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.

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 Component 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

FIGURES

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-Keyboard.

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 non-switched 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 charac-
teristics 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 telecom-
munications system. The particular tele-
communications 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 Tele-
communications Access Method (BTAM) to con-
trol the communication lines and communi-
cate 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 capa-
bility. Work stations are usually
separated from the central processor by a
distance sufficient to require common car-
rier 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 con-
nect the computer to one or more work sta-
tions. The computer and work stations are
physically connected; that is, the circuits
making up the communication lines are con-
tinuously established for predetermined
time periods during which data may be
transmitted over them. The lines that com-
prise 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 sta-
tions 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 tele-
communications 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 charac-
teristics typical of both switched and non-
switched networks. In this publication,
the term switched network refers to any
network in which a direct physical connec-
tion 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 com-
puter 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 sys-
tem 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 con-
tention (on both switched and nonswitched
lines). The RJE system permits communica-
tion 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 charac-
ters), 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. Com-
mands are also entered by the central
operator.

Jobs submitted by remote users are
passed to OS/360 for scheduling and execu-
tion. 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 pro-
vided 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 spe-
cial 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 automat-
ically 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 remote-
               ly submitted jobs to be
               written locally.

5. SHOW   - Display information per-
               taining 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 pro-
ceeds 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 com-
pleted 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 inac-
tive 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. Howev-
er, it is conditioned to receive an RJSTART
command from an inactive work station. If
any other input is received from an inac-
tive work station, it is refused, and an
error message is returned to the work sta-
tion. A work station in an active or pro-
cessing state becomes inactive by submit-
ting an RJEND command.

ACTIVE

Work stations enter the active state when
the central system receives an RJSTART com-
mand from an inactive work station or a
LOGOFF command from a processing work sta-
tion. 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 sta-
tion, for example, immediate job output and
source notification messages. Broadcast
messages are transmitted to active work
stations if requested when the RJSTART com-
mand is received.

    When the central system receives a valid
RJSTART command, the work station is logi-
cally attached to the RJE system. When the
central system receives a valid LOGOFF com-
mand (from a processing station), the cur-
rent 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 process-
ing 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 pro-
cessing work station if the work station
has no input to submit. User output is
that output which is returned only if the
user is logged on at the work station.

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

    Figure 1 shows the three states and the
commands leading to and from these states.
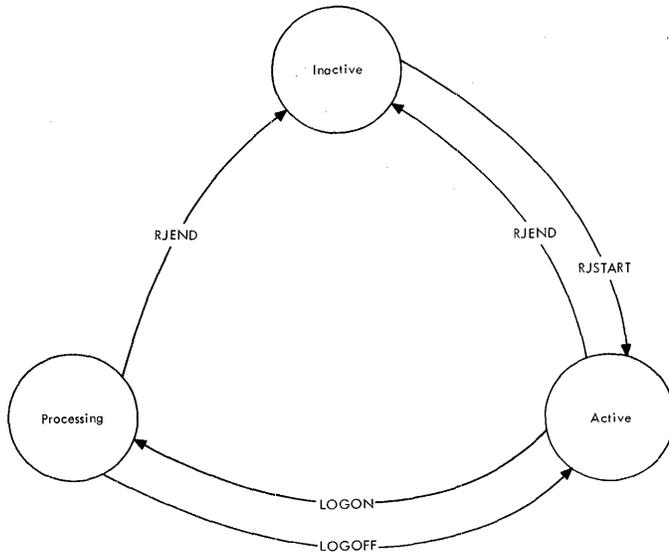
Figure 1. Transition of Work Station States

STARTUP AND CLOSEDOWN

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

CENTRAL STARTUP AND CLOSEDOWN

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

WORK STATION STARTUP

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

WORK STATION CLOSEDOWN

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

USER ACCESS

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

SYSTEM SECURITY

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

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

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

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

INPUT AT THE WORK STATION

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

JOB ENTRY

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

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

WORK STATION COMMANDS

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

OUTPUT AT THE WORK STATION

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

JOB OUTPUT

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

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

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

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

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.

16

- Output may be requested at any work station either by the originator or by a user named as the alternate recipient. <u>The recipient who first requests the output receives the only copy of the output</u>.

- The remote user may make multiple copies of his output available to either himself or an alternate by writing his output to a named data set and submitting a job step that executes an OS data set utility program - IEBPTPCH - to copy the output to SYSOUT. The IEBPTPCH program is described in the publication <u>IBM System/360 Operating System Utilities</u>, 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 instal-lation 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 protec-tion 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 allo-cation necessitates a new cataloged proce-dure, 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.

20

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 ap-
plication. 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 assump-
tions 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	$\begin{bmatrix} \underline{OUTPUT=IMMED} \\ OUTPUT=(DEFER[,userid]) \end{bmatrix}$ $\begin{bmatrix} ,NOTIFY=\left(\begin{Bmatrix} SOURCE \\ BOTH \end{Bmatrix} [,\text{'}text\text{'}] \right) \end{bmatrix}$ $\begin{bmatrix} ,CENTRAL=(\{stepname.ddname\},...) \\ ,CENTRAL=ALL \end{bmatrix}$

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 com-
pleted. 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 avail-
able. 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 out-
put 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	$\begin{bmatrix} \underline{OUTPUT=IMMED} \\ OUTPUT=(DEFER[,userid]) \end{bmatrix}$

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 anoth-
er 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 sta-
tion and inform the operator that
there is immediate output available.
Thus, the work station need not main-
tain connection with the central sys-
tem when there is no traffic over the
line. If the work station is con-
nected via a nonswitched line, no mes-
sage is sent to the central operator.

OUTPUT=DEFER
    specifies job output as deferred. The
    user must retrieve this output by com-
    mand. 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, iden-
    tified 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 subparam-
    eter. If an invalid userid is speci-
    fied, the userid subparameter is
    ignored, and a message indicating the
    error is sent to the user who sub-
    mitted 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 comple-
tion. 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 param-
eter and continues processing the
statement.

Operation	Operand
JED	$\left[\text{NOTIFY}= \left(\left\{ \begin{matrix} \text{SOURCE} \\ \text{BOTH} \end{matrix} \right\} \ [,\text{'text'}] \right) \right]$

NOTIFY=SOURCE
    indicates that the user originating
    the job desires notification of job
    completion. The procedure for notify-
    ing 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 alter-
    nate recipient in the OUTPUT parame-
    ter. If an alternate recipient is not
    specified, only the originator
    receives notification. No error mes-
    sage is sent. Procedures for notify-
    ing the user originating the job are
    the same as those for sending immedi-
    ate output, described in OUTPUT=IMMED.
    An alternate recipient receives noti-
    fication only when he is logged on
    after job completion. If the origina-
    tor requests the output before the
    alternate recipient logs on, no noti-
    fication 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 subparame-
    ter. The text is limited to 25 print-
    able 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 comple-
    tion 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                          |
|---------|----------------------------------|
|         | ┌CENTRAL=({stepname.ddname},   ┐ |
|JED      | |                          ...) | |
|         | └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
```
r-----------------------------------------------------------------------------
|       .. JED OUTPUT=(DEFER,CHC),                                *COSINE01    |
|           ..    NOTIFY=(BOTH,'CALL JONES IF NOT PRESENT'),      *COSINE02    |
|           ..    CENTRAL=(STEP1.STSDS1,STEP2.STSDS2,             *COSINE03    |
|           ..    STEP3.STSDS3)                                    COSINE04    |
L-----------------------------------------------------------------------------J
```

Example Two
```
r-----------------------------------------------------------------------------
|       .. JED OUTPUT=IMMED,                                      *SORT001     |
|           ..    NOTIFY=SOURCE                                    SORT002     |
L-----------------------------------------------------------------------------J
```

Example Three
```
r-----------------------------------------------------------------------------
|       .. JED CENTRAL=ALL,NOTIFY=SOURCE,OUTPUT=DEFER             MONLRPT      |
L-----------------------------------------------------------------------------J
```

Example Four (Incorrect)
```
r-----------------------------------------------------------------------------
|       .. JED OUTPUT=(ERR,DEFER),                               *SQROOT01     |
|           ..    NOTIFY=(BOTH,SQUARE ROOT FINISH'D              *SQROOT02     |
|           ..    CENTRAL=(STEP1.OUTPUT1,STEP2.                  *SQROOT03     |
|           ..    OUTPUT2)                                        SQROOT04     |
L-----------------------------------------------------------------------------J
```

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 $\begin{bmatrix} ,\underline{BRDCST=NO} \\ ,BRDCST=YES \end{bmatrix}$ [,CALL=integer]
..	RJEND	(no operand)
..	LOGON	userid,key
..	LOGOFF	(no operand)
..	OUTPUT	$\begin{bmatrix} J=jobname \\ U=userid \\ * \end{bmatrix}$
..	CONTINUE	$\begin{bmatrix} BEGIN \\ NO \end{bmatrix}$
..	DELETE	[J=jobname]
..	ALERT	$\begin{bmatrix} J=jobname \\ * \\ / \end{bmatrix}$
..	STATUS	$\begin{bmatrix} J=jobname \\ U=userid \\ * \\ T \end{bmatrix}$
..	BRDCSTR	(no operand)
..	MSGR	M='text'[,U=userid] [,T=termid]

Figure 5. Summary of Work Station Commands

RJSTART -- ATTACH A WORK STATION TO THE RJE SYSTEM

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

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

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

```
┌───────────┬──────────────────────────────────────┐
│Operation  │Operand                               │
├───────────┼──────────────────────────────────────┤
│           │            ┌,BRDCST=YES┐              │
│RJSTART    │    termid  │,BRDCST=NO │              │
│           │            └_____┘              │
│           │                                       │
│           │[,CALL=integers]                       │
└───────────┴──────────────────────────────────────┘
```

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

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

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

CALL=integers
    specifies the telephone number of the central system, which the work station

is to dial. This parameter is only valid if the work station has the Auto Call feature installed. The user can code a maximum of fifteen digits in this parameter.

