MRX/OS Control Language Services

Extended Reference Manual

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PREFACE

This document is intended for programmers using the Control Language Services provided for the Memorex Operating System. Included in this manual are descriptions of the Control Language, files and devices, and cataloged procedures.

Related information can be found in the following documents.

- MRX/OS Control Program and Data Management Services, Basic Reference
- MRX/OS Control Program and Data Management Services, Extended Reference
- MRX/OS Operating Procedures

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1. INTRODUCTION

Control Language Services is the control and interface program for jobs executing under control of Memorex Operating System. It performs these basic functions: interprets and processes control language statements; inputs jobs and data from the system input reader; builds a list of jobs to be initiated (job queue); enters all jobs into the system; allocates devices and files; prints a copy of control language statements, error and system messages, and job accounting information. Figure 1-1 is a functional diagram of the Control Language Services.

DEFINITIONS

The following paragraphs describe terms used in discussing the Control Language Services programs and operation.

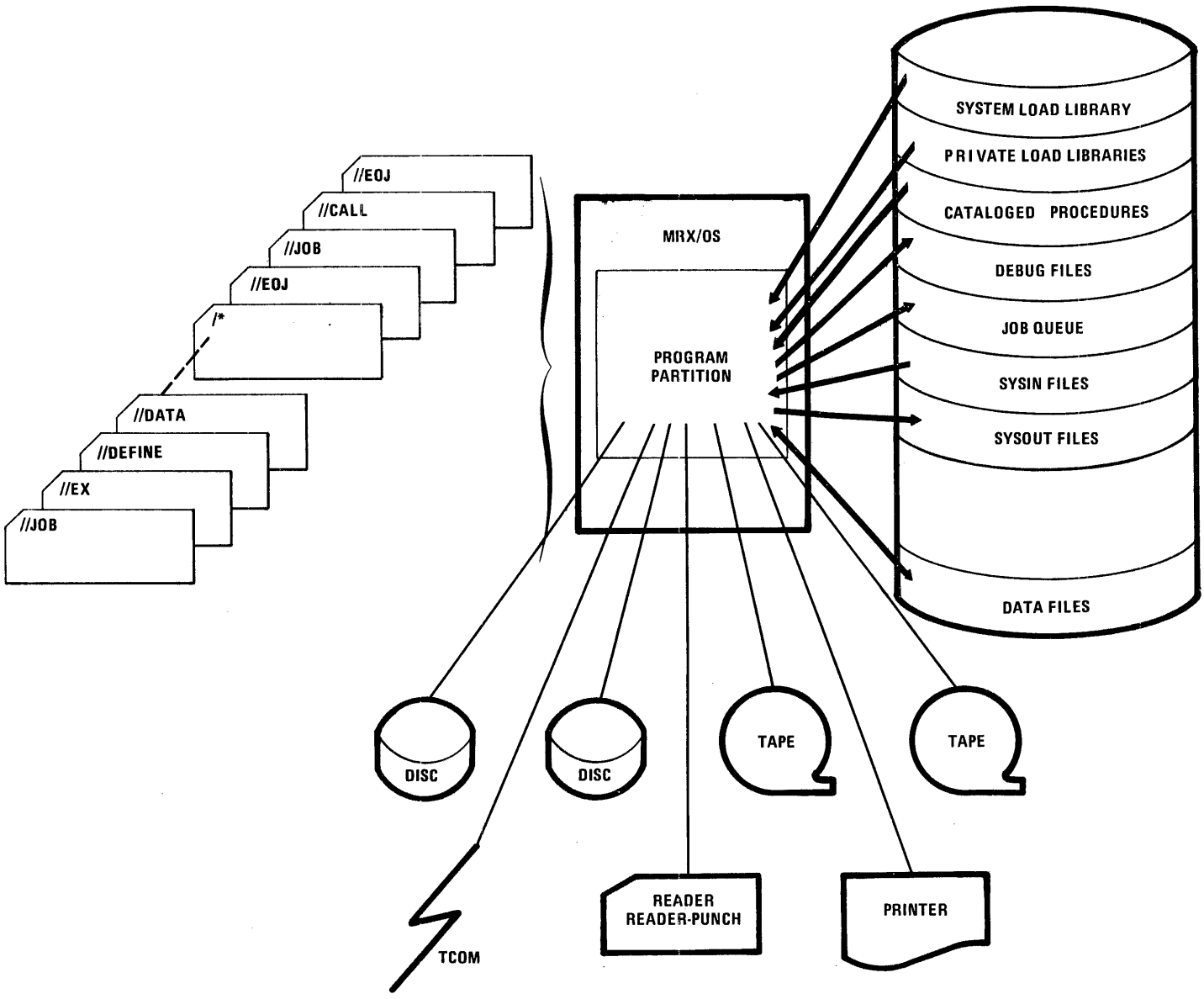
JOB AND JOB STEP

A job, by definition, is one or a group of related job steps to be executed in a program partition. A step is the execution of a single user program, which may include subroutines and other programs linked or called for execution.

CONTROL LANGUAGE STATEMENTS

Control language statements direct the execution of a job and of steps within a job. A //JOB statement defines the beginning of a job; an //EOJ statement defines its end; an //EXECUTE statement defines the beginning of a step within a job. The following is an example of the basic required statements for the execution of a job consisting of two job steps:

```
//JOB          NAME=PAYROLL
//EXECUTE      PGM=ACCT
    .      }
    .      }      File definitions and other
    .      }      optional statements
//EXECUTE      PGM=COST
    .      }
    .      }      File definitions and other
    .      }      optional statements
//EOJ
```



FUNCTIONS:

- JOB INTERFACE TO THE MRX/40 AND 50 OPERATING SYSTEM
- SYSTEM JOB HANDLER
- CONTROL LANGUAGE STATEMENT PROCESSOR

NOTE: REPRESENTATION OF JOBS DOES NOT SHOW ACTUAL STATEMENTS

Figure 1-1. Control Language Services

JOB QUEUING

Job queuing (Figure 1-2) is a feature of Control Language Services which provides for the entry of jobs from the system card reader into the job queue (reserved area on the disc) to await initiation and processing. A system input file (SYSIN) is created for each job and contains the control language statements for that job. The job which has the highest priority in the job queue, and is allowed to run in the partition, will be initiated first. Priority and partition are specified on the //JOB statement or assumed by default. Where priorities are equal, jobs run on a first-in - first-out basis.

The maximum number of entries in the job queue is specified during system generation (SYSGEN). Whenever more jobs are placed in the card reader hopper than will fit in the job queue, the remainder of the jobs in the hopper wait until interjob time (between jobs), at which point additional entries can be made in the job queue.

INPUT DATA SPOOLING

Input data spooling, a feature of Control Language Services (Figure 1-3) provides for the creation of sequential disc data files from card images as they are encountered in the card input stream. When input data spooling is performed, jobs which follow the data statement in the card reader are placed in the job queue. If data spooling is not performed, that is, the programmer specifies the system card reader as his input device, any following jobs in the card reader cannot be placed in the job queue until the job with card reader control has completed its processing. That job which selects the system card reader for its input device will be selected for initiation in the same manner as all other jobs in the job queue — by partition and priority.

OUTPUT DATA SPOOLING

Output spooling is an option that may be selected at SYSGEN time. If the spooling option is selected, the files to be spooled are queued on the output spool queue at step termination, or the files may be queued by the SPOOLQ macro (refer to **MRX/OS Control Program and Data Management Services, Basic Reference** manual). SYSOUT is queued at job termination.

If the spooling option is not selected at SYSGEN time, the //ROUTE statement is treated as if it were a //DEFINE statement; and a physical device (if available) is assigned. No Control Language Services errors result when a //ROUTE statement is encountered in a system that does not have the spooling option, unless an error would have occurred if the option were selected.

The output scheduled for a spooled device is determined by job priority, current form type, and job name. Therefore, print/punch files of a job will not necessarily be output contiguously on the same spooled device. However, continuity can be achieved by specifying a specific device with the same form type for all files.

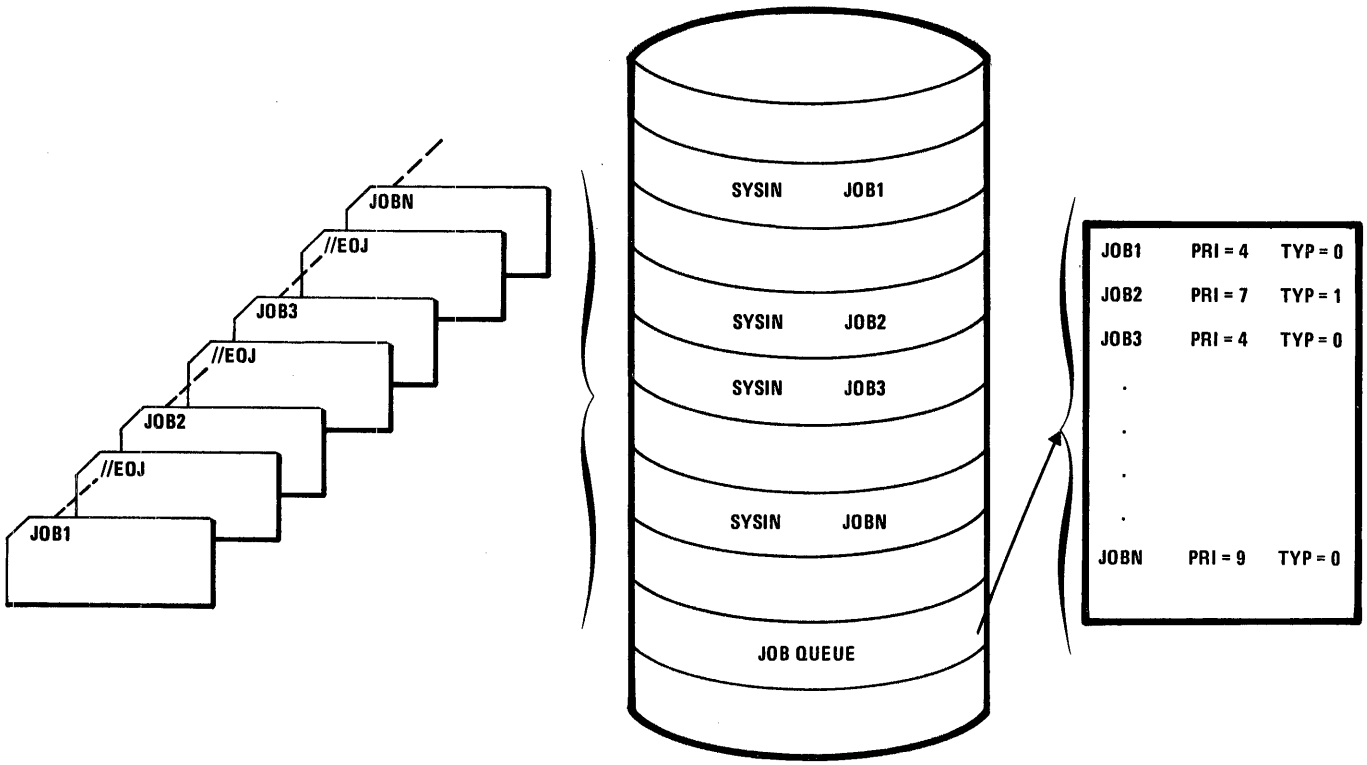
PROGRAM DESCRIPTION

Control Language Services consists of several modules stored on the system resident pack. Logically, these modules include:

- Input Reader
- Job Initiator
- Step Initiator
- Step Terminator
- Job Terminator

When required, modules are transferred into the problem program partition for execution between jobs and job steps. A minimum main storage partition of 8K bytes, which includes space for necessary control tables, is required for the modules.

In a two-partition system, Control Language Services executes in alternate partitions as the jobs terminate in them, whereas in a one-partition system, jobs are initiated serially.



FUNCTIONS:

- JOBS ARE LISTED ON THE JOB QUEUE FOR INITIATION AND PROCESSING AS THEY ARE READ IN FROM THE SYSTEM CARD READER
- JOBS ARE THREADED TO THE OTHER JOBS OF THE SAME PRIORITY
- THE FIRST JOB READ AT INITIAL PROGRAM LOAD TIME ALLOWED TO RUN IN THE PARTITION WILL BE INITIATED REGARDLESS OF PRIORITY
- ALL OTHER JOBS ARE INITIATED BY PRIORITY IN THE PARTITION IN WHICH THEY ARE ALLOWED TO RUN
- JOBS OF EQUAL PRIORITY ARE INITIATED ON A FIRST-IN-FIRST-OUT BASIS IN THE PARTITION IN WHICH THEY ARE ALLOWED TO RUN
- JOB1 READ, QUEUED AND INITIATED

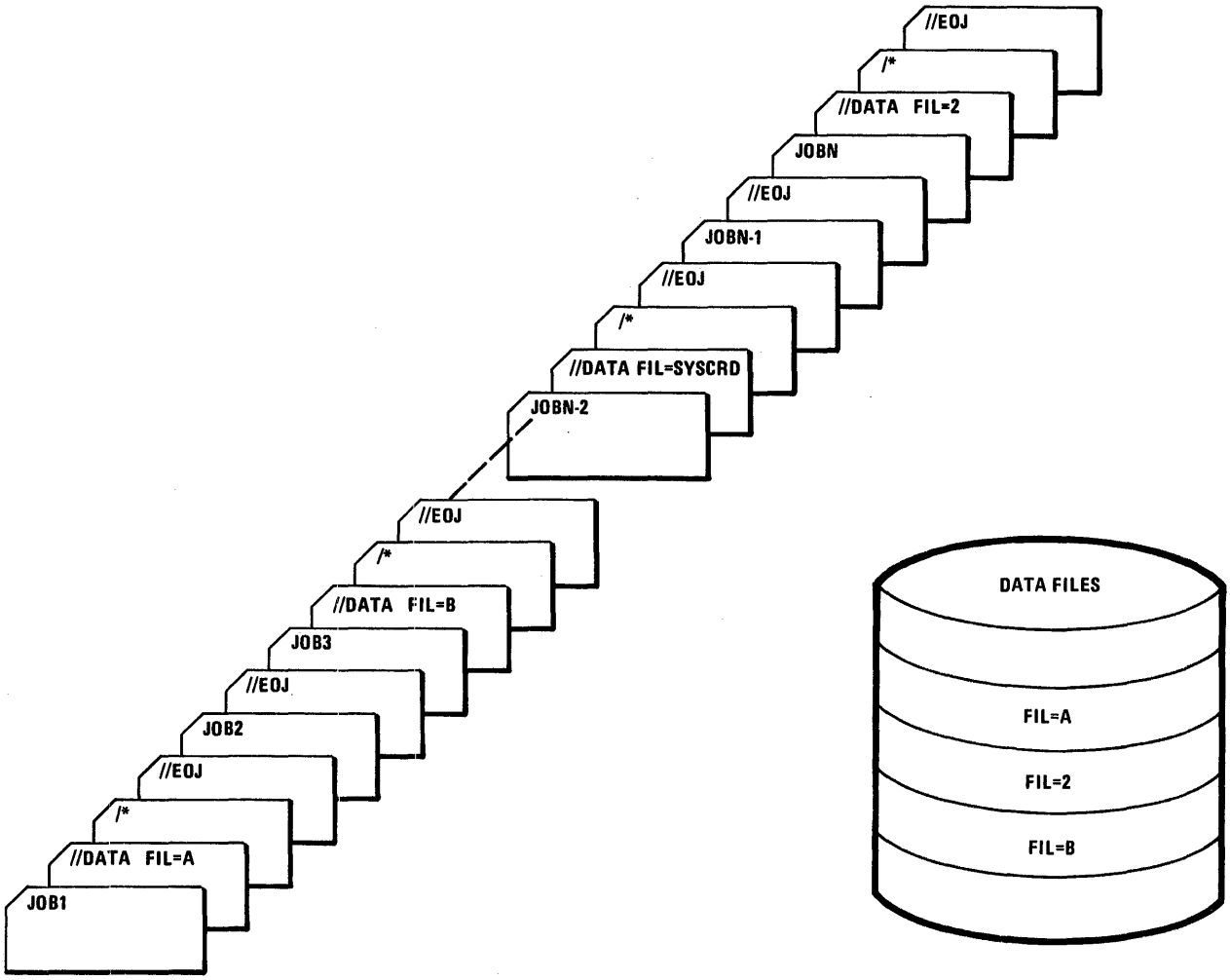
  JOB2 READ AND QUEUED

  JOB3 READ AND QUEUED

  JOBN READ AND QUEUED, HIGHEST PRIORITY WILL BE INITIATED BEFORE JOB2 OR JOB3 PROVIDED JOBN IS IN THE QUEUE BEFORE NEXT JOB INITIATION

NOTE: REPRESENTATION OF JOBS DOES
NOT SHOW ACTUAL STATEMENTS

Figure 1-2. Job Queuing



FUNCTIONS:

- READS DATA FROM WITHIN JOBS AND WRITES THIS DATA ONTO DISC
- ALLOWS LATER JOBS TO BE QUEUED
- JOB1, JOB3, AND JOBN REQUEST SPOOLING
  JOB2 AND JOBN-1 HAVE NO DATA ENTERED WITH THEM
  JOBN-2 HAS CONTROL OF CARD READ
- JOBS 1, 2, 3, and N-2 WILL BE QUEUED

  FILES A, B SPOOLED

  JOB N-2 GETS CONTROL OF CARD READER UNTIL ITS CARD DATA FILE IS PROCESSED AND THE JOB IS TERMINATED. ONLY THEN CAN JOBS N-1 AND N BE QUEUED, AND FILE 2 SPOOLED.

NOTE: REPRESENTATION OF JOBS DOES NOT SHOW ACTUAL STATEMENTS

Figure 1-3. Input Data Spooling

INPUT READER

This module of Control Language Services is loaded into the problem program partition at interjob time. As its name implies, the Input Reader reads jobs from the system card reader. Upon reading the first statement of a job (//JOB card), space for the system input (SYSIN) and the system output (SYSOUT) files are allocated. As each control language statement is read, it is output to SYSIN, thus building that file. (Explanation of these files is in Section 3 of this document.) The Input Reader requires a partition of at least 8192 bytes, but does not use more storage even if available.

Cataloged procedures which consist of control language statements cataloged on a library file, are merged with the job, if called. (See Section 4 for a discussion of cataloged procedures.)

A Control Language Services routine called Statement Interpreter is loaded with the Input Reader. The Statement Interpreter performs syntax checking on control statements input from the system card reader as well as those cataloged procedures which may have been merged.

Data files in the job stream are also read by the Input Reader, if data spooling is to be performed.

When all the control statements for a job (including cataloged procedures) have been read and found to be error free, the job is placed on the job queue to wait for initiation. The Input Reader will continue to process jobs until the job queue is filled, the card reader hopper is empty, or a job specifies control of the system card reader. The first job in after autoload, however, is initiated immediately.

