flagged as unresolved at the end of this step:

IHKPOST1
IHKPOST2
IHKABLSD
IHKBGNIN

and the names assigned to the user exits if any are included. If the compress/expand feature is present, the labels IHKCHPCK and IHKCHUPK will also be flagged as unresolved. These unresolved linkages do not affect the operation of the initialize program.

Note: If any one of the RJE macro specifications is changed after the linkage-edits have been completed, STEP1, STEP5, STEP6, and STEP7 must be redone. If any of the user-exit routines is changed, the step(s) involved (i.e., STEP2, STEP3, STEP4) plus STEP5 and STEP6 must be redone.

SAMPLE JCL		
//RJEASLE	JOB	(JOB card parameters)
//STEP1	EXEC	ASMFC
//ASM.SYSPUNCH	DD	DSNAME=RJETEMP(IHKAARJE),DISP=(NEW,KEEP)
//		SPACE=(TRK,(10,1,2)),UNIT=23xx,VOLUME=SER=xxxxxx
//ASM.SYSIN	DD	*
		RJE macro statements
/*		
//STEP2	EXEC	ASMFC
//ASM.SYSPUNCH	DD	DSNAME=RJETEMP(name of user-exit routine),
//		DISP=OLD,VOLUME=REF=*.STEP1.SYSPUNCH
//ASM.SYSIN	DD	*
		input for user-exit routine
/*		
//STEP3 format as in STEP2 for second user-exit routine		
/*		
//STEP4 format as in STEP2 for third user-exit routine		
/*		
//STEP5	EXEC	PGM=LINKEDIT,PARM=(XREF,LIST,DC,NCAL,LET)
//SYSLMOD	DD	DSNAME=SYS1.TELCMLIB,DISP=OLD
//SYSLIB	DD	DSNAME=RJETEMP,DISP=(OLD,DELETE),UNIT=23xx,
//		VOLUME=SER=xxxxxx
//SYSUT1	DD	SPACE=(TRK,(10,10)),UNIT=SYSDA
//SYSPRINT	DD	SYSOUT=A
//SYSLIN	DD	*
	INCLUDE SYSLIB(IHKAARJE)	
	NAME IHKAARJE(R)	
	INCLUDE SYSLIB(name of first user exit)	
	NAME name of first user exit(R)	

Figure 9. Sample Job Control Language (Part 1 of 2)

SAMPLE CODING FORM (Continued)			
33.	//IHKMSGDD	DD	DSNAME=SYS1.IHKMSGSL,DISP=(NEW,CATLG),
34.	//		SPACE=(750,(1,1)),UNIT=2311,
35.	//		VOLUME=SER=111111
36.	//IHKBRDDD	DD	DSNAME=SYS1.IHKBRDSL,DISP=(NEW,CATLG),
37.	//		SPACE=(400,(1,1)),UNIT=2311,
38.	//		VOLUME=SER=111111

INITIALIZATION OF ALL DATA SETS ON SAME UNIT

STATEMENT

1. Job card
2. Execute Utility program (IEHPROGM) from library
3. Define output device for output messages
4. Indicate permanently mounted volume
5. Begin input stream
6-9. Scratch RJE control tables data sets
10-12. Scratch broadcast-message data sets
13. End of SYSIN
14. Execute program to initialize RJE Control Tables data sets
15. Define output device for abnormal end output
16-27. DD statements defining RJE control tables data sets. (Allocation for 10 jobs in the system at a time, 15 users, and 15 terminals)
28. Execute program to initialize broadcast-message data sets
29. Define output device for abnormal end output
30-38. DD statements defining broadcast-message data sets.

CATALOGED PROCEDURES FOR RJE

RJE operation requires one or more procedures cataloged in SYS1.PROCLIB. One of these procedures must be referred to when the RJE task is started and stopped at the central system. This procedure contains those JCL statements required by the operating system and the central RJE system. The name of the procedures must begin with the characters RJE.

Example: Figure 10 shows a procedure illustrating the following statements and the descriptions keyed to them.

In the first statement, RJE names the procedure and is used as the procedure name on the START command at startup. IHKRJBGN must be specified as the program name on all RJE procedures. (See Appendix B for algorithm to determine size of the RJE region.)

Default options for the OS job scheduler invoked by RJE may be specified in the PARM field of the EXEC statement. If default options are not specified in the PARM field, RJE will supply a default value (in parentheses). The default options for the OS job scheduler are positional parameters within the PARM field; that is, all options must be specified prior to the one that is to be changed. In this example, SYSDA has been changed to 2311.

(1) Parameter options - One-byte field specifies whether account numbers or programmer names are required on JOB statements (C'0'):

C'0' - account numbers or programmer names not required.
C'1' - fail all jobs that do not specify a programmer's name.
C'2' - fail all jobs that do not specify an account number.
C'3' - fail all jobs that do not specify an account number and programmer name.

(2) Default priority - Priority assigned to a job when it is not specified on the JOB statement (C'00').

(3) Default time limit (C'999').

(4) Default SYSOUT primary quantity - Number of tracks to be assigned to system output data sets when no other specification is made (C'030').

(5) Default SYSOUT secondary quantity (C'010').

(6) Interpreting priority - Dispatching priority assigned to this OS job scheduler while interpreting a job (C'249').

Note: For efficient operation of RJE, this value must not exceed 249.

(7) Default region size - Size of the region that will be requested for a step when no region size specification is made in the EXEC statement (C'050').

(8) Command authorization - Specifies disposition of commands (OS commands and RJE central commands - not RJE work station commands) read from this input stream. All commands will be ignored regardless of value specified (C'3').

C'0' - Execute the command
C'1' - Display the command and execute it
C'2' - Display the command, but do not execute it until advised by operator.
C'3' - Ignore the command

(9) Label Processing - (C'2'):

C'0' - Bypassed label processing (BLP) will be treated as no label.
C'1' - BLP will be treated as bypass label.
C'2' - Request instructions from operator.

(10) Default SYSOUT device name - Name of the unit to be used for system output data sets if no UNIT parameter was specified in a system output DD statement (CL8'SYSDA').

Note: If the SYSOUT device name is to be overridden, all 8 characters (including necessary blanks) must be specified.

(11) Command authorization for Multiple Console Support (MCS) - four hexadecimal numbers from 0000 to E000 indicating which operator command groups are to be executed if read from this input stream. This parameter is valid only for systems with the MCS option (X'E000').

(12) Default MSGLEVEL value - specifies the MSGLEVEL value if no value is specified on the JOB statement. Unless there is a MSGLEVEL=entry in the JOB statement, job control statements and allocation/termination messages are recorded in the system output data set according to the value of this parameter (X'00').

For further information on the PARM field for an OS reader procedure, see the IBM System/360 Operating System: System Programmer's Guide publication, GC28-6550.

In Figure 10, statements 1 through 4 are required by the routine that initiates system tasks and must be coded as shown.

Statements 5 through 11 are required for RJE direct access storage tables and must be coded as shown.

Statements 12 through 15 are the DD statements for the SYSIN data sets. This procedure assumes a four line network. One SYSIN DD statement is included for each line. The UNIT parameter on all of the SYSIN DD statements must be specified the same for each data set and must match the UNIT parameter on the IEFDATA DD statement. The space for any one SYSIN data set is controlled by the value of the secondary allocation parameter in the SPACE parameter (20 in this example). The system provides the secondary allocation fifteen times. Depending upon the requirements of the installation, the secondary allocation parameter may be increased or decreased. Hence, the maximum allowable space for one SYSIN data set is limited to the primary space allocation plus fifteen times the secondary allocation. The block size must be 80, 160, 240, 320, or 400 bytes (400 in this example). If no block size is specified, 80 is assumed. The block size in the RJE cataloged procedure may be overridden by the DCB parameter on the SYSIN DD card. No other subparameter is valid for the DCB parameter. The name specified for the DD statement must be the name designated in the RJELINE assembly macro. The DISP parameter is coded as shown.