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

RJEND -- DETACH A WORK STATION FROM THE RJE SYSTEM

The RJEND command allows an RJE user to logically detach his work station from the system. When the RJEND command is received by the central system, closedown activities are initiated for the work station. Closedown activities involve transmission of all available messages directed to the work station. No job output is returned to the work station after the RJEND command is received. The last message sent to the work station indicates that the RJEND command was received and that the work station is now logically detached from the system. 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	$\begin{bmatrix} \text{J=jobname} \\ \text{U=userid} \\ * \end{bmatrix}$

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), indi-
cates 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 sub-
mitted 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 avail-
able deferred output created by jobs
that the user, identified in the cur-
rent 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 out-
put 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 fol-
lowing conditions:

1. A forms requirement message, indicat-
    ing a change in the form number speci-
    fied for the output, is sent to the
    work station.

2. Operator intervention at the work sta-
    tion 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 com-
mand 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 discon-
tinued 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 com-
mand. 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	$\begin{bmatrix} \text{BEGIN} \\ \text{NO} \end{bmatrix}$

BEGIN
specifies that the user desires trans-
mission 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.

28

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, <u>without</u> 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 <u>all</u> 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 job-names by clearing the system of forgotten jobs. <u>Caution</u> must be exercised when using this optional format. <u>A user should not use this format if he is sharing a userid</u> 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 <u>any</u> 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.

```
r------------T------------------------------------1
|Operation|Operand                              |
|---------+------------------------------------|
|         |  ┌J=jobname┐                        |
|         |  │jobname  │                        |
|ALERT    |  │*        │                        |
|         |  └/        ┘                        |
L---------┴------------------------------------J
```

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 indicat-
> ing 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 pend-
> ing 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 sub-
mitted). For example, if the user issues
an ALERT * and is alerted that two jobs
have output available for him, no addition-
al alerts for those two jobs are returned,
regardless of the number of subsequent
ALERT commands issued by the user. Infor-
mation 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 deter-
mine 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 indi-
cation 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 com-
mand 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 automati-
cally return the new status of a job when a
change of status occurs. The user, howev-
er, may request notification of job comple-
tion with the ALERT command.

```
r---------T------------------------------------1
|Operation|Operand                            |
|---------+----------------------------------|
|         |  ┌J=jobname┐                      |
|STATUS   |  │U=userid │                      |
|         |  │*        │                      |
|         |  └T        ┘                      |
L---------┴----------------------------------J
```

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 key-
     word parameters are omitted, the mes-
     sage 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 for-
     matted for the central operator or
     another work station as follows:

$$RJE\ MSG\ \begin{Bmatrix} *C* \\ userid_1 \end{Bmatrix}\ FR\ userid_2\ text$$

C - message by default goes to
     central

$userid_1$ - the U option is used

$userid_2$ - submitter

WORK STATION COMMAND EXAMPLES

Example One

Operation	Operand
RJSTART	NEWYORK5

The work station named NEWYORK5 is logical-
ly 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 accom-
pany 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 process-
ing. 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 com-
mand 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 infor-
mation 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.

IHK101I USER LOGGED ON userid ssssssss

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

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

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

IHK102I USER LOGGED OFF userid ssssssss

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

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

User Response: Same as to message IHK100I.

IHK103I RJEND ACCEPTED ssssssss

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

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

User Response: None.

IHK104I NO JOB(S) IN SYSTEM operation

$$\begin{Bmatrix} \text{jobname userid} \\ \text{userid} \\ \text{blank} \\ \text{termid} \end{Bmatrix} \text{ssssssss}$$

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

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

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

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

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

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

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

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

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

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

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

IHK106I INVALID RECIPIENT operation
jobname userid ssssssss

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

System Action: The request is
ignored.

User Response: None.

IHK107I JOB DELETED jobname userid
ssssssss

Explanation: The job (jobname)
specified in a DELETE command with
sequence number (ssssssss)
submitted by the designated user
(userid) has been deleted. If the
DELETE command specifies all jobs

submitted by this user, a separate
message is returned for each job
deleted. A job with the same
jobname cannot be entered until
this message is received.

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

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

User Response: None.

IHK108I STATUS jobname userid$_1$ userid$_2$

$$\left.\begin{array}{l}\text{SCHED (n)}\\\text{EXECUTING}\\\text{NORMAL END}\\\text{ABNORM END}\\\text{DISK ERROR}\end{array}\right\}\text{ssssssss}$$

Explanation: This is the response
to the STATUS command with
sequence number (ssssssss). The
response provides the status of
the job (jobname) submitted by a
user (userid$_1$) and naming another
user (userid$_2$) as an alternate
recipient.

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

EXECUTING - The job is executing.

NORMAL END - The job has completed
normally.

ABNORM END - The job 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

36

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
sssssss

Explanation: The message text
specified in a MSGR command with
sequence number (sssssss) 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 ⎫
sssssss   ⎨termid ⎬
                          ⎩CENTRAL⎭

Explanation: The message text
specified in a MSGR command with
sequence number (sssssss) 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   ⎫
sssssss   ⎩termid⎭⎩DISK ERROR⎭

Explanation: The MSGR command
with sequence number (sssssss)
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 sssssss.

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

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

IHK119I JOB WAITING DELIVERY operation
    jobname userid ssssssss

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

    System Action: The command is
    rejected.

    User Response: None.

38

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 TERMID operation ssssssss

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

         System Action: The command is
         rejected.

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

IHK143I   INVALID JOBNAME operation ssssssss

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

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

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

IHK144I   DUPLICATE JOBNAME jobname ssssssss

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

         System Action: The job is
         refused.

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

Messages Sent to Work Stations   39

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] sssssss

    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.
<u>The job residing in the central
system as a result of the error
must be deleted before the job
entry is resubmitted.</u>

IHK147I   REQD PARAMETER MISSING operation
    sssssss

    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
    sssssss

    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.
<u>The job residing in the central
system as a result of the error
must be deleted before the job
entry is resubmitted.</u>

IHK149I   ILLEGAL CONTINUATION operation
    sssssss

    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.
<u>The job residing in the central
system as a result of the error
must be deleted before the job
entry is resubmitted.</u>

IHK150I   UNDEFINED KEYWORD operation
    sssssss

    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
         sssssssss

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

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
         sssssssss

Explanation: The statement
(operation) with sequence number
(sssssssss) 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
         sssssssss

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
         sssssssss

Explanation: The text specified
in the statement (operation) with
sequence number (sssssssss) 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 sssssss

Explanation: A LOGON command with sequence number (sssssss) 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 $\begin{Bmatrix} \text{SYSIN jobname} \\ \text{SYS1.SYSJOBQE} \\ \text{jobname ddname} \end{Bmatrix}$

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

42

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

<pre>
/ 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)
</pre>

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 com-
mands. These commands provide the addi-
tional 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 re-
strictions 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 opera-
  tion. 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 state-
  ment 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 proce-
  dure. 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 sub-
  parameter 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 cen-
  tral 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 proce-
  dure. 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 speci-
  fied. 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 startup 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 pro-
cess it with the central installation out-
put writers. This command allows an opera-
tor 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 indica-
  tion 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 con-
    cerning a particular work station.

3. A list of the RJE userids and asso-
    ciated 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 cur-
    rently 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 facili-
    ties of the central system.

