



## Systems Reference Library

### IBM System/360 Operating System Planning for Conversational Remote Job Entry

This publication is a planning aid only. It is intended for use prior to the availability of Conversational Remote Job Entry (CRJE) and shall be replaced by reference documentation when CRJE becomes available.

The information in this publication represents current implementation plans, which are subject to modification during the period between announcement and availability of CRJE.

This publication contains a general description of CRJE and the facilities it provides users at remote keyboard terminals attached by communication lines to an IBM System/360 using the Operating System that provides multiprogramming with a variable or fixed number of tasks.

Information about the CRJE task, its operating environment, and how to include an installation-tailored CRJE facility in the operating system is provided for the system programmer.

A discussion of the central operator capabilities includes a description of central commands. Terminal user considerations include the terminal command language and how it enables users to prepare and enter jobs for batch processing at the central installation. Central operator messages and terminal messages are documented with explanations and suggested operator or user responses.



## PREFACE

This publication contains information to aid the potential user of Conversational Remote Job Entry (CRJE) in planning for its installation, operation, and use.

The first four sections contain an introduction, a general description of system concepts and facilities, CRJE generation considerations, and information about the CRJE task and its operating environment.

Sections five and six contain operator considerations, including operator commands and console messages.

The remainder of the publication concerns the terminal user, terminal operation, terminal commands, and messages.

The reader of the terminal user considerations section 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 reader of the sections about the creation and maintenance of the CRJE system should also 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 the functional and operational characteristics of the terminals supported by CRJE are:

IBM 1050 Data Communications System Principles of Operation, Form A24-3474  
IBM 1050 Operator's Guide, Form A24-3125  
IBM 2740 Communications Terminal, Form A24-3403  
IBM 2741 Communications Terminal, Form A24-3415  
IBM 2740/2741 Communications Terminal--Operator's Guide, Form A27-3001

First Edition, January 1969

Significant changes or additions to the specifications contained in this publication are continually being made. When using this publication in connection with the use of IBM equipment, check the latest SRL Newsletter for revisions or contact the local IBM branch office.

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

A form is provided at the back of this publication for reader's comments. If the form has been removed, comments may be addressed to IBM Corporation, Programming Documentation, Dept. 844, P.O. Box 12275, Research Triangle Park, North Carolina, 27709.

© Copyright International Business Machines Corporation 1969

CONTENTS

INTRODUCTION . . . . .	5	Job Management . . . . .	45
GENERAL DESCRIPTION . . . . .	6	System Inquiry . . . . .	46
The Conversational Environment . . . . .	6	Communication . . . . .	46
Advantages . . . . .	6	Special . . . . .	47
System Facilities . . . . .	7	Input and Output at the Terminal . . . . .	47
Session Management . . . . .	7	Commands . . . . .	47
Data Management . . . . .	8	Data Input . . . . .	47
Job Processing . . . . .	10	Message Output . . . . .	48
Inquiry . . . . .	11	Data Output . . . . .	48
Communication . . . . .	11	TERMINAL OPERATIONAL CHARACTERISTICS . . . . .	50
Syntax Analysis . . . . .	11	1050 Data Communication system . . . . .	50
CRJE GENERATION . . . . .	12	Entering Lines . . . . .	50
Hardware Considerations . . . . .	12	Interrupting Output . . . . .	50
Telecommunications Network . . . . .	12	Using the 1053 . . . . .	51
Equipment at the Central Installation . . . . .	12	Cancelling Lines . . . . .	51
Terminals Supported . . . . .	13	Correcting a Line . . . . .	51
Operating System Generation . . . . .	13	Handling Error Conditions . . . . .	51
CRJE System Specification . . . . .	14	2740 Communications Terminal . . . . .	51
CRJELINE . . . . .	14	Entering Lines . . . . .	52
CRJETABL . . . . .	16	Cancelling Lines . . . . .	52
CRJEUSER . . . . .	18	Correcting a Line . . . . .	52
Installation Exit Routines . . . . .	18	Interrupting Output . . . . .	52
Adding Commands to the System . . . . .	19	Handling Error Conditions . . . . .	52
Generation of the CRJE Load Module and . . . . .		2741 Communications Terminal . . . . .	52
Initialization Program . . . . .	20	Entering Lines . . . . .	53
Initialization and Allocation of . . . . .		Cancelling Lines . . . . .	53
System Library, User Libraries; and . . . . .		Correcting a Line . . . . .	53
Active Area . . . . .	24	Interrupting Output . . . . .	53
Cataloged Procedures for CRJE . . . . .	27	Handling Error Conditions . . . . .	53
THE CRJE TASK . . . . .	30	TERMINAL COMMAND LANGUAGE . . . . .	54
Operating Environment . . . . .	30	Command Format . . . . .	54
Control Program Facilities . . . . .	30	Delimiters . . . . .	54
Communication Serviceability . . . . .	30	Continuation . . . . .	54
Communication Line Errors . . . . .	30	Command Notation . . . . .	54
Operator Awareness . . . . .	30	Format Illustration Conventions . . . . .	54
On-line Terminal Test . . . . .	31	Terminology . . . . .	55
CENTRAL OPERATOR CONSIDERATIONS . . . . .	32	CANCEL . . . . .	55
System Startup and Closedown . . . . .	32	CONTINUE . . . . .	56
CRJE System Control . . . . .	32	DELETE . . . . .	56
System Users . . . . .	32	EDIT . . . . .	57
Remote Jobs . . . . .	32	Implicit Subcommand . . . . .	59
Communication Lines . . . . .	32	CANCEL . . . . .	59
Communication . . . . .	32	CHANGE . . . . .	59
Central Commands . . . . .	33	DELETE . . . . .	60
BRDCST . . . . .	33	END . . . . .	60
CENOUT . . . . .	34	INPUT . . . . .	60
MSG . . . . .	34	LIST . . . . .	61
SHOW . . . . .	34	MERGE . . . . .	62
START . . . . .	35	RENUM . . . . .	62
STOP . . . . .	36	SAVE . . . . .	63
USERID . . . . .	36	SCAN . . . . .	63
CENTRAL INSTALLATION MESSAGES . . . . .	38	SUBMIT . . . . .	64
TERMINAL USER CONSIDERATIONS . . . . .	42	TABSET . . . . .	64
User Capabilities . . . . .	42	EXEC . . . . .	64
Session Management . . . . .	42	LISTBC . . . . .	65
Data Management . . . . .	42	LISTDS . . . . .	65
		LISTLIB . . . . .	65
		LOGOFF . . . . .	66
		LOGON . . . . .	66
		OUTPUT . . . . .	66

SEND . . . . .	67
STATUS . . . . .	67
SUBMIT . . . . .	68
TERMINAL MESSAGES . . . . .	69
APPENDIX A: TERMINAL COMMAND FORMATS . . . . .	76
Commands . . . . .	76
EDIT Subcommands . . . . .	77

APPENDIX B: PL/I SYNTAX ERRORS . . . . .	78
Message Format . . . . .	78
Errors Detected . . . . .	78
Thorough Checking . . . . .	78
Restricted Checking . . . . .	78
APPENDIX C: STORAGE ESTIMATES . . . . .	79
INDEX . . . . .	81

Figure 1. IBM 1050 Data Communications System . . . . .	7
Figure 2. IBM 2740 Model 1 Communication Terminal . . . . .	8
Figure 3. IBM 2741 Communications Terminal . . . . .	9
Figure 4. Library Condensation . . . . .	10

Figure 5. CRJE Assembly and Linkage Edit . . . . .	15
Figure 6. User Command Control Table . . . . .	20
Figure 7. Sample JCL (Part 1 of 3) . . . . .	21
Figure 8. Sample CRJE Procedure . . . . .	29
Figure 9. EDIT Subcommands . . . . .	43
Figure 10. 1052 Keyboard . . . . .	50
Figure 11. 2740 Keyboard . . . . .	51
Figure 12. 2741 Keyboard . . . . .	53

FIGURES

The Conversational Remote Job Entry (CRJE) facility of the IBM System/360 Operating System (OS) provides job entry capability for users at remote keyboard terminals that are connected to an IBM System/360 central processing unit (CPU) via communication lines. At the request of a terminal user and under the control of CRJE, jobs are entered into the OS job stream for batch execution. Execution of remotely submitted jobs proceeds under the supervision of the OS job management routines, and the data sets comprising the job output are created using OS data management facilities. Thus, the remote CRJE user has the same batch-computing facility that is available for a local user of the operating system.

Job input consists of programs and data that are conversationally created and maintained through the updating facilities of CRJE. The terminal user enters lines of program source statements, data, and job control language (JCL) to be retained in the CRJE system. He can update this information by inserting, replacing, deleting, and changing single lines or groups of lines. To submit a job for execution, the user selects the programs, data, and job control language statements to be entered into the OS job input stream.

Prior to submitting a job for processing, the terminal user may take advantage

of the syntax analysis facility of CRJE. He can request that PL/I source statements be checked for correct syntax. The user receives error diagnostics immediately and can take corrective action; this eliminates much compilation cost and waiting for a complete job turnaround.

The listing facility of CRJE allows the terminal user to examine all or portions of job output, of programs, and of data created through the facilities of CRJE, and certain cataloged data sets created through the facilities of the OS data management routines.

CRJE also provides inquiry into the status of the system and the status of remotely submitted jobs. Status information is available for the terminal user as well as for the console operator at the central computer. In addition, there is a message facility for two-way communication between terminal users, and between terminal users and the central operator.

The facilities of CRJE are available through the use of commands. The remote user has at his disposal the terminal command language to direct the functions of CRJE. The console operator at the central computer can monitor the activity of the CRJE system through the use of central commands.

## GENERAL DESCRIPTION

CRJE is a program that runs in a multiprogramming environment in an IBM System/360 computer connected to remote terminals via communication lines. This program provides access to the data processing facilities of the central system for authorized users at the remote terminals. Users obtain the services of CRJE through commands entered at the remote keyboard device. Programs and data entered at terminals are stored in the central system where they are updated as necessary and entered into the job stream for processing. CRJE provides the control and regulation necessary for more than one user at a time to prepare and enter jobs for processing.

## THE CONVERSATIONAL ENVIRONMENT

The remote terminals serviced by CRJE are like typewriters, the keyboards serving as input units to the system and the printing mechanisms serving as output units. The terminals can be located at any distance from the central processor, the communication line providing the necessary connections.

CRJE supports three types of terminals: the IBM 1050 Data Communications System with an IBM 1052 Printer-Keyboard, an IBM 2740 (Model 1) Communication Terminal, and an IBM 2741 Communication Terminal. The 1050 system is a multi-purpose terminal in which a variety of devices, in addition to the 1052 Printer-Keyboard, can be attached to a control unit. The 2740 and 2741 are basically IBM SELECTRIC® typewriters with communication facilities.

Conversational processing is on-line processing that consists of a dialogue between the user and the central system. Input by the terminal user and response by the CRJE system alternate, as in an ordinary telephone conversation, until the terminal operator chooses to end the conversation. While operating at a terminal, the CRJE user is in constant communication with the central system and is aware of the actions being performed in his behalf. When the user enters a command, the system checks it for validity and proper syntax. If correct, the service requested is carried out, whether it be returning status information, returning job output, or entering a job into the OS job stream. If a command is invalid, the system returns an

appropriate diagnostic message, and the user can either correct the error or continue by entering another command. The user can enter another command only after the system has processed the previous command.

A user's background jobs are executed while the user continues to operate at the terminal. When a user requests the execution of a job, CRJE submits the specified job stream to the operating system for processing. Execution of the job proceeds under the control of OS job management routines, while CRJE continues to accept other commands entered by the user. When the background job terminates, the user who submitted it is notified that it is complete and that the output is available. He can then list conversationally all or portions of the output created.

## ADVANTAGES

As a terminal-oriented system, CRJE offers the advantages of centralized equipment that is available to users operating at locations up to several thousand miles away from the central installation. One computer may do the processing that would otherwise require a separate system at each remote site.

Computing power is also available on a demand basis, which is particularly desirable to users who require the services of a large computing system but not on a regular basis. In background processing of jobs submitted through CRJE, users have access to the full facilities of the System/360 Operating System.

As a conversational system, CRJE provides facilities in addition to the facilities of the operating system. Since the user directs the activity of the system and is thus aware of the actions being taken in his behalf, he receives an indication of errors and unexpected situations as they occur. He can therefore take remedial action to correct such situations before proceeding (eliminating possibly useless or unnecessary operations). This advantage is especially apparent in the areas of command entry and syntax analysis. Command errors are diagnosed as commands are entered, and

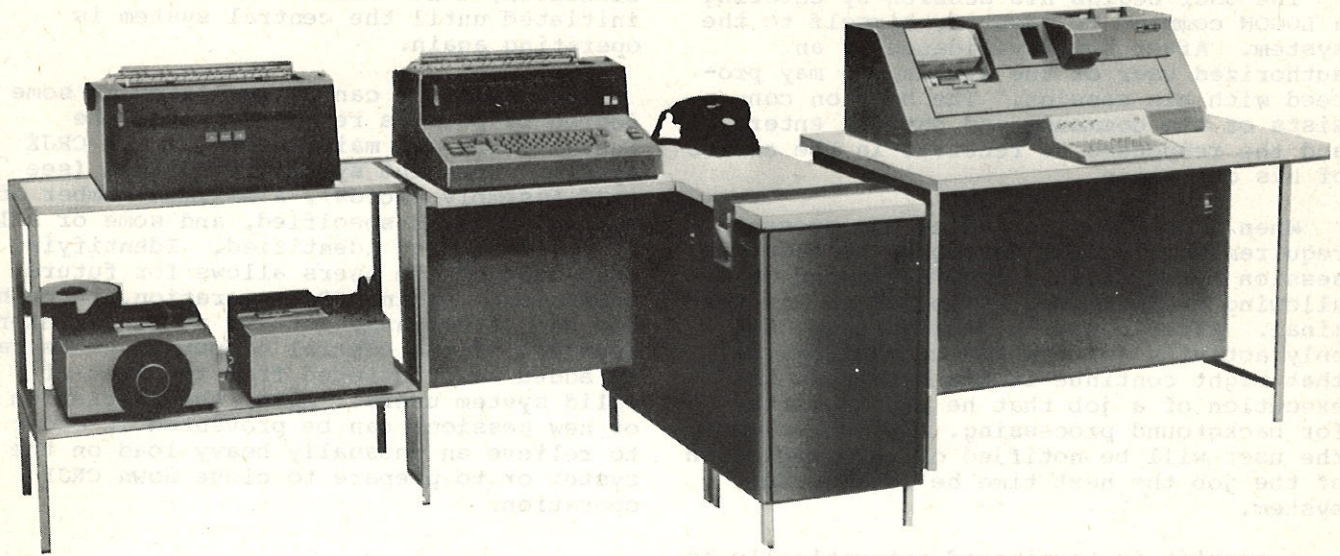


Figure 1. IBM 1050 Data Communications System

syntax errors are reported as source statements are entered. Without syntax analysis, errors are detected only through costly and time-consuming compilation.

Of equal importance is the updating facility, which provides on-line creation and modification of the programs and data used in job processing. Especially valuable to the programmer, this facility allows on-line entry of program source statements and data without the extra step of punching cards prior to transmission. The fact that programs and data are stored in the central system allows quick, efficient, on-line updating. Information pertinent to many users can be stored at the central system and can be obtained by many users, regardless of their physical locations. For example, a program that meets the requirements of several users can be stored so that users enter only the necessary data and submit the job.

#### SYSTEM FACILITIES

The features of CRJE include data management, job processing, system inquiry, message sending, and syntax analysis. The system is designed to provide terminal users with an efficient, easy-to-use method of preparing and entering jobs for execution under the operating system. In each

area, there are also provisions to allow those responsible for maintaining the CRJE system to control and supervise its use.

#### SESSION MANAGEMENT

The period of time during which a terminal user engages in conversation with the CRJE system is called his session. During his session, he is considered an active user of the system. Correspondingly, he is inactive while he is not working at a terminal. The term active may also refer to a terminal where there is a session in progress, as may the term inactive refer to a terminal where there is no session in progress. While a terminal is active, the communication line connecting it to the central processor is available for transmission of data to and from the central system. The line connection may be permanently established, or it may have to be established by dialing the telephone number of the central system. (The telecommunications network is more fully described in the Hardware Considerations section of this publication.) Communication between a terminal user and the central system is always initiated by the terminal user. Nothing is sent from the central system to a terminal until a user is active at the terminal. The user may either specifically request information or the system may send information necessary for the user to operate effectively.

The user begins his session by entering a LOGON command to identify himself to the system. After being validated as an authorized user of the system, he may proceed with his session. The session consists of the commands and data he enters, and the responses he receives in the course of his operation.

When a user has satisfied his present requirement for CRJE services, he ends his session by entering a LOGOFF command or by allowing another user to log on at his terminal. After a user's session ends, the only activity (within the central system) that might continue in his behalf is the execution of a job that he has submitted for background processing. In such a case, the user will be notified of the completion of the job the next time he logs on the system.

A session is terminated automatically as a result of a transmission error on the communication line or a shutdown of the central system. In these situations, the user is automatically logged off the system. Any data set that he was in the process of creating or updating is saved intact. After an automatic termination of a session, the user can begin another session by entering another LOGON command. If operating on a switched line, he must reestablish the connection by dialing. If session termination was caused by a central

shutdown, a new session cannot be initiated until the central system is operating again.

User sessions can be regulated to some degree by persons responsible for the installation and maintenance of the CRJE system. When the system is defined (see CRJE Assembly Macros), a maximum number of system users is specified, and some or all of the users are identified. Identifying only some of the users allows for future expansion. During CRJE operation, through the use of commands entered at the printer-keyboard of the central computer, users can be added to or deleted from the list of valid system users. Also, the initiation of new sessions can be prevented in order to relieve an unusually heavy load on the system or to prepare to close down CRJE operation.

#### DATA MANAGEMENT

CRJE provides data management services for the creation, storage, modification, and listing of programs and data by terminal users. All data entered from the terminal is converted to EBCDIC. In addition to the data created through the facilities of CRJE, the user has access to data sets created by background jobs using the data management services provided by the operating system. These data sets must be in EBCDIC.

#### User Libraries

The data sets that a user stores in the central system are kept in his user library. A user library is a partitioned data set (PDS), the members of which are referred to as CRJE data sets. Each authorized user of the CRJE system has a user library, which is generated at the central system in accordance with the storage requirements of the user and the amount of storage available in the system. User libraries are allocated prior to CRJE operation and are described to CRJE at system startup.

The partitioned data set names of user libraries have the form CRJE.LIB.userid, thus allowing one library for each userid defined in the system. In order to refer to a member of his library, however, the user need only specify the simple name under which he stored the member, or CRJE data set.

Operating system utility programs for the manipulation of partitioned data sets can be run at the central installation



Figure 2. IBM 2740 Model 1 Communication Terminal





Figure 3. IBM 2741 Communications Terminal

while CRJE is not operating. Utilities can be used for such functions as printing members of user libraries, changing the size of a library, and adding members to a library. It might be desirable to run utility programs to prepare card or tape backup material, since a permanent I/O error on a user library could result in the loss of all or part of the user's data.

#### CRJE Data Sets

A CRJE data set is a named, sequential collection of one or more related records. The records of a CRJE data set may be source language statements, Job Control Language (JCL) statements, data records, or any combination of these three. For special applications, a CRJE data set may consist of records that are CRJE commands (a command list or CLIST) or records that contain the names of CRJE data sets (a data set list or DSLIST). The applications of these data sets are described under User Capabilities.

Records of CRJE data sets are called lines because in most circumstances, each record represents one line of input entered by a user at a remote terminal. A record is composed of the line entered by the user (padded with blanks or truncated to make 80

characters) and a system-assigned line number (8 characters). The line numbers serve as identifiers by which the user specifies the line or lines he wishes to modify or list.

CRJE provides facilities for convenient manipulation of data sets and records of data sets. The user can:

- Create data sets by entering lines at his terminal.
- Store data sets in the central system for subsequent use.
- Selectively share his data sets with other CRJE users.
- Update data sets by inserting, replacing, deleting, and changing lines in the data set.
- List lines of a data set at his terminal.
- Scan PL/I statements for syntax errors.
- Renumber lines in a data set.
- Copy lines from one place to another in a data set.
- Combine two data sets.

#### Active Data Sets

During creation and modification, and prior to being stored as a member of a user's permanent library, a CRJE data set exists as an active data set in a temporary storage area called the active area. An active data set is a CRJE data set on which a user is performing operations such as creating, updating, and listing. Lines of a data set being created are collected in an active data set, which must be stored in the user's library in order to be retained in the system. If an existing data set is to be modified or listed, a copy of it serves as the active data set. A modified data set does not replace the original, permanent copy in the user's library unless it is stored with the same name as the original data set.

If a user's session is terminated automatically, his active data set, if one exists, is saved in his user library and is named ACTIVE.

When a CRJE data set is replaced in a user's library, the space occupied by the original version becomes unavailable, and the updated version follows the last member of the library. If a user tries to store a

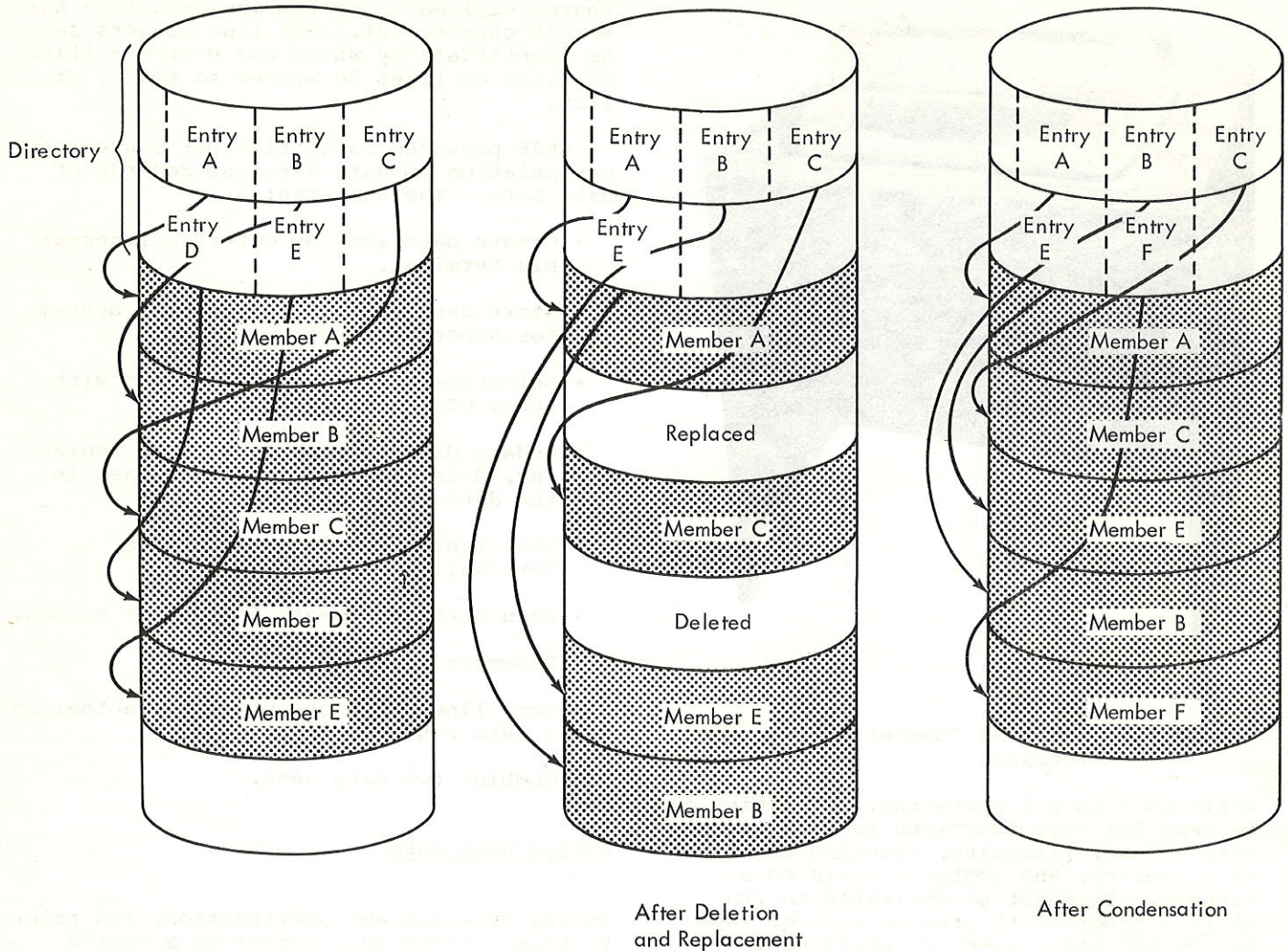


Figure 4. Library Condensation

data set, and there is insufficient space at the end of his library, it will be automatically condensed to make the unused space available (See Figure 4). If sufficient space does not become available with condensation, the user is notified and should submit the active data set for processing, if possible.