Note: When two or more volumes have been specified for SYSIN data sets and the VTOC runs out of space, RJE will not attempt to allocate space on more than one volume. Since resulting conditions may be unpredictable, never specify more than one volume for SYSIN data sets.

During RJE operation, operands of system input data definition statements (DD * and DD DATA statements) appearing in the remote input stream are replaced with information appearing in the RJE catalogued procedure

PCH=20
PCH=40
PCH=42
indicates the type of punch available at the work station:

20 specifies an IBM 2520 Card Read Punch or Card Punch.

40 specifies an IBM 2540 Card Read Punch.

42 specifies an IBM 1442 Card Read Punch.

If the parameter is omitted, a 2540 Card Read Punch is assumed.

RDR=01
RDR=20
RDR=40
RDR=42
indicates the type of card reader available at the work station:

01 specifies an IBM 2501 Card Reader.

20 specifies an IBM 2520 Card Read Punch.

40 specifies an IBM 2540 Card Read Punch.

42 specifies an IBM 1442 Card Read Punch.

If this parameter is omitted, a 2540 Card Read Punch is assumed.

PACK=YES
PACK=NO
PACK=YES indicates that the user wants to use the compress/expand capability. Data records will be compressed before transmission, and punched and printed output compressed by the central system will be expanded by the remote work station. User exit data and message output remains in expanded format. A System/360 having more than 16K bytes of main storage is required if the compress/expand option is used.

If PACK=YES is specified for the work station program, PACK=YES must also be specified in the RJETERM macro instruction identifying this work station in the central program. Similarly, if PACK=NO is specified for the work station program, PACK=NO must be specified in RJETERM.

DIAL=NO
DIAL=MAN
DIAL=AUTO
specifies the type of communication line used by the work station:

NO specifies point-to-point contention communication over a non-switched line.

MAN specifies point-to-point contention over a switched line with manual dialing.

AUTO specifies point-to-point contention over a switched line with the Auto Call special feature installed on the 2701.

If this parameter is omitted, DIAL=NO is assumed.

INTRFC=A
INTRFC=B
specifies which interface provided by the 2701 is to be used when the Dual Interface feature is installed. If the parameter is omitted, INTRFC=A is assumed.

CODE=A
CODE=B
specifies which code is EBCDIC when the dual-code feature is installed on the 2701. If this parameter is omitted, CODE=A is assumed.

USER-EXIT INTERFACE

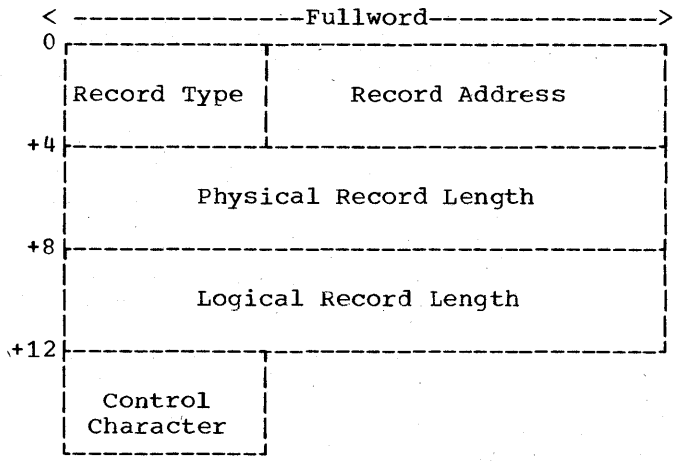
Output User-Exit Routine

Physical records are passed to a user-written output routine via an exit. This output routine need not save registers upon entry. The user must set up addressability for his routine and save any information he requires for subsequent entries. The entry point of the routine must be named IHKUSR. This routine receives control whenever output is available for it. The following information is passed to the user's routine:

Register 1 contains the address of a parameter list.

Register 14 contains the return address.

Register 1 contains the address of the parameter list that describes the output passed to the routine. This parameter is aligned on a fullword boundary. The format of this parameter list is:



Record Type: A one-byte code in hexadecimal representation indicating the type of record.

F1 - Fixed blocked records
F2 - Fixed unblocked records
F3 - Variable blocked records
F4 - Variable unblocked records
F5 - Undefined records
00 - End of File
FF - End of Job

Record Address: The address of the physical record passed to the routine.

Physical Record Length: The length (a binary value) of the physical record passed via the user exit.

Logical Record Length: The length (a binary value) of the logical records when fixed length records are passed via the user exit.

Control Character: A one-byte code (hexadecimal representation) indicating the type of control characters.

F1 - Machine code control characters
F2 - ASA control characters
F3 - No control characters

Note: The logical record field should be ignored with variable and undefined record types.

Input User-Exit Routine

Logical records are passed from a user-written input routine via an exit. This input routine is not required to save registers upon entry, but it must establish addressability and save any information needed for subsequent entries. The entry point for this routine must be named IHKUXIN. This routine receives control when a .. DATA card is read.

Register 1 contains the address of the .. DATA card.

Register 14 contains the return address.

When the user returns to RJE, one of the following conditions occurs:

1. A normal return is indicated by a zero return code in register 15. Register 1 contains the address of an 80-character logical record.

2. An I/O error that prevents further continuation is indicated by an eight (8) return code in register 15. Register 1 is not significant.

3. The end of .. DATA input is indicated by a four (4) return code in register 15.

Note: All statements that are acceptable through the card reader are acceptable through the user exit except the .. null statement.

The form of the .. DATA statement is as follows, with one or more blanks separating each operand.

ID	Operation	Operand
..	DATA	{BOS / BPS},'user information'

When a .. DATA card is read, control is given to the user. The address of the card is in register 1 to allow the user to test the 'user information' field. The user does not need to save registers, but he must establish addressability for his routine and save any information needed in subsequent entries.

When the user returns to RJE, he indicates:

a. a normal return by placing zero in register 15. Register 1 contains the address of an 80-byte logical record.

b. end of .. DATA input by placing a four (4) in register 15.

c. an I/O error by placing an eight (8) in register 15.

An invalid ID, BOS or BPS, causes the 6004A message, which will be reissued until it is corrected by a valid JECL card. After an abort message (6005), the system will wait for input from the line, the card reader, or the printer-keyboard.

If the user returns an error code (8 in register 15), RJE will:

a. set discontinue mode.

b. display message (6013) without reply to indicate error return.

c. read from card reader.

d. bypass to the next JECL or // JOB statement.

If a sequence error is detected in .. DATA input delivered from the user-written routine, RJE will:

a. display the normal sequence error message without reply.

b. display a new message (6006) indicating .. DATA input error.

c. simulate a 'C' response procedure; that is, input is bypassed to the next logical element (i.e., a JOB or JECL statement).

d. read input from the card reader if an EOF is returned when bypassing user input.

All statements that are valid for the card reader are valid for the input user exit with the exception of the .. null statement, which will be displayed and ignored.

Note: Delays (e.g., extensive I/O) in the user-written routine effect the overall throughput of the system and should be avoided.

SUPERVISOR ASSEMBLY CONSIDERATIONS

Operation of the RJE support at a remote System/360 work station depends upon the following parameters specified in the macro instructions for generating a supervisor:

1. SUPVR Macro Instruction

   CR=YES
   indicates that operator-initiated communication is used with the 1052 printer-keyboard.

2. IOCFG Macro Instruction

   DVE=n
   n must be specified as at least 2 for RJE operation.

   BSC=YES
   must be specified to include binary synchronous communication interrupt handling and error recovery routines in the assembled supervisor.

   BTAB=n
   n must be at least 1 for RJE operation.

3. SYMUN Macro Instruction

   Since the device assignments are fixed for RJE operation, symbolic units may be assigned at system generation so that no ASSGN cards will be required when the Job Control cards are submitted for RJE operation. The following assignments are used:

   SYS001
   must be assigned to the card reader used for RJE input.