After it has stopped reading jobs from the system card reader, the Input Reader searches the job queue for a job to be initiated in the partition. The Input Reader selects from the entries in the job queue as follows:

1. Jobs assignable to run in the partition.

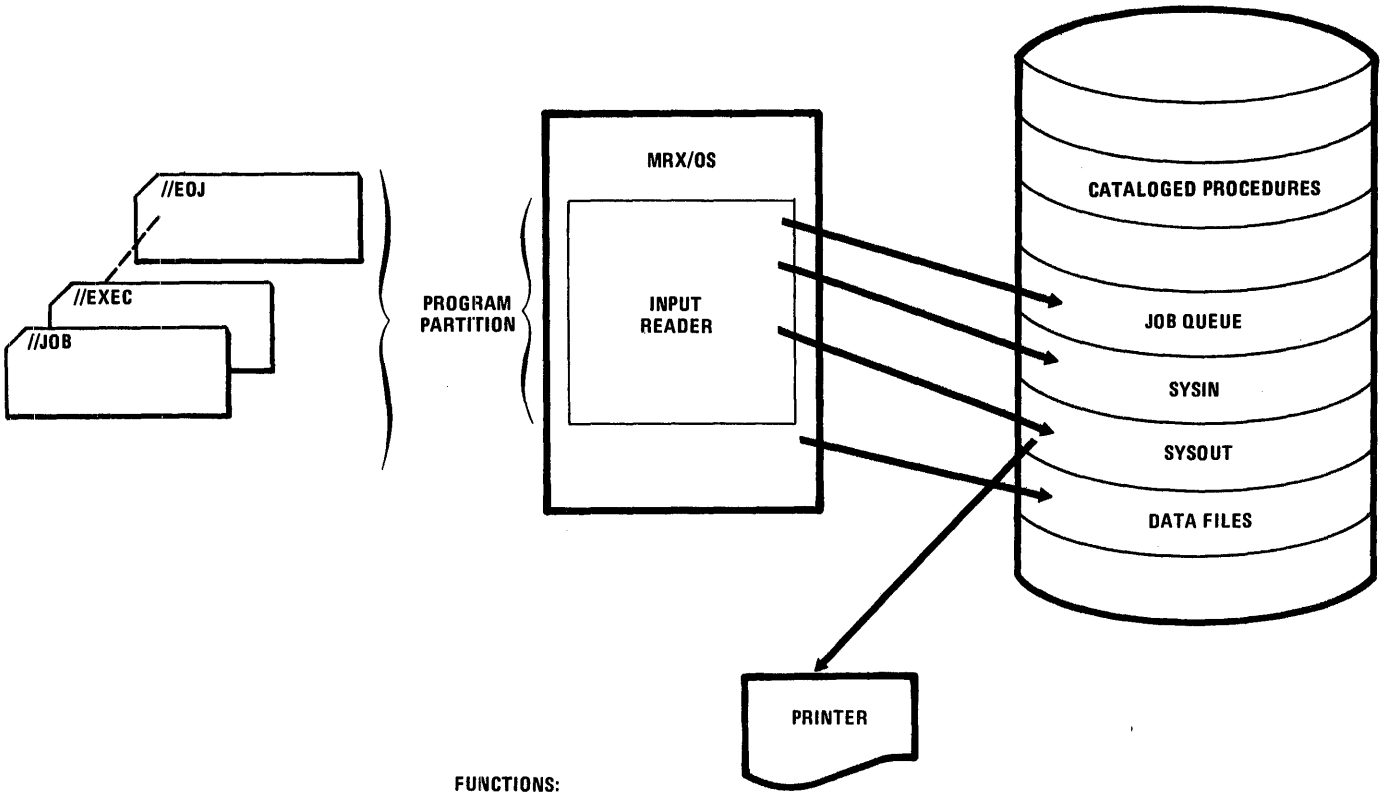
2. Within those jobs, the jobs of the highest priority.

3. Within those jobs, the first job entered into the job queue (first-in,first-out).

As soon as a job has been selected for initiation, the Input Reader releases control of the partition. A request is made to the Relocating Program Loader to load the Job Initiator.

If syntax errors are detected within a job, the control statements that have been written on SYSIN are transferred to the SYSOUT file. Those statements which contain errors are written with the error indication immediately following the statement. The format of this output is: the statement in error, followed by a flag indicator in the form of a question mark (?), and an error code followed by a description.

Example:
```
//DEEF
   ?
nnn  UNRECOGNIZABLE COMMAND
```



FUNCTIONS:

- READS CONTROL LANGUAGE STATEMENTS
- MERGES CATALOGED PROCEDURES
- BUILDS JOB QUEUE
- ALLOCATES AND BUILDS SYSIN
- ALLOCATES SYSOUT
- READS DATA INPUT STREAM
- BUILDS SPOOLED FILES FROM DATA IF SPOOLING IS REQUIRED
- BUILDS DEBUG FILES IF REQUIRED
- REJECTS JOBS WHICH HAVE CONTROL LANGUAGE ERRORS, BUILDS AND PRINTS SYSOUT FOR REJECTED JOBS
- SELECTS A JOB FOR INITIATION
- CALLS JOB INITIATOR VIA LOADER

NOTE: REPRESENTATION OF JOBS DOES NOT SHOW ACTUAL STATEMENTS

Figure 1-4. Input Reader

The remainder of the statements for that job are processed and written on the SYSOUT file along with information on detected errors for each statement. The Input Reader then prints these statements from the SYSOUT file up to the last statement containing an error. SYSIN and SYSOUT are closed and purged and the next job is read by Input Reader.

JOB INITIATOR

Following the selection of a job to be initiated in a partition, the Job Initiator receives control from the Input Reader. Date and switches are initialized. Job Initiator then opens the SYSIN and SYSOUT files for the job, causing file description tables to be created for them. Entries are made for the job in its Job Control Table (JCT), located near the end (high addresses) of the partition.

Jobs are selected for initiation by TYPE and PRIORITY in queued systems. The TYPE designates whether the job is eligible to run in the partition; and of those eligible, the one with the highest priority will be initiated first. When priorities are equal, initiation is on a first in-first out basis.

Job Initiator requires at least 4096 bytes to initiate a job.

The Job Initiator then releases control of the partition and a request is made to the Relocating Program Loader to load the Step Initiator module of Control Language Services.

STEP INITIATOR

Whenever a job step is to be executed in a partition, the Step Initiator is loaded into the partition and control is passed to it.

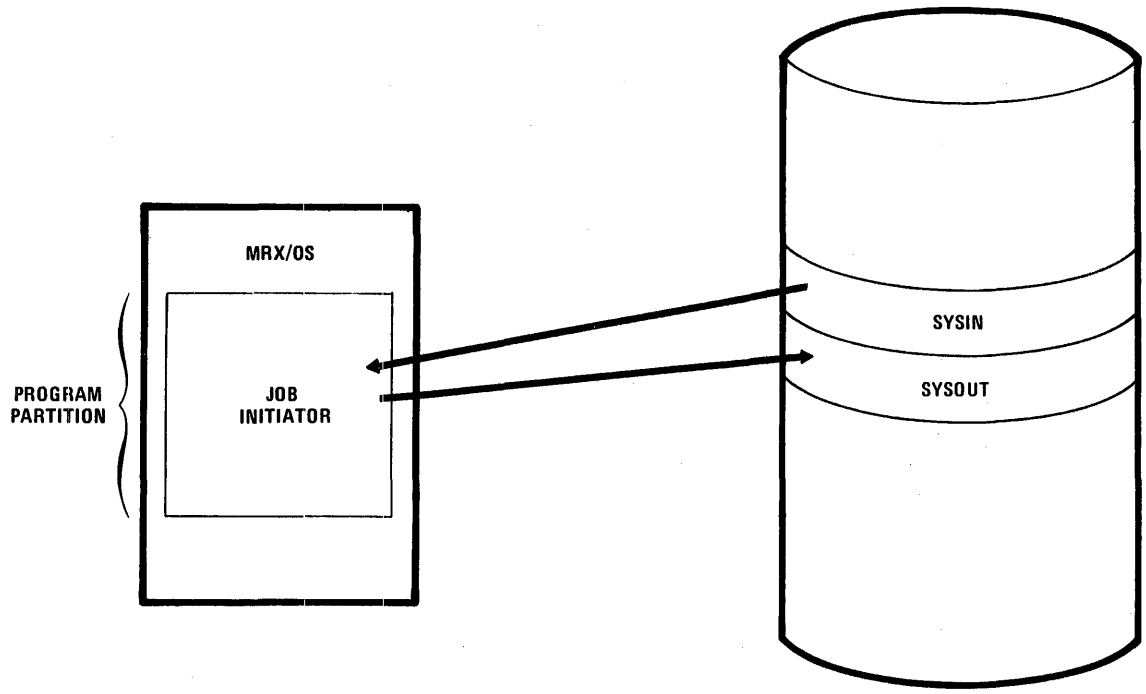
The Step Initiator processes all of the statements of a step from an //EXECUTE to the following //EXECUTE, //IF, or //EOJ. Pointers to //DEF and //PAR statements (which define data files and supply parameters) as well as information from control statements, contained on the SYSIN file, are moved to the Job Control Table. The Step Initiator outputs //TELL messages to the operator's console as it encounters them in the job stream and waits for response whenever PAUSE=YES is coded.

For a program requesting restart, a flag is set in the //DEFINE record for this file if the file has been allocated. If an "already exists" error occurs, Step Initiator ignores the error when restart is specified. When RESTART=nnn is coded, the checkpoint number is set in the Job Control Table (JTCCHKP).

In the processing of //DEFINE statements, Step Initiator outputs mount messages for volumes required but not yet mounted; locates files which do not require allocation; selects devices for unit record and tape assignments; and requests disc space through the ALLOCATE routine. (See the **Control Program and Data Management Services, Extended Reference** manual for a description of the ALLOCATE macro.) Usage conflicts for files (requests for conflicting use of non-shared and shared devices) are also cleared.

Once all statements of a step have been processed the BEGIN PGM program-name message is displayed on the console, and the program named in the //EXECUTE statement is loaded and control is passed to that program. When it has completed execution, the Step Terminator is loaded and control is passed to it. If further errors are encountered during step initiation, Step Initiator will cause the job to be aborted and SYSOUT listing to be provided.

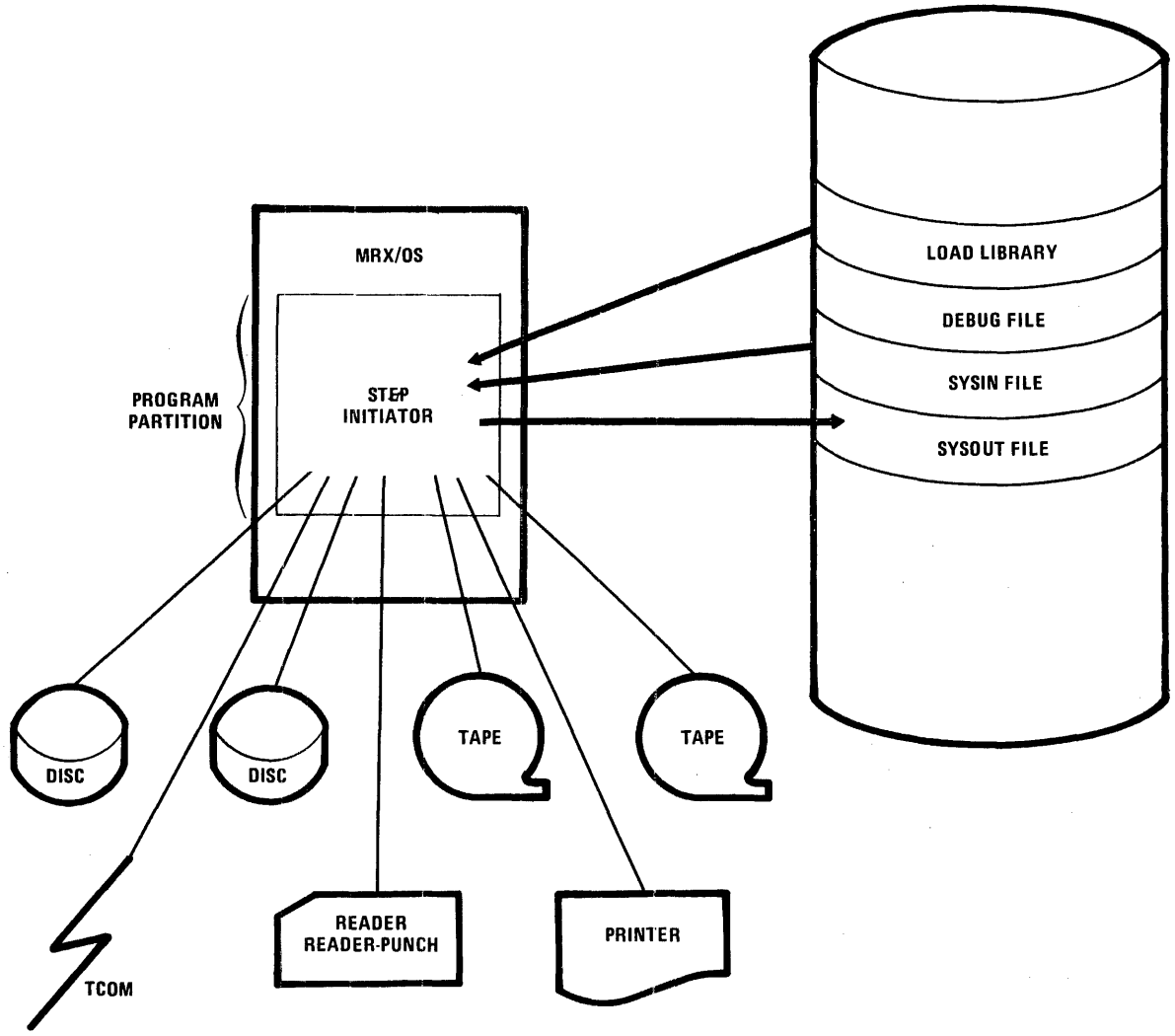
After the step has been terminated by the Step Terminator, the Step Initiator again is loaded and receives control to process the statements of the next step. If the next control language statement is an //IF statement, either the next sequential statement is processed or the step named on the //IF statement is processed. The result of a test determines which of these paths will be taken. (The //IF statement is discussed in Section 2 of this document.)



FUNCTIONS

- PERFORMS JCT ENTRIES
- OPENS AND READS SYSIN
- OPENS A SYSOUT FILE FOR THE JOB
- INITIALIZES DATE TO SYSTEM DATE, AND SWITCHES TO ZERO
- CALLS STEP INITIATOR VIA THE RELOCATING PROGRAM LOADER

Figure 1-5. Job Initiator



FUNCTIONS:

- READS STATEMENTS FROM SYSIN (SUCH AS, DEFINE AND SET)
- ASSIGNS I/O DEVICES TO THE STEP IN THE PARTITION
- PERFORMS TAPE AND DISC VOLUME MOUNTING
- ALLOCATES DISC SPACE REQUESTED ON DEF STATEMENTS
- PRINTS TELL STATEMENTS ON OPERATOR'S CONSOLE
- RE-INITIALIZES DATE TO JOB DATE AND/OR SWITCHES (FROM SET STATEMENTS)
- INITIALIZES TIME STEP IS ALLOWED TO RUN
- OPENS DEBUG FILE
- CALLS STEP TERMINATOR IF ANY ERROR IS ENCOUNTERED AND FLUSHES JOB TO SYSOUT FOR PRINTING
- CALLS THE PROGRAM FROM THE LOAD LIBRARY VIA THE RELOCATING PROGRAM LOADER OR CALLS THE JOB TERMINATOR IF NO STEPS REMAIN

Figure 1-6. Step Initiator

If the next statement is an //EXECUTE, the statement is processed by the Step Initiator as previously described. When the next statement is an //EOJ, a request is made to the Relocating Program Loader to load the Job Terminator module of Control Language Services.

PROBLEM PROGRAM

The problem program is the program named on the //EXECUTE statement. Step Initiator requests the loading of the program into the partition and passes control to this problem program.

The program is responsible for opening and closing the files it will use, and for calling the Relocating Program Loader to load additional segments of the program. When the program has completed execution, its final service request is a HALT, EHALT, or ABEND. HALT is for normal step termination. An EHALT is for job termination. ABEND requests an abnormal termination of a job. These service requests cause the Relocating Program Loader to load the Step Terminator and pass control to that Control Language Services module.

STEP TERMINATOR

Whenever the problem program in a step has completed execution (that is, goes to HALT or EHALT or ABEND), the Step Terminator is loaded. The Step Terminator checks for any open data files. All files opened by the program must be closed by the program at the end of each job step. Failure to do so results in abnormal termination of the step and job (with the exception of SYSCHK).

If the program terminates abnormally and the step is eligible for restart, the operator is asked to allow an immediate restart at the last checkpoint taken by the program. If the operator reply is YES, the Step Terminator sets the immediate restart bit (bit 1 of JTCLS) in the Job Control Table and loads the RESTART program.

All scratch files are purged (de-allocated) by the Step Terminator unless an immediate restart is in progress or abnormal termination is occurring and the user program issued the CHKPT macro. All peripheral devices assigned to the step are released for use by following steps or by the other partition.

The Step Terminator closes the DEBUG file and private load library, if used by the step. Job accounting information is placed on the SYSOUT file and the Step Initiator is loaded.

Step Terminator also searches the SYSIN file for a file to be spooled; and if found, it queues the file on the output writer queue.