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

```
┌─────────┬───────────────────────────────────┐
│Operation│Operand                            │
├─────────┼───────────────────────────────────┤
│SHOW     │ ⎛JOBS[,jobname]  ⎞               │
│         │ ⎜TERMS[,termid]  ⎟               │
│         │ ⎜USERS[,userid]  ⎟               │
│         │ ⎜DEFER           ⎟               │
│         │ ⎜DEFER,userid    ⎟               │
│         │ ⎨BRDCST          ⎬               │
│         │ ⎜MSGS            ⎟               │
│         │ ⎜MSGS,termid     ⎟               │
│         │ ⎜LERB            ⎟               │
│         │ ⎜LERB,linename   ⎟               │
│         │ ⎝ACTIVE          ⎠               │
└─────────┴───────────────────────────────────┘
```

Values coded in the operand are:

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

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

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

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

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

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

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

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

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

BRDCST
requests a copy of the current broadcast messages.

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

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

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

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

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

MSG -- COMMUNICATE WITH RJE USERS

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

1. A specific user currently logged on.

2. A specific work station.

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

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

In addition, the MSG command allows
removal from the system of those messages
that are waiting for work station startup.
This option is normally used when communi-
cation 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                             │
├──────────┼────────────────────────────────────┤
│          │ ⎧[U=userid,][T=termid,]M='text'⎫   │
│MSG       │ ⎨                              ⎬   │
│          │ ⎩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 key-
   word is omitted, the message is not
   sent. A response indicating this con-
   dition 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 char-
   acters 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 for-
matted 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 num-
bered 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 low-
   est numbered slots available.

6. Clear the data set of all existing
   messages.

```
┌──────────┬────────────────────────────────────┐
│Operation │Operand                             │
├──────────┼────────────────────────────────────┤
│          │ ⎧nn,'text'  ⎫                      │
│          │ ⎪'text'     ⎪                      │
│BRDCST    │ ⎨nn         ⎬                      │
│          │ ⎪DELETE     ⎪                      │
│          │ ⎪Ann,'text' ⎪                      │
│          │ ⎩PACK       ⎭                      │
└──────────┴────────────────────────────────────┘
```

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

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

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

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

Ann,'text'
    specifies the insertion of the text
into slot number nn. The text (up to
and including 40 alphameric charac-
ters) 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 inac-
tive slot. The contents and sequen-
tial 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.

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 $\begin{cases} \text{NO CORE} \\ \text{(blanks)} \\ \text{CSCB USE} \end{cases}$ COMMAND INVALID

> Explanation: NO CORE indicates
> that main storage was not
> available to process the central
> command.
>
> If blanks appear, the operand of
> the central command was too long,
> or a framing quote was not found
> within 62 bytes.
>
> CSCB USE indicates that 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 $\left\{ \begin{matrix} \text{uuu kkk} \begin{cases} \text{OFF} \\ \text{OFF termid} \\ \text{ON termid unitname} \end{cases} \\ \text{NO USERS IN DIRECTORY} \end{matrix} \right\}$

> Explanation: This is the response
> to a SHOW USERS or a SHOW USERS,
> userid command:
>
> where
>
> uuu
> > is the assigned userid.
>
> kkk
> > is the associated protection
> > key.
>
> OFF
> > indicates the user is
> > currently logged off.
>
> ON
> > indicates the user is
> > currently logged on.
>
> termid
> > is the work station where the
> > user was last or is currently
> > logged on.
>
> unitname
> > is the communication line
> > currently being used by the
> > work station.
>
> NO USERS IN DIRECTORY
> > indicates there are no
> > entries for that user in the
> > User Directory.
>
> System Action: Reporting
> continues until the request has
> been honored.
>
> Operator Response: None.

IHK003I   RJEND ACCEPTED termid

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

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

           Operator Response: None.

IHK004I   NO JOB(S) IN SYSTEM [jobname]

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

           System Action: None.

           Operator Response: None.

IHK005I   JOB(S) NOT COMPLETE jobname userid

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

           System Action: The request is
           ignored.

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

IHK007I   JOB DELETED jobname

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

           System Action: The job and its
           output are deleted.

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

IHK011I   MSG PENDING STARTUP $\begin{Bmatrix} \text{NONE} \\ \text{termid} \\ \text{termid NONE} \end{Bmatrix}$

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

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

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

           Operator Response: None.

IHK012I   MSG QUEUED FOR DELIVERY $\begin{Bmatrix} \text{userid} \\ \text{termid} \\ \text{TERMINALS} \end{Bmatrix}$

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

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

           Operator Response: None.

IHK013I   MSG IGNORED $\begin{Bmatrix} \text{userid} \\ \text{termid} \\ \text{DISK ERROR} \end{Bmatrix}$

           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
$$\left\{ termid \left\{ \begin{array}{l} I \\ A \ unitname \\ P \ unitname \quad uuu \end{array} \right\} \atop NO \ ACTIVE \ WORK \ STATIONS \right\}$$

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

where:

termid
    is the RJE work station identifier.

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

A
    indicates the work station is in the active state.

P
    indicates the work station is in the processing state.

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

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

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

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

Operator Response: None.

IHK028I
jobname uuu$\left\{ \begin{array}{l} aaa \\ N/A \end{array} \right\}$ $\left\{ \begin{array}{l} COMP \\ INCP \end{array} \right\}$ $\left\{ \begin{array}{l} I \\ D \quad nnn \end{array} \right\}$

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

54

user assigned this userid-key can
now gain access to the system.

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

Operator Response: None.

IHK032I USER DIRECTORY FULL userid key

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

System Action: The request is
ignored.

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

IHK033I MSGS DELETED FOR WORK STATION
         termid

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

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

Operator Response: None.

IHK034I MSG CANNOT BE ADDED $\begin{Bmatrix} \text{BRDCST} \\ \text{DELAYED} \end{Bmatrix}$ termid

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

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

submitted from the work station or
simulated because of an error
condition.

System Action: (BRDCST) The
request is ignored.

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

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

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

IHK035I INVALID SLOT NUMBER BRDCST

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

System Action: The command is
ignored.

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

IHK036I BRDCST $\begin{Bmatrix} \text{NONE} \\ \text{nn message} \end{Bmatrix}$

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 $\begin{Bmatrix} \text{SYSIN jobname} \\ \text{SYS1.SYSJOBQE} \\ \text{EMITTER WORKAREA} \end{Bmatrix}$

> 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=xxxxxxxx

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

System Action: The line is not serviced for this and all subsequent RJE startups that refer to this RJE procedure. 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 time-outs; 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.
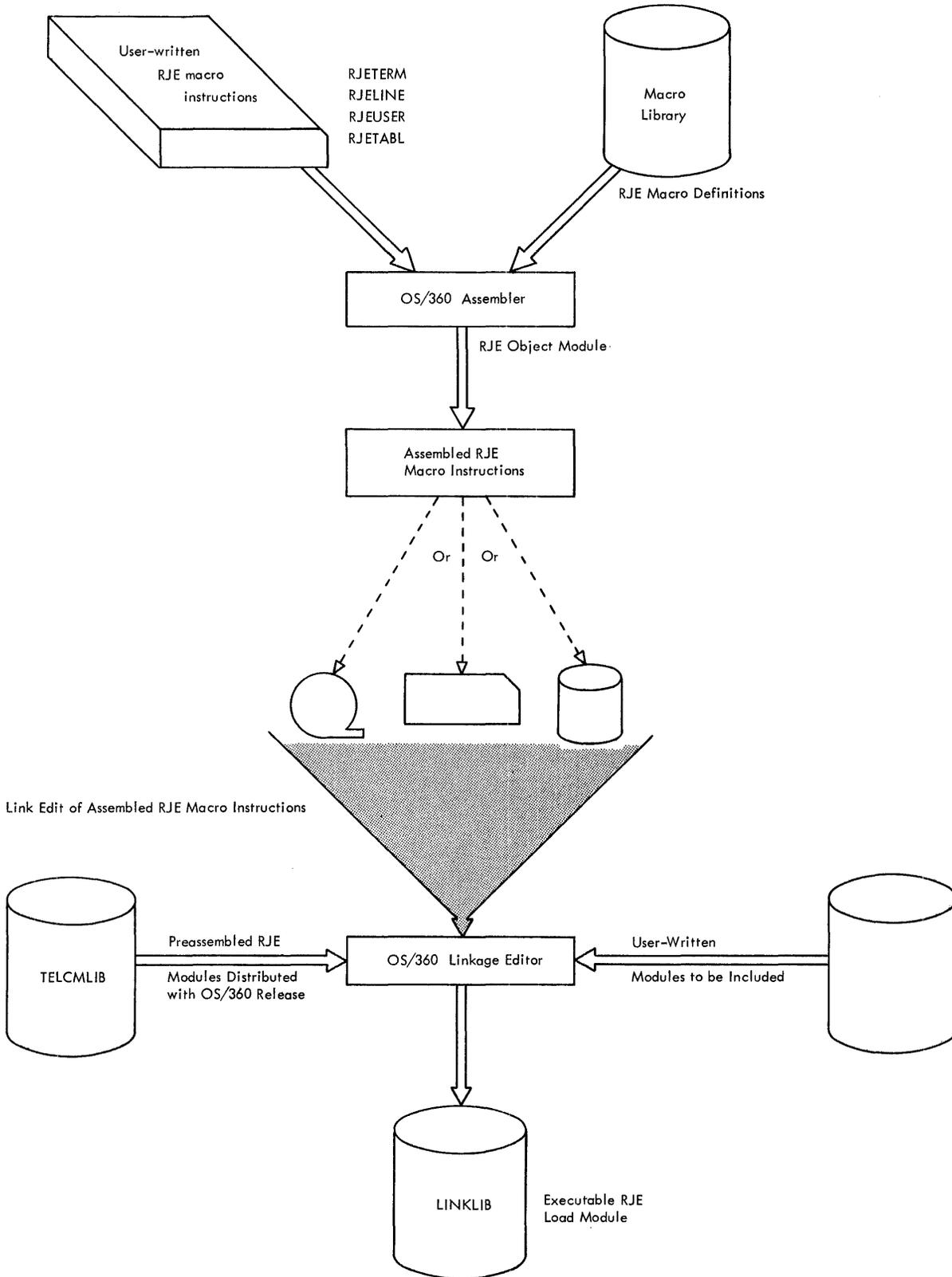
Assembly of RJE Macro Instructions