   SYS002
   must be assigned to the card punch used for RJE punched output.

   SYS003
   must be assigned to the line printer used for RJE printed output.

   SYS004
   must be assigned to the 2701 Synchronous Data Adapter used for RJE communication.

   SYSLOG
   must be assigned to the 1052 printer-keyboard.

For a complete explanation of procedures involved in generating a supervisor, refer to IBM System/360 Basic Operating System: System Generation and Maintenance, GC24-5060; IBM System/360 Basic Programming Support: Programmer's Guide, GC24-3354; and IBM System/360 Basic Programming Support: System Generation and Maintenance, GC24-5061.

IBM 2770 DATA COMMUNICATION SYSTEM

The IBM 2770 Data Communication System consists of a 2772 Multipurpose Control Unit and a range of input/output devices from which may be selected those required to meet the requirements of a given application. The IBM 2770 Data Communication System with an IBM 2772 Multipurpose Control Unit (hereafter called a 2770) may be used as a Remote Job Entry (RJE) work station. It provides input and output capability over common carrier communications lines via binary synchronous communications (BSC) procedures. It can be connected to a central System/360 by a switched or nonswitched, point-to-point contention line, or a nonswitched multipoint line. On switched point-to-point lines or nonswitched multipoint lines, the 2770 may be intermixed with the IBM 2780 Data Transmission Terminal, the IBM 1130 Computing System, and the IBM System/360 Model 20 or larger. The following features are required:

1. EBCDIC Transmission Code.
2. EBCDIC Transparency.
3. Print line (either 120-character or 132-character).
4. A card reader input device.
5. A printer for output.

In addition, a punch unit, the 2770 multipoint line control, and expanded buffer special features are supported as optional features. The printer-keyboard is not supported for RJE operation. The other input/output devices available for the 2770 (except those listed above) are also not supported for RJE operation. The card reader, the printer and the punch are the only devices supported by RJE, and the card reader and the printer are mandatory for RJE operation.

The IBM 2213 Model 1 and Model 2 printers and the IBM 1053 Model 1 and Model 2 printers are supported by RJE. For both the 2213 and the 1053, the Model 1 does not have the vertical forms control feature, as the Model 2 has, and therefore is not as suitable for output operations.

2770 JOB SELECT SWITCH SETTINGS

For RJE operations, the following job select switches must be set or jumpered (prewired by the customer engineer when a system is installed). The printer supported for RJE should be specified as output device number 1 and the punch unit should be specified as output device number 2.

1. Card reader input device select.
2. Printer output device select.
3. Punch output device select.
4. Line mode.
5. Auto Answer inhibit.
6. Transparency switch.

Note: Once these switches are set, they must remain set for the duration of the RJE processing. After the work station becomes inactive, they may be reset as desired.

OPERATING PROCEDURES

SENDING INPUT

After supplying power to the 2770 according to the procedures outlined in the IBM 2770 Data Communication System manual (GA27-3013), an RJSTART card is placed in the card reader. If no further input is to be sent and output is expected, the RJSTART card should be the only card in the card reader. If additional input is to be sent, a LOGON card and the additional input follow the RJSTART. If punched output is expected, the card punch must be in a ready state and must contain blank cards.

If the connection is via a switched line, the number may be dialed at this time. After the line connection is made, the START key must be pressed to transmit the data.

The card reader sends all the cards before performing line turnaround to look for output from the central system.

RECEIVING OUTPUT

Output to the 2770 will be directed to either the printer or punch. The printer and the punch should be in a ready state at all times to avoid the unnecessary delay of having the transmission discontinued and of having to submit a CONTINUE command to resume transmission.

DISCONTINUING OUTPUT

Output in progress may be discontinued at any time by pressing the TERMINAL RESET key (on the 2772). After output has been dis-

continued, the central system will accept input, but no output will be sent until a CONTINUE command is received. The CONTINUE command provides three options so that discontinued output may be either:

- Restarted from the beginning of the data set.
- Continued with the SYSOUT block containing the last block transmitted.
- Deleted by the options specified in the CONTINUE command.

SPECIAL FORMS OUTPUT

Output requiring special forms or cards is automatically discontinued by the central system before it is transmitted, and a message giving the required form or card number is sent from the central system to the 2770.

PRINTER

For printed output, the required forms must be placed in the printer, and a CONTINUE command must be transmitted from the card reader. When this CONTINUE is received, the central system transmits the output.

PUNCH

For punched output, the required blank cards must be placed in the card punch hopper. If the punch is not ready, output is discontinued, and a CONTINUE command must be issued to continue transmitting.

PREPARING MORE INPUT

While output is being written on the printer, the operator may load and ready the card reader to send more input. Since the work station is already in the active or processing state, (see the section States of Work Stations), no RJSTART command is submitted. Unless the work station is in the inactive state, or unless the work station is in the processing state and a new user desires access to the system, no LOGON command is required. When the output to the printer is finished, the 2770 may send input.

RJE no longer automatically disconnects a switched line connection three minutes after all job input has been submitted because the disconnect sequence transmitted from the central installation is not recognized. The user has the responsibility for disconnecting the work station from the RJE system. If he wishes to remain connected, he does nothing, even if he has completed submitting jobs, in order to continue input operations. Otherwise, the user must submit an RJEND statement at the end of his input to allow the 2770 to be disconnected from the system. After the RJEND ACCEPTED message is received, the data set phone must be manually hung up to physically break the connection.

In general, the detection of any permanent line I/O error at the central system will cause the terminal to be disconnected. When this happens, the line connection must be reestablished (for a switched line) and the RJSTART and LOGON commands must be resubmitted along with the last unacknowledged input. A line error message will be returned along with the RJSTART accepted message. Other errors and their associated recovery procedures are described below.

ERROR RECOCERY PROCEDURES

FAILURE DURING INPUT

When the card reader fails (jams, etc.), the condition should be corrected and the card reader and printer brought to ready status. Recovery must be made within approximately three minutes for input to be resumed according to the error recovery procedures defined in the 2770 component description manual. If the time required to ready the reader exceeds three minutes on a switched line, an RJSTART and a LOGON command are required to resume input operations, and all unacknowledged input must be resubmitted (assuming one job submitted at a time). When more than one job is being processed, only the jobs from the point of failure and the entire job in which the failure occurred must be resubmitted. If the Auto Answer feature is present and active on a switched line, the line will be disconnected within 21 seconds, not 3 minutes, if recovery is not made within that time. For this reason, the Auto Answer feature should normally be off while running RJE.

FAILURE WHILE RECEIVING OUTPUT

Unit Failure

When the printer or punch fails, the condition should be corrected. On a switched line, if the problem can be corrected and the 2770 can be brought to ready status, a CONTINUE command may be transmitted, and the output will resume according to the option specified in the CONTINUE command. The interrupted data set can then be transmitted from the point of interruption. On a nonswitched line, there

is no time limit, and the output may be requested via a CONTINUE command.

Unit Not Ready

If the central system tries to transmit to a device that is not in ready status, the audible alarm sounds, and the TERM ADDRESSED light comes on. Follow the procedures outlined under Unit Failure for recovery procedures.

Central Failure

If the central system fails while output is in progress, the terminal is placed in the inactive status. When the central system comes back on line, an RJSTART command must be submitted. The message ABNORMAL CENTRAL CLOSEDOWN is returned with the RJSTART acknowledgment message. Following these messages, output that was in progress at the time of the failure is resumed from the beginning; it may or may not be the first output to be received after communications are reestablished.

TESTING THE RJE SYSTEM

If it is desirable to test the system to check that transmissions are being received, a message may be sent to the sending work station. If it is returned, the system is in working order (i.e., the user may send himself a message, and if he receives it on the printer, the system is working properly).

RECOMMENDED OPERATING SUGGESTIONS

To minimize the recovery effort in case of an error, the following procedures are recommended to the 2770 operator:

1. The RJSTART and LOGON commands may be submitted separately to insure that they are correct.

2. Job input streams should be limited to a few jobs in order to limit the number that must be resubmitted in case of an input error that requires the central system to flush the entire input stream.