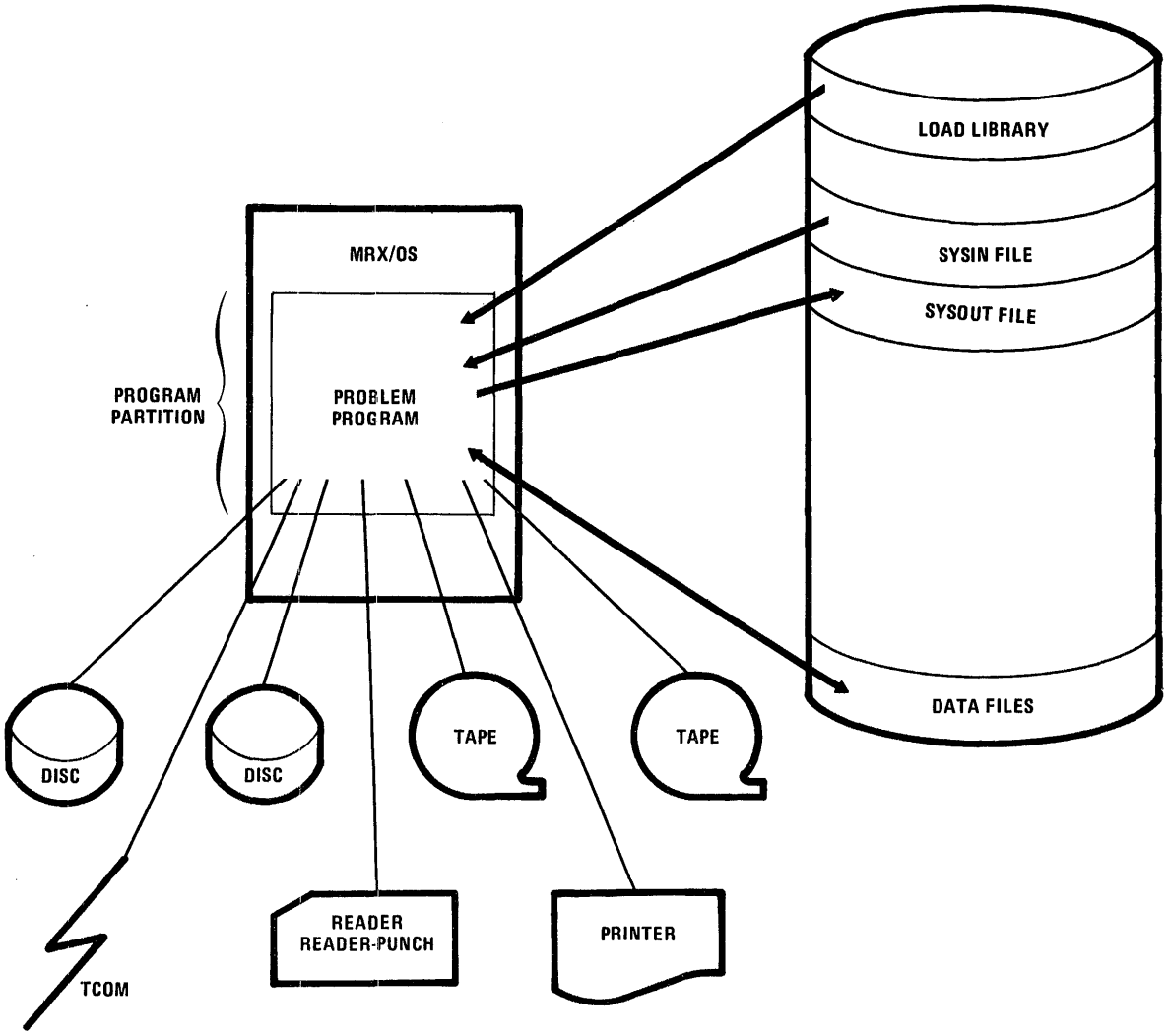
JOB TERMINATOR

Whenever an //EOJ Control Language Statement is read by the Step Initiator, the Job Terminator is loaded into the partition.

Job Terminator closes and purges the SYSIN file. The SYSOUT file is updated with job accounting information and is printed. If termination is normal or is abnormal with no checkpoints taken, user temporary files are purged. If termination is abnormal and checkpoints have been taken, purging of temporary files including SYSIN is bypassed. If spooling was not selected at SYSGEN time, SYSOUT is printed and purged. If spooling was selected, SYSOUT is queued for printing by the output writer.

All other files (work and permanent) remain on the packs until they are de-allocated via the Purge utility or Purge macro. (The Purge utility is described in the **Utility Programs Reference** manual; the Purge macro is described in **Control Program and Data Management Services, Extended Reference** manual.)

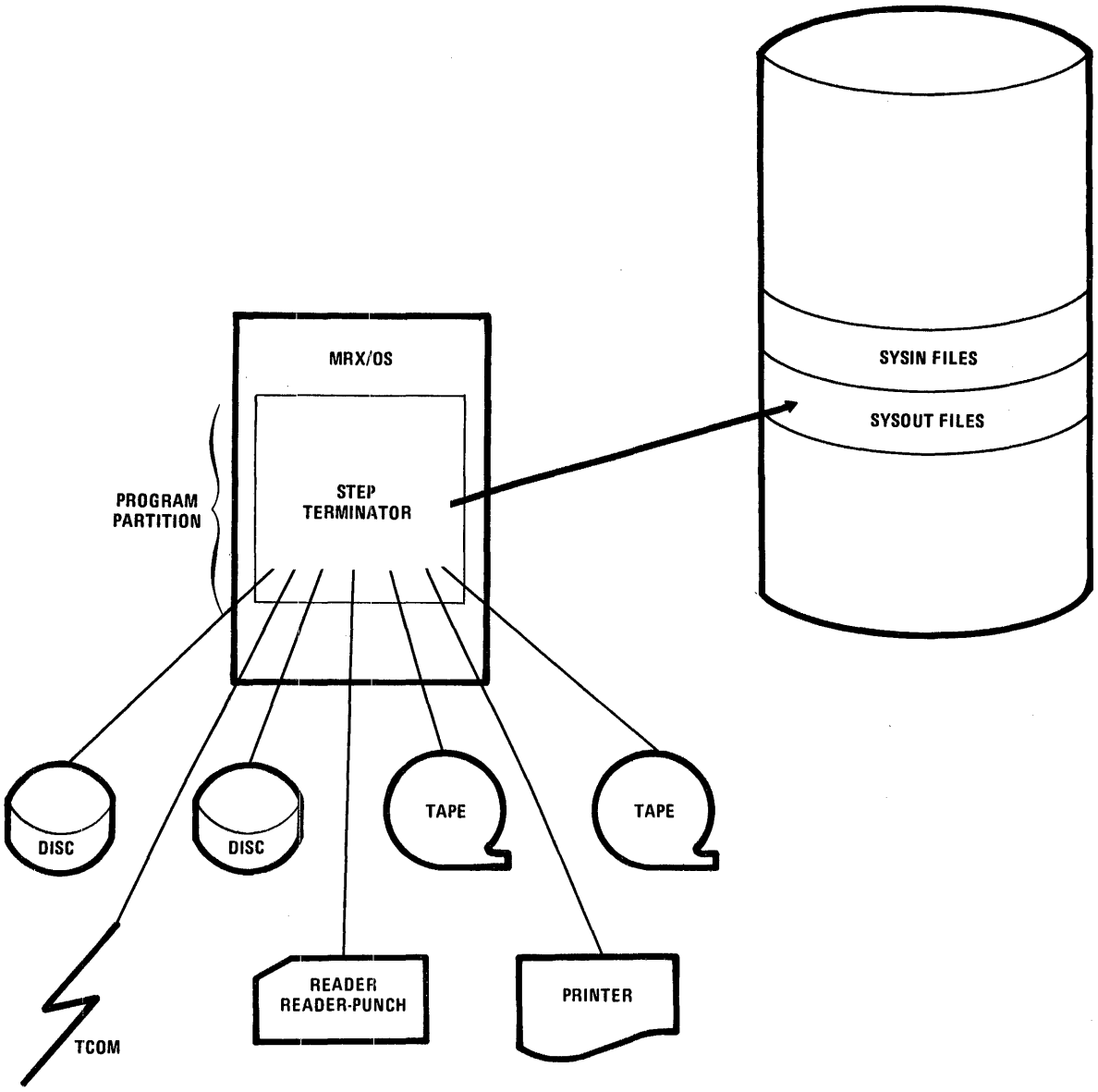
When all termination activities have been completed, Job Terminator releases control of the partition. The Input Reader is then loaded into the partition and control is passed to it.



FUNCTIONS:

- EXECUTES THE PROBLEM PROGRAM
- ACCEPTS PARAMETER STATEMENTS FROM SYSIN FILE
- DISPLAYS MESSAGES ON SYSOUT FILE
- OPENS AND CLOSES ALL DATA FILES USING INFORMATION SUPPLIED BY DEFINE STATEMENTS
- READS OR WRITES DATA ON ALL ASSIGNED I/O DEVICES
- ALSO READS DATA FROM SPOOLED DATA FILES CREATED BY INPUT READER
- PROGRAMS WITH AN OVERLAY STRUCTURE CALL PROGRAM SEGMENTS FROM LOAD LIBRARY VIA PROGRAM LOADER
- EXECUTES ANY DEBUG INSTRUCTIONS PLACED IN PARTITION
- AT TERMINATION (ABNORMAL OR NORMAL) OF PROGRAM, STEP TERMINATOR IS CALLED VIA THE RELOCATING PROGRAM LOADER

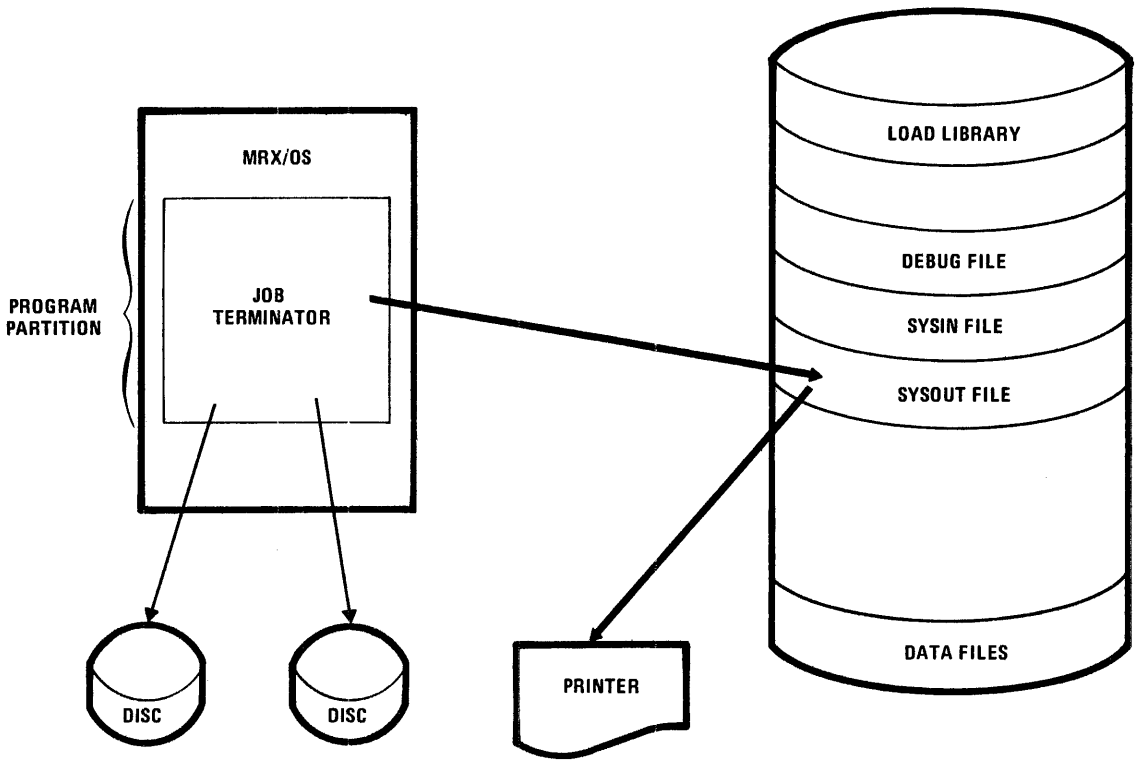
Figure 1-7. Program Execution



FUNCTIONS:

- DEASSIGNS DEVICES WHICH STEP INITIATOR ASSIGNED TO THIS STEP
- PURGES ANY SCRATCH FILES USED BY THIS STEP
- CLOSES DEBUG FILE AND PRIVATE LOAD LIBRARY, IF USED
- CHECKS FOR ANY FILES OPENED BUT NOT CLOSED BY PROGRAM; IF ANY, ABNORMALLY TERMINATES STEP AND JOB
- PLACES ACCOUNTING INFORMATION ON SYSOUT FILE
- CALLS STEP INITIATOR VIA THE RELOCATING PROGRAM LOADER TO DETERMINE WHETHER A FOLLOWING STEP IS TO BE INITIATED BY STEP INITIATOR, OR THE JOB IS TO BE TERMINATED BY JOB TERMINATOR

Figure 1-8. Step Terminator



FUNCTIONS:

- CLOSES AND PURGES SYSIN FILE
- WRITES JOB ACCOUNTING INFORMATION TO SYSOUT
- CALLS INPUT READER VIA THE RELOCATING PROGRAM LOADER
- PURGES TEMPORARY FILES FOR NORMAL TERMINATION OR ABNORMAL TERMINATION WITH NO CHECKPOINTS TAKEN
- PRINTS AND PURGES SYSOUT IF SPOOLING OPTION NOT AVAILABLE
- QUEUES SYSOUT FOR PRINTING BY OUTPUT WRITER IF SPOOLING OPTION IS AVAILABLE

Figure 1-9. Job Terminator

CONTROL FLOW

Figure 1-10 shows the flow of control in the partition among the program and the modules of Control Language Services.

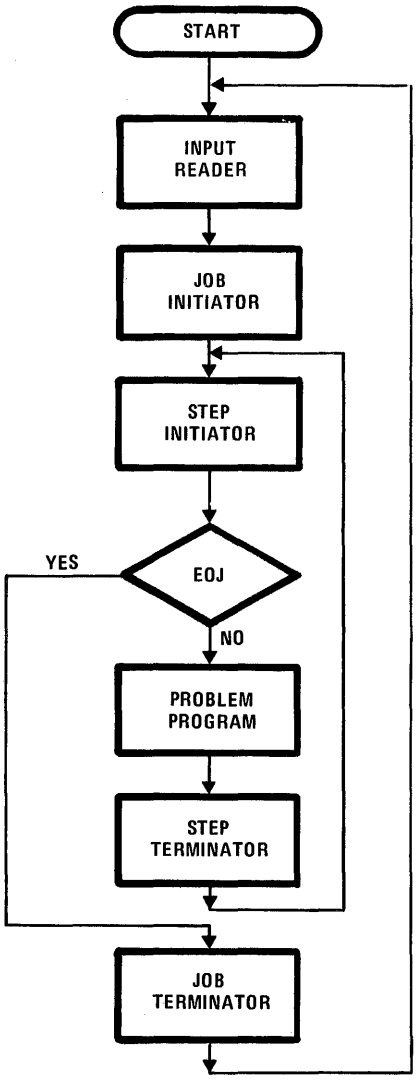


Figure 1-10. Control Language Services Control Flow

2. CONTROL LANGUAGE

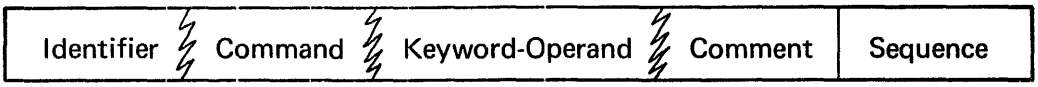
LANGUAGE DESCRIPTION

The Control Language provides the programmer with a direct interface to Control Language Services. The language is composed of the following statements which control job step, interstep, and procedure-oriented activities for the job; input data to the system; and provide comments.

Level	Statement	Description
JOB	//JOB	Identifies the job.
STEP	//EXECUTE	Specifies the program to be executed.
STEP	//PAR	Specifies information to be passed to the executing program.
STEP	//DEFINE	Specifies physical and logical qualities of a file.
STEP	//ROUTE	Specifies allocation information when spooling option is selected, or specifies physical qualities of unit record device when spooling option not selected.
STEP	//SET	Alters the job date and setting of bits in the program option switch table.
STEP	//TELL	Output message on operator's console.
INTERSTEP	//IF	Tests and transfers control to a subsequent step as a result of the test.
PROCEDURE	//DECLARE	Identifies first statement of cataloged procedure.
	//CALL	Used to merge cataloged control language statements (procedures) into the control language statements of a job.
DATA	//DATA	Identifies that which follows as a data file. Specifies file name and attributes.
DATA	/*	Data delimiter. Identifies the end of a data file.
JOB	//EOJ	Identifies the end of a job.
JOB	*(comment)	Comments card.

FORMAT

All command statements for the control language have the same basic format containing five fields:



The following general rules apply:

1. Each statement must begin on a new card.

2. The identifier field must begin in character position 1 of each statement.

3. The command field must begin in character position 3.

4. All fields must be separated by at least one blank character, except that no space is allowed between the identifier and command fields.

5. The keyword-operand and comment fields are free form.

6. Keyword-operands are separated by commas. No blank characters are allowed, except on //PAR and //TELL statements.

7. The keyword-operand field may be continued on more than one card except for the //PAR and //TELL statements.

8. A comma followed by a blank indicates that the keyword-operand field is continued on the next card.

9. On continuation cards the keyword-operand field must not begin before character position 4. The identifier field is repeated, but the command field is not.

10. The sequence field occupies the last eight character positions of the card.

IDENTIFIER FIELD

The identifier field indicates that the statement is a directive to the Control Language Services. The identifier is required on all control statements, including all continuations.

The following rules apply to the identifier field:

1. The // identifier must appear in character positions 1 and 2 for all control statements (including continuations) except the data delimiter and the comment statement.

2. The data delimiter identifier is /* (slash, asterisk, blank) which must appear in character positions 1, 2, and 3. Anything other than a blank in character position 3 will cause the card to be treated as data. Continuation is not applicable for this statement.

3. The comment statement identifier is * and must appear in character position 1. Continuation is not applicable for this statement.

COMMAND FIELD

The commands recognized by Control Language Services function is required. The following rules apply to the command field:

1. The commands recognized by Control Language Services must appear in one of the following spelled out or abbreviated forms.

Level	Command	Abbreviation
Job	//JOB	None
	//EOJ	None
Step	//EXECUTE	//EXEC or //EX
	//PAR	None
	//DEFINE	//DEF
	//ROUTE	//RTE
	//SET	None
	//TELL	//TEL
Interstep	//IF	None
Procedure	//DECLARE	//DEC
	//CALL	//CAL
Data	//DATA	//DAT

Note that there are no commands for the data delimiter and the comment statement.

2. The command field must begin in character position 3.

3. The command field is not repeated for statement continuations.

4. No space is allowed between the identifier field and the command field.

5. At least one space is required between the command field and any following field.

KEYWORD-OPERAND FIELD

The keyword-operand field lists the specifications which support the job processing features of the command as required at run time. The following rules apply to the keyword-operand field.

1. The keyword-operand field must be separated from both the preceding and the following fields by at least one blank space.

2. The field is free form with no fixed starting position, although each operand or variable symbol is limited to 17 characters maximum.

3. Each keyword-operand must consist of a descriptive keyword and an operand or variable symbol, separated by an equal sign (except on //PAR cards, which do not undergo syntax check).

   Example: LOC=YES

4. Keyword-operands can be separated only by commas (no blanks).

   Example: CAT=NO,VOLUME=65AR22,VER=YES

5. If the operand portion of the keyword-operand contains more than one entry, the multiple items are separated by commas, and the entire operand is enclosed by parentheses.

   Example: STATUS=(P,O)

6. The keyword-operand field may occupy multiple cards. The continuation of the field must be shown by a comma followed by a blank. The field may not extend past column 72. The only valid characters in column 72 is a blank or a comma.