#### OS Data Sets

In addition to CRJE data sets, the user can also gain access to certain data sets created using OS data management facilities. Such data sets, which can be created independently of CRJE, are referred to as OS data sets. To be accessible through CRJE, an OS data set must reside on a direct access storage device and be named, cataloged, and have either sequential or partitioned organization. A sequential data set or a member of a partitioned data

set can be copied into the user's active area, where it exists as an active data set. As the records are copied, they are assigned line numbers to allow the user to examine portions, as well as all, of the data set.

#### JOB PROCESSING

A terminal user can direct CRJE data sets and his active data set into the job input stream for batch processing under the facilities of the operating system. The records of the data sets specified as job input are copied to a sequential data set which becomes input to the OS Reader Interpreter routine. The internally maintained line numbers are removed in the process, leaving 80-character input records. Job processing proceeds under the control of OS job management routines. The job waits in the job queue until execution can begin.

When the job is complete, CRJE receives an indication and the user who submitted the job is notified.

The terminal user may examine the output of conversationally submitted jobs by listing named OS data sets created by the job and by listing the messages and data sets assigned to the CRJE system output class.

OS data sets that satisfy the requirements that make them accessible through CRJE (i.e., they are named, cataloged, and sequential or partitioned) can be listed by any user knowing the fully qualified name of the data set. Multiple copies are available since these data sets are only scratched at the direction of a user.

Output of conversationally submitted jobs can be directed to the CRJE system output class, which contains output to be returned to terminal users. A user can request output of this type simply by specifying the name of the job that produced the output. This output is available only to the user who submitted the job. The user can obtain only one copy of the data sets and job management messages assigned to the CRJE system output class.

Job output can be directed to devices at the central installation by assigning output data sets to OS system output classes that correspond to the desired devices. In addition, the central operator can obtain, at the central installation, output from the CRJE system output class if, for some reason, it cannot be returned to the terminal.

#### INQUIRY

CRJE allows both the terminal user and the central operator to inquire about the status of the system. A terminal user can request the status of a job that he has submitted. He can also obtain information about the CRJE data sets in his user library. The central operator can request information that indicates terminal user activity, the current system load, and line transmission error statistics. Knowing this information, he can better control and maintain the CRJE system.

#### COMMUNICATION

The message facility of CRJE provides two-way communications throughout the CRJE system. A terminal user may send messages to the central operator or to any other terminal user. A message to the central opera-

tor is queued for immediate delivery. A message to an active user is queued for delivery prior to the entry of his next command. According to the sender's specification, a message to an inactive user is either ignored or queued for delivery to the user when he becomes active. In the latter case, the message is referred to as a delayed message.

The central operator communicates with terminal users by sending messages to all or specific users and by generating broadcast messages to be delivered to all users. Like the terminal user, he can request that a message be saved for later delivery to a user not currently active. Broadcast messages are messages that contain information of general interest to all users.

#### SYNTAX ANALYSIS

##### PL/I Syntax Checker

A single statement syntax checker is provided for the latest version of the F-level PL/I language that is available on the CRJE system. Source statements entered by terminal users can be checked as they are entered, or if they have been copied onto the active data set from a library. One source statement is checked at a time, and the errors that can be detected within this statement are diagnosed.

Two levels of checking are available to the user: thorough checking or restricted checking.

For thorough checking, the structure of the syntax checker is fully resident in 27K bytes of main storage, or partially dynamic in 20K bytes.

For restricted checking, the structure of the syntax checker is fully resident in 16K bytes of main storage.

One or more of the above versions of the PL/I Syntax Checker may be included in the system during OS system generation. The specific version of the syntax checker that is to be utilized is specified in the CRJE startup procedure. The errors detected by the two levels of checking are listed in Appendix B.

When an error is detected, a diagnostic message is produced. No corrective action is attempted by the syntax checker. Multiple errors in one statement can be diagnosed as long as the continued scan through the statement does not depend on any corrective action.

## CRJE GENERATION

CRJE is included in the central system by specifying certain options in the generation of the operating system. The CRJE system must then be further defined by an assembly of CRJE macros and, possibly, installation exit routines. The macros and exit routines provide tailoring of the CRJE system to meet the particular requirements of the installation.

In addition to the specifications for the operating system generation and CRJE assembly, this section describes the equipment required for the operation of CRJE.

## HARDWARE CONSIDERATIONS

The CRJE system consists of a central processing unit connected to remote terminals over communication lines. This section describes the characteristics of the telecommunications networks supported by CRJE and the equipment required and supported for the central processor and remote terminals.

### TELECOMMUNICATIONS NETWORK

Remote terminals are connected to the central processor over switched or nonswitched lines by a point-to-point connection. A switched line provides a connection between a terminal and the central computer only for the period of time that the line is in use. Access lines link the computer and the terminal to common-carrier exchange equipment. The terminal user must establish the connection by dialing the number of the central transmission control unit.

A nonswitched line provides a permanently established connection between a terminal and the central processor. These lines, usually furnished by a common carrier, are also known as private, leased, or dedicated lines. Since the connection is continuous, dialing is not required.

All line connections in CRJE must be point-to-point; that is, only one terminal can be connected over a line, whether it is switched or nonswitched. Several terminals might be able to dial the central installation over a switched line, but the connection, once established, is between one terminal and the central computer.

## EQUIPMENT AT THE CENTRAL INSTALLATION

Conversational Remote Job Entry is available as a feature of the IBM System/360 Operating System providing multiprogramming with a variable number of tasks (MVT) or a fixed number of tasks (MFT). CRJE operation under MVT requires an IBM System/360 Model 50 with at least 384K bytes of main storage or Models 65, 67 (65 mode), 75, or 85, having at least 512K bytes of main storage. CRJE operation under MFT requires an IBM System/360, Models 40, 50, 67 (65 mode), 75, or 85, with at least 256K bytes of main storage. In addition to the minimum control program requirements, CRJE requires:

1. An IBM 2701 Data Adapter Unit, an IBM 2702 Transmission Control, or an IBM 2703 Transmission Control attached to a multiplexer channel, and equipped with an IBM Type I adapter.
2. Direct access storage space on IBM 2311 Disk Storage Drive or IBM 2314 Direct Access Storage Facility for each of the following:
  - a. CRJE tables and system libraries: Less than the capacity of one 2311. Exact requirements depend on the number of jobs, users, and terminals supported by the system.
  - b. CRJE residence: Not more than 100 tracks of 2311 storage.
  - c. Working storage (active area): At least three cylinders of 2311 storage, 30 tracks of which are used for system information. The requirements for a particular installation can be determined according to the number of users that can be concurrently active and the approximate size of their active data sets.
  - d. Space to accommodate remote job input to the OS Reader routine: This requirement depends upon the number and size of conversationally submitted jobs that can exist concurrently in the system.
  - e. User libraries: The space required for user libraries is established by the installation according to the needs of the terminal users.

The CRJE System Specification section contains guidelines for determining the specific storage requirements for the CRJE

system library, active area, job input data sets, and user libraries.

#### TERMINALS SUPPORTED

CRJE supports the following terminal devices attached to the central processing unit through a 2701, 2702, or 2703:

1. On nonswitched lines:

IBM 1050 Data Communications System  
(1052 Printer-Keyboards only).

IBM 2740 Communication Terminal  
(Model 1).

IBM 2741 Communication Terminal.

2. On switched lines:

IBM 1050 Data Communication System  
(1052 Printer-Keyboards only).

IBM 2740 Communication Terminal  
(Model 1).

IBM 2741 Communication Terminal.

The following features are required by CRJE:

IBM 1050:

Text Time-out Suppression.

IBM 2740:

Record Checking.

CRJE supports the following print elements (and the corresponding transmission codes):

IBM 1050:

PTTC/EBCD.

IBM 2740:

PTTC/EBCD.  
Correspondence.

IBM 2741:

PTTC/BCD (Standard).  
PTTC/EBCD.  
Correspondence.

The following feature is optionally supported:

IBM 2741:

Interrupt.

**Note:** An IBM 2741 terminal with the Interrupt special feature cannot be connected to a 2701 Data Adapter Unit.

All terminals using a particular switched connection (i.e., dialing the same number) must be of the same type, have the same print element and, for 2741 terminals, either all must have the Interrupt feature or none may have the Interrupt feature.

Terminals may also be equipped with special features for the operational convenience of the user. Features of this type include:

IBM 1050:

Keyboard Request (Recommended for operation on nonswitched lines only).  
Automatic EOB.  
1053 Printer.

IBM 2740:

Automatic EOB.

#### OPERATING SYSTEM GENERATION

An operating system is generated from load modules distributed on component libraries, one of which contains the CRJE modules. In order to incorporate the CRJE facility in the operating system, the CRJE modules must be copied onto system data sets of the generated system. In addition, control units and devices must be described, and the inclusion of certain libraries and processing programs must be specified. This is accomplished through the system generation macros. The following macros with indicated parameters must be included for generation of a system supporting CRJE:

**SCHEDULR:** The `OPTIONS=CRJE` parameter must be specified to include CRJE modules from the CRJE component library.

**DATAMGT:** `ACSMETH=BTAM` must be specified in order to include Basic Telecommunications Access Method modules.

**TELCMLIB:** This macro must be specified to include the telecommunications subroutine library.

**PROCLIB:** This macro specifies the inclusion of the procedure library, on which the procedure for CRJE execution will reside.

**MACLIB:** This must be specified to include the macro library, which contains the CRJE assembly macros.

**ASSEMBLR:** This macro specifies the inclusion of an assembler, which is required for the assembly of the CRJE generation macros.

**EDITOR:** This macro specifies the inclusion of the linkage editor, which is required in creating the executable CRJE load module.

An additional macro will be provided to include one or more versions of the PL/I Syntax Checker.

**Note:** The MVT or MFT version of the control program and the required control units, devices, and communications lines must be specified with appropriate system generation macros.

During the operating system generation, the resident CRJE and BTAM modules are copied from the component libraries onto the telecommunications library (TELCMLIB), from which they can be link edited to form the CRJE load module. The nonresident CRJE modules are copied or link edited onto the link library (LINKLIB), with the exception of the initialization module IHKINI, which is copied onto TELCMLIB to be link edited with the assembled CRJE macros.

Complete descriptions of OS generation procedures and generation macros are given in the publication IBM System/360 Operating System: System Generation, Form C28-6554.

#### CRJE SYSTEM SPECIFICATION

After an operating system with the features required for CRJE has been generated, the CRJE system must be defined and generated. CRJE specification involves the assembly of CRJE macros that define installation configuration and options, the assembly of optional installation exit routines, the creation of the CRJE load module, the allocation for and initialization of data sets used in CRJE operation, and the provision of a procedure for execution of CRJE.

The assembled CRJE macros and the assembled installation exit routines are link-edited with the preassembled CRJE modules on TELCMLIB to produce the executable CRJE program. The flow of data through the CRJE assembly and linkage edit steps is depicted in Figure 5.

There are three assembly macros for specifying a CRJE system tailored to installation requirements and configuration. They are:

**CRJELINE:** Describes the communication line and the characteristics of the terminals which use the line. One CRJELINE macro is required for each communication line serviced by CRJE.

**CRJETABL:** Specifies system options, such as the number of remotely submitted jobs that can exist concurrently in the system, the system output class to be used for CRJE output, the installation exit routines to be supplied, and command aliases.

**CRJEUSER:** Specifies the identification codes (userid) and associated passwords of authorized users of the CRJE system.

A description of the macros and their operands follows. The coding conventions and formats of the macros are the same as those for other assembly macro instructions.

#### CRJELINE

The CRJELINE macro defines the communications network to be supported by the CRJE system. One macro is required for each communication line to be supported. The macro identifies the line and provides information necessary for CRJE to service the line and the terminal attached by it.

Lines may be logically grouped in line groups if the following two conditions are satisfied:

1. All line connections in the groups are the same, either switched or nonswitched.
2. All terminals within the line group are of the same type and have the same features, as is explained under Terminals Supported.

If line groups are used, the macros describing the lines within the group must be specified in ascending order according to relative line numbers. Grouping is accomplished by concatenation of DD statements in the CRJE cataloged procedure, or with the UNITNAME macro during operating system generation. Additional information is provided in the publication IBM System/360 Operating System: Basic Telecommunications Access Method, Form C30-2004.

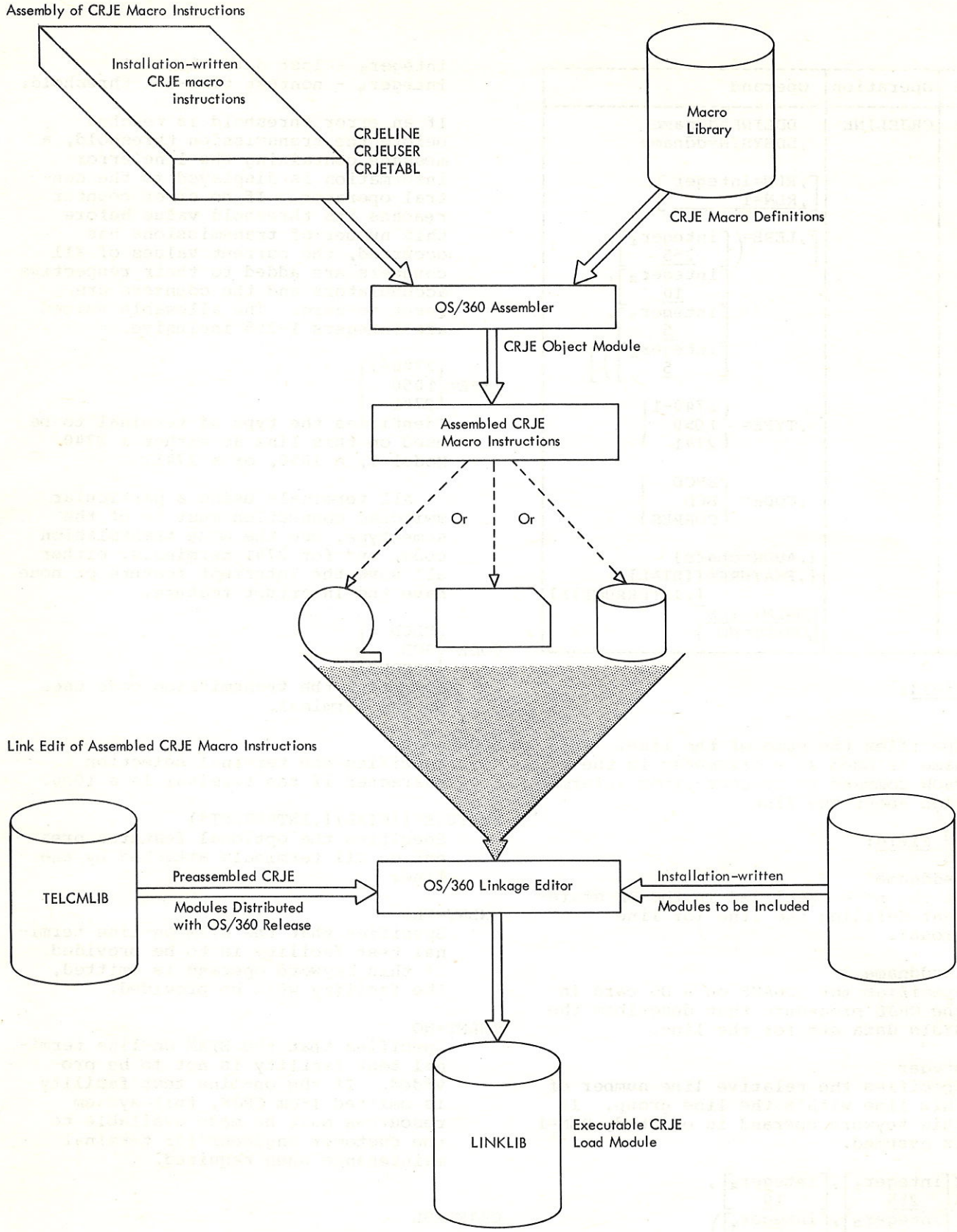


Figure 5. CRJE Assembly and Linkage Edit

Name	Operation	Operand
name	CRJELINE	DDLINE=ddname ,DDSYSIN=ddname  [,RLN=integer ,RLN=1  [,LERB=( [integer <sub>1</sub> / 255 [integer <sub>2</sub> / 10 [integer <sub>3</sub> / 5 [integer <sub>4</sub> / 5 ] ) ] )  ,TYPE= { 2740-1 1050 2741 }  ,CODE= { EBCD BCD CORRES }  [,ADDR=chars] [,FEATURE=( [DIAL [, INTERRUPT] ) ] )  [,ONLNT=YES ,ONLNT=NO ]

integer<sub>3</sub> - lost data threshold  
integer<sub>4</sub> - nontext time-out threshold.

If an error threshold is reached before the transmission threshold, a message containing the line error information is displayed to the central operator. If no error counter reaches its threshold value before this number of transmissions has occurred, the current values of all counters are added to their respective accumulators and the counters are reset to zero. The allowable values are integers 1-255 inclusive.

TYPE= { 2740-1  
1050  
2741 }

Identifies the type of terminal to be used on this line as either a 2740 Model 1, a 1050, or a 2741.

All terminals using a particular switched connection must be of the same type, use the same transmission code, and for 2741 terminals, either all have the Interrupt feature or none have the Interrupt feature.

CODE= { EBCD  
BCD  
CORRES }

Specifies the transmission code used by the terminal.

ADDR=chars  
Specifies the terminal selection character if the terminal is a 1050.

FEATURE=( [DIAL] [, INTERRUPT] )  
Specifies the optional features present on all terminals attached by the line.

ONLNT=YES  
Specifies that the BTAM on-line terminal test facility is to be provided. If this keyword operand is omitted, the facility will be provided.

ONLNT=NO  
Specifies that the BTAM on-line terminal test facility is not to be provided. If the on-line test facility is omitted from CRJE, full system resources must be made available to the customer engineer for terminal maintenance when required.

CRJETABL

The CRJETABL macro allows the installation to tailor certain CRJE system facilities to its own needs. The following information can be specified:

Name Field:

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

Operand Field:

DDLIN=ddname  
Is the name specified in the DD statement defining the line (or line group).

DDSYSIN=ddname  
Specifies the DDNAME on a DD card in the CRJE procedure that describes the SYSIN data set for the line.

RLN=integer  
Specifies the relative line number of this line within the line group. If this keyword operand is omitted, RLN=1 is assumed.

LERB= ( [integer<sub>1</sub> / 255  
[integer<sub>2</sub> / 10  
[integer<sub>3</sub> / 5  
[integer<sub>4</sub> / 5 ] ) ] )

Specifies threshold values as follows:

integer<sub>1</sub> - transmission threshold  
integer<sub>2</sub> - data check threshold



1. The maximum number of conversationally submitted jobs that may reside in the CRJE system at a given time.
2. The SYSOUT class to be used for remote job output that is to be returned to terminal users.
3. Exit routines that are provided by the installation.
4. The number of central commands that can be queued at one time for processing.
5. The maximum number of broadcast messages and the maximum number of delayed messages that can reside concurrently in the CRJE system.
6. The number of output lines to be sent to a terminal user before he is allowed to discontinue receiving the output.
7. Commands and subcommands for which the installation provides processing routines.
8. Aliases for the CRJE terminal commands and subcommands.
9. The number of users that can be authorized to use the CRJE system.
10. The maximum number of lines that can be collected to be passed to the syntax checker at one time.

JOB=integer

Specifies the maximum number of conversationally submitted jobs that may reside in the central system concurrently. The integer specified must be between 1 and 999 inclusive.

USERS=integer

Specifies the number of users that can be authorized to use the CRJE system. The integer value must be from 1 to 999 inclusive. Some or all of the users can be identified with the CRJEUSER assembly macro.

SYSCRJE=character

Specifies the SYSOUT class assigned to CRJE at the central installation. This class is for the exclusive use of CRJE. Only conversationally submitted jobs may direct output to this class.

JOBEXIT=routine name

Specifies the entry point of the exit routine to be given control when a JOB card is recognized. The routine is supplied by the installation.

ONEXIT=routine name

Specifies the entry point of the exit routine to be given control whenever a LOGON command with a valid userid and password is entered.

OFFEXIT=routine name

Specifies the entry point of the exit routine to be given control whenever a user is logged off the CRJE system, either normally or abnormally.

BUFNO={integer}  
          { 1 }

Specifies the maximum number of central commands that may be queued for processing at one time. If this value is exceeded, all additional central commands are rejected and must be resubmitted after the pending commands are processed. The integer specified must be from 1 to 100 inclusive. The default value is 1.

MSGNO={integer}  
          { 100 }

Specifies the maximum number of delayed messages that can exist concurrently in the CRJE system for delivery to users not currently active. The integer specified must be from 1 to 999 inclusive. The default value is 100.

BRDCSTNO={integer}  
          { 100 }

Specifies the maximum number of broadcast messages that can exist in the CRJE system. The central operator adds and deletes broadcast messages by

Name	Operation	Operand
[name]	CRJETABL	JOB=integer ,USERS=integer ,SYSCRJE=character  [,JOBEXIT=routine name]  [,ONEXIT=routine name]  [,OFFEXIT=routine name]  [,BUFNO={integer} { 1 }]  [,MSGNO={integer} { 100 }]  [,BRDCSTNO={integer} { 100 }]  [,OUTNO=integer]  [,ALIAS={(command name, alias},...)]  [,USERMCMD=(command ,...)]  [,USERSCMD=(subcommand ,...)]  [,CMDEXIT=routine name]  [,PL1LNO={integer} { 1 }] 

use of the BRDCST command. The integer specified must be from 1 to 100 inclusive. The default value is 100.

OUTNO=integer

Specifies the number of lines of output to be sent as a group to a terminal without an interrupt feature. The terminal user can discontinue receiving output after each group of lines.

ALIAS=({command name,alias},...)

Specifies a list of CRJE command or subcommand names and one optional alias for each command. The CRJE name and the installation alias are specified as a pair. The alias must consist of from 1 to 8 alphameric characters, the first of which is alphabetic. Either verb will be accepted from terminal users.

USERMCMD=(command,...)

Specifies a list of terminal commands for which the installation provides processing routines. The command must consist of from 1 to 8 alphameric characters, the first of which is alphabetic.

USERSCMD=(subcommand,...)

Specifies a list of EDIT subcommands for which the installation provides processing routines. The subcommand must consist of from 1 to 8 alphameric characters, the first of which is alphabetic.

CMDEXIT=routine name

Specifies the entry point of the routine to be given control for all installation-defined commands and subcommands. This operand is required if either USERMCMD or USERSCMD is specified.

PL1LNO={integer}  
1

Specifies the maximum number of lines that can be collected in a group to be passed to the PL/I syntax checker. The maximum value is 38, allowing the collection of a 3040 byte statement. The default value is 1.

CRJEUSER

The CRJEUSER macro is used to assign user identification and passwords. All the assignments need not be made at assembly time; the central operator can add users dynamically by using the USERID command. A new assembly is not necessary to add users unless the maximum number of users is to be increased.

Name	Operation	Operand
[name]	CRJEUSER	[[userid,password],...]

userid,password

Assigns a userid and password to a user. A userid and password are specified as a pair. Any number of pairs may be specified provided the maximum number of users specified in the CRJETABL macro is not exceeded.

The userid and password are each 1-8 characters and may contain only the alphameric characters: A-Z, 0-9, \$, #. The first character of each must be alphabetic.

#### INSTALLATION EXIT ROUTINES

CRJE provides three exits to allow the inclusion of special processing routines for individual installation requirements. The exits exist at session initiation (LOGON exit), session termination (LOGOFF exit), and job submission (JOB card exit). The routines that are provided must be specified in the CRJETABL assembly macro.

Linkages to installation exit routines are standard. When entered, exit routines must save registers in the 18-word save area provided by the CRJE calling routine. The address of this area is passed in register 13. Register 1 contains the address of a parameter list, which contains pointers to information for the exit routine. After doing the necessary processing, the routines restore the saved registers and return control to the address in register 14. Return codes are indicated in register 15.

#### LOGON Exit

The LOGON exit allows an installation to process the accounting information that terminal users supply in the LOGON command. The exit routine is given control after the userid and password specified in the LOGON command have been verified. The entry point of the routine must be specified in the ONEXIT operand of the CRJETABL assembly macro.

Upon entry, register 1 contains the address of a parameter list consisting of the following:

1. The address of the userid in the LOGON command.
2. The address of the accounting information in the LOGON command.

The return code in register 15 indicates whether the user is to be allowed access to the system. Return codes are:

- 0 - the user is to be allowed on the system.
- 4 - the user is not to be allowed on the system. CRJE will send an appropriate message to the user.

#### LOGOFF Exit

The LOGOFF exit allows the installation to process information concerning the user session that is being terminated, whether normally or abnormally. The entry point of the exit routine must be specified in the OFFEXIT operand of the CRJETABL assembly macro.

Upon entry, register 1 contains the address of a parameter list consisting of the following:

1. The address of the userid of the user whose session is being terminated.
2. The address of a field containing the type of terminal on which the user was working (1050, 2740-1, or 2741).
3. The address of a field containing the LOGON, LOGOFF, and elapsed time of the session. It also contains an indication of normal or abnormal termination.

#### JOB Card Exit

The JOB card exit allows the installation to examine and modify the JOB statements of conversationally submitted jobs. All JOB statements and JOB continuation statements encountered during the processing of a SUBMIT command (or subcommand) are passed to the exit routine. The statements may be modified, but they cannot be continued on an additional 80-character record. Statements returned to CRJE from the JOB card exit routine are passed to OS with no further inspection. The entry point of the exit routine must be specified in the JOBEXIT operand of the CRJETABL assembly macro.

