

## 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, version 2 (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 programs.

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.

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



Third Edition (November, 1968)

This is a major revision of, and obsoletes, C30-2006-1 and Technical Newsletters N30-2510, N30-2517, and N30-2520. The publication IBM System/360 Operating System: Planning for Remote Job Entry (MFT Version II), Form C30-2008-0, and Technical Newsletter N30-2505 are also obsoleted by this edition. Changes to the text, and small changes to illustrations, are indicated by a vertical line to the left of the change; changes or added illustrations are denoted by the symbol • to the left of the caption.

This edition applies to Release 17 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, Form N20-0360, for the editions that are applicable and current.

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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, Form C28-6534

Concepts and Facilities, Form C28-6535

Job Control Language, Form C28-6539

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, Form C28-6554

Basic Telecommunications Access Method,  
Form C30-2004

System Programmer's Guide, Form C28-6550

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, Form  
C24-5060

Programmer's Guide, Form C24-3372

Operating Guide, Form C24-3450

Operator Messages, Form C24-5024

Assembler With Input/Output Macros, Form  
C24-3361

IBM System/360 Basic Programming Support:

Programmer's Guide, Form C24-3354

Operating Guide - Basic Tape System  
(8K), Form C24-3391

System Generation and Maintenance, Form  
C24-5061

Assembler With Input/Output Macros, Form  
C24-3355

IBM 2780 Data Transmission Terminal Work  
Station

IBM 2780 Data Transmission Terminal Com-  
ponent Description, Form A27-3005

IBM 1130 Computing System Work Station

IBM 1130 Functional Characteristics,  
Form A26-5881

IBM 1130 Disk Monitor System, Version 2,  
Programming and Operator's Guide, Form  
C26-3717





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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:

1. An IBM 2701 Data Adapter Unit with Synchronous Data Adapter - Type II, or an IBM 2703 Transmission Control Unit, with the binary synchronous features, equipped for EBCDIC code and full transparency operation. The dual communications interface feature is supported on the 2701.
2. 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).
3. 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 three 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.

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

1. Card reader and card punch, or a card read punch.
2. Printer.
3. 1052 Printer-Keyboards.

RJE also supports the following special features on the 2701:

1. Auto Call.
2. Dual Communications Interface.

### 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:

1. EBCDIC Transmission Code.
2. EBCDIC Transparency.

3. Print Line (either 120-character or 144-character).
4. Auto Turnaround (only required on Model 2).
5. Extended (Enquiry-ENQ) Retry Transmission.

In addition, the following 2780 special features are supported:

1. Multipoint Line Control.
2. 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 core 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:

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

The following special features are supported:

1. One or more disk storage drives for input.
2. One disk storage drive for output.

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 con-

tinuous 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 non-switched 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 non-switched 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 OS/360 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.

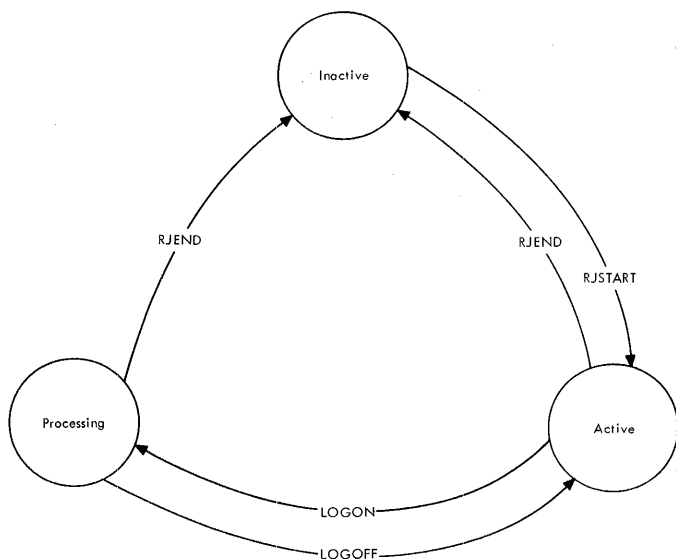


Figure 1. Transition of Work Station States

#### 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 activities (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.

#### 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 - IEBTPCH - to copy the output to SYSOUT. The IEBTPCH program is described in the publication IBM System/360 Operating System Utilities, Form C28-6586.
- 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.

#### 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.
- 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 spec-

ifies SYSIN data sets on a communication line basis. In this procedure, the installation specifies the type of direct access device, the volume serial number to be used for the SYSIN data sets for this line, the blocking factor for SYSIN data sets, and the maximum space available for any one 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 the total SYSIN allocation necessitates a new cataloged procedure, referenced at START RJE time, which makes more SYSIN space available to the system.

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. JECL uses the same coding format as that used for Job Control Language statements.

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 the status of jobs in the 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 by 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	$\left[ \begin{array}{l} \text{OUTPUT=IMMED} \\ \text{OUTPUT=(DEFER[,userid])} \\ \\ \text{[,NOTIFY=}\left\{ \begin{array}{l} \text{SOURCE} \\ \text{BOTH} \end{array} \right\} \text{[, 'text']} \\ \\ \text{[,CENTRAL=}\{\text{stepname.ddname}\}, \dots \\ \text{[,CENTRAL=ALL} \end{array} \right]$

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, Form C28-6586.