7. For continuation, the field can only be divided after a complete keyword-operand. The continued line must contain the identifier but must not contain the command.

```
Example:  //DEF   ID=FIL128,FIL=PROG6382,
          //      NUM=1450,CSD=NO,SIZ=50,
          //      BLK=10,LOC=YES,ORG=I,
          //      SPREAD=4,STA=(P,O),
          //      CAT=NO,VOL=65AR22,
          //      VER=YES
```

8. The number of specifications which may be placed on a record is limited only by the number of character positions not committed to other fields (identifier on all statements, command on the first record of a statement, and sequence field on all statements). Either single or multiple specifications may be included on any record of a statement.

9. The order of the keyword-operands on the statement is optional. There are no positional keyword-operands in the control language except on the //JOB and //CALL statements.

```
Example: //DEF ID=FIL128,FIL=PROG6382,NUM=1450
```

This statement could be written with the keyword-operands in any order, such as:

```
//DEF FIL=PROG6382,ID=FIL128,NUM=1450
```

or

```
//DEF NUM=1450,FIL=PROG6382,ID=FIL128
```

COMMENT FIELD

The comment field is used to record additional information concerning the program, the statement, or any documentation the programmer wishes to provide. The field is optional for all statements.

Although there is no specified format for this field, the following rules apply to its general use:

1. The field is free form in that it occupies no specified character positions on the card. Its only restriction is that it must be separated from both the preceding and following fields by at least one blank character.

2. No continuation of comments is allowed.

3. For the comment statement, the comment field may begin in any character position after the * identifier.

SEQUENCE FIELD

The sequence field is used to indicate the order in which statements are expected to appear in a job. The following rules apply to the sequence field:

1. The field occupies the last eight character positions of each card.

2. The field must be preceded by one or more blank characters.

3. All members of the EBCDIC code set can be used for the values in the sequence field.

4. Control Language Services will check ascending sequence and issue warning diagnostics for exceptions.

FORMAT NOTATION

In the following paragraphs of this section, each control language statement is discussed. The statement formats are given using all acceptable forms on each command and keyword. The following rules are used in statement formating in this section:

1. All forms of the command are given. Any form may be used in coding.

   Example:
   ```
   //EXECUTE
   //EXEC
   //EX
   ```

2. All references to alphanumeric fields, whether they be 8 or 17 characters maximum length, have the following restrictions. Alphabetic and numeric characters comprise the field, no embedded blanks are allowed. The dollar sign ($) is valid. (Data Management allows the dollar sign only as the first character of a file name; certain system files are preceded with the $ to identify them as system files.) The dash (-) is the only other special character that may be used within these alphanumeric fields.

   Example:
   ```
   NAME=STEP2-A
   LIB=$UTIL-LIBRARY
   ```

3. Braces { }, indicate that the user has a choice of terms; the default case is underlined.

   Example: CLS= { YES / <u>NO</u> }

4. All forms of optional keyword-operands or optional operands are enclosed by brackets [ ].

   Example: [MSC=code]

5. Parentheses ( ) are used to enclose multiple operands associated with one keyword. The parentheses are not required if only one of the operands is specified for use.

   Example: STATUS=(type,usage)

STATEMENT SPECIFICATIONS

The keyword-operands for control statements are defined by the control language, where each command is associated with specific keywords. The paragraphs which follow describe the keyword-operand specifications for each of the control language statements. The following appendices may be used along with the discussion of each statement.

- Appendix A – Summary of Control Language Statements
- Appendix B – Table of Control Language Statement Keyword Characteristics
- Appendix C – Table of required and Optional Keywords by Control Language Statement

JOB LEVEL STATEMENTS

The job level statements are used to begin and end the command sequence of a job, and to provide commentary documentation. These statements include:

- //JOB
- //EOJ
- * (comment statement)

JOB STATEMENT

```
//JOB   {NAME}
      {NAM } =job-name
      [{USER}          ]
      [{USE } =user-identification]
      [{TYPE}          ]
      [{TYP } =partition-number]
      [{PRIORITY}          ]
      [{PRI     } =job-priority-number]
      [{HOLD}   {YES}]
      [{HLD } = {NO }]
```

The //JOB statement is required to begin the command sequence for a job. This statement describes the job to Control Language Services; assigns a name to the job; identifies the user; specifies the partition in which the job may run; and indicates the priority to be assigned to the job in the job queue. It also specifies whether the job is available for initiation, or is being held pending later release by the operator. If any error is present, the job card is not recognized and Control Language Services skips for job card.

{NAME / NAM} =job-name **(required)**

The system requires a name by which it can recognize and refer to a job. This information is supplied by the NAME keyword and is used in creating the job queue entry. In addition, NAME is used to qualify scratch and temporary files; SYSIN and SYSOUT files; and spooled data files.

The operand must be unique (only one job of a name may be in the system at one time). The operand given with the NAME keyword must be a 1-to-8 character alphanumeric value. *This keyword-operand is required and must appear on the first card.*

{USER / USE} =user-identification

Installations have the option of requiring user identification to the system for job accounting purposes. If this information is not required, the USER keyword is optional; it may be included in the statement merely as added documentation. The choice of requiring user identification is made at system generation (SYSGEN) time. It may be reversed on any following generation of the system.

The operand is a 1-to-4 character alphanumeric field. There is no default.

{TYPE / TYP} =partition-number **(optional)**

The partition in which a job is allowed to run may be selected by the programmer, using the TYPE keyword. The keyword may be used to reflect partition size, partition dedication, or job requirements. Partitions are defined at SYSGEN time or at IPL time.

The operands are 1 and 2 specifying partition 1 or 2, respectively. The system default is zero, which means that the job can run in either partition.

{PRIORITY / PRI} =job-priority-number **(optional)**

The system provides the ability to designate the order in which jobs run within a partition. The PRIORITY keyword is used to define that order.

Jobs are selected from the queue first by the TYPE keyword (jobs eligible to be initiated in the partition) and then according to the PRIORITY keyword (highest priority job within a partition). Within a partition, jobs of the same priority are selected for initiation on a first-in, first-out basis.

The operand is a 1-digit numeric field of values from 1 to 9. The highest priority is designated by the largest number. A default is set by the installation at SYSGEN time.

$\left\{\begin{matrix}\text{HOLD}\\\text{HLD}\end{matrix}\right\} = \left\{\begin{matrix}\text{YES}\\\underline{\text{NO}}\end{matrix}\right\}$ **(optional)**

Control Language Services allows the operator to control the release of a job from the job queue. This control is provided by the HOLD keyword.

When HOLD=YES is encountered, a message is displayed on the operator's console informing the operator that the named job is being held in the job queue. After the operator has released the job, it will be selected for initiation according to the operands of the TYPE and PRIORITY keywords specified. If type and priority are not specified, the installation defaults are used and the job will be selected on a first-in, first-out basis as per those values.

When HOLD=NO is specified, or the HOLD keyword is not specified, the job will be selected for initiation without operator intervention. The same conditions for job selection apply.

Sample //JOB Statement

The following is an example of a //JOB statement. The required keyword, NAME, and some optional keyword-operands are used.

```
//JOB  NAME=JOB6A2,TYP=2,PRI=8,HOLD=NO
```

In this example, the job name is JOB6A2, which must be unique. The job is allowed to run in partition 2 at a priority of 8. This job will not be held in the job queue for operator release. Because the USER keyword-operand is omitted, it is assumed that the installation does not require user identification. If USER is required, the job will be rejected by the Input Reader Module of Control Language Services.

EOJ STATEMENT

```
//EOJ
```

The //EOJ statement is required to terminate the command sequence for a job. There are no keyword-operands associated with this statement, but the comment and sequence fields may be used.

COMMENT STATEMENT

```
*comment
```

The comment statement is provided to allow the programmer to include comments in the job stream. It is never required. The comment statement may occur any place within a job.

The comment statement is identified by * in character position 1; the actual comment may begin in any character position thereafter. Since there are no command and

keyword-operand fields associated with this statement, the comment can occupy the remainder of the card except for the sequence field (last eight character positions).

Sample Comment Statement

```
*OUTPUT IS PROCESSED BY JOB REPORT 62
```

STEP LEVEL STATEMENTS

The statements at the step level specify the program to be executed and indicate the run-time environment for that program. These statements include:

- //EXECUTE
- //PAR
- //DEFINE
- //SET
- //TELL

EXECUTE STATEMENT

```
//EXECUTE
//EXEC
//EX          PGM=program-name
              [{NAME|NAM}=step-name]
              [{LIBRARY|LIB}=load-library-name]
              [{TIME|TIM}=minutes]
              [{DUMP|DMP}={YES|NO|COND}]
              [{DEBUG|DEB}={YES|NO}]
              [{RESTART|RES}={YES|NO|nnn}]
```

The //EXECUTE statement is the first statement of every step. It identifies the program to be executed, names the job step, and specifies the library on which that program resides. Also indicated are the time that the step is to be allowed to run and the conditions under which a dump is to be made.

PGM=program-name **(required)**

This keyword specifies the name of the program to be executed. The program name is a 1- to 8-character alphanumeric field, which is the same name as that by which the program is cataloged on the library. If RESTART=nnn option is specified, PGM=RESTART must be specified.

{NAME / NAM} =step-name **(optional)**

The system allows job steps to be named and identified by the NAME keyword. If the step is to be referenced by the GO keyword of a preceding //IF statement, this keyword-operand is required. (The //IF statement is described later in this section.) The operand is a 1- to 8-character alphanumeric field.

{LIBRARY / LIB} =load-library-name

This keyword specifies the library on which the program to be executed resides. It is required whenever the program resides on a private load library rather than on the standard system load library ($SYSLODLIB). The operand is a 1- to 17-character alphanumeric field.

If the library is centrally cataloged, no //DEFINE statement is required for the library. Otherwise the //DEFINE statement must be included with ID=$LODLIB.

{TIME / TIM} =minutes **(optional)**

This keyword-operand gives the maximum time, in minutes, that the step is allowed to run. If the operand defined is executed, the step will be terminated abnormally and the job will be aborted.

A 4-digit numeric field is used for this operand. Maximum time that can be specified is 1440 minutes, which allows the step to run indefinitely. If 1439 minutes is specified, the step will be allowed to run for 23 hours 59 minutes before being aborted. The default is set by the installation at SYSGEN time.

{DUMP / DMP} = {YES / NO / COND} **(optional)**

The system allows the conditions for making a main storage dump to be specified. When DUMP=YES, a dump of the user partition is made at the end of the step regardless of the termination status (normal or abnormal). When DUMP=NO, the dump is not made regardless of the termination status. If the keyword is not specified or if DUMP=COND, a dump will be made upon abnormal termination of the step, but not upon normal termination.

$\left\{\begin{matrix}\text{DEBUG}\\\text{DEB}\end{matrix}\right\} = \left\{\begin{matrix}\text{YES}\\\underline{\text{NO}}\end{matrix}\right\}$ **(optional)**

This keyword* allows the programmer to call the Debug routine for use in his program. This utility provides for snapshot dumps and optional step termination at specified breakpoints.

When DEBUG=YES, Control Language Services opens the Debug directive file created with a Control Language //DATA statement. Control Language Services will also inform the Relocating Program Loader that the Debug utility is to receive control over processing. When DEBUG=NO, the program is not run in Debug mode. The default is NO.

$\left\{\begin{matrix}\text{RESTART}\\\text{RES}\end{matrix}\right\} = \left\{\begin{matrix}\text{YES}\\\text{NO}\\\text{nnn}\end{matrix}\right\}$ **(optional)**

This keyword indicates a step's eligibility for restart† after abnormal termination. RES=YES allows immediate restart if a step terminates abnormally; RES=NO does not.

The nnn operand is a 1- to 3-digit decimal number indicating location for deferred restart attempt. The nnn value is taken from the console run sheet or the SYSOUT listing of the previous run of this step. If a deferred restart is being attempted, PGM=RESTART must be specified in addition to the RESTART keyword specification in the //EXEC statement.

Whenever RESTART is specified in the //EXEC statement, a //DEFINE statement with ID=SYSCHK for the checkpoint file must also be included in the Control Language statements.

Sample Execute Statement

The following is an example of an //EXECUTE statement. The required keyword, PGM, and some optional keyword-operands are used.

```
//EXEC    PGM=LOD618,DEBUG=YES,LIB=ULIB20,
//          NAM=STEP32,TIM=80
```

In this example, the program LOD618 will be executed from the library named ULIB20. The step name is STEP32 and may be branched to by a preceding //IF statement. The program will be allowed to run 80 minutes before being aborted. The Debug routine will run with this step. Breakpoints given in the Debug data directive file that apply to this step will be activated. Since DUMP is not specified, a dump will be taken on abnormal termination, but not on normal termination of the step.

*All programmers using the DEBUG keyword must be familiar with the Debug routine and the contents of the Debug directive file. This information is available in the Control Program and Data Management Services, Basic Reference manual.

†Restart information is discussed in the **MRX/OS Control Program and Data Management Services, Basic Reference** manual.

PAR STATEMENT

Run time parameters are supplied to system programs and user programs through //PAR statements. The parameters listed on //PAR statements are read by Control Language Services and transferred to the SYSIN file. //PAR statement parameters which are included in the job stream for the execution of a system program (such as the COBOL Compiler) are read by the system program itself. Those parameters supplied by //PAR statements to be used by the problem program require an ACCEPT macro to be read from the SYSIN file. (Appendix D contains a brief description of the ACCEPT macro; further details can be found in the **Control Program and Data Management Services, Extended Reference** manual.)

The specified parameters in the //PAR statement may have the same form as other control language statements, using keyword-operands, or they may take any other form acceptable to the program using them. Regardless of the form of the parameters, the identifier, command, and sequence fields must conform to the format specifications of all other control language statements. *The //PAR statement may be continued, but each statement must begin with //PAR.*

Sample //PAR Statements

The following examples show //PAR statements which might be included in the control language statements of a step:

```
//PAR  OP=SMAP,KEY=124311,DECK=YES
//PAR  BRANCH=ABK,
//PAR  PAY:TYPE42/CONT
//PAR  SPECIAL-ORDINARY
```

In these examples, keyword and other operand forms are used. The program executed in the step uses the ACCEPT macro to obtain the //PAR statement from the SYSIN file and processes the operands internally.

NOTE

A special restriction applies to //TELL and //PAR statements: No more than 17 characters may appear in consecutive columns without a delimiter (blank, comma, equal sign).

DEFINE STATEMENT

```
//DEFINE
//DEF     {IDENTIFIER}
        {IDENT     }=file-identifier
        {ID        }
        {FILENAME}
        {FIL     }=name
        [{STATUS}={S          }]
        [{STA   }={T          }]
                  {W          }
                  {(P[,{I}])  }
                  {    {O}    }
                  {    {U}    }
        [MSC=code]
        [{DEVICE}={name              }]
        [{DEV   }={(name,quantity)   }]
                  {address(es)       }
        [{VOLUME}={volume-id                    }]
        [{VOL   }={(volume-id,volume-id,. . .)  }]
        [CSD={YES}]
             {NO }
        [{ORGANIZATION}={S}]
        [{ORG         }={R}]
                        {I}
        [{LABEL}={S}]
        [{LAB  }={N}]
                 {U}
                 {I}
                 {B}
        [{RETENTION}=number]
        [{RET      }]
        [{BUFFER}=(number,size)]
        [{BUF   }]
        [{NUMBER}={n    }]
        [{NUM   }={(n,e)}]
        [{SIZE}=(record-size[,key-size])]
        [{SIZ }]
        [{BLOCK}=(records-per-block[,keys-per-block])]
        [{BLK  }]
        [{LOCATION}={YES}]
        [{LOC     }={NO }]
                    {n  }
        [{CATALOG}={YES}]
        [{CAT    }={NO }]
        [{VERIFY}={YES}]
        [{VER   }={NO }]
        [{SPREAD}=n]
        [{SPR   }]
        [{CONTIGUOUS}={YES                      }]
        [{CON       }={NO                       }]
                      {({SX},{SP})              }
                      {({MX}  {MP})             }
        [{IVOLUME}=volume identifier]
        [{IVOL   }]
        [{IVO    }]
        [{ILOCATION}={YES}]
        [{ILOC     }={NO }]
        [{ILO      }={n  }]
        [{EXPAND}=n]
        [{EXP   }]
```

The unshaded areas in the preceding representation of the DEFINE statement apply to all file and device use, and disc space allocation. The shaded areas apply to disc space allocation and disc file expansion. Exceptions are noted in the text.

The //DEFINE statement is the run-time interface between Data Management and Control Language Services. The program is independent of the name of the file to be processed as well as the volume or device on which the file resides. Control Language Services performs all device assignments for steps and allocates space for new disc files from //DEFINE statements.

The //DEFINE statement specifies the files to be used and the device and volume requirements of a step. This statement may indicate the type of file, specify the use of a permanent file, define the attributes of the data file, and establish a logical relationship with the internal file definition of the program. The //DEFINE statement is required for a specific device or volume requested, and for file allocation.

Before coding //DEFINE statements, the programmer must be familiar with the contents of the **MRX/OS Control Program and Data Management Services, Basic Reference** manual for logical I/O processing and the **MRX/OS Control Program and Data Management Services, Extended Reference** manual for physical and block I/O processing. For the proper use of //DEFINE statements for telecommunications, the user should refer to the **MRX/OS Telecommunications Reference** manual.

I { IDENTIFIER / IDENT / ID } **=file-identifier** **(required)**

The operand of this keyword supplies a logical name to the data file. That is, IDENTIFIER specifies the name by which the program will open, close, and transfer data to or from a data file. This file identifier must be unique within a job step.

The operand is a 1- to 8-character alphanumeric (including $ and dash) field. SYSIN and SYSOUT are illegal operands for the IDENTIFIER keyword. This keyword-operand is required on all //DEFINE statements.

{ FILENAME / FIL } **=name** **(required for disc and tape)**

This operand supplies label information. If the file is being allocated, the FILENAME operand will become the catalog name for disc data files, or the label entry for tape files.

The operand is a 1- to 17-character alphanumeric field. The first character may be A-Z, 0-9, or $. Imbedded dashes are allowed, but not imbedded blanks in the succeeding characters. This keyword-operand is required for all tape and disc files, but does not apply to unit record files.

For all physical I/O, the FILENAME operand must be PIO. For telecommunication lines, except PIO, FILENAME=TP is used. Since the PIO specification requires the exclusive use of the device/volume requested, this specification is not legal for shared devices.

FILENAME=DUMMY indicates that label information and allocation attributes will be specified within the program. FILENAME=NULL specifies an optional file.

$$\left\{\begin{matrix}\text{STATUS}\\\text{STA}\end{matrix}\right\}=\left\{\begin{matrix}\text{S}\\\underline{\text{T}}\\\text{W}\\\text{P}\end{matrix}\right\} \text{ or } \left\{\begin{matrix}\text{STATUS}\\\text{STA}\end{matrix}\right\}=\left(\text{P},\left\{\begin{matrix}\text{I}\\\text{U}\\\underline{\text{O}}\end{matrix}\right\}\right) \qquad \textbf{(optional, disc only)}$$

This keyword is used to specify the type of disc file used. The first operand specifies the type as scratch (S), temporary (T), work (W), or permanent (P). The second optional operand specifies usage for permanent files only. This usage may be specified as input (I), update (U), or output (O). The default for the first operand, which specifies type, is T. If the first operand is specified as P and the second operand is not specified, the default for it is O.