Upon entry, register 1 contains the address of a two word parameter list, with word one consisting of one of the following:

1. The address of a JOB statement.
2. The address of a JOB continuation statement.
3. The address of the terminal user's response to a message generated by the exit routine.
4. The address of a X'00' if a failure occurred while writing the message or reading the response to a message generated by the exit routine. The user is logged off and the exit routine return code is ignored.

Word two contains the address of the userid of the user submitting the job.

The return code in register 15 when the exit routine returns control to CRJE can be one of the following:

- 0 - the job is to be passed to OS.
- 4 - more information must be supplied by the terminal user. Register 1 must contain the address of a 60-byte message to be sent to the user. The user's response will be returned in the next entry to the exit routine.
- 8 - aborts the submission. No more records are to be passed to the operating system for the current SUBMIT command.
- 12 - aborts the submission and sends a message to the terminal user. Register 1 must contain the address of the 60-byte message to be sent. There is no user response to the message.

#### ADDING COMMANDS TO THE SYSTEM

The installation may include additional facilities in the CRJE system by defining terminal commands and subcommands to be recognized in addition to those provided in CRJE. The installation provides the routine for processing the additional commands. The commands and subcommands must be specified in the USERMCMC and USERSCMD operands of the CRJETABL assembly macro. When one of the installation-defined commands or subcommands is recognized by CRJE, control is given to the processing routine at the entry point specified in the CMDEXIT operand of the CRJETABL macro.

The installation-supplied command processors must be reentrant if they send any messages to a terminal.

Upon entry to a command processor, register 1 contains the address of a one-word parameter list consisting of the address of the User Command Control Table.

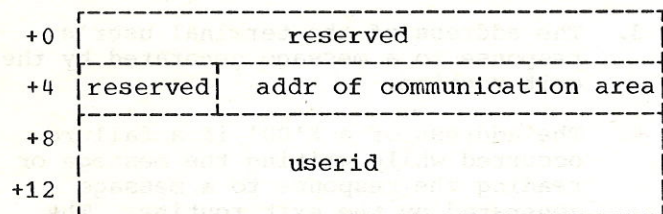


Figure 6. User Command Control Table

#### communication area

Is a 120-byte area that contains the user's command as entered from the terminal. When the command processor returns to CRJE, the area may contain a message to be sent to the terminal.

#### userid

Is the eight byte identification of the user entering the command. The userid is left justified and padded to the right with blanks.

When control is returned to CRJE, register 15 must contain one of the following return codes:

- 0 - processing complete.
- 4 - processing complete. Send message in the communication area to the terminal user.

**Note:** All messages must be padded to 120 characters with blanks. The blanks are not transmitted to the terminal.

#### GENERATION OF THE CRJE LOAD MODULE AND INITIALIZATION PROGRAM

After the completion of Stage II of the Operating System generation, the resident CRJE load module and the program to initialize the CRJE System Library must be generated. This is done by assembling the CRJE macros and installation-provided routines and by linkage editing the results to create the CRJE load module (named IHKBGN) and the initialization program (named IHKINT). Five steps are required to accomplish the above. One additional step is required for each installation routine to be included in the system. Figure 7 shows the JCL and linkage editor control cards

required for these steps. Following is a description of each step.

- STEP 1 Assembles the CRJELINE and CRJETABL macros and places the object module produced (IHKMAC) in a temporary data set (CRJETEMP) from which it will be linkage edited to SYS1.TELCMLIB in a later step.
- STEP 2 Assembles the CRJEUSER macro and places the object module produced (IHKUSR) in a temporary data set (CRJETEMP) from which it will be linkage edited to SYS1.TELCMLIB in a later step.
- STEP 3 Is necessary if the ONEXIT installation exit is to be included. The installation-written routine is assembled and placed in CRJETEMP with the name specified in the CRJETABL macro in STEP 1.
- STEP 4 Is necessary if the OFFEXIT installation exit is to be included. The installation-written routine is assembled and placed in CRJETEMP with the name specified in the CRJETABL macro in STEP 1.
- STEP 5 Is necessary if the JOBEXIT installation exit is to be included. The installation-written routine is assembled and placed in CRJETEMP with the name specified in the CRJETABL macro in STEP 1.
- STEP 6 Is necessary if the installation is adding commands to the system. The installation-written routine that processes the commands is assembled and placed in CRJETEMP with the name specified in the CRJETABL macro in STEP 1.
- STEP 7 Linkage edits the six modules created in the preceding steps from CRJETEMP to SYS1.TELCMLIB.

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

IHKDSV  
IHKCSV  
IHKSSV

and the names assigned to the installation exits if they are included. These unresolved linkages do not affect the generation of the CRJE system.

STEP 8 (At this point all modules needed in the remaining steps are on SYS1.TELCMLIB.) This step linkage edits all preassembled CRJE resident modules and the output of STEPS 1, 3, 4, 5, and 6 to create the CRJE resident load module, IHKBGN, and place it on SYS1.LINKLIB. Linkage of all resident modules is triggered by including (by use of the INCLUDE card) the CRJE modules IHKMAC and IHKAVT. The module IHKMAC, generated from the CRJE assembly macros, contains external references by which the linkage editor includes all installation exit routines. The preassembled resident module IHKAVT contains external references by which all other preassembled resident modules are also included. NCAL

must not be specified as a parameter on the linkage editor EXEC statement.

STEP 9 Creates the program for initialization of CRJE.SYSLIB, the CRJE system library. IHKUSR, IHKSMG, and IHKINI are included from SYS1.TELCMLIB. The resulting program is placed on SYS1.LINKLIB and named IHKINT with entry point IHKINI.

Note: If any one of the CRJE macro specifications (excluding CRJEUSER) is changed after the link-edits have been completed, steps 1, 7, and 8 must be redone. If CRJEUSER is changed, steps 2 and 9 must be redone. If any of the installation exit routines are changed, the steps involved (i.e., 3, 4, 5, 6) plus steps 7 and 8 must be redone.

//CRJEASM	JOB	(JOB card parameters)
//STEP1	EXEC	PGM=IEUASM
//SYSLIB	DD	DSNAME=SYS1.MACLIB, DISP=OLD
//SYSUT1		
//SYSUT2		Parameters defining the assembly utility data sets
//SYSUT3		
//SYSPRINT	DD	SYSOUT=A
//SYSPUNCH	DD	DSNAME=CRJETEMP (IHKMAC), DISP=(NEW, KEEP), X
//		SPACE=(TRK, (10, 1, 2), UNIT=23xx, VOLUME=SER=serial
//SYSIN	DD	*
		CRJELINE macro statements CRJETABL macro statement
/*		
//STEP2	EXEC	PGM=IEUASM
//SYSLIB	DD	DSNAME=SYS1.MACLIB, DISP=OLD
//SYSUT1		
//SYSUT2		Parameters defining the assembly utility data sets
//SYSUT3		
//SYSPRINT	DD	SYSOUT=A
//SYSPUNCH	DD	DSNAME=CRJETEMP (IHKUSR), DISP=(NEW, KEEP), X
//		SPACE=(TRK, (10, 1, 2), UNIT=23XX, VOLUME=SER=serial

Figure 7. Sample JCL (Part 1 of 3)

//SYSIN	DD	*	
CRJEUSER macro statement			
/*			
//STEP3	EXEC	PGM=IEUASM	
//SYSLIB	DD	Parameters defining macro library	
//SYSUT1			
//SYSUT2		Parameters defining the assembly utility data sets	
//SYSUT3			
//SYSPRINT	DD	SYSOUT=A	
//SYSPUNCH	DD	DSNAME=CRJETEMP(name of installation exit routine),	X
//		DISP=OLD,VOLUME=REF=*.STEP1.SYSPUNCH	
//SYSIN	DD	*	
input for installation exit routine			
/*			
//STEP4		format as in STEP3 for second installation exit routine	
/*			
//STEP5		format as in STEP3 for third installation exit routine	
/*			
//STEP6		format as in STEP3 for installation command processing routine	
/*			
//STEP7	EXEC	PGM=LINKEDIT, PARM=(XREF, LIST, DC, NCAL, LET)	
//SYSLMOD	DD	DSNAME=SYS1.TELCMLIB, DISP=OLD	
//SYSLIB	DD	DSNAME=CRJETEMP, DISP=(OLD, DELETE),	X
//		VOLUME=REF=*.STEP1.SYSPUNCH	
//SYSUT1	DD	Parameters defining the utility data set	
//SYSPRINT	DD	SYSOUT=A	
//SYSLIN	DD	*	
		INCLUDE SYSLIB(IHKMAC)	
		NAME IHKMAC(R)	
		INCLUDE SYSLIB(IHKUSR)	
		NAME IHKUSR(R)	

Figure 7. Sample JCL (Part 2 of 3)

		INCLUDE SYSLIB(name of first installation exit)
	NAME	name of first installation exit (R)
		INCLUDE SYSLIB(name of second installation exit)
	NAME	name of second installation exit (R)
		INCLUDE SYSLIB(name of third installation exit)
	NAME	name of third installation exit (R)
		INCLUDE SYSLIB(name of fourth installation exit)
	NAME	name of fourth installation exit (R)
/*		
//STEP8	EXEC	PGM=LINKEDIT, PARM=(XREF, LIST, DC)
//SYSLMOD	DD	DSNAME=SYS1.LINKLIB, DISP=OLD
//SYSLIB	DD	DSNAME=SYS1.TELCMLIB, DISP=OLD
//SYSUT1	DD	Parameters defining the utility data set
//SYSPRINT	DD	SYSOUT=A
//SYSLIN	DD	*
		INCLUDE SYSLIB(IHKMAC)
		INCLUDE SYSLIB(IHKAVT)
		ENTRY IHKBGN
		NAME IHKBGN(R)
/*		
//STEP9	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	Parameters defining the utility data set
//SYSPRINT	DD	SYSOUT=A
//SYSLIN	DD	*
		INCLUDE SYSLIB(IHKUSR)
		INCLUDE SYSLIB(IHKSMG)
		INCLUDE SYSLIB(IHKINI)
		ENTRY IHKINI
		NAME IHKINT(R)
/*		

Figure 7. Sample JCL (Part 3 of 3)

## Notes:

1. The SPACE parameter for the SYSPUNCH data set in STEP1 is more than adequate for assembled CRJE macros. This parameter should be altered as necessary to provide sufficient space for the installation-written routines.
2. This nine-step job requires 140 records on SYS1.SYSJOBQE reserved for the initiator. If a smaller amount was specified at system generation (60 records is the default), the number should be changed with an R 00,'140' response to the message IEF432A SPECIFY JOB QUEUE PARAMETERS at IPL.

## INITIALIZATION AND ALLOCATION OF SYSTEM LIBRARY, USER LIBRARIES, AND ACTIVE AREA

Before the CRJE system is used, the CRJE system library must be allocated and initialized, a user library must be allocated for each user requiring permanent storage at the central system, and the active area must be allocated. Once created, these data sets can be reinitialized and/or reallocated.

### CRJE System Library

The CRJE system library, named CRJE.SYSLIB, is a partitioned data set (PDS) consisting of five members:

1. SYSMSGS: Contains the system messages and diagnostics that can be written to a remote user or the central operator.
2. USERS: Contains user identification, password, and internal control information for validation of each user.
3. USERMSGS: Contains users' delayed messages.
4. JBTBLS: Contains the remote job control table.
5. BRDCST: Contains broadcast messages.

The system messages (SYSMSGS) and the user validation (USERS) members must be initialized, and directory entries established for the other three members by using the program IHKINT. After CRJE.SYSLIB has been initialized, it is possible to reconfigure the CRJE system (execute steps 1, 7, and 8 as described in the generation of CRJE) without affecting any of the users, jobs, broadcast messages, or user delayed messages currently in the CRJE system. Likewise, the CRJE system library can be reinitialized without changing anything generated by the CRJELINE or CRJETABL macros. (See the preceding section: Generation of the CRJE Load Module and Initialization Program.)

The following example shows the JCL needed to allocate the system library and to execute the initialization program IHKINT.





## CRJE Active Area

The CRJE active area should be allocated prior to CRJE startup. When CRJE closes down normally, the active area is cleared of all data, and on a normal CRJE startup, it is reinitialized. However, during a start-up following an abnormal CRJE termination, CRJE uses the information within the active area to regain the status of the system when the abnormal termination occurred. The active area may be reallocated after any normal CRJE closedown.

The exact amount of space to be allocated to this data set can not be given due to its dynamic nature, however guide lines are as follows:

1. The total space allocated must span at least three cylinders. If the TRK specification is used, the minimum is 41 tracks for 2311 and 73 tracks for 2314. The space must be contiguous.
2. Approximately 30 tracks for 2311 and 15 tracks for 2314 will be used for system information. Each active user will use approximately  $1.1(1+N/20)$  tracks for 2311 and  $1.1(+N/40)$  tracks for 2314, where N is the approximate number of lines in his active data set, e.g., for 4 active users each with a 600-line active data set for the active area on a 2311:

```
SPACE=(TRK,(170),,CONTIG)
SPACE=(CYL,(17),,CONTIG)
```

Note: No alternate track assignments should exist in the active area.

The active area can be allocated by including a DD statement in the IHKINT utility program or by use of the IEHPRGM utility program. The DD statement should have the following format:

//ACTIVE	DD	DSNAME=dsname,VOLUME=SER=serial,	X
//		UNIT=23xx,DISP=(NEW,{KEEP }), {CATLG}	X
//		SPACE=({TRK},{quantity},,CONTIG) {CYL}	

## Reinitialization and Reallocation

Once created, the CRJE system library can be reinitialized and the user libraries can be reallocated by doing some combination of the following:

1. Scratch the old data sets.
2. Uncatalog the old data sets.
3. Copy the old data sets.
4. Initialize and allocate data sets, as described above.

Scratching the Data Sets: IEHPRGM, 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 IEHPRGM see IBM System/360 Operating System: Utilities, Form C28-6586.

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

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

Copying the Data Sets: Allocation for a user library can be changed without scratching the data set by copying the PDS using the IEBCOPY utility. The DD statement describing the new copy of the library should contain the necessary space parameters. The IEBCOPY utility is described in the publication IBM System/360 Operating System: Utilities, Form C28-6586.

#### CATALOGED PROCEDURES FOR CRJE

CRJE operation requires one or more procedures cataloged in SYS1.PROCLIB. One of these procedures must be referenced when the CRJE task is started and stopped at the central system. The name of this procedure must begin with the characters CRJE and must contain certain JCL statements required by the CRJE system.

The first statement of the procedure must be the EXEC statement. PGM=IHKBGN (the resident CRJE load module) must be coded. REGION is determined by using the formula in Appendix C: Storage Estimates.

PARM field parameters of the EXEC statement will be added to provide for:

1. The selection of a version of the PL/I Syntax Checker.
2. Additional main storage for nonresident command processors.

A DD statement is required for each line to be serviced. The ddname of the statement must be the ddname specified in the CRJELINE macro (DDLNAME=ddname). For line groups, the first DD statement of the line group should have the ddname. Subsequent lines should have concatenated DD statements. The UNIT parameter contains the physical address of the lines. If a line was included in the CRJE assembly (by means of CRJELINE macro), and the installation desires not to use the line, the DD statement for that line may be omitted from the procedure with no effect on the CRJE system.

One DD statement is required for each line to define the data sets created to contain the JCL and input data for jobs submitted to the operating system. The name field of the DD statement must be the ddname specified in the CRJELINE macro (DDSYSIN=ddname) that describes the line associated with the input data set. This data set is used as a rodel. The SPACE parameter must not exceed those values specified in the IEFDATA statement of the reader procedure used by CRJE.

A DD statement is required for each volume containing CRJE user libraries (PDSS) and/or OS data sets that are to be processed. A volume

may contain one or more user libraries, or one or more OS data sets, and/or the CRJE system library (CRJE.SYSLIB). The volume referenced by the DD statement with ddname LIB1 must contain the CRJE system library. The volume must be mounted and this DD statement (LIB1) must be included. If user libraries and OS data sets referred to by CRJE users exist on more than one volume, DD statements need be included only if they will be referred to. The ddnames for subsequent volumes must be of the format: LIB2, LIB3,...LIBn. In general, it is best to include a DD statement for every disk pack mounted.

Figure 8 shows a sample procedure for a four-line system. The CRJELINE macros for this system might have been:

L01A	CRJELINE	DDLNE=LINE1,DDSYSIN=JOBIN1, TYPE=1050,CODE=EBCD	X
L01B	CRJELINE	DDLNE=LINE2,DDSYSIN=JOBIN4, TYPE=1050,CODE=EBCD	X
L01C	CRJELINE	DDLNE=LINE3,DDSYSIN=JOBIN2, RLN=1,TYPE=1050,CODE=EBCD	X
L01E	CRJELINE	DDLNE=LINE3,DDSYSIN=JOBIN3, RLN=2,TYPE=1050,CODE=EBCD	X

DD statement 2 describes the active area that was allocated and cataloged before using the CRJE system. Statements 3-6 describe the lines, with statements 5 and 6 representing two lines in a single line group.

The DD statements 7-10 describe the data sets, one per line, to be built for OS job input. Statements 11-14 inform CRJE of the disk packs that are mounted.

### OS Reader Procedure

CRJE makes use of the standard unblocked reader. A reader procedure, named RDRRCRJE, must be cataloged in SYS1.PROCLIB for CRJE job submission. It should be the same as the installation's standard unblocked reader procedure with the following three exceptions in the PARM field of the EXEC statement:

1. The "b" parameter (first byte of PARM field) must not have a value greater than 7 to insure that RDRRCRJE will not be rolled out (MVT only). For best performance 7 should be specified if accounting information and programmer name are required on the JOB statement of remote jobs; 6 if just accounting information is required; 5 if just the programmer name is required; and 4 if neither accounting information nor programmer name is required.
2. The "r" parameter (nineteenth byte of PARM field) should be set to 3 so that any central commands entered at remote terminals will be ignored.
3. The "iii" parameter (thirteenth byte of PARM field) should not exceed 249 in order not to affect CRJE performance.

Whenever the RDRRCRJE procedure is invoked by CRJE to read a job stream data set, values for the DSNAME, UNIT, VOLUME, and DISP input parameters are supplied by CRJE and override any of these on the IEFDRDR DD statement. The volume serial and unit values used are those supplied in the Unit Control Block (UCB) for the job stream data set. The DSNAME is generated dynamically with the form SYS1.CRJE.jobname, where jobname is the name of the first job in the job stream data set. DISP=(OLD, DELETE) is always specified.

	1	10	16	72
1.	//CRJE	EXEC	PGM=IHKBGN,REGION=60K	
2.	//ACTIVE	DD	DSNAME=dsname,DISP=OLD	
3.	//LINE1	DD	UNIT=01A	
4.	//LINE2	DD	UNIT=01B	
5.	//LINE3	DD	UNIT=01C	
6.	//	DD	UNIT=01E	
7.	//JOBIN1	DD	VOLUME=SER=serial,UNIT=23xx,	X
	//		SPACE=(400,(100,100),RLSE,CONTIG)	
8.	//JOBIN2	DD	VOLUME=SER=serial,UNIT=23xx,	X
	//		SPACE=(400,(100,50),RLSE,CONTIG)	
9.	//JOBIN3	DD	VOLUME=SER=serial,UNIT=23xx,	X
	//		SPACE=(400,(25,50),RLSE,CONTIG)	
10.	//JOBIN4	DD	VOLUME=SER=serial,UNIT=23xx,	X
	//		SPACE=(400,(100,100),RLSE,CONTIG)	
11.	//LIB1	DD	VOLUME=SER=serial,UNIT=23xx,DISP=OLD	
12.	//LIB2	DD	VOLUME=SER=serial,UNIT=23xx,DISP=OLD	
13.	//LIB3	DD	VOLUME=SER=serial,UNIT=23xx,DISP=OLD	
14.	//LIB4	DD	VOLUME=SER=serial,UNIT=23xx,DISP=OLD	

Figure 8. Sample CRJE Procedure

## THE CRJE TASK

### OPERATING ENVIRONMENT

Conversational Remote Job Entry operates as a system task in a multitask environment of the System/360 Operating System. It operates under the control of the version of operating system that provides multiprogramming with a variable number of tasks (MVT) or a fixed number of tasks (MFT). Being a telecommunications system, CRJE operation involves continuous service to the communication lines, over which terminal users accomplish their work. Because it is sometimes necessary to close down the system, CRJE provides system closedown and startup facilities that preserve the status of the system. Pending messages and scheduled jobs are not destroyed over a normal CRJE closedown.

### CONTROL PROGRAM FACILITIES

CRJE uses facilities of the operating system for data management, task management, and job management. Data is received and transmitted over communication lines using the Basic Telecommunications Access Method (BTAM). Data sets on direct access storage devices (DASD) are handled with the Basic Sequential and Basic Partitioned Access Methods (BSAM and BPAM). Accordingly, these data sets are accessible within the OS environment while CRJE is not operating. Data in the active area, however, which is also on DASD, is manipulated at the execute channel program level in order to provide I/O services that are tailored to meet the requirement for fast update operations.

Jobs submitted through CRJE are executed under the control of OS job management routines. CRJE builds a sequential data set consisting of the data the remote user specifies as job input. An OS reader is started on this data set, and execution proceeds as if the job had been entered locally. Conversationally submitted jobs, along with the CRJE task, compete for system resources. Jobs that require unmounted storage volumes or an unusually large amount of main storage may seriously affect the throughput of jobs in the system, since processing is delayed until the required resources become available. Remotely submitted jobs can take advantage of all the facilities of the installation operating system, with the additional ability of directing output to a system output class from which it is to be returned to the

remote user who submitted the job. Output directed to other system output (SYSOUT) classes is written to the corresponding devices at the central installation.

### COMMUNICATION SERVICEABILITY

#### COMMUNICATION LINE ERRORS

The Basic Telecommunication Access Method (BTAM) provides error recovery for the communication lines supported by CRJE. BTAM attempts to recover from errors on READ and WRITE operations by retrying the operation. When BTAM has exhausted its retry count, a permanent line error exists. BTAM issues an I/O error message to the central operator and indicates the error to CRJE. When an irrecoverable line error occurs, CRJE automatically terminates the session of the user who was active on that line and saves his active data set in his library with the name ACTIVE. In the case of a switched connection, the line is disconnected. For both switched and nonswitched connections, the line is reinitialized to allow another session to begin. Error recovery procedures for terminal users are discussed under terminal operation in the User Considerations section of this publication.

#### OPERATOR AWARENESS

In addition to messages indicating irrecoverable line errors, BTAM issues messages that give line error statistics. For each line, BTAM keeps an error count for data check, for intervention required, and for nontext time-out. BTAM also records the total number of transmissions occurring on each line. Threshold values for these counters are specified when CRJE 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. If the transmission count reaches its threshold value before any error threshold value is reached, all the counters are added to the accumulators and then reset to zero. No message is displayed.

The central operator can display the value of the accumulators at any time with the SHOW LERB command. The accumulators for one particular line or for every supported line may be requested. These accumulators are reset to zero each time the central system starts up.

#### ON-LINE TERMINAL TEST

The BTAM on-line terminal test facility is provided unless otherwise specified in the

CRJE assembly. This facility services requests initiated at the remote terminal by either the operator or an IBM Customer Engineer. The test requests may be used as a startup procedure or for terminal check-out and terminal failure diagnosis. The tests operate on-line and should be made when there is no user session in progress at the terminal. Information on how to invoke the test can be found in the publication, IBM System/360 Operating System: Basic Telecommunications Access Method, Form C30-2004.

## CENTRAL OPERATOR CONSIDERATIONS

The operator at the central installation initiates and terminates operation of CRJE and communicates with the CRJE system by means of the CRJE central commands. The commands provide the operator with the capability to dynamically control and to maintain the CRJE system, and to communicate with terminal users.

## SYSTEM STARTUP AND CLOSEDOWN

Central startup and closedown are achieved by the START and STOP commands. Once startup is initiated by the START command, terminal users can initiate and terminate sessions at will. When the startup procedure is complete, a message indicates that CRJE is in operation.

When closedown is initiated by the STOP command, the sessions in progress are automatically terminated and the communication lines are no longer serviced. A message indicates when the closedown is complete.

## CRJE SYSTEM CONTROL

The CRJE system is maintained and controlled through the use of the USERID, CENOUT, and SHOW commands. These commands provide regulation in the areas of system users, remote jobs, and communication line statistics.

## SYSTEM USERS

The central operator can control access to the CRJE system by modifying the list of authorized users of the system and by restricting user session initiation. The USERID command provides dynamic addition to and deletion from the list of valid terminal users. It also allows the operator to temporarily prevent additional users from logging on the system. This capability is particularly useful in reducing a heavy system load and in preparing for system closedown.

The SHOW command enables the operator to display information useful in the effective application of the USERID command. Any of the following information about users may be displayed: a list of all valid CRJE

users with an indication of whether each is active, an indication of whether a particular user is active and how long he has been active, and the number of currently active users. The operator can also request notification whenever any user or whenever a particular user logs on and off the system.