3. Remote Job Entry operations on the 2770 must be in "transmit transparency" mode at all times.

4. If output is expected, it is recommended that the output devices be ready at all times. If while receiving output, the user finds it urgent to submit more input, the output should be discontinued, then the input can be submitted. After submitting the input, the output can be retrieved by submitting a CONTINUE command with the desired option.

The IBM 2780 Data Transmission Terminal (Model 1 or 2) is a supported work station in the RJE system. It provides input and output capability over common carrier communication lines via binary synchronous communications procedures. Model 1 supports card input and printer output. Model 2 supports card input, printed output, and punched output. The special features required for either model of the 2780 used for RJE processing are the following:

1. EBCDIC Transmission Code.
2. EBCDIC Transparency.
3. Print Line (either 120-character or 144-character).
4. Automatic Turnaround (Model 2 only).
5. Extended (Enquiry-ENQ) Retry Transmission.

In addition, the following special features are supported, but not required:

1. Multipoint Line Control.
2. Multiple Record Transmission for printed output.
3. Operator Intervention.

Note: If the Operator Intervention feature is not present, the 2780 does not recognize an RVI character and does not exhaust all card input from the card hopper before sending an EOT to cause mode turnaround from input to output.

For a description of the various switches, lights, and controls, refer to IBM 2780 Data Transmission Terminal -- Component Description, GA27-3005.

OPERATING PROCEDURES

Normal Operation

Sending Input

After powering up the 2780 according to procedures in the 2780 manual, an RJSTART card is placed in the card reader. If no further input is to be sent and punched output is expected, blank cards are placed behind the RJSTART card to trigger the Auto Turnaround feature. If no punched output is expected, no cards follow the RJSTART. If additional input is to be sent, a LOGON card and the additional input follow the RJSTART.

When the input has been placed in the reader, the mode switch is placed in the "transmit transparent" position, and if there are no blank cards following the input data (no punched output is expected), the EOF button must be pressed. If punched output is expected, the Auto Turnaround feature must be activated by pressing the Auto Turnaround button (the button will light when active). If the connection is via a switched line, the number must be dialed at this time. After the line connection is made, the start key must be pressed to transmit the data.

The 2780 sends all the cards in the reader before performing line turnaround to look for output from the central system. The audible alarm will be triggered either by reading a blank card (by the Auto Turnaround feature on the Model 2) or by reading the last card if the EOF key has been pressed. This alarm will sound until it is turned off either by receiving output from the central system or by operator intervention. If line turnaround is triggered by running out of cards (implies no Auto Turnaround), only the printer will be ready to receive output.

Receiving Output

When the 2780 receives an EOT after receiving a complete transmission, the audible alarm sounds unless the reader is in ready status. The alarm is turned off when the 2780 receives an ENQ from the central system signifying more output, or when the operator presses the stop key causing the 2780 to drop ready status. The start keys for the printer and reader/punch must be pressed to return the 2780 to ready status.

Discontinuing Output

Output in progress may be discontinued at any time by pressing the stop key (on the reader/punch). After output has been discontinued, the central system will accept input, but no output will be sent until a CONTINUE command is received. The CONTINUE command allows three options so that discontinued output may be either:

1. restarted from the beginning of the data set,

2. continued with the SYSOUT block containing the last block transmitted, or

3. deleted by the options specified in the CONTINUE command.

Special Forms Output

Output requiring special forms or cards is automatically discontinued by the central system before it is transmitted, and a message giving the required form or card number is sent from the central system to the 2780.

Printer

For printed output, the required forms must be placed in the printer and a CONTINUE command must be transmitted from the 2780 reader. Upon receipt of this command the central system transmits the output.

Punch

For punched output, the required blank cards must be placed in the hopper (if Auto Turnaround is to be triggered). If Auto Turnaround is not active, a CONTINUE statement should be submitted to trigger the Auto Turnaround feature. After the CONTINUE command is received, the central system transmits the output to the punch. If the punch is not ready, output is discontinued, and a CONTINUE command is issued to continue transmitting. There can be no punched output if the Auto Turnaround feature is not active. If there is no punch at the 2780, output that has been designated to be punched will be printed on the printer.

Preparing More Input

While output is being written on the printer, the operator may load and ready the reader to send more input (unless Auto Turnaround is active). Since the work station is already in the active or processing state (see States of Work Stations), no RJSTART command is submitted. Unless the work station is in the inactive state, or unless the work station is in the processing state and a new user desires access to the system, no LOGON command is required. When the output to the printer is finished, the 2780 may send input. If the output is being received at the punch (or the printer, if Auto Turnaround is active), the operator must wait until the output has been completed. Then, after removing the punched output (if any) and blank cards, the operator may reload and prepare the reader to transmit input.

Error Recovery Procedures

In general the detection of any permanent line I/O error at the central system will cause the terminal to be disconnected. When this happens, the line connection must be reestablished (for a switched line) and the RJSTART and LOGON commands must be resubmitted along with the last unacknowledged input. A line error message will be returned along with the RJSTART accepted message. Other errors and their associated recovery procedures are described below.

Failure During Input

When the 2780 card reader fails (jams, etc.), the condition should be corrected and the card reader and printer brought to ready status. On a switched line recovery must be made within approximately three minutes for input to be resumed according to the error recovery procedures defined in the 2780 manual. If the time required to ready the reader exceeds three minutes on a switched line, an RJSTART and a LOGON command are required to resume input operations, and all unacknowledged input must be resubmitted. If the Auto Answer feature is present and active on a switched line, the line will be disconnected within 21 seconds, not three minutes, if recovery is not made within that time. For this reason, the Auto Answer feature should normally be off while operating RJE.

Time-Outs

RJE no longer automatically disconnects a switched line connection three minutes after all job input has been submitted because the 2780 does not recognize the disconnect sequence transmitted from the central installation. The user has the responsibility for disconnecting the work station from the RJE system. If he wishes to remain connected, he does nothing, even if he has completed submitting jobs, to continue input operations. Otherwise, the user must submit an RJEND statement at the end of his input to allow the 2780 to be disconnected from the system. After the RJEND ACCEPTED message is received, the data set phone must be manually hung up to physically break the connection. If the Auto Answer feature is active for the work station, the time limit for switched line connection recovery is 21 seconds. For this reason, Auto Answer should normally be off while operating RJE.

Carriage Control Limitation

The range of carriage control functions for the 2780 is less than that provided for

local printers. Specifically, the 2780 does not provide skips past channel 8, nor space suppression. When using the 2780 for remote output, these carriage control functions should be avoided. If they are

requested, they will result in a write and single space operation.

Failure While Receiving Output

Unit Failure

When the printer or punch fails, the condition should be corrected. On a switched line, if the problem can be corrected and the 2780 can be brought to ready status within three minutes, a CONTINUE command may be transmitted, and the output will resume according to the option specified in the CONTINUE command. If recovery requires more than three minutes, the connection must be reestablished and an RJSTART command must be transmitted. The interrupted data set can then be transmitted from the point of interruption. On a nonswitched line there is no time limit, and the output may be requested via a CONTINUE command.

Note: If punched output is to be received, blank cards must follow the CONTINUE command to trigger the Auto Turnaround feature.

Unit Not Ready

If the central system tries to transmit to a device that is not in ready status, the audible alarm sounds, and the TERM ADDRESSED light comes on. Follow the procedures outlined under Unit Failure for recovery procedures.

Central Failure

If the central system fails while output is in progress, the terminal is placed in an inactive status. When the central system comes back on line, submit an RJSTART command. The message ABNORMAL CENTRAL CLOSEDOWN is returned with the RJSTART acknowledgment message. After these messages, output that was in progress at the time of the failure is resumed from the beginning. If a remotely submitted job of a higher priority than the partially returned job completes after the central system is reactivated, but before RJE is restarted, immediate output from the higher priority job will be returned before the interrupted output is transmitted.