Detailed description of the file types and usage is given in **Control Program and Data Management Services, Basic Reference** manual. A brief description follows.

Scratch Files

Scratch files are allocated in a step and may be used only for the duration of that step. They are automatically purged at step termination. These files are always listed on the central catalog; therefore, CATALOG=NO is an illegal keyword-operand. Scratch files may never be shared.

Temporary Files

Temporary files are allocated in a step and may be used for the duration of the job. They are automatically purged at job termination. These files are always listed on the central catalog; therefore, CATALOG=NO is an illegal keyword-operand. Temporary files may never be shared.

Work Files

Work files are allocated permanently. They are not automatically purged, the Purge utility is used to perform this function. Work files may never be shared.

Permanent Files

Permanent files are allocated permanently. They are not automatically purged; the Purge utility is used to perform this function. Permanent files may be shared, depending upon the usage operand specified for the file (Table 2-1):

- Input – when a usage of input is specified, the file may be opened only for input in that step. This file may be shared with programs requesting it for update or input in the other partition.

- Update – when a usage of update is specified, the file may be opened for input or update in that step. This file may be shared only with programs requesting it for input in the other partition.

- Output – when a usage of output is specified, the file may be opened for input, update, or output in that step. This file may never be shared with a program in another partition.

Table 2-1. Sharing of Permanent Files

//DEFINE File Usage	Allowable Shared Usage		
	INPUT	OUTPUT	UPDATE
INPUT	Yes	No	Yes
UPDATE	Yes	No	No
OUTPUT	No	No	No

MSC=code **(optional)**

This keyword allows a modification security code to be specified for a permanent or work disc file. The code is used by Data Management to exclude unauthorized access to the file.

This keyword applies to both allocation and use of disc data files. The operand is a 4-character EBCDIC code. Embedded blanks and the characters ( ), = & may not be used. The default code is blanks.

$$\left\{\begin{matrix}\text{DEVICE}\\\text{DEV}\end{matrix}\right\} = \left\{\begin{matrix}\text{name}\\\text{(name, quantity)}\\\text{address(es)}\end{matrix}\right\} \qquad \textbf{(optional)}$$

This operand specifies the generic name and quantity or the device address(es) to be used for the file. The generic names of devices for MRX/OS are listed below. The default is DEV=DISC.

DISC
TAPE8 (800 bpi)
TAPE16 (1600 bpi)
CRD or READER
CRDPCH,RDRPUN,READPUNCH, or READERPUNCH
PRT or PRINTER (600 or 1200 lpm)

SYSCRD is used to specify the system card reader whether it be a reader or reader-punch (see //DATA Statement FIL=SYSCRD).

In addition, the following generic names are used for telecommunication lines. Note that the last two characters are equipment types, defined in the **Telecommunications Reference** manual.

TP80
TP84
TP86
TP88
TP8A
TPA4
TPA6

The user may specify the device requirements by.

1. Generic name only; quantity of 1 is implied.

2. Generic name and quantity (quantity greater than 1 applies only to tape, disc, and TCOM; maximum quantity of 2 for tape).

   Example: DEV=(TAPE8,2)

3. Address of a device as specified in the unit table.

   Example: DEV=101

4. Addresses of the devices requested as specified in the unit tables.

   Example: DEV=(302,303)

Specifying devices by device address instead of generic name allows two files to be applied to the same device.

$$\left\{\begin{matrix}\text{VOLUME}\\\text{VOL}\end{matrix}\right\}=\left\{\begin{matrix}\text{volume-id}\\\text{(volume-id,volume-id,. . .)}\end{matrix}\right\}$$

This specifies the volume identifier for file location. VOLUME is a required entry for disc files that are not listed on the central catalog. For tape files, VOLUME is required for the first or only volume of all files. In the case of multi-volume files, Data Management will write this volume identifier on each reel. In the case of multi-volume disc files, the user must specify the volume identifier. This keyword does not apply to unit record files. VOL=WORK may be used to specify a disc or tape volume with no volume identifier.

This operand is a 1- to 6-character field. It is an alphanumeric value given as the volume identifier.

$$\text{CSD}=\left\{\begin{matrix}\underline{\text{YES}}\\\text{NO}\end{matrix}\right\}$$ **(optional)**

This specifies whether or not data in the file is to be written in common stored data format. YES indicates that common stored data format is used; NO specifies that the data is not in common stored data format. The default is CSD=YES. If the common stored data format is used, four bytes are added to the record size for the control header.

$$\left\{\begin{matrix}\text{ORGANIZATION}\\\text{ORG}\end{matrix}\right\}=\left\{\begin{matrix}\underline{\text{S}}\\\text{R}\\\text{I}\end{matrix}\right\}$$ **(optional)**

This specifies the type of file organization as sequential (S), relative (R), or indexed (I). The system default is sequential file organization. (See the **Control Program and Data Management Service, Basic Reference** manual for additional discussion of file organizations.)

$$\left\{\begin{matrix}\text{LABEL}\\\text{LAB}\end{matrix}\right\}=\left\{\begin{matrix}\underline{\text{S}}\\\text{N}\\\text{U}\\\text{I}\\\text{B}\end{matrix}\right\}$$ **(optional, tape only)**

This specifies the type of tape label processing. The LABEL operand (valid for tape only) on the //DEFINE statement overrides any label specification for that file in the Buffer Description Table created by the Data Management DEFSF macro. The options are: standard labeled (S), nonstandard labeled (N), unlabeled (U), bypass label (B), and ignore tape label (I). (Refer to Section 3 of this manual and the **Control Program and Data Management Services, Basic Reference** manual for further details.)

{RETENTION / RET} =number **(optional, tape only)**

This designates the number of days a tape file is to be retained before it is allowed to be purged. Data Management uses this information to calculate the expiration date to be stored on the file label. RETENTION is ignored for input files.

The operand for RETENTION is a 1- to 3-digit numeric field. The system default (zeros) is used when this keyword is not given. In that case, the expiration date on that file will be the same as the creation date.

{BUFFER / BUF} =(number,size) **(optional, TCOM only)**

This keyword specifies partition space required for buffers. It has a two-part operand. The first is the number of buffers to be created for this line, and the second operand is the size of each buffer.

The number operand is a 1- to 3-digit numeric field with a value in the range of 1 to 999. The size operand is a 1- to 5-digit numeric field with a value in the range of 1 to 49999.

The buffers created with this keyword-operand are located in the partition space pool of the program partition in which the job runs and must not exceed the space available in the pool.

Sample //DEFINE Statements

The following are examples of //DEFINE statements that provide for device assignment and for the use of already allocated disc files.

```
Sample 1:  //DEF ID=SM220,DEV=PRT
```

In this example, a printer is assigned to the current job step. The file is called SM220 in the program.

```
Sample 2:  //DEF  ID=CLASS1,FIL=DA1143,VOL=136921,RET=3,
           //       DEV=TAPE8,CSD=YES
```

In this example, a tape unit is assigned to the step with a tape volume label, 136921, and tape file label, DA1143. The tape file is assumed to have standard labels. The data is in a common stored data format on an 800 bpi unit. The volume is to be retained for 3 days. The program calls the file CLASS1.

```
Sample 3:  //DEF  FIL=MASTER6BQ3,ID=SOURCE2,STA=(P,O),
           //       MSC=HR32
```

In this example, a permanent cataloged disc file is to be used. The file resides on shared resources but will not be shared because its usage is specified as output. The file is called SOURCE2 in the program. The catalog entry is MASTER6BQ3 with a modification security code of HR32. (The order of listed keyword-operands is free form.)

DISC ALLOCATION KEYWORDS

The following paragraphs describe additional //DEFINE statement keywords that are applicable to disc space allocation. VERIFY=YES may also be used for disc I/O to override the use of VER=NO at allocation. The SIZE and BLOCK keywords may also be used for the tape files, as noted in the discussion of those keywords below.

$\left\{\begin{matrix}\text{NUMBER}\\\text{NUM}\end{matrix}\right\} = \left\{\begin{matrix}\text{n}\\\text{(n,e)}\end{matrix}\right\}$ **(required, disc allocation only)**

This keyword-operand specifies the number of logical records for which space is to be allocated in a new file and optionally followed by the number of logical records to be stored in the catalog for dynamic expansion. If this operand is not given, or is zero, space allocation will not occur. If the expansion factor is omitted, zero is stored in the catalog. Dynamic expansion of sequential files occurs only at the logical I/O level.

The n and e operands are 1- to 6-digit numeric values. Use of the NUMBER keyword excludes the use of EXPAND in the same //DEFINE statement.

$\left\{\begin{matrix}\text{SIZE}\\\text{SIZ}\end{matrix}\right\}$ **=(record-size[,key-size]) (optional, disc allocation and tape I/O)**

This specifies the number of bytes per logical record for all file organizations and the number of bytes in the key for indexed files. For variable length records, the record size given is the maximum record size. If CSD=NO is not specified, the record size is incremented by four by the system.

Record size is a 1- to 4-digit numeric value in the range of 1 to 9999. Key size is a 1- to 3-digit numeric value in the range of 1 to 255.

This keyword may also be used for tape files. When specified in the //DEFINE statement and also within the program data transfer request, the specification within the program overrides the //DEFINE statement value.

The default for this keyword is 252 bytes, and applies to both tape and disc. (If CSD=YES the effect is a total record size of 256 bytes.)

{BLOCK / BLK} =(records per block[,keys per block]) **(optional, disc allocation, disc expansion, tape I/O)**

This specifies the blocking factor to be used in all disc file organizations. Also the number of keys in each key index information block may be specified for indexed files. For variable length records, the data blocking factor designates the minimum number of records per block.

The operands for this keyword are the number of records in the disc data block and optionally the number of keys in the index block. Both operands of this keyword are 1- to 3-digit numeric fields. The value of each operand is in the range of 1 to 255. The default for disc is 1 record per block.

The keyword may also be used for tape files. In this case, only the first operand (number of records) is used. When specified both in the //DEFINE statement and also within the program data transfer request, the value given within the program overrides the //DEFINE statement value. The default for tape is 1 record per block.

A more detailed explanation of this keyword is given in **Control Program and Data Management Services, Basic Reference** manual.

{LOCATION / LOC} = {YES / NO / n} **(optional, disc allocation, disc expansion)**

This defines the cylinder boundary for direct access storage space allocation. The numeric value is valid only if the VOLUME keyword is coded. The default is NO. The operand meanings are:

1. LOCATION=n specifies the cylinder number on which the file is to begin. The operand n is a 1- to 3-digit numeric value, with a range of 1 to 202.

2. LOCATION=YES specifies that the file is to begin on a cylinder boundary selected by Data Management.

3. LOCATION=NO allows the file to begin at any point on the pack.

{CATALOG / CAT} = {YES / NO} **(optional, disc allocation)**

This specifies whether or not the FILENAME and LOCATION of the file will be placed in the central catalog. CATALOG=YES specifies that the file entry will be placed on the system central catalog as well as the pack catalog. CATALOG=NO specifies that the file will not be entered on the central catalog. When CATALOG=NO is used, the VOLUME keyword is required.

CATALOG=NO applies only to work and permanent files at allocation time, and is illegal for scratch and temporary files. The system default is CATALOG=YES.

$$\left\{\begin{matrix}\text{VERIFY}\\\text{VER}\end{matrix}\right\}=\left\{\begin{matrix}\text{YES}\\\underline{\text{NO}}\end{matrix}\right\}$$ **(optional, disc allocation, disc I/O)**

This specifies burst-check. At allocation time, this option is recorded in the catalog entry. VERIFY=YES specifies that all writes to the file will be verified. VERIFY=NO specifies that no burst-check will occur. If this keyword is omitted, the system default (VERIFY=NO) will be used.

If VERIFY=NO is given at allocation time, the user may override this by specifying VERIFY=YES in the //DEFINE statement for the execution of a particular job step. This override will not, however, become a permanent characteristic of the file.

$$\left\{\begin{matrix}\text{CONTIGUOUS}\\\text{CON}\end{matrix}\right\}=\left\{\begin{matrix}\text{YES}\\\underline{\text{NO}}\\\left(\left\{\begin{matrix}\text{SX}\\\text{MX}\end{matrix}\right\},\left\{\begin{matrix}\text{SP}\\\text{MP}\end{matrix}\right\}\right)\end{matrix}\right\}$$ **(optional, disc allocation, disc expansion)**

This keyword-operand applies to both disc space allocation and disc file expansion. It specifies whether the space request is for a segmented or unsegmented block of disc space, and if specified, whether the space may occupy more than one pack. Extent and pack are coded as SX (single extent), MX (multiple extent), SP (single pack), and MP (multiple pack). Any combination of extent and pack is allowed. CON=YES means (SX,SP); and CON=NO means (MX,MP).

The CONTIGUOUS option applies only to the current space request. File expansion always results in the addition of a segment (represented by an extent in the FDT for that file): it will not necessarily yield a totally contiguous file, even if CON=YES was coded for both allocation and expansion.

$$\left\{\begin{matrix}\text{SPREAD}\\\text{SPR}\end{matrix}\right\}=n$$ **(index files only)**

This specifies the spread factor, or the frequency with which consecutive logical records of a file are written on a track. Use of the spread factor allows for faster sequential processing of records since disc access time is not lost in retrieving following records (Figure 2-1).

Operand n is a 1- to 2-digit numeric value in the range of 1 to 10 specifying a spread of 0-9. When this keyword is not used for an indexed file, logically sequential blocks of records are physically adjacent on a track.

Physical Block No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Logical Block No.	1	5	9	13	2	6	10	14	3	7	11	15	4	8	12	16

Figure 2-1. Indexed File with Spread Factor of 4

{IVOLUME / IVOL / IVO}=volume-identifier **(index files only)**

This specifies the volume on which the key index information file is to reside. If the IVOLUME keyword is not used for indexed files, the key index information file will be placed on the first volume specified in the VOLUME keyword-operand. The operand is a 1- to 6-character alphanumeric field.

{ILOCATION / ILOC / ILO}={NO / YES / n} **(index files only)**

This specifies the cylinder boundary for the beginning of space allocation for the key index information file. It is ignored if IVOL is not used.

There are three operands for this keyword; the default is NO:

1. ILOCATION=n specifies the cylinder number on which the key index information file is to begin. The operand n is a 1- to 3-digit numeric value with a range of 1 to 202.

2. ILOCATION=YES specifies that the key index file is to begin on a cylinder boundary selected by Data Management Services.

3. ILOCATION=NO allows the file to begin at any position on the pack.

Sample //DEFINE Statement for Disc Space Allocation

The following is an example of a //DEFINE statement that will result in the allocation of disc space:

```
//DEF  ID=GATHER1,FIL=SLID321BG,STA=(P,O),
//       NUM=1450,SIZ=100,BLK=10,
//       ORG=S,CON=YES
```

In this example, space will be allocated for 1450 records of 100 bytes each, blocked 10 logical records to a physical block. The file will be a sequentially organized permanent cataloged file in common stored data format, and will reside on shared disc (as defined at Initial Program Load time).

The file is cataloged as SLID321BG with a blank modification security code and is known in the program as GATHER1. Since the STATUS keyword specifies output, a request for the same file by another partition (while the step in the first requesting partition is executing) will cause the step in the second requesting partition to suspend initiation until the first step has terminated. At that time, the requested file is available for use by the step in the second partition, and initiation is continued.

DISC FILE EXPANSION KEYWORD

{EXPAND / EXP} =n **(expansion of sequential files only)**

This specifies the number of records by which an already allocated sequential file is to be expanded. This expansion takes place during step initiation. When the EXPAND keyword is used, the BLOCK keyword is required if its value is other than one (default for block keyword). The blocking factor specifies the same value as that given for that keyword when the file was allocated. The CONTIGUOUS and LOCATION keywords may also be used for file expansion. These keywords will apply only to the expanded area.

This operand is a 1- to 6-digit numeric value. Use of this keyword excludes the use of the NUMBER keyword in the same //DEFINE statement.

Sample //DEFINE Statement for Expansion

The following is an example of a //DEFINE statement that will result in the expansion of an already allocated disc file:

```
//DEF  FIL=PAY473ROLL,ID=PAY3,EXP=800
//       BLK=40,CON=YES,STA=(P,O),MSC=14WR,
//       VOL=BLY632
```

In this example, an already allocated disc file is expanded 800 records, blocked 40. The blocking factor must be the same as that of the existing file. The file is listed on the pack catalog of volume BLY632 as PAY473ROLL, with a modification security code of 14WR. The request is for contiguous space. The file being expanded is permanently allocated, with usage as output. The file will be called PAY3 in the program.

Summary of //DEFINE Statement Keywords

Table 2-2 gives a summary of //DEFINE Statement keywords according to I/O level and device category.

ROUTE STATEMENT

```
//ROUTE
//RTE     {IDENTIFIER}
        {IDENT     }=file-identifier
        {ID        }
        [{FILENAME}={name}]
        [{FIL     } {NULL}]
                  {PRINTER}
                  {PRT    }
        [{DEVICE}={READERPUNCH}]
        [{DEV   } {READPUNCH }]
                  {RDRPUN    }
                  {CRDPCH    }
                  {device address}
        [{VOLUME}={volume-identifier      }]
        [{VOL   } {(volume-id,volume-id,...)}]
                  {YES}
        [{CONTIGUOUS}={NO}                    ]*
        [{CON       } {({SX},{SP})}           ]
                      {({MX},{MP})}
        [{BLOCK}=n]*
        [{BLK  }]
        [{SIZE}=n]*
        [{SIZ }]
        [{SPOOL}={YES}]*
        [{SPL  } {NO }]
        [{NUMBER}={n    }]*
        [{NUM   } {(n,e)}]
                  {name          }
        [UCS={(name,FOLD,VER)  }]***
                  {(name,NOFOLD,NOVER)}
        [{HOLD}={YES}]**
        [{HLD } {NO }]
        [{SAVE}={YES}]**
        [{SAV } {NO }]
        [{COPY}=nn]**
        [{COP }]
        [{FORMS}=form-type]***
        [{FOR  }]
```

*Disc file allocation and disc file expansion parameters.
**Keyword passes information to the spooling function.
***Parameters for both spooler and unit record device.