## REMOTE JOBS

The operator has the same control over jobs submitted through CRJE as he has over locally submitted jobs. The commands that provide this control are described in the publication IBM System/360 Operating System: Operator's Guide, Form C28-6540. OS commands also enable the operator to display information about jobs in the operating system. In addition to OS facilities, CRJE allows the operator to list the conversationally submitted jobs that are in the operating system, with an indication of whether each is completed. This information is available with the SHOW command.

The operator can also obtain output from the CRJE SYSOUT class at the central installation. The CENOUT command provides this ability, which is useful when output cannot not be transmitted to a terminal or when undelivered output is occupying needed space on storage devices.

## COMMUNICATION LINES

Error counts and the total transmission count for communication lines are automatically displayed when any one of the counts reaches a threshold value defined during the CRJE assembly. In addition, the SHCW command provides dynamic display of the current error counts and total transmission of all lines or for a particular line serviced by CRJE. A particular line is specified by the name in the name field of the CRJELINE assembly macro that described the line.

## COMMUNICATION

The central operator can send messages to terminal users, add and delete broadcast messages, and delete delayed messages. With the MSG command, the operator can send a message to all active users or to a par-



ticular user. If a particular user is not currently active, the message can be retained for delivery when the user next logs on.

Broadcast messages are sent to each user when he logs on the system. The messages are therefore a convenient means of supplying information that users should be aware of to do their work most effectively. The central operator maintains the broadcast messages by means of the BRDCST command. With this command, he can add and delete messages, and can control the order in which the messages are sent to users. The broadcast messages can be displayed at the central installation with the SHOW command.

The central operator can delete a user's delayed messages, which cannot be delivered because the user is inactive. The MSG command provides this capability, which might be used when the maximum number of delayed messages is reached. Before deleting the messages, the operator should list them with the SHOW command so that the user will not lose any of the information contained in the messages.

CENTRAL COMMANDS

The CRJE central commands are accepted only if CRJE is in operation. If the Remote Job Entry (RJE) facility of the operating system is in operation at the same time, the letter C must be the first operand of each CRJE command entered.

The CRJE commands described in this section are presented in alphabetical order. The restrictions imposed on format and placement of these commands are the same as those for the operator commands for the operating system under the control program being used.

The commands are introduced from the printer-keyboard or the system input device. When entered from the system input device, the commands must contain the JCL identifier (//) in the first two positions of the command statement.

A CRJE command cannot be continued. It must be coded on one card or card image. No abbreviations are allowed except in the START and STOP commands.

CRJE buffers central commands so that the operator can have more than one command pending at a time. The number of commands (up to 100) that can be pending at a time is determined in the CRJE assembly.

BRDCST

The BRDCST command is used to maintain the broadcast messages. The maximum number of broadcast messages (up to 100) that can exist concurrently is determined in the CRJE assembly. No matter how many messages are allowed, each message has a numeric identifier of 0-9999 inclusive. The messages are maintained in ascending order of the identifiers. The operator may enter a message with a specific identifier, add a message following the last existing message, delete a message, or delete all the messages.

Message text may include up to 40 printable characters and blanks, and must be enclosed by single quotes. Single quotes within the text must be paired, each pair being counted as one character.

Operation	Operand
BRDCST	[C,] { nnnn, 'text' } { 'text' } nnnn DELETE

C

Indicates that this command refers to CRJE. This operand is required when CRJE and RJE are operating concurrently.

nnnn, 'text'

Requests that the message consisting of the specified text is to be entered as the broadcast message with the identifier specified by nnnn. If there is already a message with the specified identifier, it is replaced.

'text'

Requests that the message consisting of the specified text is to be added following the last existing message. The identifier for the new message is obtained by adding 10 to the identifier of the last existing message.

nnnn

Requests the deletion of the message identified by nnnn.

DELETE

Requests the deletion of all the broadcast messages.

CENOUT

The CENOUT command is used to remove job output in the CRJE SYSOUT class and to process it with a central installation output writer.

Operation	Operand
CENOUT	[C,]J=jobname,C=class

**C**  
Indicates that this command refers to CRJE. This operand is required when CRJE and RJE are operating concurrently.

**J=jobname**  
Specifies the name of the job whose output is to be handled by a central installation output writer. If the specified job is not complete or not in the CRJE system, the operator receives a message indicating that the command is rejected.

**C=class**  
Specifies the SYSOUT class in which the job output is to be placed.

MSG

The MSG command is used to send messages to CRJE terminal users. In addition, this command allows deletion of delayed messages for a user not currently logged on the system.

Operation	Operand
MSG	{M='text',[U=userid[,Q]]} [C,]{D=userid}

**C**  
Indicates that this command refers to CRJE. This operand is required when CRJE and RJE are operating concurrently.

**M='text'**  
Specifies the text of the message to be sent. If the U keyword parameter is omitted, the message is sent to all currently active users. The message text may include up to 40 printable characters and blanks, and must be enclosed by single quotes. Single quotes within the text must be paired,

each pair being counted as one character.

**U=userid[,Q]**  
Specifies that the message is to be sent to the user identified by userid. If the Q operand is specified and the user is inactive, the message will be delivered when the user next logs on the system. If Q is not specified, the message is delivered only if the user is active.

**D=userid**  
Requests the deletion of all delayed messages for the user identified by userid. A copy of these messages can be obtained with a SHOW MSGS,userid command before entering the MSG D=userid command.

SHOW

The SHOW command is used to display CRJE information on the operator's printer-keyboard. Only one type of information can be requested at a time. If more than one type is wanted, separate SHOW commands must be used.

Operation	Operand
SHOW	[C,]{ JOBS[,jobname] USERS[,userid] ACTIVE[,NUMBER] BRDCST MSGS[,userid] LERB[,linename] SESS[,userid][,RELEASE] }

**C**  
Indicates that this command refers to CRJE. This operand is required when CRJE and RJE are operating concurrently.

**JOBS**  
Requests a list of all CRJE jobs and their status. The status returned indicates only whether the job is complete.

**JOBS,jobname**  
Requests the status of the job identified by jobname. The status returned indicates only whether the job is complete.

**USERS**  
Requests a list of all valid CRJE users with an indication of whether

each user is active. The time each active user has been logged on is also returned.

request made with the SHOW SESS [,userid] command.

**USERS,userid**

Requests an indication of whether the user identified by userid is active. If he is active, the time he has been logged on is also returned.

**START**

The START command is used to start operation of CRJE. The parameters on the START command are supplied according to the preceding CRJE closedown and the activity of the operating system since the last CRJE closedown. The parameters supplied determine the action taken concerning the active area and the jobs in the CRJE system.

**ACTIVE**

Requests a list of currently active users and the time each has been logged on the system.

In general, if the OS job input queue has been formatted since the last CRJE closedown, then all job references in the CRJE system should be removed. "Coldstart" refers to a CRJE startup in which job references are removed from the CRJE system. If the operating system has been loaded since the last CRJE closedown but the input queue has not been reformatted, then CRJE should retain its references to remote jobs in the system. This type of startup is referred to as a "warmstart." If the operating system has not been loaded since the last CRJE closedown, then CRJE should retain its references to remote jobs in the system.

**ACTIVE,NUMBER**

Requests a display of the number of currently active users.

**BRDCST**

Requests a copy of the current broadcast messages. The identifiers are displayed with the messages.

**MSGS**

Requests a copy of all delayed messages in the CRJE system. Each message is listed with the userid of the user to whom it is to be sent.

**MSGS,userid**

Requests a copy of all the delayed messages for the user identified by userid.

**LERB**

Requests a list of the current values of all line error accumulators for all lines being used by CRJE. The list indicates for each line the three error-counter values (data check, intervention required, nontext timeout), and the transmission counter value. These values are cumulative since the last CRJE startup.

During a normal closedown of CRJE, each existing active data set is saved in the respective user's library, and the current control information is saved in the system library. During a startup following an abnormal CRJE closedown, CRJE can attempt an active area recovery by storing the active data sets in user libraries and by resuming operation with the system control information currently in the active area.

**LERB,linename**

Requests the error and transmission counts for the specified line. The linename is the name that was specified for the line when the CRJE system was assembled.

Operation	Operand
{START}	procname,,,({FORM}{,ABNO})
{S}	

**SESS**

Requests notification as CRJE users log on and off the system.

**Note:** The two commas following the delimiting comma after procname are required to indicate the absence of the parameters, unit and volume serial. See the description of the START command in the publication IBM System/360 Operating System: Operator's Guide, Form C28-6540.

**SESS,userid**

Requests notification when the specified user logs on and off the system.

**SESS[,userid],RELEASE**

Specifies that no notification is to be given as users log on and off the system. If userid is specified, only the notification for that user is terminated. This operand nullifies a

**procname**

Specifies the name of the cataloged procedure for Conversational Remote Job Entry operation. This procedure name must begin with the characters CRJE.

FORM

Specifies that all references to jobs in the CRJE system be removed (i.e., coldstart). This parameter should be specified if the operating system has been loaded, and the job input queue reformatted by specifying 'F' in the Q keyword parameter of the SET command. Formatting the job queue deletes all jobs in the system, including remote jobs.

Note: If FORM is specified, all jobs within the CRJE system are deleted regardless of the operating system startup.

NFMT

Specifies that all references to jobs in the CRJE system be retained (i.e., warmstart). This is specified if the operating system has been loaded since the last CRJE closedown, but the job queue has not been formatted.

Notes:

1. If the job queue has been formatted during any IPL procedure since the last CRJE closedown, all jobs are deleted. If NFMT is specified, however, CRJE retains all job references. These references can be removed only by specifying FORM.
2. If the operating system has not been loaded, and NFMT is specified, no job output existing prior to the last CRJE closedown can be retrieved during this execution of CRJE. To recover the output, the operator must reload the operating system (do not specify 'F' in the SET command) and start CRJE specifying NFMT.

NONE

Specifies that the operating system has not been loaded since the last CRJE closedown. References to jobs within the CRJE system are retained.

Note: If the operating system has been loaded and NONE is specified, then all remotely submitted jobs are deleted, even though the CRJE references to those jobs are retained. The references can be removed only by stopping CRJE, reloading the operating system, and starting CRJE specifying FORM.

ABNO

Specifies that CRJE is to execute its active area recovery procedure.

NORM

Specifies that CRJE is to execute its normal active area startup procedures. This operand must be specified if the active area has been reallocated since the last CRJE closedown.

STOP

The STOP command is used to stop operation of CRJE.

Operation	Operand
{STOP}	procname
{P}	

procname

Specifies the name of the cataloged procedure for Conversational Remote Job Entry operation. This procedure name is the same as that specified in the START command.

USERID

The USERID command is used to control the availability of the CRJE system to terminal users. Users can be added to and deleted from the list of authorized users of the system. Also, initiation of new sessions can be suspended and resumed.

Operation	Operand
USERID	[C,] { {A[DD]} = (userid, password) } {D[ELETE]} {S[UPPRESS]} {R[ESUME]}

C

Indicates that this command refers to CRJE. This operand is required when CRJE and RJE are operating concurrently.

A[DD]=(userid,password)

Indicates that the user with the specified userid and password is to be added to the list of authorized users. Each userid and password consists of 1-8 alphanumeric characters, the first of which must be alphabetic.

D[DELETE]=(userid,password)

Indicates that the user with the specified userid and password is to be deleted from the list of authorized users. A user cannot be deleted while he is active.

S[UPPRESS]

Specifies that users not currently logged on the system are not to be allowed to log on. On switched lines,

calls will not be answered. On non-switched lines, LOGON commands are rejected and the terminal user receives a message indicating that sessions are suppressed.

R[ESUME]

Specifies that users are to be allowed to log on the system. This operand nullifies the effect of a previously entered USERID SUPPRESS command.

CENTRAL INSTALLATION MESSAGES

Following is a list of CRJE messages that can appear on the central operator's printer-keyboard. The messages are listed in numerical order according to the message code numbers.

IEE326I CRJE NOT SUPPORTED

Explanation: A CRJE central operator command was entered while CRJE was not in the system.

Operation Action: None.

IHK200I LOGOFF userid

Explanation: The session of the user identified by userid has terminated. This message is informational and is issued only in reply to a SHOW SESS command.

Operator Action: None.

IHK201I ACTIVE USER { N=n  
userid time }

Explanation: A display of all valid CRJE users, all active CRJE users, or the number of users was requested by the SHOW USERS; SHOW ACTIVE; or SHOW ACTIVE,NUMBER command. N=n specifies that "n" number of users are currently active. Userid identifies a CRJE user who is currently logged on. Time is the total time in minutes that the specified user has been active.

Operator Action: None.

IHK202I INVALID USERID command

Explanation: An invalid CRJE userid (1-8 character alphameric user identifier) was specified in the command that is displayed.

Operator Action: Correct the userid and reenter the command.

IHK203I INACTIVE USER userid

Explanation: A display of all valid CRJE users was requested by the SHOW USERS command. The userid displayed is assigned to a user who is not currently logged on the system.

Operator Action: None.

IHK204I USERID PREVIOUSLY ASSIGNED

Explanation: The 1-8 character alphameric userid specified in the USERID command is assigned to another CRJE user.

System Action: The command is ignored.

Operator Action: Select a new userid and reenter the command.

IHK205I PASSWORD INVALID

Explanation: The password supplied on the USERID command is invalid for one of the following reasons:

- The password contains more than 8 alphameric characters.
- The password begins with a numeric character.
- The password received on a delete request is not the password currently assigned to the user to be deleted.

System Action: The command is ignored.

Operator Action: Correct the password and reenter the command.

IHK206I MESSAGE TEXT EXCEEDS 40 CHARACTERS

Explanation: The text portion of a BRDCST or MSG command exceeds 40 characters.

System Action: The command is ignored.

Operator Action: Compress the message text into 40 characters and reenter the command, or divide the text into two messages and enter a command for each message.

IHK207I DELETED FROM USER LIST userid

Explanation: The user identified by userid displayed has been removed from the list of valid CRJE users in response to a USERID command.

Operator Action: None

IHK208I ADDED TO-USER LIST userid

Explanation: The user identified by userid has been added to the list of valid CRJE users in response to a USERID command.

Operator Action: None.

IHK209I MESSAGE LIMIT EXCEEDED{BRDCST }  
  {DELAYED }

Explanation: The maximum number of broadcast messages (if BRDCST is specified) or user delayed messages (if DELAYED is specified) has been exceeded.

System Action: The message is ignored.

Operator Action: If the message follows a BRDCST command, use the DELETE command to remove out-of-date messages and reenter the BRDCST command; or use the BRDCST nn,'text' form to replace a message that is no longer needed.

If the message follows a MSG command, wait a few minutes and try again.

IHK210I INVALID LINENAME linename

Explanation: A SHOW LERB command was entered for the line identified by linename. The linename either did not appear in the name field of an CRJELINE assembly macro or was omitted from the CRJE procedure.

Operator Action: Reenter the command with the correct linename.

IHK211I JOB NOT IN SYSTEM jobname

Explanation: A CENOUT command was entered for the job specified by jobname. There is no record of any such job in the CRJE system.

Operator Action: Correct the jobname and reenter the command.

IHK212I LOGON userid

Explanation: The user identified by userid has logged on the system. This message is informational and is issued only in reply to a SHOW SESS command.

Operator Action: None.

IHK213I JOB COMPLETE jobname userid

Explanation: A display of the remotely submitted jobs in the central system has been requested. The job specified by jobname was submitted by the user identified by userid and is complete.

Operator Action: None.

IHK214I CENOUT jobname

Explanation: A request for local output of the remotely submitted job identified by jobname has been accepted.

System Action: The job output is removed from the CRJE SYSOUT class and placed in the SYSOUT class designated in the CENOUT command.

Operator Action: If immediate output of the job is desired, start an OS writer on the proper class and device.

IHK215I START CRJE REJECTED

Explanation: The central operator entered a START CRJE command while CRJE was running.

System Action: The command is ignored.

Operator Action: None.

IHK216I DISK ERROR{ACTIVE AREA userid }  
  {ACTIVE AREA command }  
  {dsname }

Explanation: An error occurred on an I/O operation on disk.

1. ACTIVE AREA userid: The error occurred on the active area while processing a terminal command entered by the user identified by userid.
2. ACTIVE AREA command: The error occurred on the active area while processing the central command that is displayed.
3. dsname: The error occurred on the data set identified by dsname while processing a command entered by a terminal user.

System Action: Processing of the command associated with the error is terminated.

Operator Action: If the error persists, call a customer engineer.

IHK217I BROADCAST MESSAGES START

Explanation: The following messages are the broadcast messages and their identifiers.

Operator Action: None.

IHK218I BROADCAST MESSAGES END

Explanation: Listing of broadcast messages is complete.

Operator Action: None.

IHK219I OUT OF SPACE ACTIVE AREA

Explanation: A terminal user issued a command that required the allocation of additional space in the active area, and the required space was not available.

Operator Action: Issue a USERID SUPPRESS command to prevent any more users from logging on and to allow time for some active area space to be freed before resuming session initiation.

IHK220I nnn LINE NOT OPERATIONAL

Explanation: The teleprocessing line identified by nnn (line number) is not operational. BTAM was unable to successfully complete a Read or Write operation.

System Action: The identified line is no longer serviced.

Operator Action: Notify the system programmer responsible for maintaining the system.

IHK221I MULTIPLE USE OF KEYWORD

Explanation: A keyword has been entered more than once in a central operator command.

Operator Action: Reenter the command.

IHK222I ABNORMAL CRJE CLOSEDOWN

Explanation: An irrecoverable error necessitated the termination of the CRJE program.

Operator Action: None.

IHK223I CRJE NOW ACTIVE

Explanation: The startup of CRJE is complete, and both central

operator and remote terminal commands may now be entered.

Operator Action: None.

IHK224I NO ACTIVE AREA FOR RESTART

Explanation: CRJE cannot execute its active area recovery procedures because the active area was lost at the time of the last CRJE closedown.

Operator Action: Start CRJE with NORM specified in the START command.

IHK225I LESS THAN 3 CYLINDERS FOR ACTIVE AREA

Explanation: Less than 3 cylinders are available for the active area. CRJE can not be started.

Operator Action: Inform the system programmer responsible for maintaining the system that more space must be allocated for the active area.

IHK226I REQUIRED PARAMETER MISSING ON command parameter

Explanation: The designated required parameter was not specified when the displayed central command was entered.

System Action: The command is ignored.

Operator Action: Reenter the command with all required parameters.

IHK227I INVALID VALUE FOR keyword command

Explanation: The displayed operator command specified by "command" contains an invalid value for the designated keyword.

System Action: The command is ignored.

Operator Action: Reenter the command with correct values.

IHK228I UNABLE TO OPEN ddname

Explanation: The execution of the OPEN for the line described by the DD statement with the displayed ddname was unsuccessful.

Operator Action: None.



IHK230I CRJE CLOSED DOWN

Explanation: A STOP CRJE command was entered by the central operator, and the CRJE program has completed the closedown procedures.

Operator Action: None.

IHK231I JOB INCOMPLETE jobname

Explanation: A CENOUT command was entered by the central operator for the job identified by jobname. The job has not terminated.

Operator Action: Wait until the job terminates and reenter the CENOUT command.

IHK232I NO BROADCAST MESSAGES

Explanation: There are no current broadcast messages.

Operator Action: None.

IHK233I NO DELAYED MESSAGES [userid]

Explanation: There are no delayed messages for the user identified by userid. If a userid is not specified, there are no delayed messages in the system.

Operator Action: None.

Command	Function
TO INQUIRE CREATION OF PENDING OPERATIONS	TO INQUIRE CREATION OF PENDING OPERATIONS
TO REMOVE A CRJE DATA SET FROM THE USER'S LIBRARY	TO REMOVE A CRJE DATA SET FROM THE USER'S LIBRARY
TO REMOVE A CRJE DATA SET	TO REMOVE A CRJE DATA SET

Command	Function
TO REMOVE A CRJE DATA SET	TO REMOVE A CRJE DATA SET
TO INQUIRE CREATION OF PENDING OPERATIONS	TO INQUIRE CREATION OF PENDING OPERATIONS
TO REMOVE A CRJE DATA SET FROM THE USER'S LIBRARY	TO REMOVE A CRJE DATA SET FROM THE USER'S LIBRARY

## TERMINAL USER CONSIDERATIONS

The user operating at a remote terminal of the CRJE system accomplishes his work through the use of the terminal command language. He requests system action and information by entering commands that are interpreted and processed at the central system. This section describes user capabilities, and terminal input and output.

### USER CAPABILITIES

User capabilities fall into the following general categories:

- Session management
- Data management
- Job management
- System inquiry
- Communication
- Special

Each category is described, including the commands involved in exercising the capabilities available.

### SESSION MANAGEMENT

The user has two commands with which he initiates and terminates his session.

Command	Function
LOGON	To identify the user and initiate his session.
LOGOFF	To terminate a session.

Once he has been recognized as a valid user of the CRJE system, he has access to all the facilities of the system and can use these facilities by entering terminal commands. A session continues until the user enters LOGOFF, another LOGON is entered at his terminal, or an error condition or closedown at the central system causes an automatic session termination. The user must reinitiate his session by entering another LOGON. If the terminal is attached over a switched connection, the communication line is disconnected when a session is terminated either automatically or by a LOGOFF command.

### DATA MANAGEMENT

CRJE terminal users have access to CRJE data sets in user libraries and to named OS data sets on the OS system catalog. A user can work with any CRJE data set in his own library and can examine CRJE data sets in other user libraries, if he knows the data set owner's userid and, if the data set is protected, the protection key. A user has access to OS sequential data sets and members of OS partitioned data sets.

In order to examine or modify any data set -- a CRJE data set, an OS sequential data set, or a member of an OS partitioned data set -- a copy of the data set (or member) must exist in the CRJE active area as an active data set. When the user creates a data set, he creates an active data set, which can be retained in his user library. There are two commands with which the user deletes data sets, and initiates creation and updating of data sets.

Command	Function
DELETE	To scratch an OS data set or to remove a CRJE data set from the user's library
EDIT	To initiate creation or updating operations.

If updating operations are to be performed, an active data set is created by copying the existing data set into the active area. If a new data set is to be created, the lines that the user enters from his terminal comprise an active data set.

### Data Set Attributes

Attributes are associated with all CRJE data sets and active data sets to indicate certain characteristics of the data sets. The content attribute indicates the type of records contained in the data set. Possible content attributes are:

PL1: The records are PL/I source language statements that can be syntax checked.

DATA: The records consist of data in which alphabets are maintained in upper

case. A data set containing source language statements, or possibly data input to a program would have the DATA attribute.

**TEXT:** The records consist of data in which alphabets can be in either upper or lower case.

**DSLIS:** Each record contains the name of one CRJE data set that cannot have the DSLIS attribute. Data sets with this attribute are useful in job submission.

**CLIS:** The records are CRJE terminal commands. The uses of data sets with the CLIS attribute are described in the Special category of user capabilities in this section.

The sequence attribute indicates whether line numbers are kept in positions 73-80 of each record. These line numbers are maintained in addition to line numbers automatically appended to each record. The two possible sequence attributes are:

**SEQ:** The records contain line numbers in positions 73-80. The user-entered portion of these records is limited to 72 characters.

**NOSEQ:** The records do not contain line numbers in positions 73-80. All 80 positions are therefore available for user input.

The line increment attribute is the difference between line numbers when the active data set is created or renumbered. The system normally assumes an increment of 10.

Data set attributes are assigned when a CRJE data set is created, and when an OS data set is copied into the active area. The attributes do not change unless the user specifies a change when he initiates updating of a CRJE data set.

### EDIT Subcommands

Updating operations initiated by the EDIT command are requested through the use of EDIT subcommands. After the EDIT command is entered, only EDIT subcommands are accepted until the END subcommand is entered. For ease of use, there are abbreviations for EDIT subcommands. The subcommands, their abbreviations, and their functions are shown in Figure 9.

Subcommand	Abbreviation	Function
Implicit		To enter or delete lines in the active data set.
CHANGE	C	To replace character strings within lines of the active data set.
DELETE	D	To remove lines in the active data set.
END		To terminate creation and updating operations and to delete the active data set.
INPUT	I	To insert and/or replace lines in the active data set.
LIST	L	To display lines of the active data set.
MERGE	M	To combine another data set with the active data set or to copy lines from one place to another within the active data set.
RENUM	REN	To reassign line numbers to the lines in the active data set.
SAVE	S	To store the active data set in the user's library.
SCAN	SC	To request a syntax analysis of PL/I source language statements in the active data set.
TABSET	TAB	To indicate the tab settings used while entering lines into the active data set.

Figure 9. EDIT Subcommands

### Modes of Operation

Following the entry of the EDIT command, the user operates in one of two modes, distinguished by the type of input he is entering at the terminal. In edit mode, the user enters EDIT subcommands. In input

mode, he enters lines that are to be records of the active data set.

Input mode: Input mode is entered following an EDIT command that initiates creation of an active data set or following an INPUT subcommand. Normally, line numbers are displayed at the user's terminal to request the entry of the corresponding line. These line number prompts can be eliminated optionally by the INPUT subcommand, although line numbers are still maintained in the active data set. Input lines must be 80 characters or less in length. Input lines of more than 80 characters are truncated, and input lines of less than 80 characters are padded with blanks. The user continues to enter lines in input mode until he returns to edit mode by entering a null input line.