Testing the RJE System

If it is desirable to test the system to check that transmissions are being received, a message may be sent to the sending work station. If it is returned, the system is in working order (i.e., the user may send himself a message, and if he receives it on the printer, the system is working properly).

Recommended Operating Suggestions

To minimize the recovery effort in case of an error, the following procedures are recommended to the 2780 operator:

1. The RJSTART and LOGON commands may be submitted separately to insure that they are correct.
2. Remote Job Entry operations on the 2780 are in "transmit transparency" mode at all times.
3. For a 2780 work station on a switched line to be disconnected from the RJE system after normal operation has completed, an RJEND statement should be submitted immediately after all input has been entered. After the RJEND ACCEPTED message is received, the data set phone must be manually hung up to physically break the connection.
4. If punched output is expected, it is recommended that the Auto Turnaround feature be triggered by blank cards and then that the user wait for the output. The end of output is signalled by the audible alarm, and at this time more input may be submitted if desired. If it is urgent that more input be submitted, discontinue output. Then the desired input can be submitted. The Auto Turnaround feature must be used to get punched output.
5. Unless it is certain that no punched output is going to be sent, the following steps should be performed before submitting input:
   a. Press the STOP button.
   b. Press the NPRO button (to flush cards).
   c. Set mode switch to OFFLINE and back to TSM TRSP (to drop ready status on the printer and the punch).
   d. Ready the printer.
   e. Place the input cards and blank cards in the hopper.
   f. Press the Auto Turnaround and the START buttons, respectively.
6. If it is certain that no punched output is expected (always the case for a Model 1), follow steps a through d, above, and then place the input cards in the hopper, press the End-of-File and START buttons, respectively.
7. For expected punched output, when Auto Turnaround has not been used, place blank cards in the hopper, and press the Auto Turnaround and START buttons

to ready the punch for the output that is to be received.

8. Unattended 2780 operation on a switched or multipoint line is not recommended. On a switched line, the operator must correct an input failure (card jam, etc.) within three minutes or the entire job must be resubmitted. Although no recovery time limit exists for work station failures on a multipoint line, the line remains logically attached to the work station until the error is corrected. During this period other work stations on the line are denied access to the system.

INDEX

Indexes to systems reference library manuals are consolidated in the publication IBM System/360 Operating System: Systems Reference Library Master Index, GC28-6644. For additional information about any subject listed below, refer to other publications listed for the same subject in the Master Index.

IBM System/360 OS RJE (S360-36) Printed in U.S.A. GC30-2006-4

IBM

International Business Machines Corporation
Data Processing Division
1133 Westchester Avenue, White Plains, New York 10604
[U.S.A. only]

IBM World Trade Corporation
821 United Nations Plaza, New York, New York 10017
[International]

IBM **Technical Newsletter**

File Number S360-36

Re: Order No. GC30-2006-4

This Newsletter No. GN30-2555

Date May 31, 1971

Previous Newsletter Nos.
GN30-2543
GN30-2547

IBM System/360 Operating System
Remote Job Entry

This Technical Newsletter provides replacement pages for the subject publication. These replacement pages remain in effect for subsequent releases unless specifically altered. Pages to be inserted and/or removed are:

iii,iv
11,12
19,20
65,66
66.1 (added)
67,68
141-back cover

A change to the text or a small change to an illustration is indicated by a vertical line to the left of the change.

Summary of Amendments

This Technical Newsletter provides information about the IBM System/3 Model 6 and Model 10, which are being added as supported RJE work stations. The System/3 Model 6 is supported only for World Trade use.

Note: Please file this cover letter at the back of the publication to provide a record of changes.

IBM Corporation, Publications Center, Dept. E01, P.O. Box 12275, Research Triangle Park, N.C. 27709

PRINTED IN U.S.A.

PREFACE

Remote Job Entry (RJE) extends operating system facilities to remote users. This publication describes the facilities provided by RJE, the use of these facilities and the creation of an RJE system. A brief description of the related telecommunications systems is included. Operating procedures are defined for the central installation and the various work stations. This publication also introduces Job Entry Control Language (JECL) with which a user requests, controls, and maintains RJE facilities in the system.

The RJE user should be familiar with the concepts and terminology introduced in:

IBM System/360 Operating System:

Introduction, GC28-6534

Job Control Language User's Guide, GC28-6703

Job Control Language Reference, GC28-6704

The installation programmer responsible for the creation and maintenance of the central RJE system also should be familiar with:

IBM System/360 Operating System:

System Generation, GC28-6554

Basic Telecommunications Access Method, GC30-2004

System Programmer's Guide, GC28-6550

Messages and Codes, GC28-6631

System Management Facilities, GC28-6712

Data Management Services, GC26-3746

Utilities, GC28-6586

Storage Estimates, GC28-6551

Publications relevant to programming and operation of remote work stations are:

IBM System/360 Work Station

IBM System/360 Basic Operating System:

System Generation and Maintenance, GC24-5060

Programmer's Guide, GC24-3372

Operating Guide, GC24-3450

Operator Messages, GC24-5024

Assembler With Input/Output Macros, GC24-3361

IBM System/360 Basic Programming Support:

Programmer's Guide, GC24-3354

Operating Guide - Basic Tape System (8K), GC24-3391

System Generation and Maintenance, GC24-5061

Assembler With Input/Output Macros, GC24-3355

IBM 2770 Data Communication System

System Components, IBM 2770 Data Communication System, GA27-3013

IBM 2770 System Summary, GA27-3014

IBM 2780 Data Transmission Terminal Work Station

IBM 2780 Data Transmission Terminal Component Description, GA27-3005

IBM 1130 Computing System Work Station

IBM 1130 Functional Characteristics, GA26-5881

IBM 1130 Disk Monitor System, Version 2, Programming and Operator's Guide, GC26-3717

IBM System/360 Model 20 Work Station

IBM System/360 Model 20:

Remote Job Entry Work Station, GC33-4003

Functional Characteristics, GA26-5847

Operator's Guide, G229-2137

Input/Output Control System for the Binary Synchronous Communications Adapter Operating Procedures, GC33-4002

Tape Programming System Operating Procedures, GC24-9009

Disk Programming System Operating Procedures, GC33-6004

IBM System/3 Work Station

IBM System/3:

RJE Work Station Support Reference Manual, GC19-0007 (for World Trade only)

Card System Operator's Guide, GC21-7513

RJE Work Station Support Reference Manual, GC21-7531

Disk System Halt Procedure Guide, GC21-7540

Model 6 Halt Procedure Guide, GC21-7541

IBM SYSTEM/360 MODEL 20

RJE facilities are available for the IBM System/360 Model 20 under Card Programming Support (CPS), the Tape Programming System (TPS) and the Disk Programming System (DPS); the Model 20 work station can be connected to the central System/360 by a 600-50,000 bit-per-second switched or non-switched, point-to-point (contention) line or nonswitched multipoint line. Line speed over 4800 bits per second is available only in PTP.

The minimum system requirements under CPS, TPS and DPS are:

- An IBM 2020 Central Processing Unit (submodels 2, 4 and 5) with 12K bytes of main storage.
- A card reader.
- A printer.
- An IBM Binary Synchronous Communications Adapter (Feature No. 2074 for submodel 5 and 2720 for submodels 2 and 4 for the World Trade supported adapter, and Feature No. 2074 only for all submodels for the domestically supported adapter) with EBCDIC and Full Transparency Text Mode Features.

The following additional features are supported:

- A card punch (may be required for generating the program).
- Under TPS, tape input and output.
- Under DPS, both tape and disk input and output.
- Under DPS, an IBM 2152 Printer-Keyboard.

IBM SYSTEM/3

RJE facilities are available for the IBM System/3 Model 6 (supported for World Trade use only) and Model 10 Card and Disk Systems. The system may be connected to a 1200 to 50,000 bit-per-second line via the BSC Adapter. The line may be a switched or nonswitched point-to-point line, or a nonswitched multipoint line.