Table 2-2. Summary of //DEFINE Statement Keywords*

	Device Catetory / Keyword	Logical and Block I/O						Physical I/O
		Card Reader Punch or Printer	Tape	TCOM	Disc File I/O Only	Disc Space Allocation and I/O	Disc File Expansion and I/O	All Devices
File and Device Use	ID	R	R	R	R	R	R	R
	FIL		R_1	R_2	R	R	R	R_3
	STA		I_{15}		O_4	O_4	O_4	
	MSC				O_5	O	O_5	
	DEV	R	R	R	O_6	O_6	O_6	R
	VOL		R		O_7	O_8	O_8	O_9
	CSD		O_{10}			O		
	ORG		I_{15}		O_{12}	O_{12}	O_{12}	
	LAB		O		I_{15}	I_{15}	I_{15}	
	RET		O					
	BUF			R_{11}		I_{15}		
Disc File Allocation / Disc File Expansion	NUM			I_{15}	I	R	I	
	SIZ		O_{13}			R		
	BLK		O_{13}			R	R	
	LOC					O		
	CAT					O		
	VER				O_{14}	O	O_{14}	
	CON					O	O	
	SPR					O		
	IVOL					O		
	ILOC					O		
Disc File Expansion	EXP				I	I	R	

Key: blank = Ignored
R = Required
O = Optional
I = Illegal

Notes:
1. Not used for unlabeled tape
2. FIL=TP
3. FIL=PIO
4. Required if not temporary
5. Required if used at allocation and not used with LABDEF on the OPEN
6. Required if specific drive desired
7. Required if not cataloged.
8. Required if non-shared packs desired
9. Required for disc volume mounting
10. Input tapes only
11. Required on first //DEF for logical TCOM
12. Required if not sequential
13. Applies to tape when not specified in the OPEN request for the file
14. Use disc-write-check for this step; override VER=NO at allocation for this step only
15. Results are unpredictable.

The //ROUTE statement allows a file to be spooled for output or to provide information for the unit record device such as UCS and FORMS.

{IDENTIFIER / IDENT / ID} =file-identifier **(required)**

This operand establishes the logical relationship between the program's internal file definition and the external specifications of the //ROUTE statement.

The operand is a 1- to 8-character alphanumeric (including $ and dash) field.

{FILENAME / FIL} = {name / NULL} **(optional)**

This operand supplies label information. The FILENAME operand must be identical to the entry in the central catalog. If the file is being allocated, the FILENAME operand will become the name in the catalog. FIL=NULL may be used to specify an optional file. An input request for an optional file results in end of file; an output request is ignored. If FILENAME is not specified, Control Language Services creates a default filename which is a 3-byte day of year, 6-byte time of day, and a 1- to 8-byte identifier.

{DEVICE / DEV} = {PRINTER / PRT / READERPUNCH / READPUNCH / RDRPUN / CRDPCH / device address} **(optional)**

This operand specifies the generic name or device address to be used for the output file for the spool function. Valid generic names are PRINTER, PRT, READERPUNCH, READPUNCH, CRDPCH. The default is DEV=PRINTER. If spooling was not selected at SYSGEN time, this is the device that will be assigned at Step Initiation.

{VOLUME / VOL} = {volume-identifier / (volume-id,volume-id,. . .)} **(optional)**

This operand specifies the volume serial number(s) on which the data set is located or to be allocated. The operand is a 1- to 6-character alphanumeric field.

ALLOCATION AND EXPANSION KEYWORDS

The following paragraphs describe the parameters necessary for the spool file allocation and/or expansion.

$$\left\{\begin{matrix}\text{CONTIGUOUS}\\ \text{CON}\end{matrix}\right\}=\left\{\begin{matrix}\text{YES}\\ \underline{\text{NO}}\\ \left(\left\{\begin{matrix}\text{SX}\\ \text{MX}\end{matrix}\right\},\left\{\begin{matrix}\text{SP}\\ \text{MP}\end{matrix}\right\}\right)\end{matrix}\right\}$$ **(optional)**

This operand specifies whether allocation or expansion request is for contiguous space; and if specified, whether the space may occupy more than one pack. Extent and pack are coded as SX (single extent), MX (multiple extent), SP (single pack), and MP (multiple pack). Any combination of extent and pack is allowed. CON=YES means (SX, SP); and CON=NO means (MX, MP).

$$\left\{\begin{matrix}\text{SPOOL}\\ \text{SPL}\end{matrix}\right\}=\left\{\begin{matrix}\underline{\text{YES}}\\ \text{NO}\end{matrix}\right\}$$ **(optional)**

This keyword specifies whether output to be spooled or not. SPL=YES specifies spooling. SPL=NO specifies that the output goes directly to a peripheral device. Unless the default has been changed at SYSGEN time, the default is SPL=YES.

$$\left\{\begin{matrix}\text{BLOCK}\\ \text{BLK}\end{matrix}\right\}=n$$ **(optional)**

This operand specifies the number of logical records per block. The value of each operand is in the range of 1 to 255. The default value is 1.

$$\left\{\begin{matrix}\text{SIZE}\\ \text{SIZ}\end{matrix}\right\}=n$$ **(optional)**

This operand specifies the number of bytes per logical record. Record size is a 1- to 4-digit numeric value with a range of 1 to 9999. The default value is 134.

NOTE

The user is encouraged to use even-byte record size to allow output writer to use multiple block reads.

$$\left\{\begin{matrix}\text{NUMBER}\\\text{NUM}\end{matrix}\right\}=\left\{\begin{matrix}\text{n}\\\text{(n,e)}\end{matrix}\right\}$$ **(optional)**

This keyword specifies the number of logical records for which space is to be allocated and optionally the number of logical records to be stored in the catalog for dynamic expansion.

The n and e operands are 1- to 6-digit numeric values. Unless specified otherwise at SYSGEN time, the default value is NUM=(1000,500).

SPOOLING INFORMATION KEYWORDS

The following paragraphs describe additional //ROUTE statement keywords that are used to pass information to the spooling function or provide UCS or FORMS information to the unit record device.

$$\text{UCS}=\left\{\begin{matrix}\text{name}\\\text{(name,FOLD,VER)}\\\text{(name,NOFOLD,NOVER)}\end{matrix}\right\}$$ **(optional)**

This keyword specifies the 2- to 4-character name of the Universal Character Set residing on $NUCLIB which is to be loaded prior to printing. The FOLD and VER options are available. Default values are a SYSGEN name, NOFOLD, and NOVER. If SPL=NO, the Step Initiator issues UCS mount requests and loads the UCS buffer; whereas if SPL=YES, the information is passed to the spooler. See the **MRX/OS Utilities Reference** manual for a detailed description of UCS.

$$\left\{\begin{matrix}\text{HOLD}\\\text{HLD}\end{matrix}\right\}=\left\{\begin{matrix}\text{YES}\\\underline{\text{NO}}\end{matrix}\right\}$$ **(optional)**

This keyword specifies whether the file is to be (HOLD=YES) or is not to be (HOLD=NO) placed on the spooler hold queue at step termination. Default is HOLD=NO.

$$\left\{\begin{matrix}\text{SAVE}\\\text{SAV}\end{matrix}\right\}=\left\{\begin{matrix}\text{YES}\\\underline{\text{NO}}\end{matrix}\right\}$$ **(optional)**

This keyword specifies whether the file is to be (SAVE=YES) or is not to be (SAVE=NO) purged after it has been printed or punched. Default is SAVE=NO and the file is purged after output completion.

$$\left\{\begin{matrix}\text{COPY}\\\text{COP}\end{matrix}\right\}=\text{nn}$$ **(optional)**

This operand specifies a 1- or 2-digit decimal number which specifies the number of copies to be printed or punched. Default value is 1.

{FORMS / FOR}=form-type **(optional)**

This operand specifies a 1- to 6-character alphanumeric form type which the operator will be requested to mount prior to printing or punching. Default is standard forms.

If SPL=NO, the Step Initiator issues forms mount requests; whereas if SPL=YES, the information is passed to the spooler.

SAMPLE //ROUTE STATEMENTS

The following example assigns the READPUNCH to the job identified by ID=JOB18. The default filename is created. Since SPOOL was not specified the default is YES. Before punching the operator will be requested to use form 18.

```
Sample 1:  //RTE    ID=JOB18,DEV=READPUNCH,FORMS=18
```

In the following example the MASTERFILE will be allocated in noncontiguous space on volume BLY635 with blocking factor of 10. The number of logical records is 1500 with 500 reserved for dynamic expansion. The file is to be saved after printing.

```
Sample 2:  //RTE    ID=JOB20,FIL=MASTERFILE,VOL=BLY635,
           //       BLK=10,NUM=(1500,500),SAVE=YES
```

SET STATEMENT

```
//SET    {DATE / DAT}=job-date

       and/or

       {SWITCH / SWI}=switch-setting
```

The operating system permanently allocates space in the partition for a job control table. This table contains, among other things, a job date and a program option switch byte. The problem program has access to these fields which enable the programmer to obtain the date for processing and/or output, and to test the setting of the option switch.

At the beginning of the job, the job date field is set equal to the system date, and the bits of the program option switch byte are set to zero. The //SET statement enables the user to modify the contents of these two fields in the Job Control Table. Either the job date or the switches, or both, may be altered by one //SET statement. The effect of a //SET statement remains until //EOJ is encountered or until another //SET statement with the same keyword occurs within the job. Any number of //SET statements may be included within a job.

DATE=job-date **(optional)**

This keyword-operand specifies the date to be used for date-dependencies in the job. The job date that is set need not be the current date. The operand field is a 6-digit numeric value in the form mmddyy: mm is the month with a value in the range of 01 to 12, dd is the day of the month with a value in the range of 01 to 31, yy is the decade and year with a value in the range of 00 to 99.

Example: DATE=012472

NOTE

A Julian date will be calculated by the system and will be returned when it is requested using a JDATE macro in a program. (Refer to Appendix D and the **Control Program and Data Management Services, Basic Reference** manual for further discussion of the JDATE macro.)

SWITCH=switch-setting **(optional)**

This allows the programmer to control the eight switch bits of the program option switch (POST) byte in the Job Control Table (JCT). The switches are set and changed by either the //SET control language statement or the POST macro and may be used for any purpose in the program. The switches are tested within the program via the RPOST macro. (See Appendix D of this manual and the **Control Program and Data Management Services, Extended Reference** manual for details on these macros.)

The operand is an 8-character field. Each character is specified as either a zero, a one, or an X. The value 1 sets the corresponding switch bit on in the POST byte of the JCT. The value 0 turns the switch bit off. The X leaves the switch bit as it was previously set within the job.

```
Example:  SWI=0100X1XX
```

Sample //SET Statements

The following are examples of //SET statements.

```
Example:  //SET  DATE=032172
```

In this example, the existing JDATE entry of the JCT will be changed to 032172. The SWITCH keyword-operand has been omitted and the POST byte of the JCT will not be affected by this //SET statement.

```
Example:  //SET  DATE=032173,
          //       SWI=X0100XX1
```

In this example the JDATE entry of the JCT will be changed to 032173. The POST byte of the JCT is also changed. The first, sixth, and seventh bits retain the values set in them before this //SET statement is processed. The second, fourth, and fifth bits are turned off by being set to zeros. The third and eighth bits are turned on, by being set to ones.

TELL STATEMENT

```
//TELL
//TEL       OP=message
                [{PAUSE} = {YES}]
                 {PAU  }   {NO }
```

This statement designates information to be typed on the operator's console during the initiation of a job step. The PAUSE=YES keyword-operand will cause Control Language Services to wait for an operator response before continuing initiation.

Continuation of this statement is not allowed. However, multiple //TEL statements may be used. The commend field is not allowed.

OP=message **(required)**

The operand of this keyword is the message to be printed on the operator's console. The entire EBCDIC code set is available for use in the operand. The contents of the operand will be typed on the operator's console as specified between the equal sign of the keyword and either the sequence field of the statement or the PAUSE=YES or PAU=YES keyword-operand.

Example: OP=EMPTY READER PUNCH HOPPER

{PAUSE} = {YES} **(optional)**
{PAU }   {NO }

PAUSE=YES indicates that the Control Language Services will wait for an operator response. The operator replies GO to continue processing or STOP to abort the job. When PAUSE=NO is specified or when this keyword is not coded, initiation will not be interrupted for operator response. The default is NO.

In order to write a multi-line message on the operator's console and then interrupt the initiation of the step for a response, PAUSE=YES is specified only on the last //TELL statement.

Special consideration must be given to the information that may be included in a //TELL statement. An equal sign within a message can cause Control Language Service errors. For example,

```
//TELL    OP=PGM=XYZ,FIL=ABC
```

will cause an error. However, this may be circumvented by using the following format.

```
//TELL    OP=* PGM=XYZ,FIL=ABC
```

Sample //TELL Statements

The following are examples of //TELL statements.

```
Example:  //TEL  OP=PLEASE CALL BOB MILLER,EXT394
          //TEL  OP=IF THIS JOB ABORTS
```

In this example, a multi-line message is typed on the operator's console and initiation of the step will not be interrupted.

```
Example:  //TEL  OP=EMPTY CARD READER HOPPER,PAU=YES
```

In this example a single line message is typed on the operator's console. After the message is typed, initiation of the step will be suspended until the operator replies either GO to continue initiation or STOP to abort the job.

```
Example:  //TEL  OP=REMOVE PRINTED OUTPUT FROM PRINTER
          //TEL  OP=EMPTY READER AND PUNCH OUTPUT
          //TEL  PAU=YES,OP=CALL EXT 472 ON JOB COMPLETION
```

In this example, the three line message is typed on the operator's console before initiation of the step is interrupted. Initiation will resume when the operator replies to the PAU=YES keyword-operand with GO; termination will occur when the operator responds with STOP.

NOTE

A special restriction applies to //TELL and //PAR statements: No more than 17 characters may appear in consecutive columns without a delimiter (blank, comma, equal sign).

INTERSTEP LEVEL STATEMENTS

Between steps, the //IF statement may be used to affect the conditional execution of the following job steps.

IF STATEMENT

```
//IF   { CODE } =value
       { COD  }
     GO={ step-name }
        { EOJ       }
```

The //IF statement provides for testing the condition code set by the program in the Job IF Code (JTIFC) byte contained in the job control table (JCT). As a result of the test in the //IF statement, the job will either continue with the next control statement or will skip (in a forward direction only) to a named //EXECUTE or to end of job. Only one code condition is tested in an //IF statement. However, any number of these statements may be used between steps.

$\left\{\begin{matrix}\text{CODE}\\\text{COD}\end{matrix}\right\}$=value **(required)**

This 1-byte operand field specifies a value to be compared to the JTIFC byte of the JCT. The operand may contain any EBCDIC character. If the value given as the operand of the CODE keyword is equal to the value in the JTIFC byte, Control Language Services will initiate the step named as the operand of the GO keyword.

The value in the JTIFC byte is specified in the program, via the SETIF macro. (Refer to Appendix D of this manual and **Control Program and Data Management Services, Extended Reference** manual for a detailed description of this macro.)

GO=$\left\{\begin{matrix}\text{step-name}\\\text{EOJ}\end{matrix}\right\}$ **(required)**

The operand of the GO keyword specifies either the name of a following step or EOJ. If the condition code in the JCT (JTIFC byte) is equal to the operand of the CODE keyword, a forward jump will be made to the named step if GO=step-name, or to the end of job if GO=EOJ. The step-name specified must be identical to a NAME operand of a following //EXECUTE statement within the job. An unnamed step may not be referenced. If the GO keyword names a step which is not a forward reference, all remaining steps are skipped.

The GO operand is a 1- to 8-character alphanumeric field. This keyword-operand is required.

Sample //IF Statement

The following is an example of an //IF statement.

```
//IF  CODE=M,GO=EOJ
```

In this example, if the value in the JTIFC byte of the JCT, set by the SETIF macro in the program, is equal to M, the remaining steps in the job will be skipped. If the value in JTIFC is not equal to M, the next control language statement in the job will be processed.

PROCEDURE-ORIENTED STATEMENTS

To eliminate the duplication of writing control language statements for each step, these statements may be cataloged as a source library member. This member is known as a cataloged procedure. (Cataloged procedures are described in Section 4 of this document.) The statements that identify, communicate with, and cause the merging of a cataloged procedure are known as procedure-oriented statements. There are two of these:

//CALL	(Requests the merging of a cataloged procedure from the procedure source library into the control language statements of a job step, and passes values to the procedure for variables identified in the //DECLARE statement.)
//DECLARE	(Identifies variables used within the control language statements of a cataloged procedure.)

Cataloged procedures consist of a //DECLARE as the first statement followed by step or interstep control language statements (//EXECUTE, //PAR, //DEFINE, //SET, //TELL and //IF). No other control language statements except comments are allowed.

DECLARE STATEMENT

```
//DECLARE
//DEC          [Required run-time variables]
             [Run-time default variables]
```

The //DECLARE statement is required as the first statement of every cataloged procedure having defaults. It may identify variables to be supplied to the procedure.

The Control Language statements within a cataloged procedure may include both constants and run-time variables. Constants are keyword-operands that remain unchanged for all executions of the procedure. Run-time variables are keyword-operands that may change with succeeding executions of the procedure. Run-time variables must be declared as keywords in the //DECLARE statement.

An ampersand (&) preceding an operand within a cataloged procedure identifies that operand as a run-time variable.

The keywords listed on the //DECLARE statement identify two classes of run-time variables. Keywords which are listed with no operands on the //DECLARE statement; these keywords must be specified with operands in the //CALL statement each time the cataloged procedure is called into execution. Keywords listed with operands on the //DECLARE statement supply default values for operands not specified at the time the procedure is called. These default values are set at the time the procedure is cataloged.

Sample //DECLARE Statement

```
//DEC   A,B,C,D=DISC
//DEF   ID=&A,FIL=&B,
//       VOL=&C,DEV=&D
```

In the above example of a cataloged procedure: Keywords A, B, and C are listed on the //DECLARE statement with no operands. These operands, therefore, must be specified in the //CALL statement each time the procedure is called into execution. Keyword D is listed with the default operand DISC. If this operand is not overridden by a specification in the //CALL statement at the time this procedure is called into execution, &D in the //DEF statement will be replaced with the operand DISC.

CALL STATEMENT

```
//CALL
//CAL    {PROC} =procedure-name
       {PRO }
       [{LIBRARY} =library-name]
       {LIB    }
       [Required run-time variables]
       [Default values to be overridden]
```

This statement names the cataloged procedure to be merged with the control language statements of a job. Run-time variables for that procedure are also given on the //CALL statement.

All required keywords (specified with the keyword only and no operand on the procedure //DECLARE statement) must be given on the //CALL statement. In addition, any //DECLARE default values to be overridden (specified with the keyword and operand on the //DECLARE statement) may also be given on the //CALL statement.

{PROC} =procedure-name **(required)**
{PRO }

This keyword-operand is required. It specifies the name of the cataloged procedure to be merged with the control language statements of a job. The operand is a 1- to 8-character alphanumeric field and must be identical to the member name of the procedure on the source library.

Example: PROC=RECON3

{LIBRARY / LIB} =library-name

This keyword is required whenever the procedure resides on a private library rather than on the system procedure library ($SYSPROCLIB). It specifies the library on which the cataloged procedure resides. The operand is a 1- to 17-character alphanumeric field. First character may be A-Z, 0-9, or $. No embedded blanks or special characters except dashes are allowed.

The PROC keyword and the LIBRARY keyword (if specified) must precede the required run-time variables and default values specified on the //CALL statement. They must also be in the order: PROC, LIB.