Edit mode: Edit mode is entered following an EDIT command that initiates updating operations on an existing data set, which is copied into the active area. The user operates in edit mode until he enters the END subcommand, the INPUT subcommand, or a null input line. If he enters the END subcommand, the active data set is deleted and EDIT subcommands are no longer accepted. If he submits an INPUT subcommand or a null input line, he enters input mode. The next lines entered will be added at the end of the active data set unless the user specifies otherwise with the INPUT subcommand.

#### Creating Data Sets

The user initiates the creation of an active data set with the EDIT command. He then enters the lines of the data set in response to line number prompts printed at his terminal. Prompting begins with line number 10 and proceeds in increments of 10. The INPUT subcommand can be used to change the line numbering scheme and to inhibit the prompts.

#### Storing Data Sets

The user stores the active data set in his permanent user library by using the SAVE subcommand. An updated version of a data set replaces the original one in the user library if it is saved with the same name. The space occupied by the original version, however, becomes unavailable. The library is automatically condensed when no more space is available. When his library is filled to capacity, the user can free more space only by deleting some of the CRJE data sets in the library.

#### Deleting Data Sets

The user can delete CRJE data sets in his library and OS data sets by entering the DELETE command. (The DELETE command should not be confused with the DELETE subcommand.) When a CRJE data set is deleted, the space in the user library becomes available when the library is condensed as a result of a SAVE subcommand.

#### Protecting and Sharing CRJE Data Sets

A user may protect a CRJE data set by assigning it a protection key when he saves it in his library. Other users have access to such a protected data set (with the EDIT command) if they know the protection key and the owner's userid. A data set without a protection key is accessible to any user who knows the name and the data set owner's userid. All data set sharing is on a read-only basis: that is, a user may save a data set in only his own library.

#### Modifying and Listing Data Sets

Using the EDIT subcommands, the terminal user can insert, replace, delete, and change lines in a data set; list lines of a data set; copy lines in a data set; and combine data sets. The data set involved must be the active data set. The active data set can be a copy of an existing data set, or it can be a partially created data set.

The user identifies the lines by line number. If the operation involves a range of lines, the user specifies the first and last lines in the range. If the exact line numbers are not known, an inclusive range can be specified. If the range begins with the first line of the data set, a zero (0) line number can be specified. If the range ends with the last line of the data set, a sufficiently large line number, up to eight nines (99999999), can be specified. Provision is also made for renumbering the lines in the data set.

The Implicit subcommand has the same basic functions as the INPUT and DELETE subcommands. The Implicit subcommand refers to one line at a time, while INPUT and DELETE can apply to a range of lines. There is no distinction between line insertions and replacements with the Implicit subcommand; whereas INPUT provides the additional protective facility of specifying replacement only and insertion only.

The Implicit subcommand does not initiate input mode, as does INPUT; accordingly, there are no line number prompts.

Scanning PL/I Source Statements (an installation option)

PL/I statements can be scanned for syntax errors as the lines are entered from the terminal, or existing statements can be scanned in response to a specific request. Specific requests are made with the SCAN subcommand. An automatic scan facility can be turned on by the EDIT command or the SCAN subcommand. While the automatic scan is on, all lines entered in input mode are passed to the syntax checker. The automatic scan can be turned off with the SCAN subcommand.

One line may contain several PL/I statements, and one statement can be continued on the next line. In input mode the user must immediately precede the end-of-line sequence with a hyphen (-) to indicate that the next line is a continuation line. It is not necessary to indicate a continuation line if the end of the PL/I statement is followed by a complete comment, e.g., A=10; /\* INITIALIZE A \*/. The hyphen is not saved in the active data set. It is only used to determine when the collected lines should be passed to the syntax checker. The continuation indication should only be used while the automatic scan is on. If the installation-imposed maximum number of lines is reached while collecting lines, the collected group is syntax checked.

Note: Lines entered with the Implicit subcommand are not syntax checked.

If a syntax error is detected, either in input mode or as a result of the SCAN subcommand, the user receives a diagnostic message indicating the number of the input line that contains the error. If the error is detected in input mode, the user can either ignore the error by entering a null line of input or correct the error by using the Implicit or CHANGE subcommands. Only lines contained in the group of lines just syntax checked may be corrected. When the error has been corrected, a null line of input causes the lines to be rechecked, after which input mode is resumed.

If an error is detected as the result of a SCAN subcommand, it can be corrected by using any of the EDIT subcommands. There is no automatic rechecking of corrected statements. The corrected statements can be rechecked by the SCAN subcommand or via the automatic syntax scan.

JOB MANAGEMENT

The user has four commands for controlling the submission of jobs for batch processing and the retrieval of job output in the CRJE system output (SYSOUT) class. These commands are:

Command	Function
SUBMIT	To enter a job into the OS job input stream.
OUTPUT	To request CRJE SYSOUT output of a conversationally submitted job.
CONTINUE	To resume output listing that was previously interrupted.
CANCEL	To remove a job from the CRJE system and to delete any CRJE SYSOUT output of that job.

SUBMIT and CANCEL are valid as commands and as EDIT subcommands.

To submit a job for execution, a user specifies a CRJE data set (or a combination of CRJE data sets) that provides all the necessary input required by OS for job execution. If in edit mode, the user may also specify the active data set. The input entered into the job stream must include all the JCL statements necessary for the desired processing. The JCL may invoke a procedure from the OS procedure library. Any OS data sets may be used in job processing through the facilities of JCL. A CRJE data set used as an input data set should not be defined by a JCL statement other than DD \* or DD DATA. The user might keep JCL and input in separate CRJE data sets so that he can use the same JCL to execute different programs or to process different collections of data. He must remember, however, that no two jobs in the system can have the same jobname specified on the JOB statement.

A convenient way to submit jobs is the use of a CRJE data set with the DSLIST content attribute. The user maintains, in a DSLIST, the names of the CRJE data sets that compose his job stream. Then, he simply specifies the data set with the DSLIST attribute to enter the contents of all the data sets named in the DSLIST. Other data sets may, of course, be specified in addition to the data set with the DSLIST attribute.

The JCL also controls the destination of any output produced by the job. A system output class is assigned for CRJE use when the CRJE central system is assembled. Any output data sets that the user wishes returned to him at a remote terminal must either be directed to the CRJE SYSOUT class or be created as named, sequential or partitioned, cataloged data sets. Job output in the CRJE SYSOUT class can be obtained, with the OUTPUT command, only by the user who submitted the job. If necessary, the central operator can obtain, at the central installation, output from the CRJE SYSOUT class. Access to SYSOUT data sets cannot be gained with the EDIT command, and, consequently, the data sets cannot be listed by line number. Job output in the form of OS data sets can be obtained, with the EDIT command, by any user knowing the fully qualified name of the data set. These OS data sets may be deleted by means of the DELETE command if the first qualifier of the dsname is the user's userid.

Job management messages (allocation and deallocation messages, diagnostics of JCL statements, etc.) can be directed to the CRJE SYSOUT class with the MSGCLASS parameter of the JCL JOB statement.

Any output assigned to SYSOUT classes other than the CRJE SYSOUT is directed to the corresponding devices at the central installation.

When a job terminates, the user who submitted the job is notified with an indication of normal or abnormal completion. The user then knows that output is available for examination and can proceed accordingly. After listing part of a data set in the CRJE SYSOUT class, the user may direct it to a device at the central installation by:

1. Discontinuing or interrupting the output. The procedure for interrupting output is described under Terminal Operational Characteristics.
2. Sending a message to the central operator requesting him to enter a CENOUT command. The CENOUT command will direct all the CRJE SYSOUT output of the job to devices at the central installation.

Output must be discontinued before the entire data set is printed or the data set will be scratched. The CONTINUE command allows the user to resume listing discontinued output at his terminal.

The CANCEL command is used to delete a job that the user has submitted. The job can be cancelled prior to execution, during execution, or after execution is complete;

but until the user receives a message confirming the deletion, he cannot submit a job with the same jobname as the deleted job.

#### SYSTEM INQUIRY

There are three commands available to the user for obtaining system information.

Command	Function
LISTLIB	To obtain the name and characteristics of every CRJE data set in the user's library.
LISTDS	To obtain information about a particular CRJE data set in the user's library.
STATUS	To obtain information about jobs the user has submitted.

Both the LISTLIB and LISTDS commands provide information about CRJE data sets in the user's library. The LISTLIB command pertains to all the data sets in his library, while LISTDS is used for one particular data set. The information available includes the attributes and size of the data sets, the frequency of use, and whether they are protected. The names of the data sets are supplied for a LISTLIB command.

The STATUS command allows the user to keep track of his jobs through batch processing by indicating whether a job is still waiting to be executed, is being executed, or is completed. The user receives the position of a job on the queue of jobs scheduled for execution.

#### COMMUNICATION

A user communicates with the central operator and with other CRJE terminal users by using the following two commands:

Command	Function
SEND	To send a message to the central operator or to another terminal user.
LISTBC	To request the broadcast messages.

In addition to sending messages to the central operator and to active terminal users, the user can request that, if the recipient is not active, the message be delivered to him when he next logs on the system.

When a user initiates his session (with a LOGON), he receives both the messages sent to him while he was inactive and the broadcast messages. The broadcast messages contain general information, which is supplied by the central operator. The LISTBC command allows a user to request the broadcast messages at any time during his session.

**SPECIAL**

One CRJE terminal command provides an additional user capability. Other facilities can be provided through commands that are defined by the installation and included in the system during CRJE generation. The command provided by CRJE is:

Command	Function
EXEC	To execute a sequence of commands contained in a CRJE data set.

A CRJE data set that contains terminal commands to be executed via the EXEC command must have been assigned the CLIST content attribute. The CLIST, or command list, can include commands and EDIT subcommands. The commands are executed in order, just as if they were being entered from the terminal. This facility is useful if a series of commands and subcommands is used frequently.

INPUT AND OUTPUT AT THE TERMINAL

Input entered at the terminal consists of commands, subcommands, and lines of data to be included as records of a data set. Output that can be received at a terminal includes lines of data requested by the user and messages. Because of the conversational nature of the system, alternation between input and output is frequent. Accordingly this section describes message output associated with command input; message output associated with data input, other messages, and data output.

**COMMANDS**

There is no distinction between commands and subcommands when they are considered strictly as input. The term, command, is used in the following paragraphs to refer to both commands and subcommands unless specifically noted.

Request for Commands

The indication that a command can be entered is a function of the operational characteristics of the terminal in question. (See Terminal Operational Characteristics.) In general, however, whenever the terminal keyboard is unlocked, and the user is not in input mode, a command can be entered. A detailed description of the commands that can be entered is given in the Terminal Commands section of this publication.

Response to Commands

A message response to a command usually indicates an error in the command, indicates an unexpected situation arising during the processing of the command, or supplies information requested by the command. An error in a command might be a syntactical error, an invalid command name or operand, or a command entered in the wrong mode (for example, an EDIT subcommand entered when the user is not in edit mode). Unexpected situations include such cases as a nonexistent data set referred to, a nonexistent line number specified, and an undeliverable message. Job status, user library or CRJE data set information, and broadcast messages are supplied in message responses to the STATUS, LISTDS, and LISTBC commands respectively.

In general, a user does not receive messages that simply confirm the successful execution of a command. If he receives an indication to enter another command, the user may assume that the preceding command has been processed with no unexpected results.

**DATA INPUT**

With the exception of the Implicit subcommand, data or input lines for a data set can only be entered in input mode, which is initiated by the EDIT command or the INPUT subcommand.

## Request for Data

When the user is entering lines in the course of building or modifying a data set, a line number is printed at the beginning of the line on his keyboard to indicate that the next line of data can be entered. The line that he enters is assigned the line number that is printed. The user can request, with the INPUT subcommand, that these line number prompts not be sent to him. If he so requests, then the indication to enter a line is a function of the operational characteristics of his terminal. As in the case of requests for commands, this indication is generally the unlocking of his keyboard.

## Response to Data

In general, the only response to a line of data entered is the line number prompt for the next line. Receipt of the prompt for the next line implies that the previous line has been successfully entered, as requested, in the data set. If the lines being entered are PL/I statements that are being scanned for syntax errors, the receipt of a line number prompt also indicates that any statements passed to the syntax checker contain no syntax errors.

Message responses to data input indicate unexpected conditions or syntax errors. An unexpected condition might be the truncation of an input line that contains more 80 characters, or the attempt to insert an input line that is not to replace any existing lines.

## MESSAGE OUTPUT

In addition to the messages mentioned above, terminal output includes messages that are not direct responses to input. Messages sent to a user by the central operator or by other terminal users belong to this category of message output. Notification messages are generated when conversationally submitted jobs terminate, either normally or abnormally. Since users continue to enter commands while jobs are executed in the background, job notification messages occur independently of commands being entered at the time jobs terminate. A message indicating a closedown of the system is not related to input entered at a terminal, since closedown is initiated at the central installation.

Messages that are not immediate responses to commands are delivered to a terminal just prior to the entry of a command. They do not appear while a user is entering lines in input mode. With the exception of messages generated by the central operator or by a terminal user, all CRJE messages -- response messages and other messages -- are identified by message codes. The terminal user can request, with the LOGON command, that these message codes be included in all messages sent to him. Otherwise, message codes are not sent with messages that are self-explanatory in the context of the terminal-system dialogue.

## DATA OUTPUT

Data output is received at a terminal only when a user requests its delivery. This output can be the contents of a specific CRJE or OS data set, or it can be SYSOUT output of a conversationally submitted job.

## Request for Output

One command and one subcommand are available for requesting data output. The OUTPUT command is used to list the SYSOUT output of a job submitted by the user entering the command. The LIST subcommand is used to list lines of the active data set. The active data set can, of course, be a copy of a CRJE data set, an OS data set, or a data set currently being built.

Job output can be requested with the OUTPUT command by simply specifying the jobname. After an output data set in the CRJE SYSOUT class is returned in its entirety, the data set is scratched. Therefore, only one copy of SYSOUT output can be obtained.

Lines of a data set in the active area can be listed as often as desired, since the active data set is not scratched until the END subcommand is issued. Any data set that can be specified in the EDIT command can be listed by line number. Records of OS data sets are assigned line numbers as they are copied into the active area. Logical records greater than 80 characters in length are transformed into an integral number of 80-byte records in the active area. If the record length is not more than 120 bytes, the active data set records are reformatted so that they can be listed, one logical record per line, at the terminal. Otherwise, the output is printed at the terminal in 80-character lines.



Interruption of Output

The terminal user can discontinue the transmission of output to his terminal. If his terminal has an interrupt feature, he can discontinue receiving output at any time by following the procedure described under Terminal Operational Characteristics. If a terminal does not have an interrupt feature, output is returned in groups of lines, and the user can interrupt the output between groups of lines. The number of lines in a group is specified at the central installation in the CRJE assembly.

If job output, requested by the OUTPUT command, is discontinued, the data set

being delivered is not scratched. The user can resume receiving the output that was discontinued or can skip, and thereby delete, the data set that was discontinued, by entering a CONTINUE command. To be effective, the CONTINUE command must be entered during the same session during which the interrupt occurred and before another OUTPUT command is entered.

If listing of lines of the active data set is discontinued, the LIST request is assumed to be satisfactorily completed. The user may, of course, continue the listing or list lines again by entering another LIST subcommand.

## TERMINAL OPERATIONAL CHARACTERISTICS

For each of the three terminals supported by CRJE -- the 1050 Data Communications System, the 2740-1 Communications Terminal, and the 2741 Communications Terminal -- there are procedures defined for entering lines of input, cancelling lines, correcting lines, interrupting output, and handling error conditions. These procedures are defined for each of the terminals supported.

### 1050 DATA COMMUNICATION SYSTEM

After power is turned on at the terminal, and, for switched connections, line connection has been established by dialing the central installation, the terminal user conducts his session by typing lines on the keyboard. Input lines consist of commands and subcommands requesting system services, or lines of data.

Operating procedures for the 1050 appear in the publication IBM 1050 Operator's Guide, Form A24-3125.

### ENTERING LINES

Initiation of a line entry varies according to whether or not the terminal is equipped with the Keyboard Request special feature, which provides an additional key, the Request Key.



Figure 10. 1052 Keyboard

Without a Request Key: In order for the terminal user to communicate with the central system, the 1052 Keyboard switch must be set to SEND. The terminal user can enter a line whenever the Proceed light is on and the Resend light is off. The keyboard is unlocked when the Resend light goes off.

With a Request Key: The user depresses the Request key prior to the entry of a line if any output has been received at his terminal since the entry of his last line. If there is no output to be received following the entry of a line, the Resend light goes out and the keyboard is unlocked, indicating that another line can be entered.

Ending a line entry depends upon whether the automatic EOB special feature is installed on the terminal. The automatic EOB feature causes the End-of-block (EOB) line control character to be generated automatically when the Return key is depressed and the EOB switch is set to Auto.

With automatic EOB: The end of a line is indicated when the EOB key (alternate coding and 5) or Return key is depressed. The user must terminate each command or subcommand and each line of data by depressing the EOB or Return key.

Without automatic EOB: The end of a line is indicated when the EOB key (alternate coding and 5) or the Return and EOB keys are depressed.

Note: A carrier return character immediately preceding EOB is deleted.

### INTERRUPTING OUTPUT

Data output is sent to 1050 terminals in groups of "n" lines, where "n" is specified in the CRJE assembly. The user can discontinue or continue receiving the output between each group by taking appropriate actions. This action varies as follows:

Without a Request Key: If the keyboard switch is set to the OFF position, the user does not have to take any action to continue receiving the output. If the keyboard switch is set to SEND, the Proceed light comes on, and the user must take positive action to either discontinue or continue receiving output. To receive the next "n" lines, the user just enters EOB (or Return if using automatic EOB) with a

null line of input. To receive the remaining output requested by the last command, the user enters one space followed by the end-of-line sequence. To discontinue, the user proceeds with his session by entering his next command.

With a Request Key: No user action is required to continue receiving the output. If output is to be discontinued, the user must depress the Request key at some time prior to the break in output.

#### USING THE 1053

Although no special programming support is provided for the 1053, CRJE's use of the common addressing character permits the 1053 to be used as an output device. Output can be directed to an IBM 1053 Printer attached to the 1050 system by setting appropriate switches on the 1052 panel. If the Printer 1 switch is set to HOME and the Printer 2 switch is set to SEND REC, then any output received at the terminal is listed on the 1053 printer. This procedure provides a convenient means of directing bulk output to an alternate printer (the 1053).

#### CANCELLING LINES

Any time prior to entering the end-of-line sequence, the user can cancel the entire input line by depressing the Back Space Key immediately followed by the end-of-line sequence. The current line is ignored, and the user is allowed to enter another line.

#### CORRECTING A LINE

The user can correct erroneous characters in a line that has not yet been terminated by an end-of-line sequence. This is accomplished by backspacing to the first character in error. Starting with this character, the user retypes the remainder of the line. The characters and spaces entered replace the originally typed characters and spaces. To prevent overprinting when the correction is typed, the user may manually move the paper up one or two lines.

#### HANDLING ERROR CONDITIONS

Error conditions are indicated by lights on the 1052 Printer-Keyboards.

RECEIVE ALARM light: This light is turned on if there is an incorrect switch setting, if paper is required, or if paper is not properly inserted.

DATA CHECK light: When power is turned on, this light comes on and can be turned off by depressing the Data Check key.

If the Data Check light comes on while output is being received, a transmission error has occurred. The light is turned off by depressing the Data Check key. If the transmission is not successful within three retries, the user's session is automatically terminated and his active data set is saved.

If the Data Check light comes on while entering lines, the user should turn off the light by depressing the Data Check key and should reenter the input line. If the error persists during three retries, the user's session is automatically terminated.

RESEND light: This light is turned on each time a line is entered. If it remains on over an extended period of time (perhaps a minute), a transmission error may have occurred. The light should then be turned off by depressing the Resend key, the line reset by depressing the Attention Line Reset key, and input requested by depressing the Request key, if present. When the Proceed light comes on, the user can continue with his next line.

#### 2740 COMMUNICATIONS TERMINAL

After power is turned on at the terminal and, for switched connections; the line connection has been established by dialing the central installation, the terminal user can proceed with his session. The Local/Communicate key must be set to Communicate.

Complete operating instructions for the 2740 are given in the publication IBM 2740/2741 Communications Terminal - Operator's Guide, Form A27-3001.



Figure 11. 2740 Keyboard

## ENTERING LINES

The Bid key is used to request control of the communication line preceding the entry of a line if it is the first input line of the session (i.e., LOGON), or if any output has been received at the terminal since the entry of the last line. After the Bid key is depressed, the Transmit light is turned on and the keyboard is unlocked. If no output is returned following the entry of a line, then the user may enter another line when the Restart (RST) light goes off and the keyboard is unlocked.

Ending a line entry depends upon whether the automatic EOB feature is installed on the terminal. The automatic EOB feature causes the end-of-block (EOB) line control character to be generated automatically when the RETURN key is depressed.

With automatic EOB: The end of a line is indicated when the EOB key or the Return key is depressed. When using the automatic EOB feature, the Auto CK (auto check) switch located on the left side of the 2740 cabinet must be set to Mplx (multiplexer). If this switch is set to OFF, operational procedures are the same as those for a terminal without automatic EOB.

Without automatic EOB: The end of a line is indicated when the EOB key or the Return and EOB keys are depressed.

Note: A carrier return character immediately preceding EOB is deleted.

## CANCELLING LINES

Any time prior to entering the end-of-line sequence, the user can cancel the entire input line by depressing the Back Space key immediately followed by the end-of-line sequence. The current line is ignored, and the user is allowed to enter another line.

## CORRECTING A LINE

The user can correct erroneous characters in a line that has not yet been terminated by an end-of-line sequence. This is accomplished by backspacing to the first character in error. Starting with this character, the user retypes the remainder of the line. The characters and spaces entered replace the originally typed characters and spaces. As a convenience to prevent overprinting when the correction is typed, the user may manually move the paper up one or two lines.

## INTERRUPTING OUTPUT

Data output is sent to 2740 terminals in groups of "n" lines, where "n" is specified in the CRJE assembly. At each of these logical breaks, the user can discontinue or continue receiving the output by taking the appropriate positive action. To receive the next "n" lines of output, the user depresses the Bid key followed by the EOB key, or Return key if the terminal has automatic EOB, with a null line of input. To receive the remaining output requested by the last command, the user depresses the Bid key and enters one space followed by the end-of-line sequence. To discontinue receiving output, the user enters his next command by depressing the Bid key and entering the line, followed by the end-of-line sequence.

## HANDLING ERROR CONDITIONS

The Restart (RST) light indicates error conditions on the 2740 terminal. This light comes on each time a line is terminated. If the light does not go off within a minute, a transmission error has occurred. Depressing the Restart key turns the light off and unlocks the keyboard. The user should then retransmit the line. After three retries, the user's session is terminated automatically and his active data set is saved. The communication line should be checked.

The Restart light is also turned on if an error occurs while output is being received. The transmission is retried three times, and if the error persists, the user's session is terminated automatically.

## 2741 COMMUNICATIONS TERMINAL

After power is turned on at the terminal and, for switched connections, the line connection is established by dialing the central installation, the terminal user can proceed with his session. The Local/Communicate switch must be set to Communicate.

Complete operating procedures for the 2741 are described in the publication IBM 2740/2741 Communications Terminal - Operator's Guide, Form A27-3001.

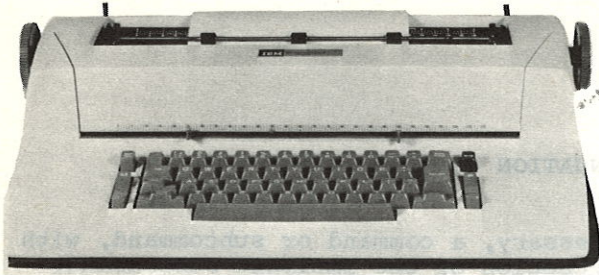


Figure 12. 2741 Keyboard

#### ENTERING LINES

A line can be entered whenever the terminal keyboard is unlocked. The keyboard is unlocked when power is turned on and the Local/Communicate switch is set to Communicate, and after output is received. If no output is received following the entry of a line, the unlocking of the keyboard is accompanied by a slight movement of the print element.

The user must terminate each line with the end-of-line sequence, which is generated by depressing the Return Key.

#### CANCELLING LINES

Any time prior to entering the end-of-line sequence, the user can cancel the entire input line by depressing the Back Space Key immediately followed by the end-of-line sequence. The current line is ignored, and the user is allowed to enter another line.

#### CORRECTING A LINE

The user can correct erroneous characters in a line that has not yet been terminated by an end-of-line sequence. This is accomplished by backspacing to the first character in error. Starting with this charac-

ter, the user retypes the remainder of the line. The character and spaces entered replace the originally typed characters and spaces. As a convenience to prevent overprinting when the correction is typed, the user may manually move the paper up one or two lines.

#### INTERRUPTING OUTPUT

The procedure for interrupting output being received at a 2741 terminal depends upon whether the terminal has the Interrupt special feature.

With Interrupt Feature: Output is sent without logical breaks, and the user can stop the output at any time by depressing the attention key. He then proceeds to enter his next line of input, followed by carrier return.