User-written
RJE macro
instructions

RJETERM
RJELINE
RJEUSER
RJETABL

Macro
Library

RJE Macro Definitions

OS/360 Assembler

RJE Object Module

Assembled RJE
Macro Instructions

Or   Or

Link Edit of Assembled RJE Macro Instructions

TELCMLIB

Preassembled RJE

Modules Distributed
with OS/360 Release

OS/360 Linkage Editor

User-Written

Modules to be Included

LINKLIB

Executable RJE
Load Module

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
		$\left[\begin{array}{l} \text{,RLN=1} \\ \text{,RLN=integer} \end{array} \right]$
		$\left[\text{,LERB=} \left(\left[\begin{array}{c} \text{integer}_1 \\ \underline{255} \end{array} \right], \left[\begin{array}{c} \text{integer}_2 \\ \underline{10} \end{array} \right], \left[\begin{array}{c} \text{integer}_3 \\ \underline{5} \end{array} \right], \left[\begin{array}{c} \text{integer}_4 \\ \underline{5} \end{array} \right] \right) \right]$
		[,ID=(type,{chars,termid},...)]
		$\left[\text{,MODE=} \left(\text{[IBC]} \left[\begin{array}{c} A \\ ,B \end{array} \right] \left[\begin{array}{c} A \\ ,B \end{array} \right] \right) \right]$
		$\left[\begin{array}{l} \text{,}\underline{\text{CP=MVT}} \\ \text{,CP=MFT} \end{array} \right]$
name	RJETERM	$\left[\begin{array}{l} \underline{\text{TYPE=2780}} \\ \text{TYPE=CPU} \\ \text{TYPE=1130} \end{array} \right]$
		$\left[\begin{array}{l} \text{,}\underline{\text{PUNCH=YES}} \\ \text{,PUNCH=NO} \end{array} \right]$
		$\left[\begin{array}{l} \text{,}\underline{\text{PRTSZ=120}} \\ \text{,PRTSZ=132} \\ \text{,PRTSZ=144} \end{array} \right]$
		[,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] $\left[\begin{array}{l} \text{,}\underline{\text{BUFNO=1}} \\ \text{,BUFNO=integer} \end{array} \right]$

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 spec-
ified 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 com-
munication lines. This grouping is done by
concatenation of DD statements in the cata-
loged 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 $\left[\begin{matrix}\text{,}\underline{RLN=1}\\\text{,RLN=integer}\end{matrix}\right]$ $\left[\text{,LERB=}\left(\left[\begin{matrix}\text{integer}_1\\\underline{255}\end{matrix}\right]\text{,}\right.\right.$ $\left[\begin{matrix}\text{integer}_2\\\underline{10}\end{matrix}\right]\text{,}$ $\left[\begin{matrix}\text{integer}_3\\\underline{5}\end{matrix}\right]\text{,}$ $\left.\left.\left[\begin{matrix}\text{integer}_4\\\underline{5}\end{matrix}\right]\right)\right]$ [,ID=(type,{chars, termid},...)] $\left[\text{,MODE=}\left(\text{[IBC]}\left[\text{,}\frac{A}{B}\right]\left[\text{,}\frac{A}{B}\right]\right)\right]$ $\left[\begin{matrix}\text{,}\underline{CP=MVT}\\\text{,CP=MFT}\end{matrix}\right]$

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 dis-
   played 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 con-
   trol 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 informa-
   tion about the line.

Operand Field
DDLINE=ddname
   is the name specified in the DD state-
   ment defining the line (or line
   group). The DD statement defining the
   line must be included in the cataloged
   procedure required for RJE (see Cata-
   loged Procedures for RJE).

DDSYSIN=ddname
   is the name of the DD statement defin-
   ing 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$_1$, integer$_2$,
        $\underline{255}$ $\underline{10}$
        integer$_3$, integer$_4$
        $\underline{5}$ $\underline{5}$
   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 com-
   mand: SHOW LERB, linename (see Cen-
   tral Commands). The allowable values
   are integers 1-255 inclusive. The
   underlined value is assumed for any
   parameter omitted.

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

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

    type is replaced with one of the fol-
    lowing 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)[1] for the work station.

    termid is replaced with the name spec-
    ified 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 mul-
    tidropped work station by repeating
    its paired chars and termid values in
    the subparameter list.

MODE=([IBC]$\left[,\frac{A}{B}\right]\left[,\frac{A}{B}\right]$)
    IBC (Intermediate Block Check) speci-
    fies 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 Communica-
        tions Interface A of the 2701
        Data Adapter Unit.

---
[1]The 2780 has two polling characters and
   the 1130 has one.

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

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

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

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

    Programmer's Note: If the trans-
    mission control unit is a 2703,
    the last two suboperands $\left[\frac{A}{B}\right]\left[,\frac{A}{B}\right]$
    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 state-
ment 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 mes-
sage be displayed to the operator if 10
lost data errors occur before 255 transmis-
sions. The other assumed threshold values
are satisfactory. The attached work sta-
tions 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  | ┌TYPE=2780┐                 |
|    |         | |TYPE=CPU  |                 |
|    |         | └TYPE=1130┘                 |
|    |         |                             |
|    |         | ┌,PUNCH=YES┐                |
|    |         | └,PUNCH=NO ┘                |
|    |         |                             |
|    |         | ┌,PRTSZ=120┐                |
|    |         | |,PRTSZ=132|                |
|    |         | └,PRTSZ=144┘                |
|    |         |                             |
|    |         | [,ID=chars]                 |
```

Name Field

name

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

Operand Field

TYPE=2780
TYPE=CPU
TYPE=1130

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 alphameric characters. These are A-Z, 0-9, $, # and . Also, each must be three characters long.

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

RJEUSER	20,HYE,123,AND,12$,LOW,
	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
		[,JOBCARD=routine name]
		[,JOBACK=routine name]
		[,COMMERR=routine name]
		[,BUFNO=1 / ,BUFNO=integer]

Operand Field

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

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

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

SYSUSER=char
> identifies the SYSOUT class for output to be passed to a user-written output routine for processing. If the work station supports a user-written output routine, it receives all output in this data set for processing. If the work station supports the user exit,

but the option is not exercised, or
the work station does not support a
user exit, (e.g., the 2780) output
identified with this output class is
printed at the remote work station.

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

    Programmer's Note: If a user speci-
    fies 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.

JOBCARD=routine name
    is the name of the user-written rou-
    tine that examines a remotely sub-
    mitted JOB statement, including con-
    tinuation cards. This routine name
    identifies the entry point of the rou-
    tine given control when a JOB state-
    ment is received.

JOBACK=routine name
    is the name of the user-written rou-
    tine that may examine and modify the
    job acknowledgment message. This rou-
    tine 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 encoun-
    tered during RJE operation. The rou-
    tine name identifies the entry point
    of the routine given control after the
    error is found.

BUFNO=1
BUFNO=integer
    specifies the maximum number of cen-
    tral 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 operat-
ing 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 defini-
tions 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 JOBCARD user
            exit is to be included. The user-
            written routine is assembled and
            placed in RJETEMP with the name
            specified in the RJETABL macro in
            STEP 1.

STEP 3 - is necessary if the JOBACK user
            exit is to be included. The user-
            written routine is assembled and
            placed in RJETEMP with the name
            specified in the RJETABL macro in
            STEP 1.

STEP 4 - is necessary if the COMMERR user
            exit is to be included. The user-
            written routine is assembled and
            placed in RJETEMP with the name
            specified in the RJETABL macro in
            STEP 1.

STEP 5 - linkage editing of four modules
            created in the preceding steps
            from RJETEMP to SYS1.TELCMLIB is
            accomplished.

Note: The following labels will be flagged
as unresolved at the end of this step,

            IHKABLSD
            IHKAASTO
            IHKCMDSV
            IHKWTRSV

and the names assigned to the user exits if
any are included. These unresolved link-
ages 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:

    IHKABLSD
    IHKAASTO
    IHKCMDSV
    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)	
/*		

Notes:

1. The SPACE parameter for the SYSPUNCH data set in STEP1 is more than adequate for assembled RJE macros. This parameter should be altered as necessary to provide sufficient space for the user-written routines.

2. This seven-step job requires 120 records on SYS1.SYSJOBQE reserved for the initiator. If a smaller amount was specified at system generation (60 records is the default), the number should be changed with an 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=xxxxxx,DCB=(DSORG=DA)