The minimum system requirements are:

System/3 Model 10 Card System

- IBM 5410 Processing Unit with 8K bytes of main storage.
- IBM 5424 Multifunction Card Unit.
- IBM 5203 Printer.
- IBM BSC Adapter with EBCDIC code and the Transparency feature.

System/3 Model 10 Disk System

- IBM 5410 Processing Unit with 12K bytes of main storage.
- IBM 5444 Disk Storage Drive.
- IBM 5424 Multifunction Card Unit.
- IBM 5203 Printer.
- IBM BSC Adapter with EBCDIC code and the Transparency feature.

System/3 Model 6

- IBM 5406 Processing Unit with 8K bytes of main storage.
- IBM 5444 Disk Storage Drive.
- IBM 5213 Printer.
- IBM BSC Adapter with EBCDIC code and the Transparency feature.

Note: RJE requires a printer for logging messages. Therefore, RJE support for the Dual Program feature may require an IBM 5471 Printer-Keyboard.

The following special features are supported:

Model 10 Disk System

- IBM 5471 Printer-Keyboard for input and output.
- IBM 5444 Disk Storage Drive for input and output.

Model 6 Disk System

- IBM Keyboard for input.
- IBM 5496 Data Recorder for input and output.
- IBM 5444 Disk Storage Drive for input and output.

Refer to IBM System/3 RJE Work Station Support Reference Manual, GC19-0007 (for World Trade only) or GC21-7531, for additional information.

This section describes the basic characteristics and operational concepts of the Remote Job Entry telecommunications system: what it is, how its sections are related, how communication proceeds, and how control is maintained. A number of commonly used terms are defined.

The RJE system is, in effect, a specific application of a computer-based telecommunications system. The particular telecommunications system used for Remote Job Entry is characterized by a number of work stations that are connected to a central processor by one or more communication lines operating in half-duplex mode. A half-duplex line is a line over which data can flow in either direction, but in only one direction at a time.

The RJE program uses the OS Basic Telecommunications Access Method (BTAM) to control the communication lines and communicate with the work stations. Work station is used as a general term to represent interconnected equipment at the remote location having both input and output capability. Work stations are usually separated from the central processor by a distance sufficient to require common carrier facilities to accomplish communication with the central processor. The system, however, may include work stations attached to the central location by local lines. Regardless of location, all supported work stations are classified as "remote" since they are attached to the central system by an IBM 2701 or 2703 transmission control unit.

TELECOMMUNICATIONS NETWORKS

A telecommunications system may utilize a nonswitched network, a switched network, or a combination of the two.

A nonswitched network consists of a number of private or leased lines that connect the computer to one or more work stations. The computer and work stations are physically connected; that is, the circuits making up the communication lines are continuously established for predetermined time periods during which data may be transmitted over them. The lines that comprise a nonswitched network are known variously as private, leased, or dedicated lines. These lines are usually furnished by a common carrier on a contract basis between specified locations for a continuous period or for regularly recurring periods at stated hours for the exclusive use of one customer.

A switched network allows many work stations to communicate with the computer without requiring dedicated communication connections. The computer and the several work stations are connected by access lines to the common-carrier exchanges serving their respective locations. A complete and continuous data path is established between computer and work station only for the period of time in which transmission takes place. The connection is established by dialing the telephone number of the unit at the other end. In this case, line refers to a discrete data path between the telecommunications control unit and the common carrier exchange. The service provided by the common carrier is usually on a time-used basis.

Some communication networks have characteristics typical of both switched and nonswitched networks. In this publication, the term switched network refers to any network in which a direct physical connection between computer and work station must be established by dialing in order for data transmission to occur. The term nonswitched network refers to a network in which the communication lines linking computer and work station are continuously established, thus requiring no dialing.

NETWORK CONTROL

Initial contact between the central system and the remote work stations in an RJE system may occur in two ways, dependent on the type of line connection between them. The connections possible are multipoint (on nonswitched lines) and point-to-point contention (on both switched and nonswitched lines). The RJE system permits communication using either type of connection.

If a work station is connected via a multipoint line, data is sent and received under control of the central system. In order to send data, the work station must be polled by the central system. In order to receive data, the work station must be selected by the central system. Polling is an invitation to a work station to transmit data to the central system. Once a work station has accepted this invitation (through recognition of its polling characters), it may use the line to send data.

Program, the 1130 Work Station Program, and the IBM System/360 Model 20 (2020) Work Station Program support the feature.

MULTIPLE RECORD FEATURE

The optional multiple record feature of the 2780 work station is supported by RJE for printed output. It provides increased system throughput by blocking up to seven output records. At RJE assembly time, the user specifies this option in the RJETERM macro instruction for the central system.

SYSTEM MANAGEMENT FACILITIES

RJE supports the system management facilities (SMF) feature of the operating system that is provided to record a history of each job as it is processed and to monitor jobs as they are processed. SMF gathers and records job information that can be used by management programs to report system efficiency, performance, usage and costs. This feature also allows the manager to add installation-written routines that enforce installation standards of identification, priority, resource allocation, and maximum execution time. For additional information, see IBM System/360 Operating System: System Management Facilities, GC28-6712.

REVERSE INTERRUPT LINE CONTROL

RJE uses the binary synchronous communications (BSC) reverse interrupt (RVI) line control character to allow two or more types of supported work stations to be connected to the same switched line. For example, a 2770, a 2780, an 1130, a System/3, or a System/360 Model 20 or larger may use the same switched line connection.

SYSTEM OVERLOAD

An overload condition results if direct access storage space at the central installation is insufficient to meet the demands of the system. Input already received and acknowledged by RJE is not affected by an overload condition. Any input transmission causing an overload condition is aborted and must be entirely resubmitted at a later time.

In each overload situation, a message is sent to both the central operator and the work station operator indicating the particular resource depleted. If the system continues to be overloaded, the direct access storage space allotted for the resource must be increased to reflect more realistically the peak traffic requirements of the system. An alternate solution may be to reschedule the work load to take advantage of periods of relative inactivity.

The total system input capacity is specified by the central installation and is dependent on the following resources:

- The quantity of SYS1.SYSJOBQE space - specified at OS system generation or during IPL.
- The number of concurrent jobs RJE is to maintain - specified at RJE assembly.
- The quantity of space for remotely submitted SYSIN data - specified in an RJE cataloged procedure referenced in the START command for RJE.

SYS1.SYSJOBQE depletion results when job input submitted both locally and from attached work stations, exceeds the limit specified by the central installation. If this condition continues to occur, the size of the SYS1.SYSJOBQE must be increased to reflect both the local and remote requirements of the system. This will require that SYS1.SYSJOBQE be scratched and reallocated.

An overload condition also occurs when the number of remote jobs resident in the central system exceeds the limit specified when the RJE program was assembled. Remote jobs are resident until the output is removed from the RJE SYSOUT class. This condition is relieved by requesting the output of completed remote jobs or by deleting jobs that are tying up the system. The central operator can do this with the CENOUT command. The RJE user can do this with the OUTPUT and DELETE commands. If the condition continues to occur, the number of remote jobs RJE can maintain must be increased. This requires an RJE assembly.

Depletion of SYSIN space is the final cause of a system overload. In its cataloged RJE procedure, the installation specifies SYSIN data sets on a communication line basis. In this procedure, the installation specifies the maximum space available for any one SYSIN input data set. Specifying the maximum amount of space allocated for one input data set prevents one job from getting all the SYSIN space. This is a system protection feature, and no special action is necessary at the central system if a job exceeds this limit. On the other hand, a regular depletion of space for SYSIN allocation necessitates that more SYSIN space be made available to the system (See the section entitled Cataloged Procedures for RJE).