Without Interrupt Feature: Data output is sent in groups of "n" lines, where "n" is specified in the CRJE assembly. At each of these logical breaks, the user can discontinue or continue receiving the output by taking the appropriate action. To receive the next "n" lines, the user depresses either the Attention Key or the Return Key with a null line of input. To receive the remaining output requested by the last command, the user enters one space followed by carrier return. To discontinue receiving output, the user enters his next command followed by carrier return.

#### HANDLING ERROR CONDITIONS

If the keyboard is locked for an extended period of time, the communication line connection may be broken. If after a minute the keys are still locked, the Attention Key should be depressed. No response to this action indicates a line error. The user's session is terminated and his active data set is saved. If operating on a switched line, the line connection must be reestablished. The user must reinitiate his session by entering a LOGON command.

TERMINAL COMMAND LANGUAGE

COMMAND FORMAT

The general format of command language statements is:

Operation	Operand
A command verb, a subcommand verb, or the abbreviation of a subcommand verb.	One or more operands separated by delimiters. (This field may be blank).

The operation field contains a verb, or the abbreviation of a verb, that identifies the command or subcommand and its requested action. The verb or abbreviation must be entered exactly as shown in the command format illustration.

The operand field may be blank for certain commands and subcommands or may contain one or more operands that either provide required information or request optional system actions. Operands may be positional or keyword. A positional operand consists of a symbolic name (e.g., dsname or jobname), a character string, or one or two numbers specifying a line, a range of lines, or a starting line and increment value. Positional operands must be first in the operand field and must appear in a prescribed order. Keyword operands may appear in any order following the positional operands. Keyword operands are distinguished by a keyword, which must be entered exactly as illustrated. A keyword operand may be followed by a parameter enclosed in parentheses, e.g., ACCT (account information).

Commands may be entered as either upper or lower case alphabetic characters.

DELIMITERS

Delimiters are used to separate the operation field from the operand field and to separate operands in the operand field. With the exception of the Implicit subcommand, delimiters may be one or more blanks, a single comma, or a combination of a single comma and one or more blanks.

CONTINUATION

If necessary, a command or subcommand, with the exception of the Implicit subcommand, may be continued from one line to the next. The division can be made only between operands, however. The user immediately precedes the end-of-line sequence with a hyphen (-) to indicate that the next line is a continuation line. The end-of-line sequence may vary according to the type of terminal. (See Terminal Operational Characteristics.) The first operand in the continuation line may be preceded by delimiters.

COMMAND NOTATION

The following section gives a detailed description of the commands and subcommands in the CRJE terminal command language. The commands are presented in alphabetical order. The EDIT subcommands are presented following the EDIT command, with the Implicit subcommand first and the other subcommands following in alphabetical order. Each description includes the following:

1. The command name.
2. A brief functional description.
3. Command format illustration.
4. A description of the operands.
5. A description of the command, discussing what the command does from a user's standpoint, explaining any restrictions and limitations, and providing programming notes.

FORMAT ILLUSTRATION CONVENTIONS

Several conventions are followed in illustrating the format of the terminal command language:

- Upper case letters, numbers, and punctuation marks must be entered 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 user must substitute specific information or specific values.
- Items or groups of items within brackets, [ ], are optional; they may be omitted at the user's discretion. Any item or group of items not within brackets must be coded.
- Braces, { }, enclose 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 entered by the user.
- If an alternative item is underlined, that item is implied. That is, if none of the items are specified, the underlined item is assumed to be the user's choice.
- An ellipsis, ..., indicates that the preceding item or group of items can be entered more than once in succession.

#### TERMINOLOGY

Following is a list of terms used in the command description. The definition follows the term.

##### dsname

The name of a data set. The data set can be a CRJE data set or an OS data set accessible through CRJE. The name can take several forms, depending upon the type of data set being referred to.

##### dsname [(userid[key])]

This is the format for a CRJE data set name. The dsname, userid, and key symbols are separated using the same delimiters that are valid between operands. The userid and key specifications must be enclosed in parentheses.

dsname: The 1-8 character name that is assigned to a CRJE data set in the EDIT command or in the SAVE subcommand. This corresponds to a member name in the user's library.

userid: The 1-8 character identification of the user in whose library the data set resides.

key: A three-character protection key that can be assigned to a CRJE data

set when it is stored using the SAVE subcommand.

##### 'dsname[(member name)]'

This is the format for an OS data set name. The dsname and member name symbols cannot be separated by blanks or commas. The entire operand must be enclosed by single quotes. The member name must be enclosed by parentheses.

dsname: The full name, including qualifiers, of the OS data set. If the data set is to be deleted by means of the DELETE command, the first qualifier must be the userid of the user entering the command.

member name: The simple name, enclosed by parentheses, that specifies a member of a partitioned data set.

##### increment

The numeric value used to develop successive line numbers in a data set. A value of 10 is assumed when no increment is specified.

##### jobname

The 1-8 character symbol specified in the name field of a JCL JOB statement. This consists of 1-8 alphameric characters, the first of which must be alphabetic.

##### key

A three-character key assigned to a CRJE data set for protection. The characters can be alphabetic, numeric, or special.

##### linenum

Line number: a 1-8 character number that specifies the number associated with an existing line or that specifies the number to be assigned to a line currently being entered.

##### password

An identifier used for the password, consisting of 1-8 alphameric characters, the first of which must be alphabetic. A password is assigned to each user by the central installation.

##### userid

The identification assigned to a user. This consists of 1-8 alphameric characters, the first of which must be alphabetic.

##### CANCEL

The CANCEL command is used to remove a job from the CRJE system.

Operation	Operand
CANCEL	jobname

jobname

Specifies the name of the job that is to be removed. The jobname is the name specified in the name field of the Job Control Language JOB statement.

The user can cancel any job that he has previously submitted. The job can be cancelled while it is still on the operating system job queue waiting to be initiated, while it is currently being executed, or after it has terminated either normally or abnormally. When the job is actually removed from the system depends upon its status at the time the CANCEL is entered. If the job is on the job queue, it is flagged to be removed from the system when it is initiated. If the job is being executed, the CANCEL is effective immediately. If the job is completed, all of that job's output that is in the CRJE SYSOUT class is deleted. If some of the output has already been listed, but transmission was interrupted, then all the remaining output is deleted.

When the job is actually removed from the system, the user receives a message indicating that the job is deleted. Not until that message is received can the user submit another job with the same jobname.

### CONTINUE

Used in conjunction with the OUTPUT command, the CONTINUE command requests that output that was previously interrupted be resumed.

Operation	Operation
CONTINUE	[H[ERE] B[EGIN] N[EXT]]

H[ERE]

Specifies that transmission of output is to be resumed with the first record of the SYSOUT block that was being written when the output was discontinued. If records are blocked, there is a possibility of duplicate records since transmission is resumed at the beginning of a block rather than with a specific record.

B[EGIN]

Specifies that output is to be continued starting with the beginning of the data set that was being transmitted when output was discontinued. If system messages were being transmitted when output was interrupted, output is resumed with the beginning of the block of messages that were being transmitted. Thus, BEGIN and HERE have the same effect if system messages were being delivered when output was discontinued.

N[EXT]

Specifies that output be continued at the beginning of the next SYSOUT data set for the job. The data set that was being transmitted when output was interrupted is deleted. If the interruption occurred during the transmission of system messages, output is resumed with the next block of messages or, if that was the last block of messages, with the next data set.

The CONTINUE command is only valid after the user has discontinued receiving CRJE SYSOUT output that he previously requested with the OUTPUT command. This OUTPUT command must have been entered during the user's current session and must be the last OUTPUT command entered prior to the entry of the CONTINUE command. If a new session is in progress, the user must reenter an OUTPUT command in order to receive the remaining output of a job. The OUTPUT command can also be entered to continue receiving output that was interrupted in the same session. The results would be the same as those following a CONTINUE BEGIN command, unless the OUTPUT command requests system messages, in which case all system messages are retransmitted instead of only the current block of messages.

### DELETE

The DELETE command is used to scratch an OS data set or to remove a CRJE data set from the user's own library.

Operation	Operand
DELETE	dsname [P[URGE] NOP[URGE]]

dsname

Specifies the name of the data set to be deleted. Depending upon whether the data set is a CRJE data set or an OS data set, this operand takes one of two forms:



dsname: Specifies the simple name of a CRJE data set. The data set must reside in the library of the user entering the command.

'dsname[(member name)]': Specifies the fully qualified data set name of an OS data set. The first qualifier of the dsname must be the userid of the user entering the command. This operand can also specify a member of an OS partitioned data set. The entire operand must be enclosed in single quotes.

**P[URGE]**

Specifies that the expiration date of an OS data set be ignored. If this operand is omitted and the expiration date has not passed, the data set is not deleted.

**NOP[URGE]**

Specifies that an OS data set be deleted only if the expiration date has passed. This is a default option.

When a CRJE data set is removed from the user's library, the space occupied by that data set becomes available only after the library has been condensed to make space available to save a data set.

The catalog entry of an OS/data set is deleted if the data set is sequential or if it is partitioned and no member name is specified in the dsname operand. The catalog entry is not deleted if a member of a partitioned data set is specified.

The user should delete OS data sets created by jobs he has submitted as soon as there is no longer any need to retain them. By so doing, he avoids tying up storage space at the central installation.

**EDIT**

The EDIT command is used to initiate updating operations on a copy of a CRJE or OS data set or to initiate the creation of a new CRJE data set.

Operation	Operand
EDIT	dsname [NEW] [NUM] [S[CAN] NOS[CAN]] [OLD] [NONUM] [PL1[(integer1 integer2)] [C[HAR]48]] [C[HAR]60]] DSLIST CLIST DATA TEXT

**dsname**

Specifies the name of the CRJE data set to be created, or the name of a CRJE or OS data set to be updated. This operand is required and must be the first operand entered. If a data set is to be created, the operand NEW must also be specified. If the operand OLD is specified or if neither NEW nor OLD is specified, the data set is to be updated. If it does not exist, the user will be notified. The format of dsname depends upon whether the data set is in a CRJE user library or on the OS system catalog.

**dsname[(userid [key])]**

Specifies the CRJE data set to be created or updated.

dsname: specifies the simple name of a data set to be created or an existing data set in the library of the user entering the command.

dsname (userid): Specifies the name of an unprotected data set that exists in the library of the user identified by userid.

dsname (userid key): Specifies the name of a protected data set that exists in the library of the user identified by userid. Key specifies the protection key assigned to the data set.

**'dsname[(member name)]'**

Specifies the fully qualified name of an OS data set residing on a direct access storage device. Only cataloged sequential data sets and members of cataloged partitioned data sets are valid.

**NEW**

Specifies that a new data set is to be created. The dsname operand must be the simple name of a CRJE data set.

**OLD**

Specifies that a data set is to be

updated. The dsname operand must specify an existing CRJE or OS data set.

#### NUM

Specifies that line numbers are to be maintained as the last 8 characters of lines that are entered in input mode. This operand assigns the SEQ sequence attribute to a CRJE data set. If this operand is specified, the user can enter only 72 characters of data input per line. This operand should not be specified for an OS data set. If specified, the last 8 characters of each record in the active data set are overlaid with a line number, and the records will be treated as 80-character records.

#### NONUM

Specifies that line numbers are not to be maintained as the last 8 characters of lines entered in input mode. If this operand is specified, the CRJE data set is assigned the NOSEQ sequence attribute. If this operand is omitted and a new data set is to be created, the SEQ sequence attribute is assumed and line numbers will be kept within the records.

#### S[CAN]

Specifies that the automatic syntax scan by statement is to be invoked for all lines subsequently entered in input mode. If this operand is omitted, input lines will not be scanned.

#### NOS[CAN]

Specifies that lines subsequently entered in input mode are not to be scanned for syntax errors. This is a default option.

#### PL1

#### DSL1

#### CL1

#### DATA

#### TEXT

Specifies the content attribute for the active data set. The specified attribute replaces the currently assigned attribute of an existing CRJE data set. The DATA attribute is assumed if this operand is not specified and a data set is to be created (i.e., the NEW operand was specified). The attributes that can be assigned are as follows:

PL1 [([integer1 integer2] [C[HAR]48] [C[HAR]60])]

Indicates PL/I source language statements. These statements can be scanned for syntax errors if the

installation included the PL/I Syntax Checker in the OS system generation and CRJE startup procedure. C[HAR]60 and C[HAR]48 specify whether the 60-character set or the 48-character set is used in source statements. C[HAR]60 is the default option. Integer1 specifies the left source margin. Integer2 specifies the right source margin. The default option is 2 (left) and 72 (right).

#### DSL1

Indicates names of CRJE data sets. When a data set with this attribute is specified in a SUBMIT command, the contents of all data sets named in the list are entered into the OS input stream.

#### CL1

Indicates a list of CRJE terminal commands and/or subcommands that may be executed via the EXEC command.

#### DATA

Indicates data in which alphabetic characters are to be maintained in upper case. Lower case alphabetic characters entered in input mode will be translated to upper case.

#### TEXT

Indicates data in which alphabetic characters are to be maintained in upper and lower case, exactly as entered.

When the EDIT command is entered, space in the active area is assigned. If OLD is specified, the data set is copied into the active area to serve as the active data set. The active data set exists until the END subcommand is entered. If the user wishes to retain the active data set as a permanent data set in his CRJE library, he must store it using the SAVE subcommand.

If a CRJE data set is to be updated, its data set attributes are not changed unless specifically indicated by the operands that are entered. If operands that assign attributes are omitted, the currently assigned attributes are not changed.

If NEW is specified, input mode is entered, and the user will be prompted for input lines for the active data set. Line numbering begins with line number 10 and proceeds in increments of 10. The line numbering scheme can be varied with the INPUT subcommand. The user can enter edit mode to submit a subcommand by entering a null line of input.

If an OS data set is specified, the data set or member must exist. For reference purposes, line numbers are assigned as the records are copied into the active area.

Each logical record is transformed into an integral number of 80-byte records, with blanks as padding to the right in the last line of each set, if necessary. Line numbers are assigned in increments of 10, starting with line number 10. If the length of the input records does not exceed 120 bytes, then the entire input record is printed on one line when specified in the LIST subcommand.

Edit mode is entered if the data set is to be updated. In edit mode, the user can enter any of the EDIT subcommands in performing his updating operations. Updating operations include inserting, deleting, changing, replacing, copying, renumbering, scanning, and listing lines in the active data set. Other data sets can be merged with the active data set. While in edit mode, the user can submit and cancel jobs. The valid EDIT subcommands are the Implicit subcommand, CANCEL, CHANGE, DELETE, END, INPUT, LIST, MERGE, RENUM, SAVE, SCAN, SUBMIT, and TABSET. The descriptions of these subcommands follow.

#### IMPLICIT SUBCOMMAND

The Implicit subcommand can be used to enter or delete lines in the active data set while in edit mode.

Operation	Operand
(no operation verb)	linenum[Δtext]

#### linenum

specifies the line number of the line to be deleted or entered. If this is the only operand, the line with the specified line number is deleted. If accompanied by the text operand, the line number specified is assigned to that line of text.

#### Δtext

Specifies the text to be entered as the line with the line number specified in the preceding operand. If a line with the specified line number exists, it is replaced. If one does not exist, the line is inserted. The delimiter Δ must be a single blank or a single comma. The text can consist of up to 80 characters (or 72 if the data set has the SEQ attribute).

The Implicit subcommand allows the user to enter lines in the active data set without being in input mode. Only one line can be entered at a time. No line number prompts are received. The user is not

notified as to whether a line has been inserted or whether it has replaced an existing line.

#### CANCEL

The CANCEL subcommand is used to remove a job from the CRJE system. It has the same function as the CANCEL command.

Operation	Operand
CA[NCCEL]	jobname

#### jobname

Specifies the name of the job that is to be removed. The jobname is the same name specified in the name field of the JCL JOB statement.

The user can cancel any job that he has previously submitted. The job can be cancelled while it is still on the operating system job queue waiting to be initiated, while it is currently being executed, or after it has terminated either normally or abnormally. When the job is actually removed from the system depends upon its status at the time the CANCEL is entered. If the job is on the job queue, it is flagged to be removed from the system when it is initiated. If the job is being executed, the CANCEL is effective immediately. If the job is completed, all of that job's output that is in the CRJE SYSOUT output class is deleted. If some of the output has already been listed but transmission was discontinued, then all the remaining output is deleted.

When the job is actually removed from the system, the user receives a message indicating that the job is deleted. Not until that message is received can the user submit another job with the same jobname.

#### CHANGE

The CHANGE subcommand is used to replace a character string in a line or a group of lines of the active data set.

Operation	Operand
C[HANGE]	linenum [linenum] Δtext <sub>1</sub> Δtext <sub>2</sub> [Δ[A[LL]]]

linenum [linenum]

Specifies the line or the range of lines to be affected by the change. If a range is specified, those lines with line numbers ≥ the first line specified and ≤ the last line number specified are affected.

This command causes every occurrence of the characters 46 in line number 50 to be replaced by the characters 1234.

line 50 (before): A46AAA46AAAAA  
line 50 (after): A1234AAA1234AAAAA

Δtext<sub>1</sub>Δtext<sub>2</sub>

Specifies the character string to be replaced - text<sub>1</sub> - and the replacement characters - text<sub>2</sub>. Δ is a single character that delimits the character strings. Δ can be any printable, non-numeric character other than a comma. Obviously, Δ cannot appear in either character string. Each character string can contain up to 40 characters. If text<sub>2</sub> contains more characters than text<sub>1</sub>, the line will be expanded to accommodate the additional characters. If expansion results in more than 80 characters, the line will be truncated after position 72 for a data set with the SEQ attribute, or after position 80 for a data set with the NOSEQ attribute. The user will be notified if truncation occurs. If text<sub>1</sub> is longer than text<sub>2</sub>, the line is compressed. Positions 73-80 are not affected if the data set has the SEQ attribute.

DELETE

This subcommand is used to remove a line or a group of lines in the active data set.

Operation	Operand
D[DELETE]	[[linenum [linenum]]]

no operand

Specifies that the last line of text entered in input mode is to be deleted.

linenum [linenum]

Specifies the line or the group of lines to be deleted. If a range of lines is specified, those lines with line numbers ≥ the first line number specified and ≤ the last line number specified are deleted.

Δ[A[LL]]

Specifies that every occurrence of text<sub>1</sub> is to be replaced by text<sub>2</sub>. If ALL is not specified, only the first instance of text<sub>1</sub> in each line is replaced.

END

The END subcommand terminates creating and updating operations.

CHANGE is an EDIT subcommand and can only be entered in edit mode. All of the operands are positional and must be entered as they appear in the illustration.

Operation	Operand
END	(no operand)

Example 1.

C 50,70 /46/3

This subcommand causes the character 3 to replace the characters 46 the first time they appear in each line from line number 50 through line number 70 of the active data set.

When the END subcommand is entered, the active data set is deleted. Subsequent EDIT subcommands are not valid until another EDIT command is entered.

line 50 (before): A46AAA46AAAAA  
line 50 (after): A3AAA46AAAAA  
line 60 (before): BBB4646BBBBB  
line 60 (after): BBB346BBBBB  
line 70 (before): 46CCCCCCC46C  
line 70 (after): 3CCCCCCC46C

INPUT

The INPUT subcommand allows the user to enter lines of input into the active data set. The user can specify replacement only, insertion only, or a combination of the two. Input mode is entered as a result of the INPUT subcommand.

Example 2.

CHANGE 50 \*46\*1234\*ALL

Operation	Operand
I[INPUT]	[linenum [R [[increment] [I]] [RE[PLY] [NOR[EPLY]]]

#### linenum

Specifies the line number of the first line of text to be entered in input mode. Line numbering begins with the specified number and will continue in increments of whatever line increment attribute was assigned to the data set. If a line number exists, the existing line is replaced by the line that is entered. If a line number does not exist, the input line is inserted following the next lowest-numbered line.

#### linenum increment

Specifies the line numbering scheme for the lines subsequently entered in input mode. Line numbering begins with the first number specified and proceeds in increments as specified. If a line number exists, the existing line is replaced by the input line. If a line number does not exist, the input line is inserted following the next lowest-numbered line.

#### linenum [increment] I

Specifies that the lines subsequently entered in input mode are to be inserted only, beginning with the specified line number. If an increment is not specified, 1 is assumed. If a line number is generated that is greater than or equal to an existing line number, the user will receive an error message.

#### linenum R

Specifies that lines subsequently entered in input mode are to replace the existing lines, starting with the specified line number. If the specified line does not exist, the user will receive an error message.

#### RE[PLY]

Specifies that a line number prompt is to be printed prior to each line subsequently entered in input mode.

#### NOR[EPLY]

Specifies that line number prompts are to be printed for lines subsequently entered in input mode. If this operand is omitted, the line number prompts will be printed. The lines entered subsequently are numbered, even though the line numbers are not printed.

When an INPUT subcommand is submitted, input mode is entered, during which the user types in lines of data. If no line number is specified in the subcommand, line numbering begins following the last line of the active data set. The increment used is the line increment attribute assigned to the data set. To terminate input mode, the user enters a null line of input.

#### LIST

The LIST subcommand is used to display a line or a group of lines in the active data set.

Operation	Operand
L[IST]	[[linenum [linenum]] [NUM [NONUM]]

#### linenum [linenum]

Specifies the line or the range of lines to be listed. If a range is specified, those lines with line numbers  $\geq$  the first line specified and  $\leq$  the last line number specified are listed. If no line numbers are specified, the entire active data set is listed.

#### NUM

Specifies that line numbers are to be listed with the data. If the data set has the SEQ attribute, the line number will only be listed once.

#### NONUM

Specifies that line numbers are not to be listed with the data. Positions 73-80 are not printed if the data set has the SEQ attribute.

The user can terminate the listing by following the interrupt procedures defined for his terminal type. If the terminal does not have an interrupt feature, the listing is returned in groups of "n" lines, where "n" is an installation-defined value. The user can terminate the listing between groups of "n" lines. If the terminal has an interrupt feature, the listing proceeds without stopping. The user can interrupt at any time. In order to complete a listing that has been interrupted, the user must reenter the LIST subcommand specifying the lines he wants listed.

**MERGE**

The MERGE subcommand is used to combine a CRJE data set with the active data set or to copy lines from one place to another within the active data set.

Operation	Operand
M[ERGE]	{dsname} [[linenum linenum] {**} [linenum]

**dsname**

Specifies the CRJE data set to be combined with the active data set. This operand must have one of the following formats:

**dsname:** specifies a data set in the library of the user entering the command.

**dsname (userid):** specifies the name of an unprotected data set in the library of the user identified by userid.

**dsname (userid key):** specifies the name of a protected data set in the library of the user identified by userid. Key specifies the protection key assigned to the data set.

**\*\***

Specifies the active data set. This operand indicates that lines are to be copied from one place to another in the active data set.

**linenum linenum**

Specifies the range of lines to be inserted in the active data set. Those lines with line numbers  $\geq$  the first line number specified and  $\leq$  the last line number specified are inserted. If no line numbers are specified, the entire data set is inserted. This operand is positional in that, if entered, it must be entered following the dsname or \*\* operand.

**linenum**

Specifies the line number of the active data set after which the specified lines are to be inserted. If this operand is omitted, the lines are added following the last line of the active data set.

The lines that are inserted, and any subsequent lines in the active data set, are renumbered according to the line increment attribute of the active data set.

**Example:**

M ADD (USERA) 10,50 20

This command results in inserting lines 10-50 of the CRJE data set ADD, which is in the library of the user identified by USERA, into the active data set following line 20. After the insertion, the lines following line 20 in the active data set are renumbered.

Active data set (before)		ADD	
line		line	
10	SOURCE 1	10	ADD 1
20	SOURCE 2	20	ADD 2
30	SOURCE 3	30	ADD 3
40	SOURCE 4	40	ADD 4
.		50	ADD 5
.		60	ADD 6
.		70	ADD 7
110	SOURCE 11	80	ADD 8
120	SOURCE 12		

Active data set (after MERGE)	
line	
10	SOURCE 1
20	SOURCE 2
30	ADD 1
40	ADD 2
50	ADD 3
60	ADD 4
70	ADD 5
80	SOURCE 3
90	SOURCE 4
.	
.	
.	
160	SOURCE 11
170	SOURCE 12

**RENUM**

The RENUM subcommand requests that new line numbers be assigned to the lines in the active data set.

Operation	Operand
REN[UM]	[linenum [increment]]
	[10 [10]]

#### linenum [increment]

Specifies the numbering scheme to be used in renumbering the lines. Numbering begins with the specified line number and continues according to the specified increment. If the increment is not specified, an increment of 10 is used. The increment used becomes the line increment attribute of the data set.

#### no operand

Specifies that line numbering begin with 10 and proceed in increments of 10.

All of the lines in the active data set are renumbered. If the data set has the SEQ attribute, then the new line numbers are also retained in the last eight positions of the records.

#### SAVE

The SAVE subcommand is used to store the active data set in the user's CRJE library.

Operation	Operand
S[AVE]	[dsname] [K[EY](key)]

#### dsname

Specifies the simple name under which the active data set is to be stored. The name consists of 1-8 alphanumeric characters, the first of which must be alphabetic. If no dsname is specified, the dsname specified in the EDIT command is used.