```
        ddname=IHKFSTDD,IHKJEDDD,IHKUDRDD,IHKTDRDD

        SPACE(a,(b,c))

            a)  SYS1.IHKFSTB                a=24
                SYS1.IHKJEDTB               a=98
                SYS1.IHKUDRTB               a=18
                SYS1.IHKTDRTB               a=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.IHKTDRTB     see RJETERM            b=no. of RJETERMs
            c)  c=5
```

INITIALIZING THE BROADCAST-MESSAGE DATA SETS

IHKCDBMI is used to initialize the broadcast and message data sets. In addition to the EXEC statement, the input stream for IHKCDBMI includes:

- A DD statement named SYSABEND specifying an output device in case of an abnormal end of job.

- A DD statement for each of the three data sets associated with the broadcast messages and delayed messages as described below:

//IHKTXTDD	DD	DSNAME=SYS1.IHKTXTTB,DISP=(NEW,CATLG),
//		SPACE=(60,(251,20)),UNIT=xxxx,
//		VOLUME=SER=xxxxxx,DCB=(DSORG=DA)
//IHKMSGDD	DD	DSNAME=SYS1.IHKMSGSL,DISP=(NEW,CATLG),
//		SPACE=(750,(1,1)),UNIT=xxxx,
//		VOLUME=SER=xxxxxx
//IHKBRDDD	DD	DSNAME=SYS1.IHKBRDSL,DISP=(NEW,CATLG),
//		SPACE=(400,(1,1)),UNIT=xxxx,
//		VOLUME=SER=xxxxxx

Note: A change in the size of the data set is made by a change in the macro definition of IHKAARJE. A change is necessary to alter the provision for number of jobs, users, terminals, or lines in the system.

If any change is made to decrease the number of terminals, or if the order of terminals as specified in the RJETERM macros is changed, IHKCDBMI should be executed. Otherwise, delayed messages existing prior to the RJE assembly may be sent to the wrong terminal.

Caution: When IHKCDBMI is executed, all delayed messages and broadcast messages are purged.

			SAMPLE CODING FORM
1.	//JOB1	JOB	
2.	//STEP1	EXEC	PGM=IEHPROGM
3.	//SYSPRINT	DD	SYSOUT=A
4.	//DD1	DD	VOLUME=SER=111111,DISP=OLD,UNIT=2311
5.	//SYSIN	DD	*
6.		SCRATCH	DSNAME=SYS1.IHKFSTB,VOL=2311=111111,PURGE
7.		SCRATCH	DSNAME=SYS1.IHKJEDTB,VOL=2311=111111,PURGE
8.		SCRATCH	DSNAME=SYS1.IHKUDRTB,VOL=2311=111111,PURGE
9.		SCRATCH	DSNAME=SYS1.IHKTDRTB,VOL=2311=111111,PURGE
10.		SCRATCH	DSNAME=SYS1.IHKTXTTB,VOL=2311=111111,PURGE
11.		SCRATCH	DSNAME=SYS1.IHKMSGSL,VOL=2311=111111,PURGE
12.		SCRATCH	DSNAME=SYS1.IHKBRDSL,VOL=2311=111111,PURGE
13.	/*		
14.	//STEP2	EXEC	PGM=IHKINTAB
15.	//SYSABEND	DD	SYSOUT=A
16.	//IHKFSTDD	DD	DSNAME=SYS1.IHKFSTB,DISP=(NEW,CATLG),
17.	//		SPACE=(24,(11,5)),UNIT=2311,
18.	//		VOLUME=SER=111111,DCB=DSORG=DA
19.	//IHKJEDDD	DD	DSNAME=SYS1.IHKJEDTB,DISP=(NEW,CATLG),
20.	//		SPACE=(98,(11,5)),UNIT=2311,
21.	//		VOLUME=SER=111111,DCB=DSORG=DA
22.	//IHKUDRDD	DD	DSNAME=SYS1.IHKUDRTB,DISP=(NEW,CATLG),
23.	//		SPACE=(18,(15,5)),UNIT=2311,
24.	//		VOLUME=SER=111111,DCB=DSORG=DA
25.	//IHKTDRDD	DD	DSNAME=SYS1.IHKTDRTB,DISP=(NEW,CATLG),
26.	//		SPACE=(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=IHKRJBGN,REGION=80K,
	//		PARM='0009990300102490050322311'
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.	//IHKTDRDD	DD	DSNAME=SYS1.IHKTDRTB,DISP=OLD,DCB=DSORG=DA
9.	//IHKTXTDD	DD	DSNAME=SYS1.IHKTXTTB,DISP=OLD,DCB=DSORG=DA
10.	//IHKMSGDD	DD	DSNAME=SYS1.IHKMSGSL,DISP=OLD
11.	//IHKBRDDD	DD	DSNAME=SYS1.IHKBRDSL,DISP=OLD
12.	//DUMDD1	DD	DISP=(OLD,KEEP),
	//		VOLUME=SER=XXXXXX,SPACE=(TRK,(5,20)),
	//		UNIT=23XX,DCB=BLKSIZE=400
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.

JOBCARD EXIT

The JOBCARD user exit allows a user-written program to examine each remotely submitted JOB statement and to alter its operand field. Neither the jobname nor the operation field can be changed. The address of the JOB card is passed to the user routine in register 1. JOB continuation cards are passed to the user routine in the same way by subsequent entries. Control must be returned to the system before further processing of the job entry. The user exit is passed a //null statement if job statement continuation is expected but not received.

COMMERR EXIT

The COMMERR user exit allows a user-written program to assume control after RJE has unsuccessfully exhausted its retries following a line error. When the user gets control via the exit, register 1 contains the address of the Data Event Control Block (DECB) associated with the line in error.

The user may issue any BTAM macro (except OPEN and CLOSE) in this exit. The associated WAIT macro instruction, however, degrades the performance of the RJE system. The user-written routine also can interrogate the BTAM line error block and take appropriate action. If a multidropped work station is permanently in error, CHGNTRY macro instructions may be issued to skip that work station in the polling and addressing lists. If entries are skipped, they are restored to the list when the central system is restarted with the START command.

Control returns to the system after the error is examined and desired action is taken.

JOBACK EXIT

The JOBACK user exit allows a user-written program to examine and alter the text of the RJE job acknowledgment message (message IHK117I) before it is sent to the user. This routine also may construct its own message containing up to 59 characters. The additional message is sent following the RJE constructed acknowledgment.

The text address of the RJE constructed message is passed to the routine in register 1. The JOBACK routine must provide its own 59-byte buffer to construct an additional message. If no additional message is constructed, the routine returns control to the system with a nonzero return code in register 1. If an additional message is constructed by the routine, the address of the message is passed in register 1 with a zero return code in register 15 when control returns to the system.

OPERATOR AWARENESS

A BTAM system-to-operator message is displayed for the central operator whenever an irrecoverable communication error occurs. In addition, error counts for each line are displayed for the central operator. For each line, BTAM keeps an error count for data check, for intervention required, and for nontext time-out. BTAM also records the number of transmissions occurring on the line. The user may specify threshold values for these counters when the RJE support is assembled. If any one of the three error counters reaches its threshold count before the transmission threshold count is reached, a message is displayed for the central operator. This message identifies the line and gives all three error counts and the transmission count. After the message is displayed, the error counts and the transmission count are added to accumulators, and the counters reset to zero. The central operator may display the value of the accumulators at any time with the SHOW LERB command. The accumulators for one line or for every supported line may be requested. These accumulators are reset to zero each time the central system starts up.

Note: If the transmission count reaches its threshold count before any error count, the counters are added to the accumulators and reset to zero. No message is displayed.

ERROR RECOVERY PROCEDURES

When BTAM has exhausted its error retries at the central system, a permanent line error exists. BTAM posts the error to RJE and displays a message to the central operator. At an IBM System/360 work station, when a permanent line error exists, a message is displayed for the remote operator; at a 2780, an alarm is sounded.

The remote operator procedures required after an irrecoverable error depend upon the remote work station and are described in detail in the sections on the individual work stations. In general they involve resubmitting only that portion of the remote input stream for which the central system has not returned a written acknowledgment.

Note: RJE does not inhibit any facility provided for error recovery in IBM Binary Synchronous Communications System.

SYSTEM RESTART

A restart condition results when an irrecoverable error occurs at the central system requiring the supervisor to be reloaded.

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)   │
└─────────────────────────────────────────────┘
```
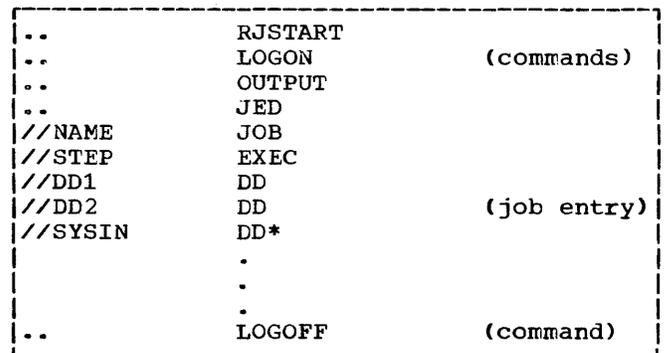
Figure 11.   Logical Elements of an Input Stream