JOB ENTRY CONTROL LANGUAGE

The additional flexibility and control required by the remote entry are provided in the RJE system by Job Entry Control Language (JECL). JECL is independent of Job Control Language (JCL), allowing system independence for RJE applications and isolation of those control statements needed only for an RJE application. As a result, only JECL statements are added or removed when a user moves between local and remote environments. The job and its scheduling information (in JCL) are the same in either environment except that JCL In-Stream Procedures are not supported in the remote RJE environment. JECL uses the same coding format as that used for Job Control Language statements. For further information on In-Stream Procedures, see the IBM System/360 Operating System Job Control Language Reference, GC28-6704, and the IBM System/360 Operating System: System Programmer's Guide, GC28-6650.

The RJE user identifies himself and his work station to the system with JECL. When the user and the work station are identified as part of the system, the user may request other RJE facilities with additional JECL statements. These other RJE facilities include the ability to:

- Select job output control options.
- Communicate with the central operator.
- Communicate with other RJE users.
- Inquire about status of jobs in system.
- Receive notification of job completion.
- Detach the work station from the system.
- Continue transmission of interrupted output.
- Define RJE processing of a remotely submitted job.

JECL STATEMENTS

Communication between the user and RJE processing programs is accomplished by two types of Job Entry Control statements:

1. Job Entry Definition Statement.
2. Work Station Command Statement.

These control statements aid the RJE processing programs in the servicing of users and the supervision of work stations attached to the RJE system.

THE JOB ENTRY DEFINITION STATEMENT

The Job Entry Definition Statement (called the JED statement) marks the beginning of a job entry. It is the only JECL statement that may be continued on successive cards. With the JED statement, the user specifies disposition of job output, notification at job completion, alternate recipient of the output, and information to be returned with notification. The JED statement is an optional statement. If a job in the input stream is not preceded by a JED statement or the JED statement is in error, RJE system default options are assumed.

THE WORK STATION COMMAND STATEMENTS

For the RJE user, work station command statements provide a convenient means of requesting RJE facilities to aid him in his application. They enable him to request output, determine the status of a job, specify the state of the work station, etc. A thorough discussion of the commands provided and the facilities that they offer is provided in the section on Work Station Commands.

FIELDS IN THE CONTROL STATEMENTS

Control statements submitted at a work station contain two identifying characters (..) and four fields: operation, operand, comment, and sequence. In some of the statements one or more of the fields are blank. Figure 2 shows the fields in each statement.

Statement	Columns 1 & 2	Fields (Columns 4-71)	Columns 73-80
Job Entry Definition	..	JED Operand Comment*	Sequence*
Work Station Command	..	Operation Operand Comment* (Command)	Sequence*

*Optional

Figure 2. Fields in the Control Statements

RJELINE - DESCRIPTION OF THE COMMUNICATIONS LINE

The RJELINE macro instruction designates characteristics that are required by RJE to service the communications line and attached work stations. One macro is specified for each line that RJE must support. The RJELINE macros must appear first in the macro deck. In addition, when line groups are used, they must be grouped by relative line numbers in ascending order. Line group denotes a logical grouping of communication lines. This grouping is done by concatenation of DD statements in the cataloged procedure, or with the UNITNAME macro during system generation. If lines are to be grouped, three conditions must be met:

1. All line connections must be the same, either switched or nonswitched.
2. All work stations within the line group must be of the same type.
3. All lines must be attached to the same type of control unit.

Name	Operation	Operand
name	RJELINE	DDLINE=ddname ,DDSYSIN=ddname [,RLN=1 / ,RLN=integer] [,MSGQEB=4 / ,MSGQEB=integer] [,JOBQEB=10 / ,JOBQEB=integer] [,LERB=([integer1 / 255] [,integer2 / 10] [,integer3 / 5] [,integer4 / 5])] [,ID=(type,{chars, termid},...)] [,MODE=([IBC] [,A / B] [,A / B])] [,IDVER=(integer,chars)] [,CP=MVT / ,CP=MFT] [,ONLNT=NO / ,ONLNT=YES] [,MODEM=STANDARD / ,MODEM=CC3977 / ,MODEM=PTT]

Additional explanation of line groups is provided in the publication IBM System/360 Operating System: Basic Telecommunications Access Method, GC30-2004. Information supplied by this macro provides:

1. Access to line information specified at system generation.
2. Identification of line groups, to avoid a need for additional control blocks.
3. Threshold values for error counters that cause an error message to be displayed to the central operator when any of the values is reached.
4. The polling list for multidrop lines, giving the polling characters of the work stations.
5. A description of optional features available on the communications control unit to which the line is attached.
6. The OS control program under which RJE is to operate.

Name Field

name
: specifies the name of the line. This name is used as a parameter in the SHOW command to request error information about the line.

Operand Field

DDLINE=ddname
: is the name specified in the DD statement defining the line (or line group). The DD statement defining the line must be included in the cataloged procedure required for RJE (see Cataloged Procedures for RJE).

Note: Except in the case of line groups, the ddname must be unique.

DDSYSIN=ddname
: is the name of the DD statement defining the SYSIN data set for the line. This DD statement must also be part of the cataloged procedure for RJE.

RLN=1
RLN=integer
: specifies the relative line number of this line within the line group. If this keyword parameter is omitted, RLN=1 is assumed.

MSGQEB=4
MSGQEB=integer
: specifies the number of messages that can be queued for a work station at any given time. If this keyword parameter is omitted, MSGQEB=4 is assumed.

JOBQEB=10
JOBQEB=integer
: specifies the number of jobs that can

be queued for a work station at any given time. If this keyword parameter is omitted, JCBQEB=10 is assumed.

Note: It is recommended that the number of QEBs specified must be greater than or equal to the number of jobs being submitted on any given line at any given time in the system.

LERE=([integer$_1$ 255][,integer$_2$ 10][,integer$_3$ 5][,integer$_4$ 5])

specifies the various threshold values. If an error threshold is reached before the transmission threshold, a message containing line error information is displayed to the central operator. If no error counter reaches its threshold value before this number of transmissions have occurred, the current values of all counters are added to their respective accumulators, and the counters are reset to zero. These accumulator values may be displayed with the command: SHOW LERE, linename (see Central Commands). The allowable values are integers 1-255 inclusive. The underlined value is assumed for any parameter omitted.

Integer$_1$ -- transmission threshold
Integer$_2$ -- data check threshold
Integer$_3$ -- lost data threshold
Integer$_4$ -- nontext time-out threshold

ID=(type,{chars,termid},...)

specifies the type of work stations attached to the RJE system via a multipoint line. This parameter must be present for multipoint lines and must be omitted for other line connections. In addition, the keyword subparameter list supplies the polling character(s)[1] and identification of each work station attached to the line.

type is replaced with one of the following values:

2770 - if the attached work stations are IBM 2770 Data Communication Systems.
2780 - if the attached work stations are IBM 2780 Data Transmission Terminals.
1130 - if the attached work stations are IBM 1130 Computing Systems.
2020 - if the attached work stations are IBM System/360 Model 20 Computing Systems.
INTMX - for a multipoint line, INTMX must be specified if different types of remote work stations are to be connected on the same multipoint line. For example, if 2770s, 2780s, 1130s, and 2020s are mixed on the same line, INTMX must be specified. For System/3, INTMX must be specified regardless of the terminal types on the line.

chars is replaced with the EBCDIC hexadecimal equivalent of the polling character(s)[1] for the work station.

termid is replaced with the name specified in the RJETERM macro describing the work station.

Note: One pair of chars and termid values is required in the subparameter list for each work station on the line. Priority may be given to a multidropped work station by repeating its paired chars and termid values in the subparameter list.

If INTMX is specified, each chars field within the ID parameter must be the same length. For example, if 2770s, 2020s, and 2780s are mixed on the same line, SYN characters (hex 32) must be added, left justified, to each chars field so that all chars fields are equal in length.