If the LIB keyword is not coded, the first run-time variable may not begin with LIB.

Required Run-Time Variables

The required run-time variables supply the values for the run-time variables listed on the //DECLARE statement with keywords and no operands. If //CALL names a variable that is non-existent, it is ignored.

Default Values to be Overridden

These entries provide values which override default values specified in the //DECLARE statement with keyword operand.

Sample //CALL Statements

The following are examples of //CALL statements.

```
Sample 1:    //CALL   PROC=PAWN3B,LIB=PROCLIB1
```

In this example, PAWN3B is the cataloged procedure on library PROCLIB1 which will be merged with the Control Language statements of the step. The //DECLARE statement contains no required variables, and there are either no defaults given or all defaults are accepted for this execution of the procedure.

```
Sample 1:    //CALL   PROC=SEND241,SOURCE=FIL 42,
             //         SPOT=467,LINES=20
```

In this example, the cataloged procedure is called SEND241 and resides on $SYSPROCLIB, the system library for cataloged procedures. Defaults are being overridden, or entries are required for LINES, SOURCE, and SPOT (listed on the //DEC statement with no operands).

Sample 3: At run time those operands in the procedure identified by an ampersand (&), will be replaced by run-time variables. These run-time variables are listed on the //CALL statement, or as default values on the //DEC statement. Operands provided by //DECLARE and/or //CALL statements, when substituted into the Control Language statement of the cataloged procedure must not cause format errors in statement of test procedures. The format of the //CALL and //DECLARE statements is the same as that described under FORMAT previously in this section.

```
//JOB    NAME=PAYROLL
//EX     PGM=PR146G-A,TIME=75
//CALL   PROC=PAYPROC1,LIB=PAYPROK,A=PROC1234,
//       B=FIL147,C=AQ1439,D=(P,O)
//EOJ
```

The procedure PAYPROC1 contains the following code:

```
PAYPROC1
//DEC    A,B,C,D,E=DISC
//DEF    ID=&A,FIL=&B,
//       VOL=&C,STA=&D,DEV=&E,
//       NUM=1600,SIZ=128,BLK=1
```

At run time the operands are substituted into the //DEFINE statement, and it reads as follows:

```
//DEF    ID=PROC1234,FIL=FIL147,
//       VOL=AQ1439,STA=(P,O),DEV=DISC,
//       NUM=1600,SIZ=128,BLK=1
```

DATA LEVEL STATEMENTS

All data is entered into the system through the data level statement within the job. The data level statements are //DATA and /* (data delimiter).

The user may enter data to the system in one of two ways: either by spooling the data to a sequential disc file to be read by one or more of the job steps, or by temporarily dedicating the system reader to his job through the use of SYSCRD. In either case, he must precede the //DATA statement with a //DEF statement to identify the file in each step that uses it. Spooling is generally preferred on two counts: it does not tie up the system reader which temporarily prevents the entry of other jobs, and it provides input data files which may be read by more than one job step. (However, in an environment using the reader-punch as primary input device, the SYSCRD file preloaded with blank cards is the user's only means of punching cards.)

DATA STATEMENT

```
//DATA   {FILENAME} = {SYSCRD       }
       {FIL     }   {data-file-name}
       [CLS={YES}]
            {NO }
       [{BLOCK} =blocking factor for spooled data]
        {BLK  }
       [{NUMBER} =number of records]
        {NUM   }
       [{CONTIGUOUS} = {YES}]
        {CON       }   {NO }
```

The //DATA statement is used to identify the data file which follows. Within a job, data files always precede the //EOJ statement. If the data is spooled more than one data file may be included in a job. //DATA statement is required for each data file in the job. A spooled data file is reusable; it may be read by more than one step of a job.

When spooling data, the data file(s) may appear any place in a job, following a complete statement, after the //JOB card and before the //EOJ card. The FILENAME keyword names the file to be built.

Only one SYSCRD //DATA statement specifying FIL=SYSCRD can be used in a job. This //DATA statement and its associated data file must immediately precede the //EOJ statement. Multiple data files are entered, in this case, by coding data delimiters following each set of data cards that the job processes as a file (Figure 2-2). Control of the card reader will be given to the job using the data file for the duration of the job. When the data delimiter is encountered, the card reader file is closed by the program. In order to read each additional set of data (following a data delimiter) the program must again issue an open request for the card reader, using the IDENT specified in the //DEFINE statement for that file, and must again close the file when the data delimiter is read.

The data delimiter, /* (slash, asterisk, blank), must be used to end each data file including the last data file within the job; except when CLS=YES is specified, /*CLS is the data delimiter. The //EOJ card immediately follows the last data delimiter in the job.

When the data cards are to be read directly from the system card reader by the program, the data file must immediately precede the //EOJ card; FILENAME=SYSCRD must also be given in the //DATA statement. In this situation, the card reader is controlled by the program, until the job has processed the data and has terminated. Only then is control of the card reader returned to the system so that Control Language Services can read and initiate additional jobs.

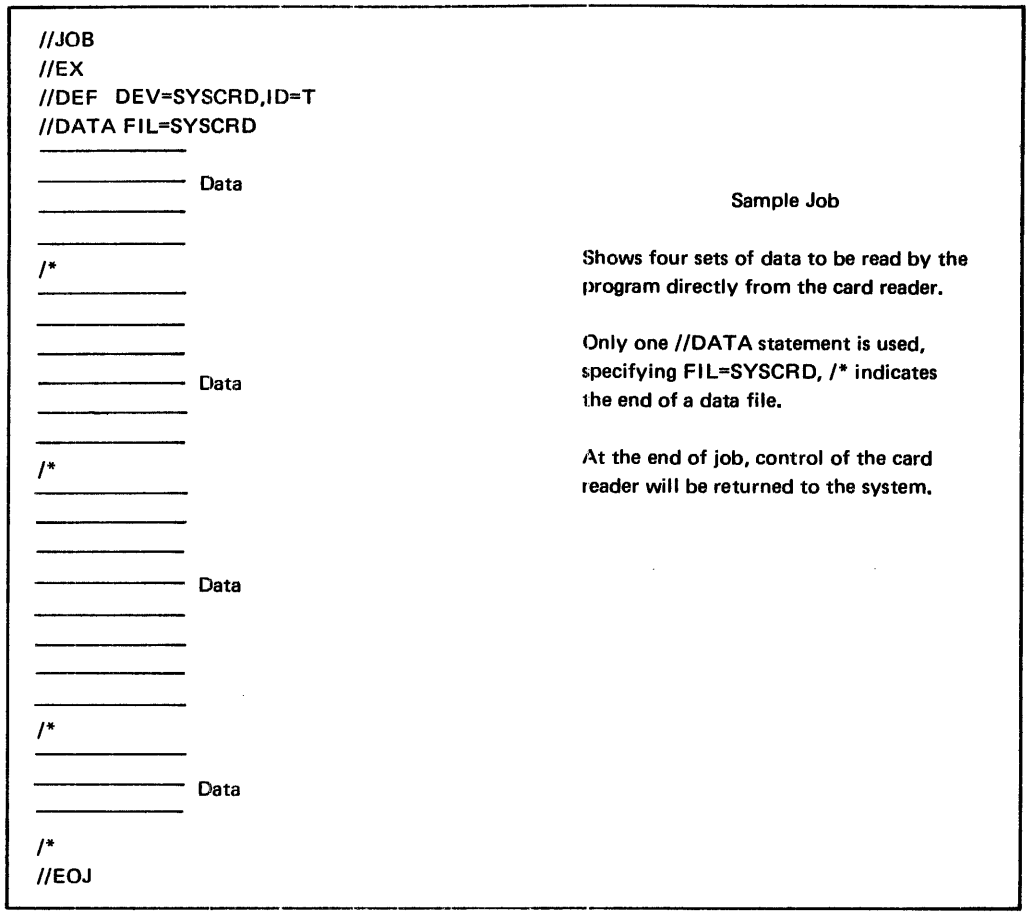


Figure 2-2. Sample Job with Card Reader Control by the Program

$$\left\{\begin{matrix}\text{FILENAME}\\\text{FIL}\end{matrix}\right\}=\left\{\begin{matrix}\text{SYSCRD}\\\text{data-file-name}\end{matrix}\right\}$$ **(required)**

This keyword specifies the name of the file to be built from the cards which follow. If data-file-name is used, this operand must be the same as that coded for the FILENAME operand of a //DEFINE statement within the job. If SYSCRD is used, the preceding //DEFINE statement uses DEV=SYSCRD rather than file-name.

When FILENAME=SYSCRD is used, control of the system card reader is passed to the job until all following data has been processed and the job has completed execution. The data-file-name operand is a 1- to 17-character alphanumeric field. First character may be A-Z, 0-9, or $. No embedded blanks or special characters except dashes are allowed.

CLS= { **YES** / **NO** } **(optional)**

The system allows control language statements to be placed in data files. Whenever this is done, as when creating procedure files, the CLS keyword is required. The CLS keyword-operand has no meaning when FIL=SYSCRD is used.

CLS=YES indicates that the control statement identifier (//) may be found in columns 1 and 2 of the records. The /*CLS data delimiter is the only statement that will stop placement of cards in the data file. All cards between the //DATA and /*CLS statements are spooled.

CLS=NO specifies that there are no control statements in the file. The first statement with the // or /* identifier beginning in column 1 is assumed to be a control language statement and will terminate the file. The default is CLS=NO.

{ **BLOCK** / **BLK** } **=blocking-factor for spooled data** **(optional)**

This operand specifies the blocking factor to be used in data spooling. It indicates the number of logical records to be placed in each physical block. The BLK keyword has no meaning when FIL=SYSCRD is used. The default is BLOCK=1.

{ **NUMBER** / **NUM** } **=n** **(optional)**

This keyword is used to specify the number of logical records for which space is to be allocated for the spooled data file. If this operand is not given, the default value NUM=1000 is assumed. This parameter has no meaning if FIL=SYSCRD.

The NUMBER operand is a 1- to 5-digit numeric value. The maximum value of operand n is 32,767.

{ **CONTIGUOUS** / **CON** } = { **YES** / **NO** } **(optional)**

This keyword specifies whether the space request is for a segmented or contiguous block of disc space for the spooled data file. CON=YES specifies that contiguous disc space is required. CON=NO indicates that segmented disc space is acceptable for this request. The default is NO. This parameter has no meaning if FIL=SYSCRD.

Sample //DATA Statements

Sample 1:

Example of data entry under program control of system card reader:

```
//JOB    NAME=SAMPLE
//EX     PGM=LIBUTIL
//DEF    ID=SEQIN,DEV=SYSCRD
  .
  .      (other //DEF and //PAR statements for program)
  .
//DATA   FIL=SYSCRD
  .
  .      (input data)
  .
/*
//EOJ
```

Sample 2:

Example of spooled data file, read by both steps of a two step job:

```
//JOB    NAME=GEMINI
//EX     PGM=FIRST
//DEF    ID=INPUT,FIL=PROC1630
  .
  .      (other //DEF and //PAR statements as required)
  .
//EX     PGM=SECOND
//DEF    ID=PRIME,FIL=PROC1630
  .
  .      (other //DEF and //PAR statements as required)
  .
//DATA   FIL=PROC1630,CLS=YES,NUM=35,CON=YES
  .
  .      (input data)
  .
/*CLS
//EOJ
```

DATA DELIMITER STATEMENT

/*

/* (slash, asterisk, blank) is the data delimiter. This statement is required at the end of each data file.

There is no command for this statement and it has no keywords. The comment field may be used beginning in card column 4. Any character other than blank in card column 3 will cause the card to be treated as data and not as a data delimiter with the exception of /*CLS.

If CLS=YES in the //DATA statement, all cards between the //DATA and /*CLS cards are considered to be data.

JOB STREAM CONVENTIONS

A sample job stream is illustrated in Figure 2-3. Another sample may be found in Appendix G. Control language statements are listed as they might appear in a job. Within a job step the //EXECUTE statement must appear first. Other statements in the step may be in any order, but should be grouped by command. All statements in a job step are processed by Control Language Services prior to the program being loaded. Note the job stream conventions used.

Appendix G contains two sample jobs that include a variety of Control Language statements and appropriate keyword-operands to run these particular jobs.

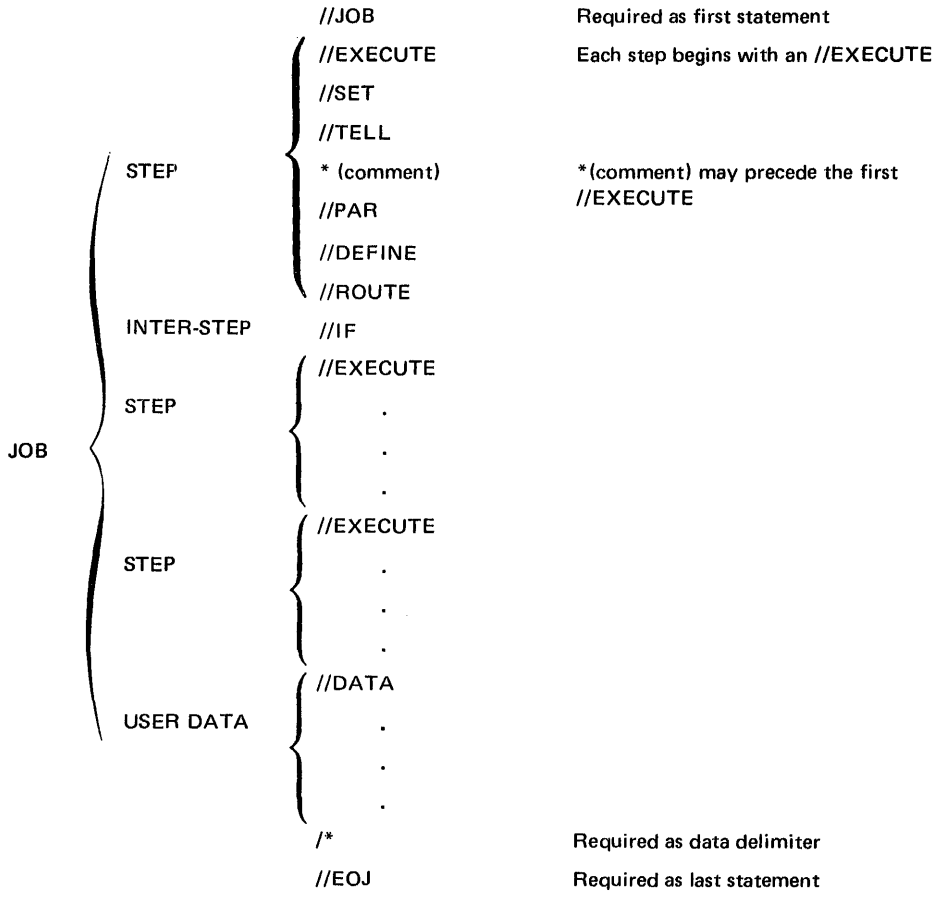


Figure 2-3. Sample Job Stream

3. FILES AND DEVICES

GENERAL DESCRIPTION

The assignment of all devices and the allocation of disc space may be performed via the Control Language Services program. The step-level control language statement which requests a device, volume, or file is the //DEFINE statement.

Space allocation and disc file use occur through the control language statement interface to Data Management Services. Internal allocation and use of disc files, completely within the program, and without the use of a //DEFINE statement, can only occur for cataloged files residing on shared disc. This technique is intended for use by system programs. It is, however, available for use in application programs.

SPECIAL FILES

Control Language Services allocates space for the system files used by job steps. These files are the system input file, called SYSIN, and the system output file, called SYSOUT. Space is allocated and these files are built for every job by Control Language Services. These files do not require a //DEFINE statement. Files requested as a result of LIB=keyword and/or DEBUG=YES parameters on the //EXECUTE statement are also handled by Control Language Services. A //DEFINE statement, however, is required for the CHECKOUT file created as a result of DEBUG=YES keyword-operand on a //EX statement. A //DEFINE statement is also required whenever an uncataloged private load library is used.

SYSIN (SYSTEM INPUT FILE)

Every job has a uniquely named system input file, allocated as a temporary cataloged file by the Input Reader, and built by the Input Reader and Job Initiator modules of Control Language Services. SYSIN contains all of the control language statements for a job including those which are merged from cataloged procedures. It is from this file that the job and its steps will be initiated at run time. SYSIN is built and used exclusively by the system.

The //PAR statements which are part of the job are placed on the SYSIN file. They are accessed during program processing by the ACCEPT macro. (See Appendix D of this document, and the **Control Program and Data Management Services, Extended Reference** manual for further details on the ACCEPT macro.) SYSIN is automatically purged by Job Terminator.

Data cards in the job are placed on a separate data file, specified on the //DATA statement, or are read by the program directly from the system card reader for processing. No relationship should be formed between this data file and the SYSIN file.

In the event of a system crash or other condition preventing normal job termination, replying N to the retain job queue question causes IPLMON to purge all outstanding SYSIN, SYSOUT, and spooled data files.

SYSOUT (SYSTEM OUTPUT FILE)

Each job has a uniquely named system output file, which is created during job processing. The SYSOUT file is allocated as a temporary cataloged file by the Input Reader module of Control Language Services, SYSOUT contains a copy of the control language statements read and processed by Job Initiator and Step Initiator. Error and system messages, and job accounting information are also written to SYSOUT. The problem program may write messages on the SYSOUT file by using the DISPLAY macro. (See Appendix D of this document, and the **Control Program and Data Management Services, Extended Reference** manual for a description of the DISPLAY macro.)

At job termination, the SYSOUT file will be printed and automatically purged by the Job Terminator. If no printer is available the operator will be informed and the file will be printed when a subsequent job termination occurs and a printer is available.

In the event of a system crash or other condition preventing normal job termination, replying N to the retain job queue question causes IPLMON to purge all outstanding SYSIN, SYSOUT, and spooled data files.

$LODLIB (PRIVATE LOAD LIBRARY)

Control Language Services will request program loading from a private load library when specified by the LIB=keyword on the //EXECUTE statement. If the private load library is cataloged, no //DEFINE statement is required. However, if the library is not listed on the central catalog, a //DEFINE statement specifying ID=$LODLIB must be provided. The Step Initiator routine of Control Language Services opens the library for input, and Step Terminator automatically closes it at the end of the step.

CHECKOUT (CHECKOUT DEBUGGING DIRECTIVES)

When DEBUG=YES is specified on a //EXECUTE statement, the Step Initiator routine of Control Language Services will automatically open the associated debug directive data file entered with the job. A //DEFINE statement specifying ID=CHECKOUT and FILENAME with the same operand as given on the //DATA statement of the debug directive file must be included with the control language statements of the step. This file is automatically closed by the Step Terminator of Control Language Services at the end of the step.

DEVICE ASSIGNMENT AND FILE DEFINITION

The //DEFINE statement includes all of the keywords necessary to describe the attributes of a file and of the device on which it resides. The level of involvement of the Control Language Services depends upon the type of file used.