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

Operation	Operand
JED	$\left[ \begin{array}{l} \text{OUTPUT=IMMED} \\ \text{OUTPUT=(DEFER[,userid])} \end{array} \right]$

**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 job name 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 } [ , 'text' ] ) ]
	[ BOTH ]

#### 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 one or more 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

1

\_\_\_\_\_

Operation	Operand
RJSTART	termid[, <u>BRDCST=YES</u> [, <u>BRDCST=NO</u> ] [,CALL=integers]

t.

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.

B.

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

B

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.

C

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. In addition, the work station receives the status of all jobs still residing in the central system that were submitted from the work station.

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 SYS-OUT 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 been deferred and has not been called for by an OUTPUT command. 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	[ jobname ] [ J=jobname ]

jobname or 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	<div> <div>J=jobname</div> <div>jobname</div> <div>*</div> <div>/</div> </div>

| J=jobname or 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	<div> <div>J=jobname</div> <div>U=userid</div> <div>*</div> <div>T</div> </div>

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* } FR userid2 text
```

\*C\* - message by default goes to central

userid<sub>1</sub> - the U option is used

userid<sub>2</sub> - 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.



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.

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.

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.

IHK104I NO JOB(S) IN SYSTEM operation

(jobname userid) ssssssss  
 {userid  
 {blank  
 {termid }

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.

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 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<sub>1</sub> userid<sub>2</sub>

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

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<sub>1</sub>) and naming another user (userid<sub>2</sub>) 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 has completed abnormally.

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 has completed abnormally.

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 }  
ssssssss {termid }  
                                  (CENTRAL)

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 } INVALID {  
ssssssss {termid } DISK ERROR }

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.

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 (sssssss) 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) }	{ JED }
{ EXECUTING }	{ DEFAULT }
{ DISK ERROR }	

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 (sssssss), 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.

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 TERMD 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 (sssssss).

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. 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 (sssssss).

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 (sssssss) 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 (sssssss), 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 (sssssss).

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.

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.

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)

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 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. (It 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.



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 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	<div style="display: flex; align-items: center;"> <div style="font-size: 3em; margin-right: 10px;">}</div> <div>           JOBS[,jobname]            TERMS[,termid]            USERS[,userid]            DEFER            DEFER,userid            BRDCSF            MSGS            MSGS,termid            LERB            LERB,linename            ACTIVE         </div> </div>

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.

**MSG**

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.