Example:

```
ID=(INTMX,C1C1F0,RJETERM1,3232A1,RJETERM2,32C1F6,RJETERM3)
```

where: RJETERM1 is the name of the RJETERM macro instruction defining the 2770; RJETERM2, the name of the RJETERM macro instruction defining the 2020; and RJETERM3, the name of the RJETERM macro instruction defining the 2780.

F0 is the standard input device selection character for 2770s.

F6 is the standard input device selection character for 2780s.

MODE=([IBC][,A B][,A B])

IBC (Intermediate Block Check) specifies that the transmission control unit will recognize the intermediate block-check character and perform block checking without turning the line around. If this suboperand is omitted, intermediate block checking is not performed. The parameter IBC is required for 2770 and 2780, and is

---

[1]The 2780 and the System/3 have two polling characters, and the 1130 and the Model 20 have one.

optional if CPU, 1130, or 2020 is specified in the RJETERM macro.

A
: specifies that communications are to be through the Dual Communications Interface A of the 2701

Data Adapter Unit.

B
specifies that communications are to be through the Dual Communications Interface B of the 2701 Data Adapter Unit. The 2701 must have the dual interface feature in order to code B. If this suboperand is omitted, A is assumed.

A
specifies that transmission will be in code A for 2701 Data Adapter Unit Dual Code Feature.

B
specifies that transmission will be in code B for 2701 Data Adapter Unit Dual Code Feature.

If this suboperand is omitted, A is assumed. The code selected must be in EBCDIC.

Programmer's Note: If the transmission control unit is a 2703, the last two suboperands must be omitted. [A/B][,A/B]

IDVER=(integer,chars)

integer
specifies the number of characters specified in the chars field that follows.

chars
specifies the identification verification characters (in hexadecimal representation of device code). The chars field must include an ENQ character (in hexadecimal) as the last character of the field. This operand is used only for switched line connections.

Example:

IDVER=(3,E6E62D)

where: 3 indicates the number of characters to follow.

E6E6 represents the two identification verification characters for a 2770.

2D is the hexadecimal representation of the ENQ character.

CP=MVT
specifies the RJE system is to operate in an MVT system. The MVT system is assumed if the CP keyword is omitted.

CP=MFT
specifies the RJE system is to operate in an MFT system.

QNLNT=NO
ONLNT=YES
specifies whether the option ERROPT=T is set in the BTAM DCB macro instruction for RJE. If the parameter ONLNT=YES is specified, ERROPT=T is set and the BTAM on-line test facility is included in the central program. This allows on-line test to be invoked without discontinuing RJE at the central computer. For information on using the on-line test feature see IBM System/360 Operating System Basic Telecommunications Access Method, GC30-2004. If the parameter is omitted, on-line test is not included.

MODEM=STANDARD
MODEM=CC3977
MODEM=PTT
specifies the type of data set to perform the modulation-demodulation and control functions necessary to provide compatability between remote work stations and the central installation.

STANDARD specifies that a standard data set (not a World Trade data set) is present. If this operand is specified, the line connection to the central system can be either switched or nonswitched. If the MODEM parameter is omitted, a standard data set is assumed.

CC3977 specifies that a World Trade IBM 3977 Continuous Carrier data set is present. If this operand is specified, the line connection to the central system must be on a nonswitched line.

PTT specifies that the data set present is not capable of providing for the central system an answering tone. If this operand is specified, the answering tone is provided by the central system to indicate to the calling operator that he should switch to data mode for transmitting data. The line connection to the central system must be on a switched line.

```
┌──────┬─────────┬──────────────────────────┐
│Name  │Operation│Operand                   │
├──────┼─────────┼──────────────────────────┤
│LINE2 │RJELINE  │DDLINE=LINEGRP4,RLN=2,    │
│      │         │LERB=(,,10),DDSYSIN=      │
│      │         │                INPUT42,  │
│      │         │ID=(1130,E8,NYC,E7,LA,E8, │
│      │         │                NYC,E9,CHI)│
└──────┴─────────┴──────────────────────────┘
```

Figure 8. Example of RJELINE Macro Instruction

Example: Figure 8 shows the RJELINE macro instruction describing a multidrop line, named LINE2, with three attached 1130 work

staticns. The line is defined by DD statement LINEGRP4 and is the second line defined in the line group. The SYSIN data set is defined with DD statement INPUT42. The installatien desires that an error message be displayed tc the operatcr if 10 lost data errors cccur before 255 transmissions. The other assumed threshold values are satisfactory. The attached work stations are named IA, NYC, and CHI and have the respective polling characters X, Y, and Z. Pricrity is tc be given to work station NYC. The assumed operating environment is MVT.

RJETERM - DESCRIBE A WORK STATICN

The RJETERM macrc is used to describe each work station to the RJE systerm. One macro instruction must be specified fcr each work station to be supported by RJE.

Name	Operation	Operand
name	RJETERM	[TYPE=2780] [,PACK=NO]
		[TYPE=CPU] [,PACK=YES]
		[TYPE=1130]
		[TYPE=2020]
		[TYPE=2770]
		[,PUNCH=YES] [,FEATURE=NONE]
		[,PUNCH=NO] [,FEATURE=2780MR]
		[,FEATURE=2770EB]
		[,PRTSZ=120]
		[,PRTSZ=132]
		[,PRTSZ=144]
		[,ID=chars]

Name Field
name
assigns the RJE symbolic name to the work station. This name, called the termid, identifies the work station to RJE. The work station is referred to by the termid rather than by its machine address. The termid is used in logically attaching the work station to the RJE system, in routing messages to the work statien, and in retrieving infcrmation fcr the work station.

Operand Field
TYPE=2780
TYPE=CPU
TYPE=1130
TYPE=2020
TYPE=2770
identifies the type work station as:

(1) An IBM Data Transmissicn Terminal (TYPE=2780).

(2) An IBM System/360 Computing System (TYPE=CPU).

(3) An IBM 1130 Computing System (TYPE=1130).

(4) An IBM System/360 Model 20 Computing System or an IBM System/3 Computing System (TYPE=2020).

(5) An IBM 2770 Data Communication System (TYPE=2770).

If this parameter is omitted, the work station is assumed to be a 2780.

Note: On a switched line connection, either an 1130, a Model 20, or a System/360 Computing System may be specified as TYPE=CPU, and hence, may use the same line. On a multipoint line, either a Model 20 or 1130 computing system may be specified as TYPE=1130 and may use the same line.

PUNCH=YES
PUNCH=NO
specifies whether a card punch is available at the work station. If the parameter is omitted, a card punch is assumed.

PRTSZ=120
PRTSZ=132
PRTSZ=144
specifies the length of the print line at the work station. A print line of 120 characters is assumed if the parameter is omitted. For TYPE=2770, 120 should be specified unless the expanded buffer feature is present. With this feature, either 120 or 132 is valid. For TYPE=2780, only 120 and 144 are valid.

Note: For the 2770, in order to use the full 132-character print line, the expanded buffer feature must be present. If this feature is not present, only 120-character output lines are supported.

ID=chars
if specified, indicates that the work station is connected to the RJE system via a multipoint line. The ID keyword value is the EBCDIC hexadecimal equivalent of the addressing character for the work station. For example, if the addressing character is the letter A, the ID keyword is coded as ID=C1 since C1 is the EBCDIC hexadecimal equivalent of A. Valid addressing characters for 2780 work stations are alphabetic. This keyword is not coded if the work station is connected via a point-to-point or switched line.

INDEX

Indexes to systems reference library manuals are consolidated in the publication IBM System/360 Operating System: Systems Reference Library Master Index, GC28-6644. For additional information about any subject listed below, refer to other publications listed for the same subject in the Master Index.

IBM System/360 OS RJE (S360-36) Printed in U.S.A. GC30-2006-4

IBM®

International Business Machines Corporation
Data Processing Division
112 East Post Road, White Plains, N.Y. 10601
[USA Only]

IBM World Trade Corporation
821 United Nations Plaza, New York, New York 10017
[International]