#### K[EY](key)

Specifies that the data set be assigned the specified key for protection from unauthorized access. If this operand is specified, another user must enter the key as well as the dsname and userid in order to examine the data set. If a key is not specified, another user has access to the data set by supplying only the dsname and userid. Key can be any three character identifier.

The active data set can be saved only in the library of the user entering the command. The data set is stored with the attributes specified in the EDIT command.

If the OLD keyword was specified on the EDIT command, and either dsname is not specified on SAVE or the dsname on SAVE is the same as the dsname on EDIT, then the active data set replaces a CRJE data set with the same name.

If the NEW keyword was specified on EDIT, or if the dsname on SAVE is different from the dsname on EDIT, then CRJE checks for an existing CRJE data set with the same name. If a duplicate is found, the user is prompted for a new dsname. If the user responds with a null input line, then the active data set replaces the data set in the user's library.

If there is not enough space available in the user's library, the library is automatically condensed in order to free any unused space. If sufficient space is not available after condensation, the user receives a message indicating that the active data set cannot be saved. The user should submit the active data set for processing, if possible, since it will be deleted when the END subcommand is entered.

#### SCAN

The SCAN subcommand requests a syntax analysis of a statement or group of statements in the active data set. This subcommand is also used to control the automatic syntax scan of lines entered in input mode.

Operation	Operand
SC[AN]	[linenum [linenum]] [ON [OFF]]

#### linenum [linenum]

Specifies the line or the range of lines to be scanned. If a source statement does not end on the last line specified, scanning continues to the end of the statement or until the installation-imposed maximum number of lines is reached.

#### ON

Specifies that all lines subsequently entered in input mode are to be scanned for syntax errors.

#### OFF

Specifies that lines subsequently entered in input mode are not to be scanned for syntax errors.

The SCAN subcommand is valid only if the PL/I syntax scan facility was included in the OS system generation and CRJE startup

procedure. The active data set must have the PL1 content attribute, which is assigned with the EDIT command.

## SUBMIT

The SUBMIT subcommand is used to enter one or more jobs into the OS job input stream for batch processing.

Operation	Operand
SUB[MIT]	{dsname}... **

### dsname

Specifies a data set the contents of which are to be incorporated into the input stream. This must be the name of a CRJE data set and must have one of the following formats:

dsname: specifies the simple name of a data set in the library of the user entering the command.

dsname (userid): specifies an unprotected data set in the library of the user identified by userid.

dsname (userid key): specifies a protected data set in the library of the user identified by userid. Key specifies the protection key assigned to the data set.

\*\*

Specifies that the contents of the active data set are to be incorporated into the input stream.

Up to ten operands can be specified in one SUBMIT subcommand. The data sets are entered into the input stream in the order they are specified. If a data set with the DSLIST attribute is specified, the contents of all the data sets named in the DSLIST are submitted.

Records entered into the input stream are checked to verify that at least one JCL EXEC statement accompanies each JOB statement. The JOB statement and any continuation statements are checked by an installation exit routine, if one is provided. The user may receive messages generated by the installation exit routine. The exit routine may also request that the submission be aborted. Such a request does not affect any records encountered prior to the abort request.

The contents of the specified data sets are passed to the OS job management routines for batch processing. The user can continue with his session while the job is executed in the background. When the job is completed, the user will receive a message indicating normal or abnormal termination. The user may inquire about the status of jobs he has submitted by entering the STATUS command.

## TABSET

The TABSET subcommand is used to define tab settings for lines subsequently entered in input mode.

Operation	Operand
TAB[SET]	[num...] [OFF]

### num...

Specifies the tabulation settings for input lines. Each number specified indicates a position in the input record where a field is to begin. Depressing the TAB key at the terminal causes blanks to be inserted up to the next field in the record. A maximum of ten positions may be specified. If more than ten are specified, the first ten are used. The user is notified of the action taken.

### OFF

Specifies that subsequent tabulation is not to result in the insertion of blanks for maintaining fields in input records. Tab characters will not be translated. This is the default option if no operand is specified.

Once the TABSET subcommand has been entered, it remains in effect to the end of the current session, or until overridden by another TABSET subcommand.

The user is responsible for setting and resetting the physical tabs on his terminal. Any input lines required in setting or resetting tabs should be cancelled according to normal operating procedures. (See Terminal Operational Characteristics.)

## EXEC

The EXEC command is used to execute a series of commands contained in a CRJE data set.



Operation	Operand
EXEC	dsname [L[IST]] [NOL[IST]]

**dsname**

Specifies the data set that contains the sequence of commands to be executed. This must be a CRJE data set with the CLIST attribute. It can have one of the following formats:

**dsname:** specifies the simple name of a data set in the library of the user entering the command.

**dsname (userid):** specifies an unprotected data set in the library of the user identified by userid.

**dsname (userid key):** specifies a protected data set in the library of the user identified by userid. Key specifies the protection key assigned to the data set.

**L[IST]**

Specifies that each command in the command list is to be printed at the terminal prior to execution. If this operand is omitted, the commands will not be listed.

**NOL[IST]**

Specifies that the commands in the command list are not to be printed at the terminal.

The CLIST data set may contain commands and subcommands with the exception of LOGON, LOGOFF, and EXEC. The commands and subcommands are executed as if they were entered from the terminal. If a command or subcommand requires input from the terminal (for example, EDIT and INPUT), the normal messages or line number prompts are received at the terminal to request the input. If an error requires the user to reenter the command, execution of the CLIST is terminated. Execution of a CLIST is also terminated if a LOGON, LOGOFF, or EXEC command is encountered in the command list.

**LISTBC**

The LISTBC command is used to request a copy of the broadcast messages.

Operation	Operand
LISTBC	(no operand)

The broadcast messages contain information of general interest to all users. The messages are created and maintained by the central operator.

**LISTDS**

The LISTDS command is used to request information about a CRJE data set in the user's library.

Operation	Operand
LISTDS	dsname [S[TATUS]] [H[ISTORY]]

**dsname**

Specifies the CRJE data set about which information is requested. The data set must be in the library of the user entering the command. Accordingly, dsname is the simple name assigned to that data set. The attributes of the data set, and any information requested by other operands is returned to the user. This operand is required and must be the first operand specified.

**S[TATUS]**

Requests the size of the data set and an indication of whether the data set is assigned a protection key.

**H[ISTORY]**

Requests the following information about the data set: creation date (first time saved), date last modified (last time saved), and the number of times accessed since created.

To obtain the attributes, status, and history of all the CRJE data sets in the library, the LISTLIB command can be used.

**LISTLIB**

The LISTLIB command is used to list the names of all the CRJE data sets in the user's library with information about each.

Operation	Operand
LISTLIB	[S[TATUS]] [H[ISTORY]]

**no operand**

Requests the names and attributes of all the CRJE data sets in the library of the user entering the command.

### S[TATUS]

Requests, in addition to the names and attributes of the data sets in the user's library, the size of each data set and whether it is protected.

### H[ISTORY]

Requests, in addition to the names and attributes of the data sets in the user's library, the following information: creation date (first time saved), date last modified (last time saved), and the number of times accessed since created.

The attributes, status, and history of a particular CRJE data set can be obtained with the LISTDS command.

### LOGOFF

The LOGOFF command is used to terminate the user's session.

Operation	Operand
LOGOFF	(no operand)

After the user enters the LOGOFF command, the starting, ending, and elapsed time of his session is printed at his terminal. If the terminal is connected over a switched line (i.e., the connection was established by dialing), the line is disconnected.

The user's session is also terminated if a valid LOGON is entered from the active terminal. This avoids line disconnection if the terminal is attached to the central processor over a switched connection.

### LOGON

The LOGON command identifies the user and initiates his session.

Operation	Operand
LOGON	userid/password [A[CCT](accounting information)] [BC] [M[SGID]] [NOBC] [NOM[SGID]]

#### userid/password

Specifies the user's identification code and password. Each consists of 1-8 alphanumeric characters assigned to

the user by the installation. If either is invalid, the user will receive a message requesting the correct information. If the correct information is not supplied, the LOGON is rejected and, for switched connections, the line is disconnected.

### A[CCT](accounting information)

Specifies up to 33 characters of accounting information. The information is processed by an installation exit routine if one is provided. If an exit routine is not provided, this operand is ignored.

### BC

Requests a copy of the broadcast messages. Broadcast messages may also be requested with the LISTBC command.

### NOBC

Specifies that the broadcast messages not be listed. If this operand is omitted, the broadcast messages will be listed.

### M[SGID]

Specifies that message codes, or identifiers, are to be printed with terminal messages that are self-explanatory in the context of the session dialogue. The codes are not printed if this operand is omitted.

### NOM[SGID]

Specifies that message codes are not to be printed with terminal messages that are self-explanatory in the context of the session dialogue. This is a default option.

### OUTPUT

The OUTPUT command is used to request CRJE SYSOUT output of a conversationally submitted job.

Operand	Operand
OUTPUT	jobname [SMSG]

#### jobname

Identifies the job whose output is requested. If this is the only operand specified, only the data sets in the CRJE SYSOUT class are returned.

#### SMSG

Specifies that job management messages are to be returned in addition to output data sets.

Output that can be requested with the OUTPUT command consists of data sets and OS job management messages that are in the CRJE SYSOUT class. Data sets are directed to this class by specifying, in the JCL Data Definition (DD) statement, the SYSOUT class assigned to CRJE by the central installation during CRJE assembly. Messages are routed to the CRJE SYSOUT class if the MSGCLASS parameter of the JOB statement specified the CRJE SYSOUT class.

If the logical record size of an output data set exceeds the length of the print line of the terminal, the records are truncated to the number of characters that can be printed on one line.

After a SYSOUT data set has been transmitted in its entirety, the data set is deleted. The job management messages are deleted either after all of them have been transmitted or after all the output data sets of the job have been transmitted.

The terminal user can discontinue the transmission of output by following the interrupt procedures defined for his terminal type. The output is returned according to whether or not his terminal has an interrupt feature. If the terminal does not have an interrupt feature, the output is returned in groups of "n" lines, where "n" is an installation-defined value. The user can discontinue receiving output between groups of "n" lines. If the terminal has an interrupt feature, the listing proceeds without stopping. The user can interrupt at any time.

The CONTINUE command can be used to resume output listing that has been discontinued. The CONTINUE command must be entered during the same session in which the interrupt occurred, and must be entered before another OUTPUT command is entered. Otherwise, the OUTPUT command can be used to list the remainder of the job's output in the CRJE SYSOUT class.

SEND

The SEND command is used to send a message to the central operator or to another terminal user.

Operation	Operand
SEND	'text' [N[OW] L[OGON]] [U[SER](userid)]

'text'  
Specifies the text of the message to

be sent. This must be the first operand entered. If this is the only operand specified, the message is sent to the central operator. The message text may include as many as 40 characters. The single quotes enclosing the text may be omitted if there are no commas or blanks within the text. If single quotes are used to delimit the text, any single quotes to be included in the text (e.g., apostrophes) must be paired.

N[OW]  
Specifies that the message is to be delivered to a user only if he is currently logged on the system.

L[OGON]  
Specifies that, if the user to receive the message is not currently active, the message is to be delivered to him when he next logs on the system.

U[SER](userid)  
Specifies the userid of the terminal user to whom the message is to be sent.

Following the entry of a SEND command, the user will receive a message indicating the action that has been taken. This indicates whether the message is queued for delivery to an active user, delayed because the recipient is currently inactive, or ignored because the recipient is currently inactive.

STATUS

The STATUS command is used to request information about jobs the user has submitted.

Operation	Operand
STATUS	[jobname]

jobname  
Requests the status of the job identified by jobname.

no operand  
Requests a list of all the jobs submitted by the user, and the status of each job.

Only the user who submitted the job can request the status of it. A job is considered to be in the CRJE system as long as the CRJE SYSOUT class contains output for the job.

The status information returned indicates whether a job is scheduled for execution, is currently being executed, is completed, or is not in the system. If a job is scheduled for execution, its position on the job queue is provided.

**SUBMIT**

The SUBMIT command is used to enter one or more jobs into the OS job input stream for batch processing.

Operation	Operand
SUBMIT	dsname ...

**dsname**

Specifies a data set the contents of which are to be incorporated into the input stream. This must be the name of a CRJE data set and must have one of the following formats:

**dsname:** specifies the simple name of a data set in the library of the user entering the command.

**dsname (userid):** specifies an unprotected data set in the library of the user identified by userid.

**dsname (userid key):** specifies a protected data set in the library of the user identified by userid. Key specifies the protection key assigned to the data set.

Up to ten operands can be specified in one SUBMIT command. The data sets are entered into the input stream in the order they are specified. If a data set with the DSLIST attribute is specified, the contents of all the data sets named in the DSLIST are submitted.

Records entered into the input stream are checked to verify that at least one JCL EXEC statement accompanies each JOB statement. The JOB statement and any continuation statements are checked by an installation exit routine, if one is provided. The user may receive messages generated by the installation exit routine. The exit routine may also request that the submission be aborted. Such a request does not affect any records encountered prior to the abort request.

The contents of the specified data sets are passed to the OS job management routines for batch processing. The user can continue with his session while the job is executed in the background. When the job is completed, the user will receive a message indicating normal or abnormal termination. The user may inquire about the status of jobs he has submitted by entering the STATUS command.

Following is a list of messages that can appear at a remote terminal. The messages are listed in numerical order according to the message code number. Some of these messages may be received without message codes if the user so requests when he initiates his session.

Messages originated by terminal users or the central operator do not have message codes. This includes the broadcast messages. The message text in these cases depends upon the text specified by the sender of the message.

In this section, the term command refers to either a command or a subcommand unless specifically noted.

```
IHK300   OUT OF SPACE [ dsname
                       ACTIVE AREA
                       SYSOUT
                       ]
                       jobname
```

**Explanation:** There is either not enough main storage or not enough disk space to process the last command entered from the terminal.

1. dsname - Condensation of the user's library did not make enough space available to save the CRJE data set identified by dsname.

**System Action:** Processing of the SAVE subcommand is terminated. The contents of the active area are unchanged.

**User Action:** Submit the active data set for processing, if possible. If this is not possible, list the active data set, enter an END subcommand to end edit mode, delete any CRJE data sets in your library that are no longer needed, and recreate the active data set using the listing as a guide. Reenter the SAVE subcommand.

2. ACTIVE AREA - No more space is available in the active area.

**System Action:** Processing of the last command entered is terminated. The central operator is notified.

**User Action:** Allow a few minutes for other user's active data sets to be deleted. Then reenter the command.

3. SYSOUT - The main storage required for the SYSOUT data set buffer is not available.

**System Action:** The OUTPUT command is ignored.

**User Action:** Reenter the OUTPUT command. If the error persists, the blocksize of the SYSOUT data set may be too large. Either send the central operator a message to use CENOUT to write the job at the central installation, or cancel the job and resubmit it using a smaller SYSOUT blocksize.

4. jobname - The SUBMIT processor ran out of space while writing the job, identified by jobname, to disk. All input specified in the SUBMIT command prior to the designated job has been submitted to the operating system. Processing of the rest of the input specified in the SUBMIT command has been terminated.

**User Action:** Break the input stream into several smaller input streams. If this condition occurs frequently, request the system programmer at the central installation to increase the SPACE parameter on the data definition (DD) statement for your communications line.

5. None of the above - there was not enough space to process the last command entered.

**System Action:** Processing of the last command is terminated.

**User Action:** Reenter the command. If the error occurs frequently, notify the system programmer at the central installation.

IHK301 NO LOGONS ALLOWED

**Explanation:** The central operator has suppressed the initiation of additional sessions. This could be in preparation for system closedown or an attempt to reduce the system load.

**User Action:** Enter the LOGON command later.

IHK302 OPERAND INVALID [integer]

Explanation: The nth operand entered on the last command was not recognized; "n" is indicated by the displayed integer.

System Action: The command is ignored.

User Action: Correct the operand and reenter the command, or enter a new command.

IHK303 LOGON REJECTED BY INSTALLATION EXIT

Explanation: The routine supplied by your installation did not accept the LOGON command entered.

User Action: Correct the LOGON command according to the information required by your installation. Reenter the command.

IHK305 COMMAND VERB INVALID

Explanation: The last command entered at the terminal is invalid for one of the following reasons:

- The operation field of the command exceeds eight characters.
- The operation field of the command is numeric, rather than alphabetic.
- The command entered is not in the list of CRJE and user commands and aliases.

User Action: Enter a new command.

IHK306 COMMAND VERB INVALID IN EDIT MODE

Explanation: The terminal user is in the process of editing a data set in the active area and has entered a command that is not a valid EDIT subcommand.

User Action: The terminal user must perform one of the following actions:

- Enter a valid EDIT subcommand.
- Enter a SAVE subcommand to place the contents of the active area in the user's library. Enter an END subcommand to get out of edit mode. Then reenter the desired command.
- Enter an END subcommand to get out of edit mode. (The contents of the active area are lost if no

SAVE is issued before the END subcommand). Reenter the desired command.

IHK307 INVALID LINE NUMBER

Explanation: The line number entered on the last command from the remote terminal either is more than eight digits or contains a nonnumeric character.

User Action: Reenter the last command with the correct line number or enter a new command.

IHK308 LOGON REQUIRED

Explanation: A LOGON command must be the first command entered during each user's terminal session. A valid LOGON (with valid userid and password supplied either in the initial command or in response to prompting) has not been entered for the current user session.

User Action: Enter a LOGON command.

IHK309 COMMAND INVALID IN CLIST

Explanation: During the processing of a EXEC command, a LOGOFF, LOGON, or EXEC command was encountered in the CLIST data set.

System Action: Processing of the EXEC command is terminated. The next command to be processed must be entered from the remote terminal.

User Action: Enter the next command from the remote terminal. When all processing is complete for the data set currently in the active area, edit the CLIST data set and remove the invalid command.

IHK310 ILLEGAL CONTINUATION

Explanation: The last command entered from the remote terminal was continued incorrectly in one of the following ways:

- The operation field and the first full operand of a terminal command were not entered before a continuation indicator.
- Continuation was indicated at a place other than between two operands. A given operand must not be continued from one line of input to another.

User Action: Reenter the entire command or enter a new command.

IHK311 QUOTES NOT BALANCED

Explanation: The last command entered from the remote terminal contains unbalanced quote marks (').

User Action: Reenter the entire command or enter a new command.

IHK312 NO BROADCAST MESSAGES

Explanation: There are no current broadcast messages.

User Action: None.

IHK313 PARENTHESES NOT BALANCED

Explanation: An unequal number of left and right parentheses have been included in the last command entered from the remote terminal.

User Action: Enter the command correctly or enter a new command.

IHK314 TEXT DELIMITER MISSING

Explanation: One of the following conditions occurred on a CHANGE subcommand entered from the remote terminal:

- The character used as a delimiter for the character strings occurs in one or both of the character strings.
- The delimiter used between the character strings was not the first nonnumeric character in the first nonnumeric operand.

User Action: Enter the CHANGE command correctly or enter a new command.

IHK315 ILLEGAL TEXT DELIMITER

Explanation: The CHANGE subcommand entered from the remote terminal contains a text delimiter that is invalid for one of the following reasons:

- A numeric character was used as a delimiter for the character strings.
- The character used as the delimiter between the character strings was not the first character in the first nonnumeric operand.

User Action: Enter a correct CHANGE subcommand or enter a new command.

IHK316 TEXT LENGTH EXCEEDS <sup>{72}</sup>80 LINE TRUNCATED

Explanation: The last command entered from the remote terminal specified a line of input to the active data set. The length of the input line exceeded the allowable maximum. If line numbers are contained within the line, the maximum is 72 characters. Otherwise, the maximum is 80 characters.

System Action: The truncated line has been entered in the active data set.

User Action: If the truncated line is acceptable, continue with the next line.

If the truncated line is not acceptable, delete the line and reenter the excessively long line as two input lines.

IHK317 REQUIRED OPERAND OMITTED operand

Explanation: The last command entered from the remote terminal lacked the required operand specified by "operand".

User Action: Reenter the command, being sure to include all required operands or enter a new command.

IHK318 INVALID KEYWORD keyword

Explanation: The indicated value for the keyword was specified incorrectly on the last command entered from the remote terminal.

User Action: Reenter the entire command or enter a new command.

IHK319 MESSAGE LENGTH EXCEEDS 40

Explanation: The last terminal command entered was a SEND command that contained a message with text length greater than 40 characters.

User Action: Compress the message into 40 characters and reenter the command; break the message into two messages and enter one command for each message; or enter a different command.

IHK320 MESSAGE LIMIT EXCEEDED

Explanation: The maximum number of messages to be maintained in the user delayed message data set has been exceeded, and the message input via the SEND command has been ignored since the specified recipient of the message was not active.

User Action: None.

IHK321 MULTIPLE USE OF KEYWORD keyword

Explanation: A keyword operand specified by "keyword" has been coded more than once in the last command entered from the remote terminal.

User Action: Reenter the command or enter a new command.

IHK322 ABNORMAL CRJE CLOSEDOWN

Explanation: An irrecoverable error has caused the termination of the CRJE program.

User Action: None.

IHK323 INVALID RECIPIENT FOR JOB

Explanation: The last command input from the remote terminal was an OUTPUT command for a job that the user entering the command did not submit.

User Action: Enter a new command.

IHK324 JOB INCOMPLETE

Explanation: An OUTPUT command was entered at the remote terminal for a job that is not complete.

User Action: Enter a new command now and reenter the command after the job terminates.

IHK325 JOB NOT IN SYSTEM

Explanation: An OUTPUT command was entered at the remote terminal for a job for which the CRJE system has no record, or a STATUS command was entered for a job not in the CRJE system.

User Action: None.

IHK326 DUPLICATE JOBNAME

Explanation: A SUBMIT command requested the submission of a job with the same jobname as another job already in the CRJE system.

System Action: Reading of the data sets specified in the SUBMIT command is terminated, and an OS reader is started on the data set containing the job stream generated by the SUBMIT processor prior to the time the duplicate jobname was encountered.

User Action: One of two actions is possible:

- Remove the existing job by requesting the output via the OUTPUT command or deleting the job via the CANCEL command. Then reenter the SUBMIT command for the new job.
- Change the jobname for the new job to be submitted and reenter the SUBMIT command.

IHK327 NO JOB CARD

Explanation: The data sets specified by the SUBMIT command did not include a JOB card.

User Action: Add a JOB card to the appropriate data set and reenter the SUBMIT command.

IHK328 MAXIMUM JOBS EXCEEDED jobname

Explanation: The last command entered from a remote terminal was a SUBMIT command, which requested the submission of the job identified by jobname. However, the maximum number of jobs to be maintained by CRJE has been reached and the named job cannot be submitted at this time.

System Action: No more input is read from the data sets specified in the SUBMIT command. An OS reader is started on the job stream data set that was created by the SUBMIT processor prior to reaching the maximum number of jobs allowed.

User Action: Four courses of action are possible:

- Cancel previously submitted jobs to reduce the number of jobs in the system.
- Request the output of previously submitted jobs to reduce the number of jobs in the system.
- Reenter the command after performing one or both of the above actions.



- Wait until later and retry the SUBMIT command.

IHK329 JOB TERMINATION {NORMAL } jobname

Explanation: The remotely submitted job identified by "jobname" has terminated, and the output is now available.

User Action: None.

IHK330 CRJE CLOSED DOWN

Explanation: A STOP CRJE command was entered by the central operator, and the CRJE system is in the process of closing down. No more input can be entered from the remote terminal.

System Action: The active data set, if one exists, is saved in the user's library under the name ACTIVE.

User Action: None.

IHK331 JOB DELETED jobname

Explanation: The remotely submitted job identified by "jobname" has been cancelled by CRJE in response to a DELETE request.

System Action: All references to this job including any available output have been deleted.

User Note: The cancellation of the job is not complete until the message appears. Another job with the same jobname can not be submitted until the cancellation is complete.

IHK332 DISK ERROR { (jobname (ddname) )  
ACTIVE AREA }  
dsname }

Explanation: An error has occurred during an I/O operation on disk.

1. jobname (ddname): The error occurred while either writing the job input stream to disk (for SUBMIT) or reading the SYSOUT data set identified by ddname (for OUTPUT).

System Action: If the error occurred while processing an OUTPUT command, all references to the job are deleted. If the error occurred while processing a SUBMIT command,

all previously read records have been submitted to the operating system.

2. ACTIVE AREA: The error occurred on the active area while processing the last command entered.

System Action: Processing of the command is terminated, and a message is also sent to the central operator.

User Action: Reenter the command. If the error persists, notify the system programmer at the central installation.

3. dsname: The error occurred while reading or writing the OS data set or CRJE data set identified by dsname.

System Action: Processing of the command associated with the error is terminated. A message is also sent to the central operator.

User Action: Reenter the command. If the error persists, notify the system programmer at the central installation.

IHK333 INVALID USERID

Explanation: The userid specified in the last command entered from the remote terminal does not exist in the list of valid CRJE users.

System Action: The command is ignored.

User Action: Determine the correct userid and reenter the command, or enter a new command.

IHK334 EXCESSIVE OPERANDS

Explanation: More than the allowable number of operands were entered on the last command.