**MSG, 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 alphanumeric 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 alphanumeric 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 alphanumeric 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.

MESSAGE RESPONSES TO THE CENTRAL OPERATOR

IEE301I jjj JOB CANCELLED

Explanation: The job named jjj was cancelled either by a CANCEL command submitted by the operator or by RJE.

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

Operator Response: None.

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

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 another central command was being processed in the system when a second 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 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.

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.

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.

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.

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.

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 WARMSTART NOT EXECUTED  
becomes  
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 uuuu } }  
          { 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.

uuuu  
    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 uuuu { aaa } { COMP } { I  
                      { N/A } { INCP } { D nnn }

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.

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.

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.

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.

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.

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

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.

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. In this case, this message will be preceded by the OS job scheduler 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.

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)

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 is not removed 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.

IHK064I LINE XXX NOT OPERATIONAL

Explanation: The control unit for this line is nonoperational.

System Action: The line is not serviced during this period of RJE activity. The error is ignored and 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=xxxxxxx

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. The error is ignored and 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.



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 link-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 link-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 link edited with the resident modules). These modules are then available for later assembly and link 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.

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.

- **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 link 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, Form C28-6554.

#### 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 link 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 link-edit step. The OS/360 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.

# Assembly of RJE Macro Instructions

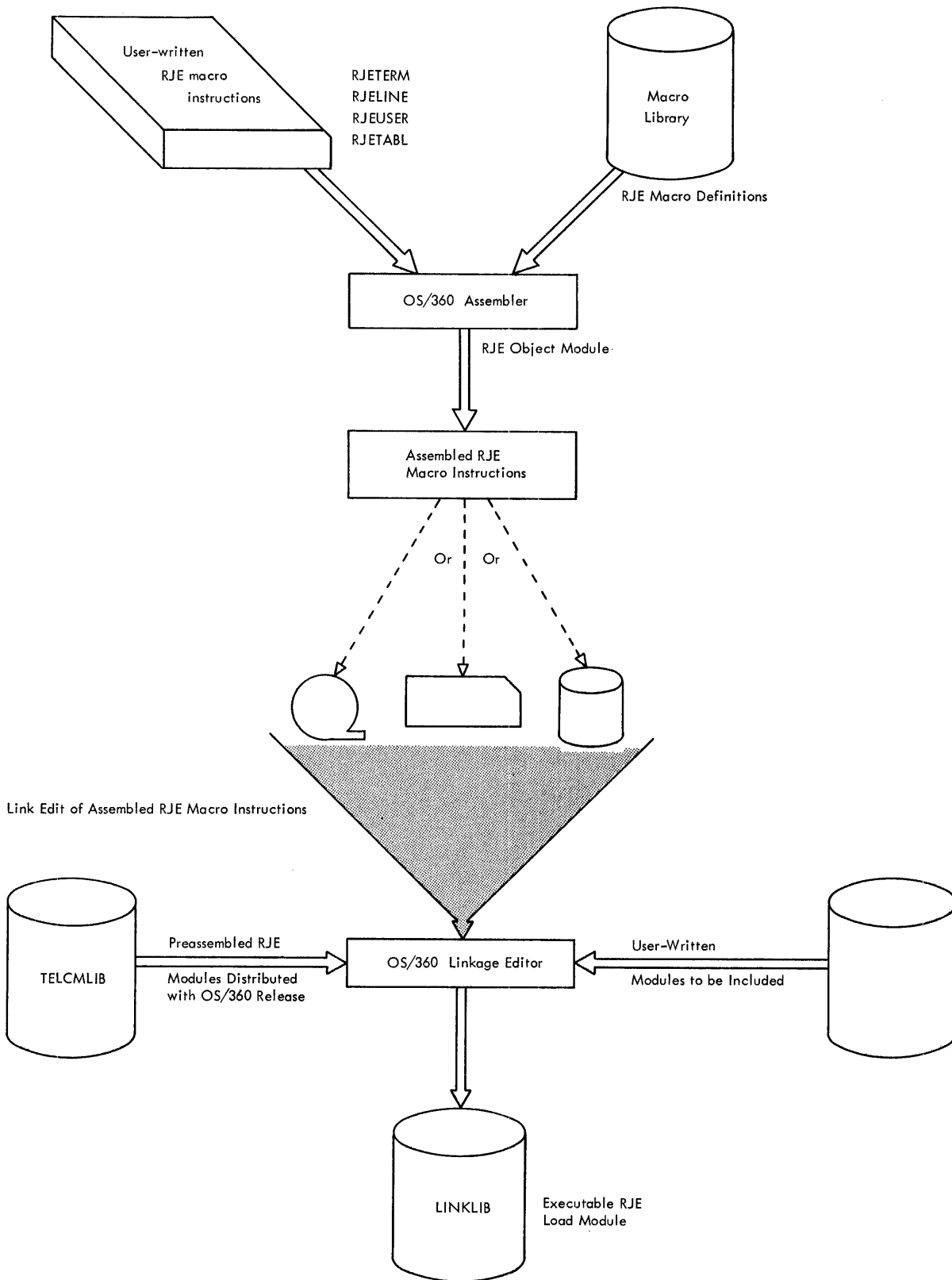


Figure 6. RJE Assembly and Link Edit

The object modules produced by the Assembler are edited by the OS/360 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. Figure 7 provides a summary of RJE macro instructions.

Name	Operation	Operand
name	RJELINE	DDLINE=ddname  ,DDSYSIN=ddname  [,RLN= <u>1</u> [,RLN=integer]  [,LERB=([integer <sub>1</sub> ], [integer <sub>2</sub> ], [integer <sub>3</sub> ], [integer <sub>4</sub> ])) 255      10      5      5 [,ID=(type,{chars,termid},...)] [,MODE=([IBC] [A] [A] B      B [,CP=MVT] [,CP=MFT]
name	RJETERM	[TYPE=2780] [TYPE=CPU] [TYPE=1130]  [,PUNCH=YES] [,PUNCH=NO]  [,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= <u>1</u> [,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, two 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.

Name	Operation	Operand
name	RJELINE	DDLINE=ddname ,DDSYSIN=ddname  [,RLN= <u>1</u> ,RLN=integer]  [,LERB=([integer <sub>1</sub> , <u>255</u> integer <sub>2</sub> , <u>10</u> integer <sub>3</sub> , <u>5</u> integer <sub>4</sub> ])] [,ID=(type,{chars, termid},...)]  [,MODE=([IBC] [,A B] [,A B])]  [,CP=MVT ,CP=MFT]

Additional explanation of line groups is provided in the publication IBM System/360 Operating System: Basic Telecommunications Access Method, For C30-2004. 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  