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, 60J5. 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 follwed (see Printer-Keyboard Procedures). If the problem cannot be corrected, operator communication procedures should be initiated to close the card reader (see Printer-Keyboard Procedures).

Irrecoverable communication errors result when communication is lost with the central system because of either line errors or a central failure. In either case, the work station is logically detached by the central system and restart procedures are necessary. The response received when restart procedures are executed indicates whether the error was due to a line error or to a central failure.

To terminate RJE operation because of an error, the operator must reply with an 8 to any message except those issued by the work station program (those starting with a 6). On messages issued by the work station program, he must reply with a 1 and manually disconnect the adapter. If no message is issued, the operator should press the request key on the printer-keyboard and reply 8 to the request message.

RESTART PROCEDURES

Restart procedures involve regaining communication with the central system and submitting an RJSTART command. If the error occurs during an output operation, output automatically resumes either where it was interrupted (after a line error) or at the beginning of the job (after a central failure).

If the error occurs during an input operation, all unacknowledged input must be resubmitted.

6000A   RJSTART Command Required

             Explanation: An error has
             occurred that has caused loss of
             communication with the central
             system. The line has been closed,
             and an RJSTART command must be
             submitted from the card reader to
             reestablish communications.

             System Action: The system waits
             for the reply.

             Operator Response: The operator
             must enter a valid RJSTART command
             through the card reader in order
             to resume processing. The
             following reply is the only valid
             response to this message:

             A - The RJSTART command has been
                 entered into the card reader.

6001A   RJSTART Command Invalid

             Explanation: The RJSTART command
             submitted is invalid.

             System Action: The system waits
             for the reply.

             Operator Response: The operator
             must enter a valid RJSTART command
             in order to resume processing.
             The operator enters one of the
             following letter codes to indicate
             how he desires to correct the
             error:

             A - The error is to be corrected
                 from the card reader.
             B - The error is to be corrected
                 from the printer-keyboard.

             On a switched line the operator
             has approximately three minutes to
             enter a reply.

6002 or   6002A LOGON, RJEND, or CONTINUE
             Required

             Explanation: Input submitted was
             either in error or out of
             sequence. A LOGON, RJEND, or
             CONTINUE command is required. The
             LOGON command is required if input
             is available for transmission to
             the central system. The RJEND
             terminates RJE activity at the
             work station. The CONTINUE
             command is entered if output was
             discontinued.

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-Keyboard 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-Keyboard Procedures). If it is not possible to correct the problem, operator communication procedures must be initiated to signify end-of-file (..null card) on the card reader (see Printer-Keyboard Procedures).

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

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 / ,UEXIT=NO] [,DISK=YES / ,DISK=NO]
	[,PRT=120 / ,PRT=132 / ,PRT=144] [,PCH=20 / ,PCH=40 / ,PCH=42]
	[,RDR=01 / ,RDR=20 / ,RDR=40 / ,RDR=42] [,DIAL=NO / ,DIAL=MAN / ,DIAL=AUTO]
	[,INTRFC=A / ,INTRFC=B] [,CODE=A / ,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.

END

OPTIONAL

USER-EXIT
SOURCE

ASSEMBLER
CONTROL CARDS

END IHKDBSRT

RJE MACRO
STATEMENT

ASSEMBLER
CONTROL CARDS

SYSRES

S/360
ASSEMBLE

USER-EXIT OBJECT
DECK (OPTIONAL)

WORK STATION
PROGRAM OBJECT
DECK

RELOCATABLE OBJECT
MODULES ON CARDS
OR RELOCATABLE
LIBRARY OF SYSRES

SYSRES

S/360
LINK EDIT

OBJECT
MODULE
ON CORE
IMAGE
LIBRARY
SYSRES
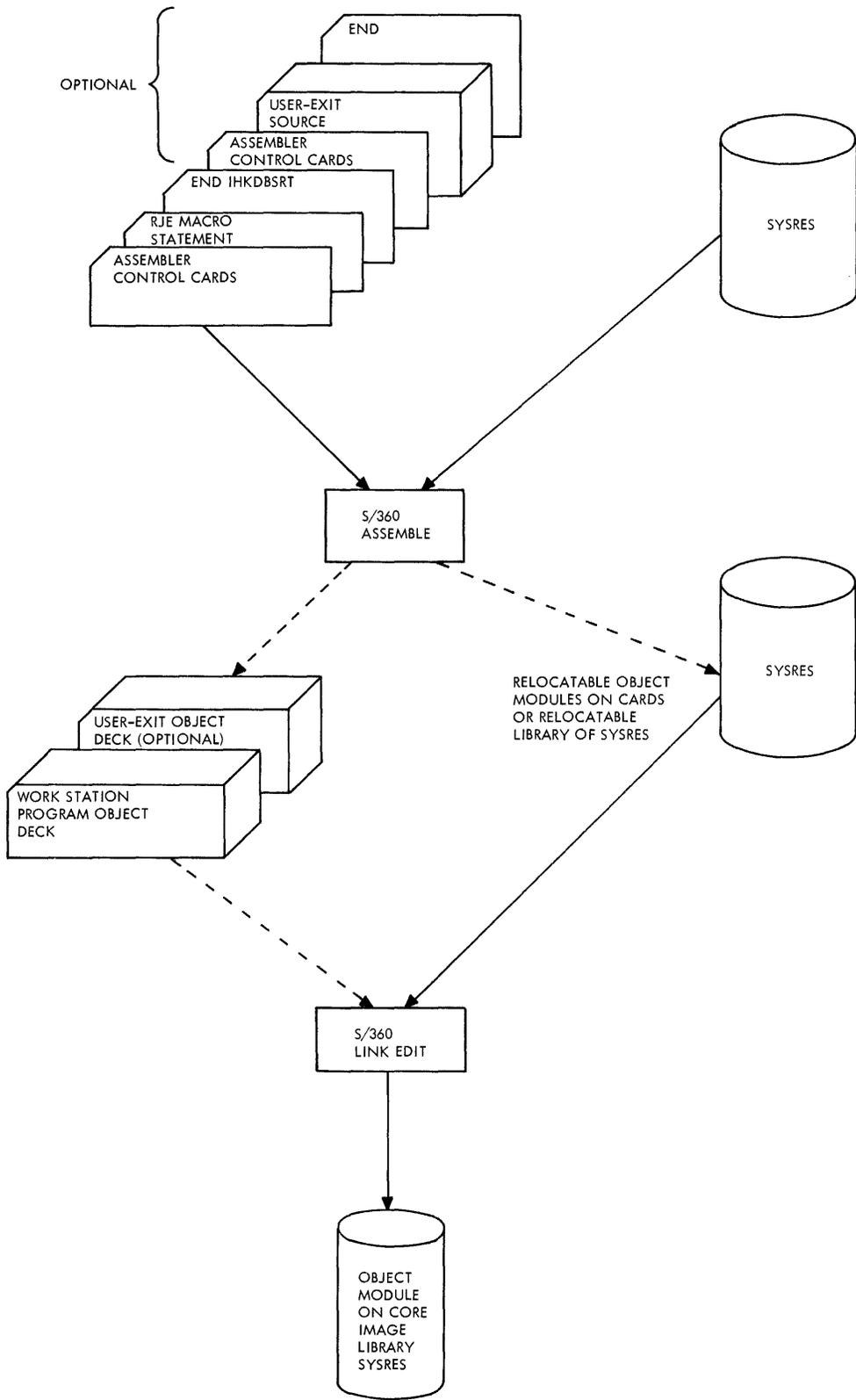
Figure 12.   BOS System Generation