- TABSET can specify a maximum of 10 tab settings.
- SUBMIT can specify a maximum of 10 data set names including the double asterisk (\*\*) to indicate the active area.

User Action: Reenter the command or enter a new command.

IHK335 MESSAGE DELAYED

Explanation: The recipient specified by the SEND command is inactive. The message will be delivered when the recipient becomes active.

User Action: None.

IHK336 MESSAGE ENQUEUED

Explanation: The recipient specified by the SEND command is active, and the message has been enqueued for delivery.

User Action: None.

IHK337 MESSAGE IGNORED

Explanation: The recipient specified by the SEND command is inactive, and the message was not saved for later delivery.

User Action: If desired, reenter the command with the LOGON operand to indicate that the message is to be delivered when the user becomes active.

Note: Remember that NOW and LOGON are mutually exclusive operands.

IHK340 NO LINES IN RANGE

Explanation: An operation was requested for a range of line numbers in the user's active area. No lines exist with line numbers within the given range.

User Action: Enter a new command.

IHK341 TEXT1 NOT FOUND

Explanation: The character string specified on a CHANGE subcommand as the text to be replaced does not exist in the lines to be changed.

User Action: None.

IHK343 DUPLICATE ATTRIBUTE

Explanation: More than one attribute was specified for the data set in the active area.

User Action: Reenter the correct EDIT command.

IHK344 PL1 SUBATTRIBUTE INVALID

Explanation: The subattribute specified on the EDIT command for a

PL/I data set in the active area is invalid.

- Only C[HAR]48 or C[HAR]60 are valid indicators of the character set to be used.

- The left source margin must be greater than or equal to 1 and less than the right source margin. The right source margin must be less than or equal to 80 if the data set has the NOSEQ attribute, or 72 if the data set has the SEQ attribute.

User Action: Reenter the command.

IHK346 EXCESSIVE BACKSPACES

Explanation: The remote terminal user entered so many backspace characters that the carriage was logically positioned to the left of the first print position; a negative input line length resulted. The command was ignored.

User Action: Enter a new command.

IHK347 UNABLE TO OPEN dsname

Explanation: The execution of the OPEN for the specified data set was unsuccessful.

User Action: None.

IHK350 USERID INVALID/MISSING, ENTER USERID

Explanation: Either the userid specified on the LOGON command was invalid, or no userid was entered.

User Action: Enter a 1-8 character alphameric user identifier only.

IHK351 PASSWORD INVALID/MISSING, ENTER PASSWORD

Explanation: Either the password specified in the LOGON command was invalid, or no password was specified.

User Action: Enter the 1-8 character alphameric password only.

IHK352 USERID INVALID, USER LOGGED OFF

Explanation: The terminal user was unsuccessful in his response to a prompt requesting a valid userid.

User Action: None.

IHK353 PASSWORD INVALID, USER LOGGED OFF

Explanation: The terminal user was unsuccessful in his response to a prompt requesting a valid password.

User Action: None.

IHK354 LOGOFF xx.xx LOGON xx.xx xxxx MIN TOTAL TIME.

Explanation: The CRJE terminal user has entered a LOGOFF command

or has been logged off by the system. xx.xx specifies time in hours and minutes. xxxx specifies time in minutes only.

User Action: None.

IHK355 USERID ALREADY IN USE

Explanation: The userid entered on a LOGON command is being used by an active user.

User Action: Wait until the other user logs off.



EDIT SUBCOMMANDS

1. `linenum` [`Δtext`]
2. `CA[NCEL]` `jobname`
3. `C[HANGE]` `linenum` [`linenum`] `Δtext1Δtext2`[`Δ[A[LL]]`]
4. `D[ELETE]` [`linenum` [`linenum`]]
5. `END`
6. `I[NPUT]` [`linenum` [`R`] [`increment`] [`I1`]] [`RE [PLY]`] [`NOR [EPLY]`]
7. `L[IST]` [`linenum` [`linenum`]] [`NUM`] [`NONUM`]
8. `M[ERGE]` {`dsname`} [`**`] [`linenum` [`linenum`]] [`linenum`]
9. `REN[UM]` [`linenum` [`increment`]] [`10`] [`10`]
10. `S[AVE]` [`dsname`] [`K[EY] (key)`]
11. `SC[AN]` [`linenum` [`linenum`]] [`ON`] [`OFF`]
12. `SUB[MIT]` {`dsname`} [`**`] ...
13. `TAB[SET]` [`num ...`] [`OFF`]

## APPENDIX B: PL/I SYNTAX ERRORS

### MESSAGE FORMAT

The format of a message produced by the PL/I Syntax Checker is:

IKMnnn xxxxxxxx text describing error

nnn is the identification number for the message.

xxxxxxx is the number of the line in which the error was detected.

### ERRORS DETECTED

#### THOROUGH CHECKING

The PL/I Syntax Checker will detect almost all errors in a PL/I statement that are dependent on information present in a single statement. Examples of the thorough checking errors are:

- Unmatched string quotes, parentheses, and comment brackets
- Unrecognizable statement (i.e., the main part of the statement, excluding labels and prefixes, does not start with an identifier or a semicolon)
- Errors in prefixes and labels
- Errors in constants and pictures
- Errors in format lists and data lists
- Invalid use of options and attributes
- Errors in expressions
- Missing or invalid use of comma, colon, parenthesis, equal sign, and semicolon.

Certain errors are not detected although they can be detected in a single statement. The reason is either that these errors are

special cases of errors normally dependent on information from more than one statement or that they are infrequent errors which are complicated to detect. Examples of these are:

- Multiple declarations of one item within the same declare statement
- Inconsistent use of one item within the same statement, e.g., LABEL: A=LABEL + 1; A(1)= A + A(1,2,3);
- Errors in sterling constants
- An INITIAL attribute list specifies too few or too many initial values for an item
- More than 64 parameters in a parameter list.

Note: Compile-time statements are ignored by the PL/I Syntax Checker.

#### RESTRICTED CHECKING

When the level of checking is restricted, the PL/I Syntax Checker will detect a subset of the thorough checking errors (see above). The restricted checking errors are:

- Unmatched string quotes, parentheses and comment brackets
- Unrecognizable statement or missing semicolon
- Errors in prefixes and labels
- Invalid input characters
- All errors in assignment, REVERT, SIGNAL, BEGIN, STOP and EXIT statements, in the ON condition part of an ON statement, and in the IF clause part of an IF statement.

The following formula can be used to determine the size in bytes of the CRJE region.

$$54550 + 1342A + 72B + 64C + 768D + E + 1900F + 240G + (H_1 + H_2 + \dots H_n) + I + 4096J + K + L.$$

where

- A = number of lines - from CRJELINE macros.
- B = number of completed jobs not returned to users.
- C = number of line groups - from CRJELINE macros.
- D = number of different transmission codes from CRJELINE macros.
- E = device-dependent requirement. This includes the requirement for each device type supported by CRJE and for each line according to the type of device attached by the line. Include the appropriate figure from the following table for each type of device supported by CRJE.

Terminal	Type of Connection	Requirement in bytes
IBM 1050	switched	208
IBM 1050	nonswitched	200
IBM 2740-1	switched	240
IBM 2740-1	nonswitched	180
IBM 2741	switched	194
IBM 2741	nonswitched	168

For each line, include the appropriate figure from the following table for the device attached by the line.

Terminal	Type of Connection	Requirement in bytes
IBM 1050	switched	88
IBM 1050	nonswitched	56
IBM 2740-1	switched	48
IBM 2740-1	nonswitched	32
IBM 2741	switched	48
IBM 2741	nonswitched	40

F = 1 (one) if the BTAM on-line terminal test facility is included. If the facility is not included, F=0.

G = the number of OUTPUT, SAVE, RENUM, and MERGE commands that can be serviced simultaneously. If more than the specified number of commands are entered, some may be temporarily rejected because main storage is not available for processing.

H<sub>1</sub>, H<sub>2</sub>, ...H<sub>n</sub> block size of the SYSOUT data set +524 for each line simultaneously executing an OUTPUT command. If additional OUTPUT commands are entered, they may be temporarily rejected because main storage is not available for processing.

I = PL/I Syntax Checker requirement, if included. The requirement can be determined using the following formula:

$$\left\{ \begin{matrix} 17408 \\ 21504 \\ 28672 \end{matrix} \right\} + 280 \text{ PL1LNO}$$

where

PL1LNO = maximum number of PL/I statement lines. (See CRJETABL macro.)

17408 = base requirement for restricted checking (fully resident).

21504 = base requirement for thorough checking with partially dynamic structure.

28672 = base requirement for thorough checking with fully resident structure.

J = number of additional blocks of storage for nonresident terminal command processing routines. If J=8, space is available for all nonresident command processors to be loaded at system startup. If space is not available for all command processors to be resident, performance can be improved by using the resident BLDL table. The BLDL option is described in the publication IBM System/360 Operating System: System Programmer's Guide, form C28-6550.

K = installation exit routine requirement. This is the size of any exit routines provided by the installation. If no





Where more than one page reference is given, the major reference is first.

- Accounting information 18,66
- Active area
  - general 9,42,58
  - recovery 35,36
  - storage requirement 12,26
- Active data set
  - general 9,42,58
  - copy of OS data set 10,58
  - creation 44
  - deletion 60
  - session termination 9,30
  - stored in user library 63
- Active terminal 7
- Active user 7
- Alias, command 18
- Assembly, CRJE 14,20
- Attributes see: data set attributes
- Automatic syntax scan 45,58,63
- Automatic EOB (end-of-block)
  - 1050 13,50
  - 2740 13,52
- Bid key 52
- BRDCST command 33
- Broadcast messages
  - central operator considerations 33,35
  - definition 11
  - limitation 17
  - in system library 24
  - terminal user considerations 65,66
- BTAM (Basic Telecommunications Access Method) 13,30,31
- CANCEL command 45,46,55
- CANCEL subcommand 45,46,59
- Catalogued procedure
  - for CRJE execution 27-28,35,36
  - for OS reader 28
- CENOUT command 34
- Central commands
  - buffering 17,33
  - general 33
- CHANGE subcommand 43,59
- Character sets (for PL/I) 58
- CLIST 43,47,58,65
- Closedown, system 30,32,36
- CMDEXIT operand 18,19
- Coldstart 35,36
- Command alias 18
- Command processing installation exit 18,19
- Commands see: central commands; EDIT subcommands; terminal commands
- Communication line see also: line group; linename; on-line terminal test
  - CRJE procedure requirements 27
  - Disconnection 30,66
  - error conditions 30,51,52,53
  - error information 16,30,32,35
  - nonswitched 12,13
  - point-to-point connection 12
  - serviceability 30
  - switched 12,13
  - threshold values 16,30
- Communications network 12,14
- Content attribute 42,58
- Continuation
  - of commands 54
  - of PL/I statements 45
- CONTINUE command 45-46,49,56
- Conversational environment 6
- CRJE assembly 14,20
- CRJE data set
  - creation 44,57
  - deletion 44,56
  - general 9,42
  - listing 44,61
  - protection 44,63,65,66
  - status information 65
  - updating 42,44
- CRJE system specification
  - assembly and link-edit steps 20-24
  - assembly macros 14-18
  - catalogued procedures 27-29
  - initialization and allocation of data sets 24-27
  - installation exits 18-20
- CRJELINE macro 14
- CRJETABL macro 16
- CRJEUSER macro 18
- DATA content attribute 42,58
- Data set attribute 42,58,65
- Data sets see: active data set; CRJE data set; OS data set; system library; user library
- DDLIN operand 16,27
- DDSYSIN operand 16,27
- Dedicated line 12
- Delayed messages
  - central operator considerations 33,34,35
  - definition 11
  - limitation 17
  - in system library 24
  - terminal user considerations 47
- DELETE command 42,44,56
- DELETE subcommand 43,44,60
- Delimiters 54
- Direct access storage requirements
  - active area 26
  - general 12
  - job input 12
  - system library 25
  - system residence 12
  - user library 25

Main page references are those listed first.

Discontinue output see: interrupting  
output  
DSLISIT 43,45,58

EDIT command 42,57  
Edit mode 44  
EDIT subcommands  
adding to system 18,19  
function 43  
listed 77

End-of-line sequence  
1050 50  
2740 52  
2741 53

END subcommand 60,58,43

EXEC command 47,64-65

Exit routines  
command processors 19  
inclusion in system 20  
JOB card exit 19  
linkage to 18  
LOGOFF exit 19  
LOGON exit 18

Hardware considerations see also: storage  
requirements  
central installation 12  
communications network 12  
terminals 13

Implicit subcommand 43,44-45,59

Inactive terminal 7

Inactive user 7

Initialization program 20,21,24

Input mode 44

INPUT subcommand 43,44,60

Input from terminal 47,48

Installation exit routines see: exit  
routines

Interrupt feature 13,53

Interrupting output

after LIST subcommand 61

after OUTPUT subcommand 67

facility 49

procedure

1050 50

2740 52

2741 53

Job cancellation 46,56,59

JOB card installation exit 19

Job input

specified by user 10,64,68

storage requirement 12

to OS reader 10,28

Job management messages 11,46,66-67

Job output

central operator considerations 32,34

continuing 56

general 11

interrupting (discontinuing) 49,67

returned in groups of lines 18,49,67

SYSOUT (system output)class 11,17,45-46

terminal user considerations 45-46,66-67

Job processing

general 6,10-11,45-46

restriction 17

Job queue  
formatting of 35  
remote jobs on 10,68

Job status  
at central installation 32,34  
at terminal 67

Job submission 19,45,64,68

JOBEXIT operand 17,19

Jobname 55

Key,protection 55,63

Keyboard request feature 13,50

Keyword operand 54

Leased line 12

LERB operand

CRJELINE macro 16

SHOW command 35

Library see: system library; user library

Line see: Communications line

Line (record of data set)

cancelling

1050 51

2740 52

2741 53

correcting

1050 51

2740 52

2741 53

copying 62

deleting 59,60

displaying 61

entering

1050 50

2740 52

2741 53

inserting 59,60-61

renumbering 62-63

replacing 59,60,61

Line group 14,27

Line increment attribute 43,61,63

Line number

column 73-80,43,85-61

general 44,48,55

internal 44

job submission 10

OS data sets 58-59

reassign 62-63

Line number prompts 44,48,61

Linename 16,32,35

LIST subcommand 43,61

LISTBC command 46-47,65

LISTDS command 46,65

LISTLIB command 46,65-66

LOGOFF command 42,66

LOGOFF installation exit 19

LOGON command 42,66

LOGON installation exit 18

Machine configuration see: hardware  
considerations

MERGE subcommand 43,62

Message codes 48,66,69

Message output see also: broadcast

messages; delayed messages

central installation 38-41

terminal 48,69-75

Main page references are those listed first.

- Message sending
  - by central operator 34
  - general 11
  - by terminal user 46-47,67
- MFT (Multiprogramming with a Fixed Number of Tasks) 12,30
- Modes of operation 43-44
- MSG command 34
- MVT (Multiprogramming with a Variable Number of Tasks) 12,30
  
- Nonswitched line 12,13
- NOSEQ sequence attribute 43,58,60
- Null input line 44,58,61
  
- OFFEXIT operand 17,19
- On-line terminal test 16,31
- ONEXIT operand 17,18
- Operand field 54
- Operation field 54
- OS (S/360 Operating System)
  - facilities available 30
  - reader 28,30
  - system generation 13
  - utilities 9,26-27
- OS data set
  - CRJE procedure requirements 28
  - general 10,42
  - line numbers 48,58
  
- Password 18,55,66
- PLI content attribute 42,58
- PLILNO 18,79
- PL/I statement continuation 45
- PL/I syntax checker see also: PL/I syntax errors; syntax analysis
  - checking options 11,27
  - functional description 11
  - included in CRJE catalogued procedure 27
  - included in OS system generation 14
  - restriction (number of lines) 18,45,63
  - storage requirement 79
- PL/I syntax errors
  - correction 45
  - detected 78
  - message format 78
- Point-to-point line connection 12
- Positional operand 54
- Print elements 13
- Private line 12
- Protection key 44,55,63
  
- Region requirement 27,79-80
- Relative line number 14,16
- Remote job control table 24
- RENUM subcommand 43,62-63
- Request key 13,50-51
- Restricted syntax checking 11,78
- RJE (Remote Job Entry) 33
  
- SAVE command 43,44,58,63
- SCAN subcommand 45,63
- SEND command 46,67
- SEQ sequence attribute 43,58,60,61
  
- Session
  - general 7-8,42
  - initiation 18,66
  - regulation 8,32,36
  - termination 19,30,32,66
- SHOW command 32,34-35
- Source margin (for PL/I statements) 58
- START command 32,35-36
- Startup, system 30,32,35-36
- STATUS command 46,67-68
- STOP command 32,36
- Storage requirements see: direct access storage requirements; region requirements
- Subcommands see: EDIT subcommands
- SUBMIT command 45,68
- SUBMIT subcommand 45,64
- Switched line 12,13
- Syntax analysis see also: PL/I syntax checker; PL/I syntax errors
  - automatic syntax scan 45,58,63
  - PL/I statements 45
  - requesting 58,63
  - responses 48
  - restriction 63
- Syntax checker see: PL/I Syntax checker
- SYSOUT (system output class) 11,17,46
- System generation
  - CRJE generation
    - assembly macros 14-18
    - catalogued procedures 27-30
    - initialization and allocation of data sets 24-27
    - installation exit routines 18-20
    - load module 20-24
  - OS system generation 13-14
- System library
  - allocation and initialization 24,21,24-25
  - defined in CRJE procedure 28
  - general 24-25
  
- Tabulation 64
- TABSET subcommand 43,64
- TELCMLIB (telecommunications subroutine library) 13,14
- Telecommunications network 12,14
- Terminal commands
  - adding to system 18,19-20
  - continuation 54
  - format 54
  - lists of 76
- Terminals
  - error conditions
    - 1050 51
    - 2740 52
    - 2741 53
  - features
    - supported 13
    - specification of 16
  - general 6
  - operation
    - 1050 50-51
    - 2740 51-52
    - 2741 52-53
- TEXT content attribute 43,58

Main page references are those listed first.

Thorough syntax checking 11,78  
Transmission codes 13,16

User

information display 34-35  
regulation 32,36-37  
restriction 17

User capabilities 42

User identification 18,66

User library

allocation 25  
condensation 10,44,63  
defined in CRJE procedure 27  
general 8,25  
storage requirement 25

Userid 18,55,66

USERID command 32,36-37

USERMCMC operand 18,19

USERSCMD operand 18,19  
Utility programs 9,26-27

Warmstart 35,36

1050 terminal

features 13  
operation 50-51

1053 printer 51

2311 disk storage 12

2314 disk storage 12

2740 terminal

features 13  
operation 51-52

2741 terminal

features 13  
operation 52-53

READER'S COMMENT FORM

IBM System/360 Operating System  
Planning for Conversational Remote Job Entry

C30-2010-0

● How did you use this publication?

- As a reference source
- As a classroom text
- As a self-study text

● Based on your own experience, rate this publication . . .

As a reference source:	Very Good	Good	Fair	Poor	Very Poor
As a text:	Very Good	Good	Fair	Poor	Very Poor

● What is your occupation?

● We would appreciate your other comments; please give specific page and line references where appropriate. If you wish a reply, be sure to include your name and address.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

● Thank you for your cooperation. No postage necessary if mailed in the U. S. A.

**YOUR COMMENTS, PLEASE . . .**

This publication is one of a series that serves as a reference source for systems analysts, programmers, and operators of IBM systems. Your answers to the questions on the back of this form, together with your comments, help us produce better publications for your use. Each reply is carefully reviewed by the persons responsible for writing and publishing this material. All comments and suggestions become the property of IBM.

Please note: Requests for copies of publications and for assistance in using your IBM system should be directed to your IBM representative or to the IBM sales office serving your locality.

Fold

Fold

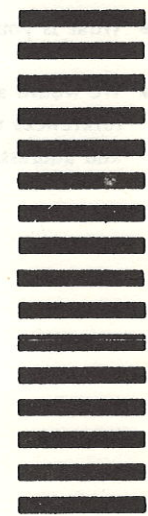
FIRST CLASS  
PERMIT NO. 569  
RESEARCH TRIANGLE PARK  
NORTH CAROLINA

**BUSINESS REPLY MAIL**  
NO POSTAGE STAMP NECESSARY IF MAILED IN U. S. A.

POSTAGE WILL BE PAID BY . . .

IBM Corporation  
P.O. Box 12275  
Research Triangle Park  
North Carolina 27709

Attention: Programming Documentation, Dept. 844



Cut Along Line

Fold

Fold



International Business Machines Corporation  
Data Processing Division  
112 East Post Road, White Plains, N.Y. 10601  
[USA Only]

IBM World Trade Corporation  
821 United Nations Plaza, New York, New York 10017  
[International]

Additional Comments:

IBM S/360 CRJE Printed in U.S.A. C30-2010-0

UNITED STATES DEPARTMENT OF COMMERCE

INTERNATIONAL BUSINESS MACHINES CORPORATION  
Data Processing Division  
112 East Post Road, White Plains, N.Y. 10601  
USA Only  
IBM World Trade Corporation  
350 West Street, Room 1200, New York, New York 10014  
Teletype Central



International Business Machines Corporation  
Data Processing Division  
112 East Post Road, White Plains, N.Y. 10601  
[USA Only]

IBM World Trade Corporation  
821 United Nations Plaza, New York, New York 10017  
[International]



File Number S360-36

Re: Form No. C30-2010-0

This Newsletter No. N30-2531

Date April 15, 1969

Previous Newsletter Nos.

N30-2529 (obsolete)

IBM SYSTEM/360  
OPERATING SYSTEM  
PLANNING FOR CONVERSATIONAL REMOTE JOB ENTRY

This supplemental Technical Newsletter to the IBM System/360 Operating System: Planning for Conversational Remote Job Entry publication, Form C30-2010, obsoletes the previous Technical Newsletter N30-2529, dated March 10, 1969. Changes to the text are indicated by a vertical line. These pages provide planning information for:

1. The FORTRAN Syntax Checker, an additional feature of CRJE; and
2. Text Time-Out Suppression, which has been made an optional instead of required feature on an IBM 1050 Data Communications System used as a CRJE terminal.

This Technical Newsletter should be placed in the front of the base publication.

The FORTRAN Syntax Checker provides a facility for checking FORTRAN IV source statements for correct syntax. Errors are detected for the basic FORTRAN IV language (level E) and for the full FORTRAN IV language (levels G and H).

The analysis performed is similar to that performed by the PL/I Syntax Checker. Diagnostics are made on a single statement basis with no cross-checking between different statements or between distinct syntactical units within one statement.

In scanning a statement, elements may be detected that are erroneous for all three language levels. In such a case, the same diagnostic is produced regardless of the language level specified. There are, however, errors unique to each language level. These errors relate to features not supported at a particular level, such as the use of full FORTRAN IV language features not allowed in FORTRAN E.

There are three checking options available: FORTRAN E only, which is available in 15K bytes of main storage; FORTRAN G and H only, which is available in 17K bytes, and FORTRAN E, G, and H, which is available in 20K bytes.

### System Generation Considerations

The OS system generation macro instruction that provides inclusion of PL/I Syntax Checker modules is also used to include appropriate modules for the FORTRAN Syntax Checker. Parameters in the PARM field of the EXEC statement of the CRJE cataloged procedure will be added to provide for the selection of a version of the syntax checker to be used during CRJE execution.

The operand FORTLNO= $\left. \begin{matrix} \text{integer} \\ 19 \end{matrix} \right\}$  is added to the CRJETABL macro to indicate the number of lines that can be collected to be passed to the syntax checker at one time. The integer specified, which must be from 1 to 19 inclusive, indicates the number of continuation lines allowed. The default is 19, which means that any FORTRAN statement consisting of the first line and a maximum of 19 continuation lines will be accepted for syntax analysis.

### User Considerations

Scanning FORTRAN statements for syntax errors is similar to scanning PL/I statements. Entering lines is the same except that only one FORTRAN statement is allowed per line and a continuation line in FORTRAN must have a character other than a blank or a zero in position six. Correcting syntax errors is the same for FORTRAN and PL/I.

The user can request that FORTRAN statements be scanned as they are entered (with the automatic scan), or he can request that lines in the active data set be scanned (by using the SCAN subcommand). The EDIT command contains an additional operand,

FORT $\left. \begin{matrix} E \\ G \\ H \end{matrix} \right\}$ , which indicates the content attribute of the data set.

E, G, and H indicate the language level of the source statements. This information is used whenever a syntax scan of the data set is requested.

### Storage Estimates

The following formula can be used to determine the storage requirement for the FORTRAN Syntax Checker:

$$\left. \begin{matrix} 15360 \\ 17408 \\ 20480 \end{matrix} \right\} + 96(\text{FORTLNO} + 1)$$

where 15360 = base requirement for FORTRAN E only.  
17408 = base requirement for FORTRAN G and H only.  
20480 = base requirement for FORTRAN E, G, and H.  
FORTLNO = maximum number of continuation lines that can be collected (from CRJETABL macro).

Note: If both PL/I and FORTRAN syntax checkers are used, only the larger of  $96(\text{FORTLNO} + 1)$  and  $280(\text{PL1LNO})$  (see Appendix C) need be included.