DDLIN=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).

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.

LERB= integer<sub>1</sub> , integer<sub>2</sub> ,  
       255           10  
       integer<sub>3</sub> , integer<sub>4</sub>  
       5           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<sub>1</sub> -- transmission threshold  
 Integer<sub>2</sub> -- data check threshold  
 Integer<sub>3</sub> -- lost data threshold  
 Integer<sub>4</sub> -- 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)<sup>1</sup> and identification of each work station attached to the line.

type is replaced with one of the following values:

2780 - if the attached work stations are IBM 2780 Data Transmission Terminals.

1130 - if the attached work stations are IBM 1130 Computing Systems.

chars is replaced with the EBCDIC hexadecimal equivalent of the polling character(s)<sup>1</sup> 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.

MODE=([IBC],<sup>A</sup><sub>B</sub>,<sup>A</sup><sub>B</sub>)

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 used only for 2780 and must be omitted if CPU or 1130 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.

<sup>1</sup>The 2780 has two polling characters and the 1130 has one.

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 <sup>A</sup><sub>B</sub> must be omitted.

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.

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	Operation	Operand
name	RJETERM	<div>[TYPE=2780]</div> <div>[TYPE=CPU]</div> <div>[TYPE=1130]</div> <div>[,PUNCH=YES]</div> <div>[,PUNCH=NO]</div> <div>[,PRTSZ=120]</div> <div>[,PRTSZ=132]</div> <div>[,PRTSZ=144]</div> <div>[,ID=chars]</div>

### 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

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).

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

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

PUNCH=YES  
PUNCH=NO

specifies whether a card punch is available at the work station. (A punch is required at a remote System/360 CPU.) 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=2780, only 120 and 144 are valid.

### 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.

**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 alphanumeric 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, 1a#,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 [,JOB CARD=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 that has no user exit, the output is printed.

**JOB CARD=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.

**JOB ACK=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.

**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 JOB CARD 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 JOB ACK 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,

IHKABLS  
IHKAAS  
IHKCMS  
IHKWTR

and the names assigned to the user exits if any are included. 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:

IHKABLSO  
IHKAASO  
IHKCMSV  
IHKWTRSV

and the names assigned to the user exits if any are included. These unresolved linkages do not affect the generation of the RJE system.

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)		
/*		
<u>Notes:</u>		
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 R00,'120' response to the message IEF432A 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, Form C28-6586

Name	Operation	Operand
[name]	SCRATCH	DSNAME=name, VOL=23xx=serial number, PURGE

Group 1 and/or 2 may be scratched.

**Note:** When the IEHPROGM utility is used and the SCRATCH utility control statement is specified with the VTOC, PURGE, and SYS keywords, all data sets that have names beginning with the letters SYS and having a P as the nineteenth character of the name will be deleted, since data set names with these characteristics are created by the operating system itself.

## UNCATALOGING THE DATA SETS

IEHPROGM, with the UNCATLG statement, is used to uncatalog data sets. This is used only when the unit or 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=xxxxxxx, DCB=(DSORG=DA)	
ddname=IHKFSTDD, IHKJEDDD, IHKUDRDD, IHKTRDD			
SPACE(a, (b, c))			
a)	SYS1.IHKFSTB	a=24	
	SYS1.IHKJEDTB	a=98	
	SYS1.IHKUDRTB	a=18	
	SYS1.IHKTRDTB	a=68	
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.IHKTRDTB	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 IHKCDDBMI 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:

//IHKTXDD	DD	DSNAME=SYS1.IHKTXDTB,DISP=(NEW,CATLG),
//		SPACE=(60,(251,20)),UNIT=xxxx,
//		VOLUME=SER=xxxxxxx,DCB=(DSORG=DA)
//IHKMSGDD	DD	DSNAME=SYS1.IHKMSGSL,DISP=(NEW,CATLG),
//		SPACE=(750,(1,1)),UNIT=xxxx,
//		VOLUME=SER=xxxxxxx
//IHKBRDD	DD	DSNAME=SYS1.IHKBRDSL,DISP=(NEW,CATLG),
//		SPACE=(400,(1,1)),UNIT=xxxx,
//		VOLUME=SER=xxxxxxx

**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, IHKCDDBMI should be executed. Otherwise, delayed messages existing prior to the RJE assembly may be sent to the wrong terminal.

**Caution:** When IHKCDDBMI 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.IHKXTTB,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.	//IHKTD RDD	DD	DSNAME=SYS1.IHKTDRTB,DISP=(NEW,CATLG),
26.	//		SPACE=(68,(15,5)),UNIT=2311,

SAMPLE CODING FORM (Continued)

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
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').
- (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 (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').

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 xxxxxx is the serial number of the volume reserved for SYSIN data. The 23xx represents any direct access device supported by the operating system. 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. 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 name specified for the DD statement must be the name designated in the RJELINE assembly macro. The DISP parameter is coded as shown.

Statements 16 and 17 are the DD statements for the line. 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=IHKRJBN, REGION=80K,
	//		PARM='000999030010249050322311'
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=(OLD,KEEP)
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.	//IHKTDRTD	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.	//IHKBRDDJ	DD	DSNAME=SYS1.IHKBRDSL,DISP=OLD
12.	//DUMDD1	DD	DISP=(OLD,KEEP),
	//		VOLUME=SER=XXXXXX,SPACE=(TRK,(5,20)),
	//		UNIT=23XX,DCB=BLKSIZE=400
13.	//DUMDD2	DD	DISP=(OLD,KEEP),
	//		VOLUME=SER=XXXXXX,SPACE=(TRK,(5,20)),
	//		UNIT=23XX,DCB=BLKSIZE=400
14.	//DUMDD3	DD	DISP=(OLD,KEEP),
	//		VOLUME=SER=XXXXXX,SPACE=(TRK,(5,20)),
	//		UNIT=23XX,DCB=BLKSIZE=400
15.	//DUMDD4	DD	DISP=(OLD,KEEP),
	//		VOLUME=SER=XXXXXX,SPACE=(TRK,(5,20)),
	//		UNIT=23XX,DCB=BLKSIZE=400
16.	//CPUGRP	DD	UNIT=0BA
	//	DD	UNIT=0BB
17.	//A2780GRP	DD	UNIT=0CA
	//	DD	UNIT=0CB

Figure 10. Example of RJE Cataloged Procedure

## USER EXITS

Remote Job Entry 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.

### JOB CARD 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.

### 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, CHGENTRY 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.

### JOB ACK EXIT

The JOB ACK 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 JOB ACK 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.

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;
3. The operator issues the START command for RJE.

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.

#### 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 serves as an RJE supported work station. The IBM System/360 BOS/BPS Remote Job Entry Work Station Program is supplied for 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. 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.

Commands may be entered at the printer-keyboard without interfering with a job stream entered from the card reader. This feature enables a particular user to LOGON at the printer-keyboard, enter commands, and LOGOFF, without affecting the user logged on at the card reader. The following special rules govern the handling of this feature:

- If a user logs on at the card reader and a LOGON is submitted at the printer-keyboard, the LOGON submitted at the printer-keyboard is effective only for input submitted at the printer-keyboard, i.e., input submitted up to an end-of-file (space EOB). It will not affect the card reader input stream. The LOGON submitted at the card reader is retransmitted, and displayed if the option is selected, following the input entered at the printer-keyboard or after a LOGOFF is submitted from the printer-keyboard.
- 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.