END

USER-EXIT
SOURCE DECK

ASSEMBLER
CONTROL CARDS

END IHKDBSRT

RJE MACRO
STATEMENT

ASSEMBLER
CONTROL CARDS

OPTIONAL

SYSTEM
TAPE

S/360
ASSEMBLE

USER-EXIT OBJECT
DECK (OPTIONAL)

WORK STATION
PROGRAM OBJECT
DECK

SYSTEM
TAPE

S/360
LINK EDIT

LOADABLE
OBJECT MODULE
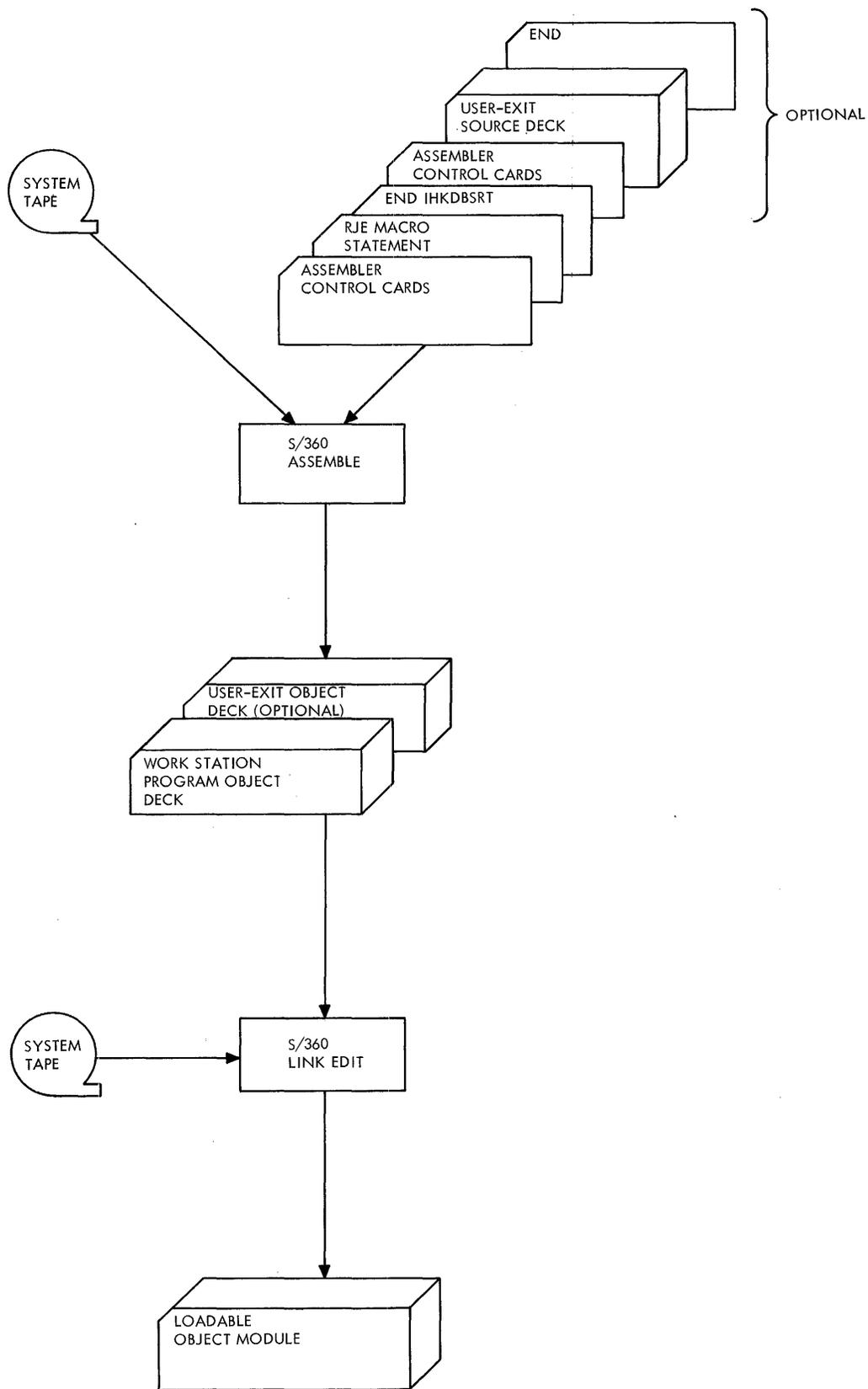
Figure 13. BPS System Generation

DIAL=NO
DIAL=MAN
DIAL=AUTO
    specifies the type of communication
    line used by the work station:

    NO   specifies point-to-point conten-
            tion communication over a non-
            switched line.

    MAN   specifies point-to-point conten-
            tion over a switched line with
            manual dialing.

    AUTO   specifies point-to-point conten-
            tion 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 out-
put is available for it. The following
information is passed to the user's
routine:

Register 1 contains the address of a param-
eter 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:


```
    < ---------------Fullword--------------->
  0 ,----------------T------------------------,
    |               |                         |
    |Record Type    |    Record Address       |
    |               |                         |
 +4 |---------------+-------------------------|
    |                                         |
    |         Physical Record Length          |
    |                                         |
 +8 |-----------------------------------------|
    |                                         |
    |         Logical Record Length           |
    |                                         |
+12 |---------------T-------------------------'
    |               |
    | Control       |
    | Character     |
    '---------------'
```
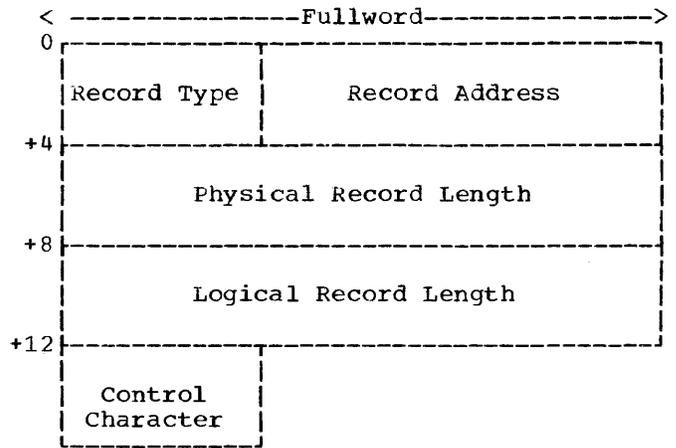
Record Type: A one-byte code in hexadeci-
mal representation indicating the type of
record:

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 physi-
cal 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 (hexa-
decimal 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. <u>IOCFG Macro Instruction</u>
   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. <u>SYMUN Macro Instruction</u>
   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 sub-
   mitted for RJE operation. The follow-
   ing assignments are used:

   <u>SYS001</u>
        must be assigned to the card
        reader used for RJE input.

<u>SYS002</u>
     must be assigned to the card
     punch used for RJE punched
     output.

<u>SYS003</u>
     must be assigned to the line
     printer used for RJE printed
     output.

<u>SYS004</u>
     must be assigned to the 2701 Syn-
     chronous Data Adapter used for
     RJE communication.

<u>SYSLOG</u>
     must be assigned to the 1052
     printer-keyboard.

For a complete explanation of proce-
dures involved in generating a super-
visor, refer to <u>IBM System/360 Basic</u>
<u>Operating System: System Generation</u>
<u>and Maintenance</u>, Form C24-5060; <u>IBM</u>
<u>System/360 Basic Programming Support:</u>
<u>Programmer's Guide</u>, Form C24-3354; and
<u>IBM System/360 Basic Programming Sup-</u>
<u>port: System Generation and Main-</u>
<u>tenance</u>, 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 com-
munication lines via binary synchronous
communications procedures. Model 1 sup-
ports 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 fea-
tures 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 Ter-
minal -- 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 con-
nection 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 Turna-
round 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 interven-
tion. If line turnaround is triggered by
running out of cards (implies no Auto Turn-
around), only the printer will be ready to
receive output.

Receiving Output

    When the 2780 receives an EOT after
receiving a complete transmission, the au-
dible 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 con-
    taining 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 cen-
tral system before it is transmitted, and a
message giving the required form or card
number is sent from the central system to
the 2780.