#### 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.

## 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, Form C24-3450, or IBM System/360 Basic Programming Support: Basic Tape System Operating Guide, Form C24-3391. 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 four control functions initiated by the operator from the printer-keyboard: discontinuing output, signifying card reader input, signifying printer-keyboard input, and signifying end-of-file on the card reader after an error. These functions are initiated by the operator pressing the request key on the printer-keyboard and replying with a nonnumeric 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).

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 followed (see Printer-Keyboards Procedures). If the problem cannot be corrected, operator communication procedures should be initiated to close the card reader (see Printer-Keyboards 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.



## RJE MESSAGES

### 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.

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 has 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-Keyboards Procedures.

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-Keyboards 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-Keyboards Procedures).

On a switched line, these actions must be accomplished within approximately three (3) minutes in order to maintain communications with the central system.

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 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.

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.

6999

Proceed

Explanation: This message is displayed as a result of a E 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 link edit of the RJE macro instruction. The assembly of the RJE macro results in an object module. This object module is then link edited with the user-written output routine if the user exit is used. The link-edit step creates the executable load module which is loaded into main storage for execution as with 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 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 ]  [ ,PRT=120 ] [ ,PCH=20 ] [ ,PRT=132 ] [ ,PCH=40 ] [ ,PRT=144 ] [ ,PCH=42 ]  [ ,RDR=01 ] [ ,DIAL=NO ] [ ,RDR=20 ] [ ,DIAL=MAN ] [ ,RDR=40 ] [ ,DIAL=AUTO ] [ ,RDR=42 ]  [ ,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 is to be included in the RJE work station pro-

gram. 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.

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.

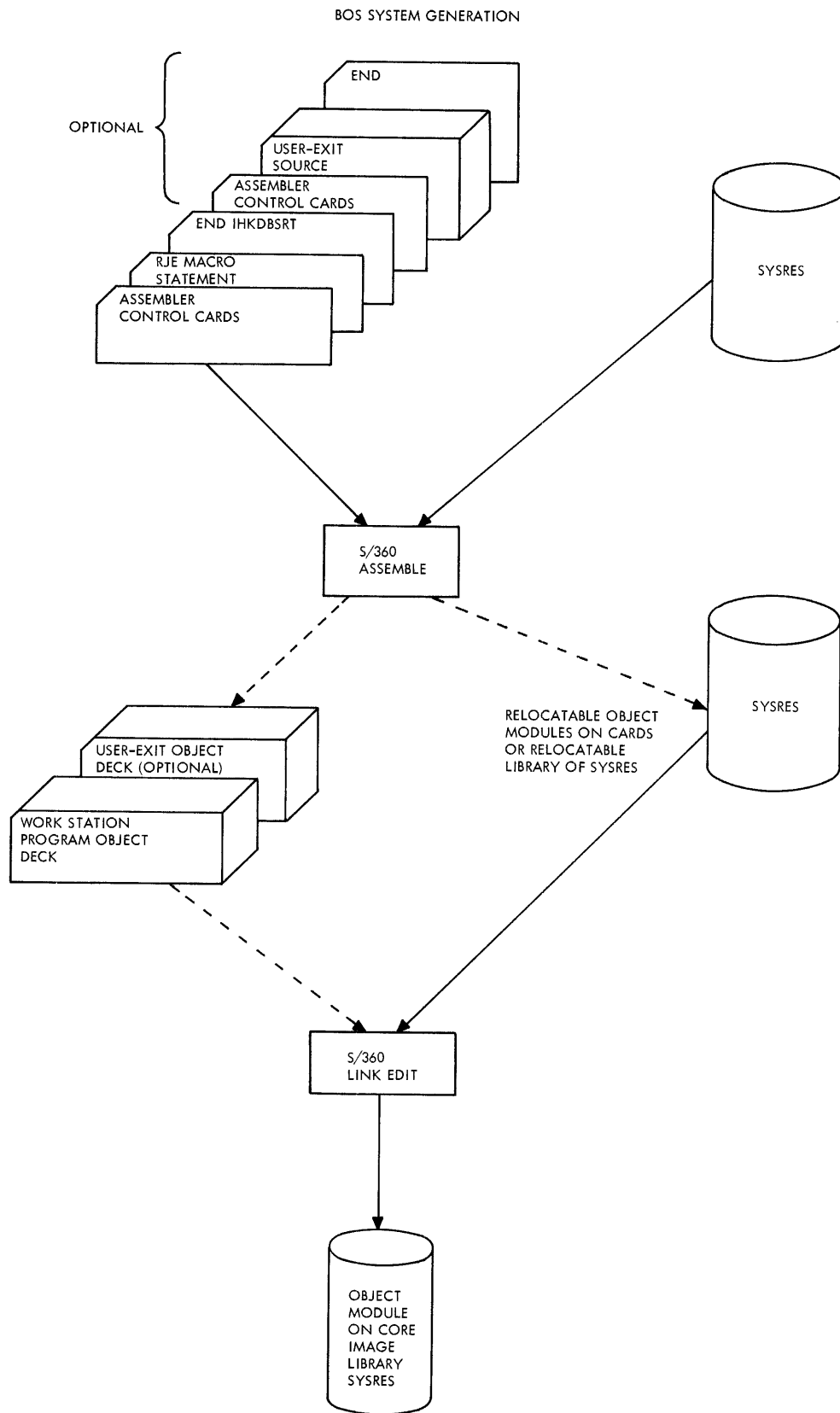


Figure 12. BOS System Generation

# BPS SYSTEM GENERATION

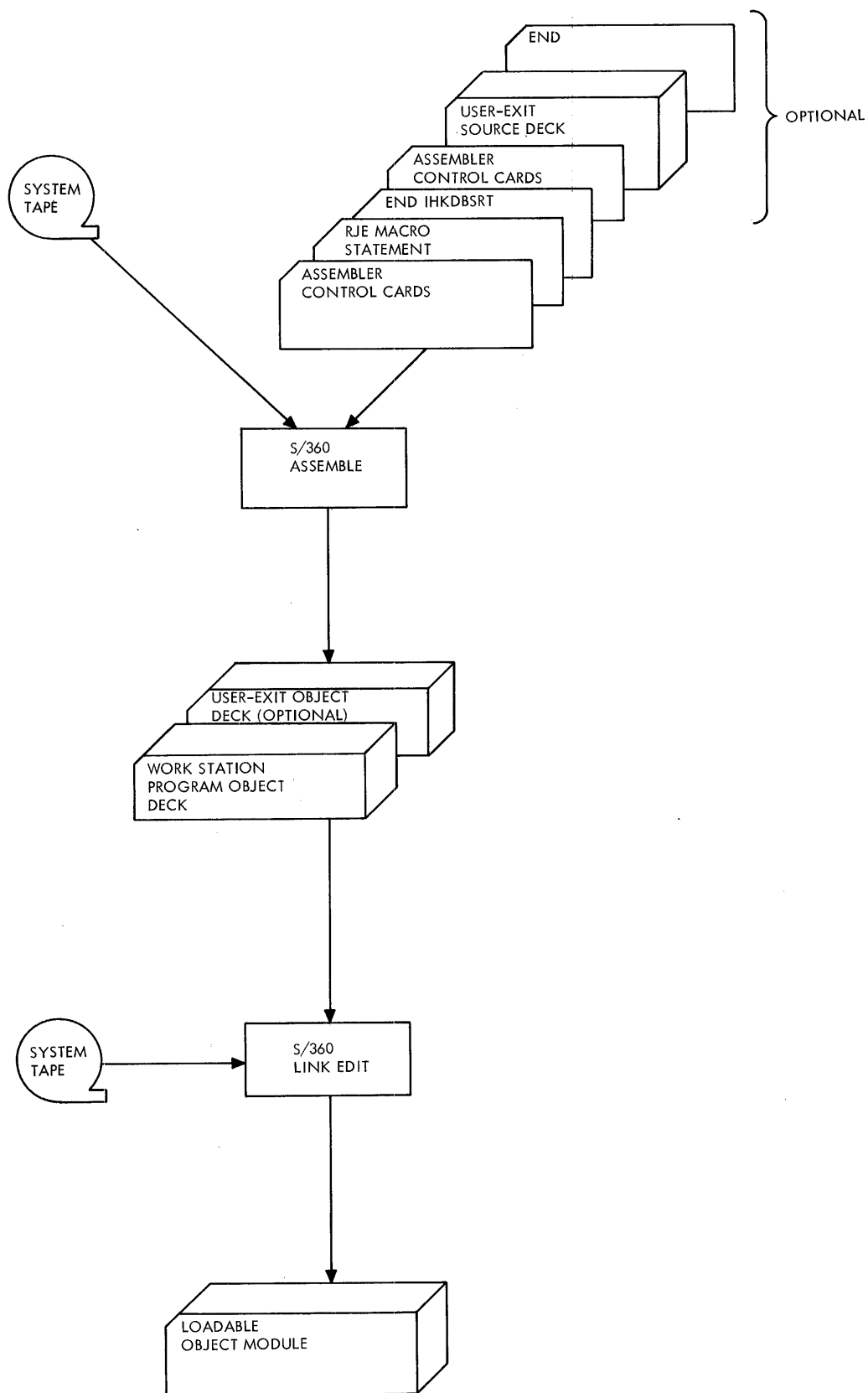


Figure 13. BPS System Generation

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.

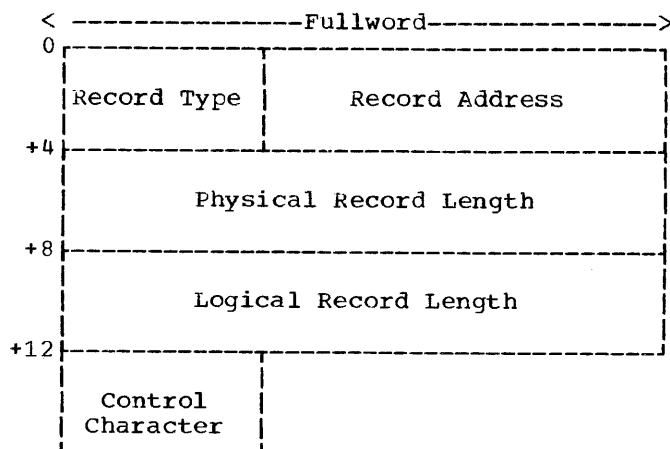
#### USER-EXIT INTERFACE

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.

#### 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, Form C24-5060; IBM System/360 Basic Programming Support: Programmer's Guide, Form C24-3354; and IBM System/360 Basic Programming Support: System Generation and Maintenance, Form C24-5061.



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 a description of the various switches, lights, and controls, the user is referred to IBM 2780 Data Transmission Terminal -- Component Description, Form A27-3005.

## 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.

## 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.

## Aborted Transmission

The central system will abort data transmission if an RJSTART or LOGON command is missing. The 2780 will drop ready status; the INCP light will be turned on, and the audible alarm will sound. No message will be returned to indicate the error. The omitted command and all input must be resubmitted.

## Three Minute Time-Out

When a 2780 attached to a switched line stops transmitting input or receiving output for any reason (e.g., all input transmitted, all output received, card jam, forms check, discontinue operation, etc.), a three minute time-out period is initiated. If no further transmission in either direction occurs during this time-out period, the system will disconnect the 2780. A reconnection and an RJSTART card is required to resume RJE activity at this time. Any partially submitted job (for example, in the case of a card jam) must be completely resubmitted. If the Auto Answer feature is active for the work station, this three minute limit is reduced to 21 seconds. As noted above, 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 single space.

## Input Stream Flushed

When an error causes the central system to flush the entire input stream being transmitted from the work station, one of the following messages will be returned to the 2780:

```
IHK114I  MAX JOBS EXCEEDED jobname
IHK140I  INVALID USERID  LOGON
IHK141I  INVALID PROTECTION KEY  LOGON
IHK142I  INVALID TERMID  RJSTART
IHK143I  INVALID JOBNAME JOB
IHK144I  DUPLICATE JOBNAME jobname
IHK145I  NO JOB CARD

IHK147I  REQD PARAMETER MISSING {RJSTART}
                                   {LOGON }
IHK148I  ILLEGAL DELIMITER {RJSTART}
                                   {LOGON }
IHK150I  UNDEFINED KEYWORD {RJSTART}
                                   {LOGON }
IHK161I  OUT OF SPACE {SYSIN
                      {SYS1.SYSJOBQE}
IHK162I  SYSIN LIMIT EXCEEDED jobname
IHK163I  DISK ERROR {Q MGR RJE ABORTED
                    {Q MGR [jobname]
                      volume-serial
                      jobname ddname}
```

The recovery procedures for each of these messages are described in the section Messages Sent to Work Stations.

## 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 CLOSDOWN 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. 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.

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 core 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 core 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.

#### 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 slave 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, Form C26-3717.

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/360 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.

# 1130 RJE ERROR MESSAGES

The first digit of the messages has the following meaning:

- 0 - Error in RJE00.
- 1 - Error in the initializing part of RJE.
- 2 - Error, during the processing of the RJE program, that does not require an operator reply.
- 5 - Error, during the processing of the RJE program, that requires a reply from the operator.
- 9 - Non-error message.

## 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 exits to the Disk Monitor Supervisor.

Operator Response: The operator must reload the generation program and enter a valid card.

## 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 not 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.

## 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 core.

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.

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 core.

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 core.

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 core.

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 core.

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 core.

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.

Explanation: An error that requires operator intervention has occurred on the printer.

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.

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, Form C26-3717, replaces XXXX.

System Action: The system waits for the operator reply.

Operator Response: The operator must enter one of the following codes within approximately three minutes 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.

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 core.

#### 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.

#### OPERATOR MESSAGES

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/360 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.

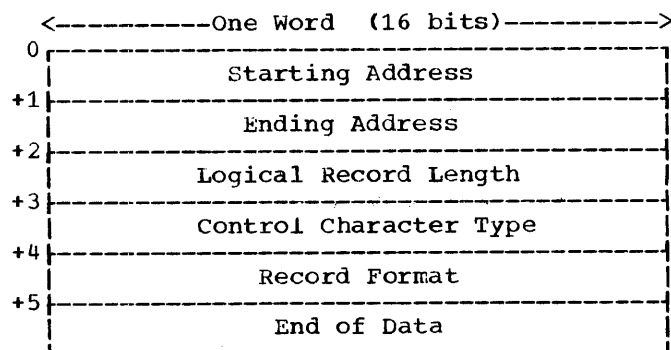




## USER EXIT INTERFACE

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 user-exit routine receives control when output becomes available for it. 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 is aligned on an even word boundary. The format of this list is:



**Starting Address:** The address of the block received from the central system.

**Ending Address:** The ending address+1 of the block received from the central system.

**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/360 Record Format:** The code indicating the type of record.

- 1 - Fixed unblocked
- 2 - Fixed blocked
- 3 - Variable unblocked
- 4 - Variable blocked
- 5 - Undefined

**End of Data:** If zero, indicates end of data.

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.

**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:

ID	Operation	Operand
..	DATA	DMS {,C ,D,xaaa[,bbbb]}

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/360 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 both of them are specified, they must be separated by a comma. The default for LINE parameter is to the LINE indication that was specified in the previous job (the first time through, the default is to LINE=P).

```
[LINE=P      ] [UEXIT=(address 1, address 2)]
[LINE=S
[LINE=M(x,y)]
```

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.

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)

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. 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/360 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/360 jobs follow in the proper sequence. An RJSTART command must be the first card.

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 alphanumeric characters, contained in columns 73-80 of each card in the job stream.

(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

(4)  
IEF404I D16 ENDED

(3)  
//D12 JOB MSGLEVEL=1,REGION=100K  
--JECL and allocation messages--

(3)  
-----output from link edit step-----  
-----output from go step-----

(14)  
IHK003I RJEND ACCEPTED RALEIGH

(13)  
//D16 JOB MSGLEVEL=1,REGION=100K  
--JCL and allocation messages--  
-----output from link edit step-----  
--JCL and allocation messages--  
-----output from go step-----

# 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
```



CORE REQUIREMENTS

## (1) RJE Region

## Dynamic Storage Requirements:

RJE region (MVT) or partition (MFT)

$$41311+408A+1740B+68C+24D+18E+96F+48G+16H+ \\ (13+10X)I+(13+9X)J+K+L+M+O+P+Q+R+S+ \\ [(624+N_1)+(624+N_2)+\dots+(624+N_n)]^1$$

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.
- F is the number of central command queue blocks requested in the RJETABL macro.
- 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 is the maximum number of terminals connected on a multipoint line.
- I is the number of multipoint lines for 2780s.
- J is the number of multipoint lines for 1130s.

<sup>1</sup>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.

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.

M

- is  
 (a) 248 if BDAM is included in RAM or link pack.  
 (b) 2752 if BDAM is not included in RAM or link pack.

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.

$N_1$  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  $[(624+N_1)+(624+N_2)+\dots(624+N_n)]$  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 Space (MVT only)

The size of the system queue space for RJE can be calculated with the following algorithm:

$$3568+92A+100B+80C+144D+48E$$

where

A = number of line groups - from RJE-LINE 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 or BDAM).

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).

## 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:

$$\left[\frac{J}{42}\right] + \left[\frac{J}{22}\right] + \left[\frac{U}{46}\right] + \left[\frac{W}{27}\right] + 11$$

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:

$$\left[\frac{J}{58}\right] + \left[\frac{J}{36}\right] + \left[\frac{U}{62}\right] + \left[\frac{W}{43}\right] + 8$$

The symbols used are explained under the section for the 2311.



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).

Maximum use of the resident SVC option is made. This option is requested by including TRSVC in the RESIDENT keyword sub-parameter 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 RESIDENT keyword sub-parameter 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, Form C28-6550.

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:

BDAM	IGG019KA	IGG019KQ
	IGG019KC	IGG019KU
	IGG019KK	IGG019LI

BTAM IGG019MA  
IGG019MB  
IGG019MS

Placing frequently used nonresident modules used by RJE in the BLDL option is requested by specifying BLDLTAB in the RESIDENT keyword subparameter list in the SUPRVSR system generation macro instruction. The names of frequently used RJE modules are the following:

IEFLOCDQ IHKCDMEQ  
IHKCAOSR IHKCDMSH  
IHKCARJN IHKCDRMV  
IHKCBLGN IHKCFQOP  
IHKCBRJS IHKCFSTB  
IHKCDBIN IHKCGDT2  
IHKCDBTW IHKCHJPR  
IHKCDBTX IHKCHNDT  
IHKCDMDQ

APPENDIX D: RJE ACRONYMS

BDAM	-	Basic Direct Access Method	JCL	-	Job Control Language
BSAM	-	Basic Sequential Access Method	JECL	-	Job Entry Control Language
BSC	-	Binary Synchronous Communication	JED	-	Job Entry Definition
BTAM	-	Basic Telecommunications Access Method			
CCW	-	Channel Command Word	MFT	-	Multiprogramming with a Fixed Number of Tasks
CPU	-	Central Processing Unit	MVT	-	Multiprogramming with a Variable Number of Tasks
DASD	-	Direct Access Storage Device			
DCB	-	Data Control Block	OS	-	IBM System/360 Operating System
DEB	-	Data Extent Block			
DECB	-	Data Event Control Block	RJE	-	Remote Job Entry
ECB	-	Event Control Block			
EOB	-	End of Block	TCU	-	Transmission Control Unit
EOD	-	End of Data	Termid	-	Terminal Identification
EODAD	-	End-of-Data Address	TTR	-	Relative Track and Record Number
EOF	-	End of File			
EOT	-	End of Transmission	UDIR	-	User Directory
ID	-	Identification	Userid	-	User Identification
I/O	-	Input/Output			



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Form C30-2006-2

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