2780 Data Transmission Terminal 95

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 $\begin{Bmatrix} \text{RJSTART} \\ \text{LOGON} \end{Bmatrix}$

IHK148I   ILLEGAL DELIMITER $\begin{Bmatrix} \text{RJSTART} \\ \text{LOGON} \end{Bmatrix}$

IHK150I   UNDEFINED KEYWORD $\begin{Bmatrix} \text{RJSTART} \\ \text{LOGON} \end{Bmatrix}$

IHK161I   OUT OF SPACE $\begin{Bmatrix} \text{SYSIN} \\ \text{SYS1.SYSJOBQE} \end{Bmatrix}$

IHK162I   SYSIN LIMIT EXCEEDED jobname

IHK163I   DISK ERROR $\begin{Bmatrix} \text{Q MGR RJE ABORTED} \\ \text{Q MGR [jobname]} \\ \text{volume-serial} \\ \text{jobname ddname} \end{Bmatrix}$

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 CLOSEDOWN is returned with the RJSTART acknowledgment message. After these messages, output that was in progress at the time of the failure is resumed from the beginning. If a remotely submitted job of a higher priority than the partially returned job completes after the central system is reactivated, but before RJE is restarted, immediate output from the higher priority job will be returned before the interrupted output is transmitted.

Testing the RJE System

If it is desirable to test the system to check that transmissions are being received, a message may be sent to the sending work station. If it is returned, the system is in working order (i.e., the user may send himself a message, and if he receives it on the printer, the system is working properly).

Recommended Operating Suggestions

To minimize the recovery effort in case of an error, the following procedures are recommended to the 2780 operator:

1. The RJSTART and LOGON commands may be submitted separately to insure that they are correct.

2. Job input streams should be limited to a few jobs in order to reduce the number that must be resubmitted in case of an input error that requires the central system to flush the entire input stream.

3. Remote Job Entry operations on the 2780 are in "transmit transparency" mode at all times.

4. 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 on a logical disk drive that is not present in this RJE run. The logical disk drive asked for replaces x in the message.

System Action: The system exits to the Disk Monitor Supervisor.

Operator Response: He may reload the RJE program after having changed the user-exit parameters or after having introduced the requested logical disk drive.

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.

J59   PREOPERATIVE ERROR CODE XXXX OCR=

Explanation: A pre-operative error has occurred in the user-exit routine; or a logical disk drive that is ready during the loading of the work station program and used in the processing of the preceding job has been referred to and found to be not ready. The pre-operative error code as defined in Appendix A, IBM 1130 Disk Monitor System, Version 2, Programming and Operator's Guide, 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:

```
       <----------One Word  (16 bits)---------->
   0  +------------------------------------------+
      |              Starting Address            |
  +1  +------------------------------------------+
      |               Ending Address             |
  +2  +------------------------------------------+
      |            Logical Record Length         |
  +3  +------------------------------------------+
      |            Control Character Type        |
  +4  +------------------------------------------+
      |                Record Format             |
  +5  +------------------------------------------+
      |                End of Data               |
      +------------------------------------------+
```
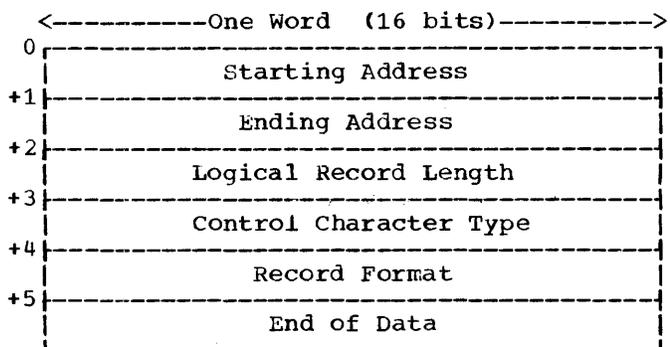
Starting Address: The address of the block received from the central system.

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).

$$\begin{bmatrix} \text{LINE=P} \\ \text{LINE=S} \\ \text{LINE=M(x,y)} \end{bmatrix} \text{[UEXIT=(address 1, address 2)]}$$

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 alphameric 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----

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

(14)
IHK003I RJEND ACCEPTED RALEIGH

REMOTE CARD READER INPUT

```
(1)
. . RJSTART RALEIGH,BRDCST=YES   T1
(2)
. . LOGON RTP,XYZ                T2




(3)
. . JED CENTRAL=ALL              T3
//D12 JOB MSGLEVEL=1,REGION=100K
//   EXEC LKEDG
//LKED.SYSIN DD *
--object modules--
/*
//GO.DATAOUT DD SYSOUT=A
//GO.SYSIN DD *
--data--
/*
(4)
. . JED OUTPUT=(DEFER,POK)       T4
//D16 JOB MSGLEVEL=1,REGION=100K
//   EXEC LKEDG
//LKED.SYSIN DD *
--data--
/*




(5)
. . ALERT D16                    T5

(6)
. . LOGOFF                       T6



(8)
. . LOGON POK,ABC
(9)
. . ALERT *






(10)
. . OUTPUT



(11)
. . ALERT /

(12)
. . STATUS U=RTP




(13)
. . OUTPUT *


(14)
. . RJEND
```

REMOTE PRINTER-KEYBOARD

```
(1)
IHK120I BROADCAST MESSAGES FOLLOW
--broadcast message - if there are any--
IHK120I BROADCAST MESSAGES END
--delayed messages - if there are any--
IHK100I RJSTART ACCEPTED T1
(2)
IHK101I USER LOGGED ON RTP T2
```

```
(3)
IHK117I JOB ACCEPTED D12 RTP EXECUTING JED
***THIS MESSAGE BUILT BY JOBACK USER EXIT
(4)
IHK117I JOB ACCEPTED D16 RTP EXECUTING JED
***THIS MESSAGE BUILT BY JOBACK USER EXIT


(5)
IHK105I JOB(S) NOT COMPLETE ALERT RTP
          D16 T5

(6)
IHK102I USER LOGGED OFF RTP T6



(5)
IHK109I NOTIFY D16 RTP

(8)
IHK101I USER LOGGED ON POK


(9)
 IHK109I NOTIFY D16 POK



(10)
IHK154I NOT AVAILABLE OUTPUT POK




(11)
IHK115I ALERTS CANCELLED POK
(12)
IHK108I STATUS D16 RTP NORMAL END




(14)
IHK103I RJEND ACCEPTED
```

CORE REQUIREMENTS

(1) RJE Region

Dynamic Storage Requirements:

RJE region (MVT) or partition (MFT)

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

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.

----
[1]The sum within the brackets must be raised to the next multiple of 2K and the entire total raised to the next multiple of 2K for MVT environments.

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 $[(624+N_1)+(624+N_2)+\ldots(624+N_n)]$ 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 RESIDNT keyword subparameter list on the SUPRVSOR system generation macro. Transient SVCs used by RJE not in the standard list are:

SVC 22	IGC0002B
SVC 23	IGC0002C
SVC 27	IGC0002G
SVC 29	IGC0002I
SVC 32	IGC0003B
SVC 35	IGC0003E
SVC 64	IGC0006D

Maximum use of the link pack (MVT) or RAM option is made. This option is requested by including RENTCODE(MVT) or ACSMETH(MFT) in the RESIDNT keyword subparameter list on the SUPRVSOR system generation macro. Including those reentrant modules of the job scheduler (IEFVHA) and queue manager in link pack if they are active tasks while RJE is in the system, results in overall reduction of main storage usage. Modules used by RJE that could be placed in the MVT link pack area are:

IEFQDELE
IEFQMDQ2
IEFQMSSS
IEFVHA.

The use of the link pack, RAM resident SVC, and BLDL options is described in the publication IBM System/360 Operating System: System Programmer's Guide, 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                          IEFLOCDQ  IHKCDMEQ
            IGG019MB                          IHKCAOSR  IHKCDMSH
            IGG019MS                          IHKCARJN  IHKCDRMV
                                              IHKCBLGN  IHKCFQOP
    Placing frequently used nonresident       IHKCBRJS  IHKCFSTB
modules used by RJE in the BLDL option is     IHKCDBIN  IHKCGDT2
requested by specifying BLDLTAB in the        IHKCDBTW  IHKCHJPR
RESIDNT keyword subparameter list in the      IHKCDBTX  IHKCHNDT
SUPRVSOR system generation macro instruc-     IHKCDMDQ
tion.  The names of frequently used RJE
modules are the following:
```

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

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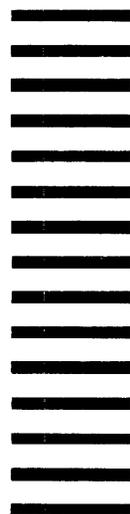
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