The following sections discuss the categories of devices available on the MRX/40 and 50 Systems. Devices and files for logical and block I/O are described by device type. Files to be manipulated by physical I/O are discussed collectively under that heading in this section.

UNIT RECORD DEVICES

In order to make a file on a unit record device available for use by a program executing in a partition, Control Language Services must assign the device to a job step. A unit record device must be assigned for the exclusive use of a single step in a partition. The unit record devices available for use with the MRX/40 and 50 Systems are card readers, card reader-punches, and line printers.

The assignment of a unit record device to a job step requires that a //DEFINE statement for the file be included in the control language statements of the step. The identifier (name by which the file is known in the program) and the device must be designated on the //DEFINE statement for the file. Any other information given on the statement will be ignored since it would not apply to unit record devices. Specifically, filename, which applies to all other categories of files, has no meaning for unit record equipment and is ignored, except in the cases of FIL=PIO, FIL=DUMMY, and FIL=NULL.

NOTE

> In a system using reader-punch for the system reader, a //DEFINE statement specifying DEVICE=CRDPCH is illegal. Punching may be done only by specifying FIL=SYSCRD in the //DATA statement and following it with the estimated number of blank cards required for punching and using DEV=SYSCRD on the associated //DEFINE statement.

MAGNETIC TAPE DEVICES

Volume control and device assignment for files that reside on magnetic tape are performed by Control Language Services. Magnetic tape units must be assigned for the exclusive use of a single job step in a partition.

Tapes used for input may have standard or non-standard labels, or they may be unlabeled. Tapes used for output must either have standard labels or be unlabeled.

Labels on input tapes may be bypassed or ignored. Label bypass results in the tape being positioned to the first data block past any standard label. The program must correctly position the tape past any non-standard labels. When labels are to be ignored, no tape

positioning or label checking takes place. The program must position the tape to the first data block. The option to ignore or bypass labels is selected by the LABEL keyword of the //DEFINE statement.

For a detailed description of the format and content of standard and non-standard labels refer to **Control Program and Data Management Services, Extended Reference** manual.

STANDARD LABELED TAPES

A standard labeled tape contains a volume label to identify the tape reel and a file label to identify the data file. The //DEFINE statement keywords that correspond to these labels are VOLUME and FILENAME respectively.

Input

When a standard labeled tape is opened for input, the volume identifier given in the //DEFINE statement is compared to the volume serial number contained in the volume label of the first or only reel of the file. The file is opened only if these are equal. If not equal, a message is issued instructing the operator to mount another tape and retry, or abort the job.

Output

When a standard labeled tape is opened for output, the volume identifier specified in the //DEFINE statement identifies the tape reel in a mount message to the operator. This volume identifier is also compared to the volume label (volume serial number) normally written previously by a utility routine. If these items are equal the file is opened and the file label is written, using the operand of the FILENAME keyword in the //DEFINE statement as the file name for this label. If these items are not equal or there is no volume label on the tape, a message indicating this is sent to the operator. The operator is instructed to mount another tape and retry, or supply the necessary information for Data Management to create the standard label. The volume number of the first volume becomes the serial of all the volumes of that file.

NON-STANDARD LABELED TAPES

Non-standard labeled tapes do not contain volume labels. The volume identifier given in the //DEFINE statement for these tapes is used only for mount messages. File labels specified in the //DEFINE statement are not compared.

Input

When a non-standard labeled tape is opened for input a check is made to determine that the tape mounted does not contain a standard label. If a standard labeled tape has been mounted, a message is issued instructing the operator to mount the correct volume and retry, or to abort the job.

Output

Non-standard labels may not be used for output. An attempt to open a non-standard labeled tape for output results in an error message and abnormal termination of the job.

UNLABELED TAPES

The volume identifier given in the //DEFINE statement for unlabeled tapes is used only for mount messages. File labels specified in the //DEFINE statement are not compared.

Input

When an unlabeled tape is opened for input a check is made to ensure that the tape mounted does not contain a standard label. If a standard labeled tape was mounted, a message is issued instructing the operator to mount the proper input tape and retry, or abort the job.

Output

When an unlabeled tape is opened for output a check is made to ensure that the reel mounted is truly unlabeled. If a standard labeled tape was mounted, the label will be overwritten if it has expired. If the label has not expired, a message is issued instructing the operator to override the expiration date, mount another tape and retry, or abort the job.

TELECOMMUNICATION DEVICES

The use of telecommunications within a job step requires the assignment of each line used by the program. The keyword-operands of the //DEFINE statement have the following significance. The IDENTIFIER keyword specifies the logical terminal name. This is the name defined in the TRMDEV macro. (See **Telecommunications Reference** manual for the description of this macro and for a complete discussion of telecommunications.) The DEVICE keyword specifies the terminal line to be enabled. The FILENAME keyword is always given as TP unless physical I/O is to be used; then FIL=PIO is specified. The number and size of buffers for each line is specified with NUMBER and SIZE keywords respectively.

DIRECT ACCESS STORAGE DEVICES (DISC)

At Initial Program Load (IPL) time, disc drives may be specified as either shared or unshared for that installation. This function is performed by the SHARE and UNSHARE directives as described in the **MRX/OS Operating Procedures** manual. The IPL commands amount to an override of the SYSGEN selection.

Once the status of a disc drive has been specified as shared or unshared, it will remain that way until overridden by new directives at a subsequent IPL time.

SHARED DRIVE

A shared disc drive is one that is available for simultaneous use by both partitions. The share command may be issued only at IPL time or when the system is cycled down.

UNSHARED DRIVE

An unshared disc drive is one that is available exclusively to one job step at any given time. Packs on these drives may be mounted at step initiation and CLOVEd (closed for the purpose of mounting the next volume of the file) during a step.

FILES

Disc files may be shared, that is, the file may be opened simultaneously by job steps in either partition. In order for a file to be shared, it must reside on a shared disc drive and be defined in the status keyword of the //DEFINE statement as either a permanent input or permanent update file. (Refer to Section 2 of this document for shared file restrictions.)

DISC FILE ORGANIZATION

The ORGANIZATION keyword of the //DEFINE statement specifies the organization of the file as sequential, relative or indexed.

A sequential file which occupies more than one volume (multi-volume file), may use one or more disc drive units. If only one disc is used, a CLOVE macro will allow the mounting of the next volume of the file. If more than one disc drive is used, one drive must be requested for each volume of the file. This is accomplished by specifying multiple operands in the VOLUME and DEVICE keywords of the //DEFINE statement. In this case, volumes may be mounted on any combination of shared and unshared disc drives. Volume switching is performed by the system.

Indexed and relative multi-volume files, unlike sequential files, must have all volumes of the file mounted for the duration of the step. These volumes must be mounted exclusively on either shared or unshared devices. A combination of shared and unshared devices is not allowed.

DISC SPACE ALLOCATION

The allocation of disc space is performed by the system for all types of files (scratch, temporary, work and permanent) using information supplied on the //DEFINE statement.

Scratch and temporary files must always be centrally cataloged (CAT=NO is illegal), but permanent and work files may be cataloged or uncataloged.

Volume identifiers must always be specified for uncataloged files but are optional for cataloged files. If a volume identifier is supplied, the space will be allocated on the pack(s) specified. If a volume identifier is not specified (legal only for cataloged files) the space will be allocated on a shared volume.

The identifier and filename must be given with every space allocation request. If a modification security code is to be required for use of the file in any subsequent step, it must be specified at allocation time. Also at allocation time, the number and size of records and the number of records per block must be given. This information is used to determine the amount of disc space which must be allocated. If relative or indexed file organization is to be used, it must be specified, and if the data is not to be in common stored data format, that too must be specified.

DISC FILE EXPANSION

The EXPAND keyword of the //DEFINE statement is used to specify the number of records by which an already allocated sequential file is to be expanded. The NUMBER keyword, which is used to specify the number of records for which space will be allocated in a new file, cannot be specified in the same //DEFINE statement that contains an EXPAND keyword-operand.

The IDENTIFIER and FILENAME keywords must be specified in the //DEFINE statement for every file that is to be expanded.

The BLOCK keyword which specifies the number of records per block, and the STATUS keyword which specifies type and usage must be the same as that specified at allocation.

The programmer may request contiguous space for the expanded area. Expansion of a file automatically creates a separate segment for the expanded area (causing an EXTENT to be added to the FDT for the file). The CONTIGUOUS keyword-operand on the //DEFINE statement for expansion of a file references the expanded area only, and is not related to the allocation of the original file, whether contiguous or segmented.

LOGICAL INPUT/OUTPUT

The DEVICE keyword on the //DEFINE statement initiates device assignment. A specific unit may be chosen by coding the physical address as the operand of the DEVICE keyword, or a generic device name may be specified which enables Control Language Services to select an available unit. If a device has already been defined, a subsequent //DEFINE statement referring to the same device by hardware address will be assigned to that same device. However, a subsequent //DEFINE statement using the generic name will force Control Language Services to assign another device of the same type.

The VOLUME keyword on the //DEFINE statement specifies the required disc pack and is a required keyword for an uncataloged file. The operand of this keyword will be used in the mount message requesting the pack. For cataloged files, Control Language Services will create the mount message using the volume identification specified in the central catalog. The VOLUME keyword is optional for these files.

The IDENTIFIER and FILENAME keywords are required for logical I/O. IDENTIFIER specifies the logical file name (name by which the file is known to the program). FILENAME specifies the name of the file on the central or pack catalog.

PHYSICAL INPUT/OUTPUT

The disc device units to be used for physical I/O must be assigned for the exclusive use of a single job step in a partition. Devices assigned for physical I/O cannot be shared.

One //DEFINE statement is required for each device to be assigned for physical I/O. This define statement must contain the IDENTIFIER, VOLUME, and DEVICE keywords. These keywords specify the logical file name, the disc pack, and the disc drive respectively. The FILENAME keyword must also be specified in the //DEFINE statement and must have as its operand PIO for physical input/output. There is no protection against the PIO user. For example, a user performing physical output to the printer can interfere with output proceeding to the printer from the other partition.

4. CATALOGED PROCEDURES

GENERAL DESCRIPTION

A cataloged procedure is one or more control language statements placed on a source library as a member. The LIBUTIL program performs the function of placing the cataloged procedure on the source library. The //CALL statement within a job performs the function of merging the cataloged procedure with the control language statements of the job.

Appendix H gives rules governing variable replacement in procedures.

WRITING A CATALOGED PROCEDURE

The first statement of a cataloged procedure is the //DECLARE control language statement. The default values for run-time variables are specified by coding keyword and associated operand.

The //CALL statement is used to request that the named cataloged procedure be merged with the control language statements of the job. All of the run-time variable symbols specified as keywords without operands on the //DECLARE statement of the procedure may be given as keywords with operands on the //CALL statement will include only the name of the cataloged procedure requested, as the operand of the PROC keyword and possibly the name of the library on which the procedure resides, as the operand of the LIB keyword.

Following the //DECLARE statement, the step-level control language statements may be included in the procedure. The //JOB, //EOJ, //DATA, /* (data delimiter), and //CALL statements are not allowed.

All run-time variables in the control language statements of a cataloged procedure have an ampersand (&) immediately preceding the operand. The ampersand identifies the operand as a variable to be replaced at run time. Note that the ampersand is a reserved character in this language, reference to it anywhere is interpreted as the lead character of a variable.

```
Example:    //DEC   PROGFIL
            //DEF   ID=FIL128,FIL=&PROGFIL
```

In this example, the identifier is FIL128. The name of the file will be given as the operand of the keyword PROGFIL on the //CALL statement. PROGFIL is entered without an operand on the //DECLARE statement so there is no default value.

When PROGFIL is given as a keyword with no operand on the //DECLARE statement, it must appear as a keyword-operand on the //CALL statement. If an operand for PROGFIL appears on both statements, the operand given on the //CALL statement is used at run time.

Examples:
```
PROCED1
  //DEC PROGFIL,SOURCE=FIL1482
```

In this example PROGFIL is specified as a required run-time variable in the called procedure PROCED1; whereas, SOURCE is optional.

```
//CALL PROC=PROCED1,LIB=PROCLIB,PROGFIL=B1423
```

In this example B1423 is given as the run-time variable for PROGFIL; the default for SOURCE is accepted.

Where PROGFIL is given as a keyword-operand on the //DECLARE statement, a default has been established. The keyword is optional on the //CALL statement, and, if it is omitted, the value given as the operand on //DECLARE statement will be used.

Examples:
```
SPECIAL1
  //DEC PROGFIL=B1432,SOURCE=FIL1482
  //DEF ID=FIL128,FIL=&PROGFIL
  //PAR LINES=30,PAGES=60,GROUP=&SOURCE
```

This example sets two default values, PROGFIL and SOURCE.

```
//CALL PROC=SPECIAL1,LIB=PROCLIB,SOURCE=FIL679
```

This example accepts the default for PROGFIL and overrides the default for SOURCE.

```
//CALL PROC=SPECIAL1,LIB=PROCLIB,PROGFIL=140271,
//       SOURCE=FIL679
```

This example overrides the defaults for both PROGFIL and SOURCE.

```
//CALL PROC=SPECIAL1,LIB=PROCLIB,PROGFIL=140271
```

This example overrides the default for PROGFIL and accepts the default for SOURCE.

```
//CALL PROC=SPECIAL1,LIB=PROCLIB
```

This example accepts the default for both PROGFIL and SOURCE.

CATALOGING A PROCEDURE

A cataloged procedure is entered into the system in the form of a data file which is normally placed on the source library specified as $SYSPROCLIB. It may, however, be placed on a private load library provided that the library is both shared and cataloged, and the //CALL statements contains a LIBRARY keyword-operand. In this case, the LIB keyword-operand is required on the //CALL statement to indicate which library the called procedure is located on. The data file (which consists of the procedure) is identified by the //DATA statement, which includes the name of the file being created, specified as the FILENAME keyword-operand. CLS=YES must be specified on the //DATA statement, to inform the system that control language statements are included in the data file. A data file may contain only one set of control language statements to be cataloged. Therefore, only one //DECLARE statement may be included in a single data file.

In order to execute a cataloged procedure, it must be a member of a source library. A procedure is placed on a library via the UPDATE command of the LIBUTIL program. The methods for creating a library and the operation of the LIBUTIL routine are discussed in detail in the **Program Library Services Reference** manual. Any programmer cataloging procedures on libraries must be familiar with the contents of that manual.

An example of a cataloged procedure may be found in Appendix G.

USING CATALOGED PROCEDURES

The method for including a cataloged procedure in a job is to reference that procedure on a //CALL control language statement. The name of the cataloged procedure to be called must be specified on the //CALL statement and must be identical to the member name specified to LIBUTIL when the procedure was placed on the library.

The //CALL statement must give values for all variable symbols required by the procedure. The //CALL statement also specifies any default operands to be overridden. All other variable symbols specified on control language statements of the procedure, but not included on the //CALL statement, must be keywords for which default values have been specified on the //DECLARE statement. The following example shows a job calling a cataloged procedure:

Example:

```
//JOB  NAME=JOB128,TYPE=1,USE=AZ1Q,PRI=4
//CALL PRO=PROC1621,LIB=PROCLIB,LINES=60,
//       DATE=010173,SOURCE=PAYROLL1,
//       OBJECT=PAYROLL2
//EOJ
```

The following example shows a procedure that could be referenced by JOB128:

```
//DECLARE SOURCE,OBJECT,LINES=55,DATE
//EX   PGM=COBOL
//SET  DATE=&DATE
//PAR  SMOD=&SOURCE,OMOD=&OBJECT
//PAR  LINES=&LINES
//DEF  -----
//DEF  -----
```

This example specifies DATE, SOURCE, OBJECT, and LINES as variable symbols. DATE, SOURCE, and OBJECT must be given values on the //CALL statement whenever the procedure PROC1621 is called. A default is supplied for LINES, and may be overridden on the //CALL statement. Only the //SET and //PAR statements of this procedure reference variable symbols.

A. SUMMARY OF CONTROL LANGUAGE STATEMENTS

JOB LEVEL STATEMENTS

Within a job, all control language statements are allowed. The following are required:	
//JOB	First statement of every job.

//EXECUTE
//EXEC
//EX
	The first command following the //JOB statement, whether in line or as the first executable command (following //DECLARE) of a called procedure.

//EOJ	Last statement of every job.

STEP LEVEL STATEMENTS

//EXECUTE
//EXEC
//EX
	The first executable statement of every step; identifies the program to be executed.

The following statements may also be included:	
//PAR	Specifies run-time parameters to the program.
//DEFINE //DEF	Specifies devices, volumes, and files requested by the step.
//ROUTE //RTE	Allows output spooling or unit record device allocation.
//SET	Specifies job date and/or POST byte switch settings.
//TELL //TEL	Places messages on the operator's console.
//CALL	Merges Control Language statements from a cataloged procedure.
*	Comment statement.
Within a step, the following statements are not allowed:	
//JOB	First statement of every job.
//DATA //DAT	Defines the following data file. If data is spooled, it may appear anywhere between //JOB and //EOJ. If not spooled, it must immediately precede the //EOJ.
/*	Specifies the end of a card file.
//DECLARE //DEC	Designates the following control statements as a cataloged procedure, provides the specification statement for the procedure.
//IF	Provide for branching based on condition code test.
//EOJ	Last statement of every job.

INTERSTEP LEVEL STATEMENTS

The only Control Language Statements occurring between steps are:	
//IF	Provide for forward branching based on condition code test.
*	Comment statement.

CATALOGED PROCEDURES

Within a cataloged procedure, the following control language statement is required:	
//DECLARE //DEC	Specifies all keywords to be provided in calling the procedure; required as first statement of a cataloged procedure.
The following statements may also be included:	

//EXECUTE
//EXEC
//EX
	The first executable statement of every step, identifies the program to be executed.

//PAR	Specifies run-time parameters to the program.
//DEFINE //DEF	Specifies devices, volumes, and files requested by the step.
//SET	Specifies job date and/or POST byte switch settings.
//TELL //TEL	Places messages on the operator's console.
//IF	Provide for forward branching based on condition code test.
*	Comment statement.
The following statements are not allowed:	
//JOB	First statement of every job.
//DATA //DAT	Identifies the following data file.
/*	Specifies the end of a card file.
//CALL //CAL	Calls a cataloged procedure.
//EOJ	Last statement of every job.

DATA LEVEL STATEMENTS

A data file identified with the CLS=YES keyword on its //DATA statement may contain any control language statement, except /* (data delimiter) which terminates all data files. If CLS=NO on the //DATA statement, any control language statement except * (comment), will terminate the data file. CLS=YES has no meaning with FIL=SYSCRD.

B. TABLE OF CONTROL LANGUAGE STATEMENT KEYWORD CHARACTERISTICS

//JOB Statement

Keyword	Operand Field		Default	Remarks
	Size	Content		
NAME= NAM=	1 to 8	Alphanumeric*	None – required entry	Specifies name of job as known to system. NAME keyword must appear on first card of statement. Jobs must have unique names.
USER= USE=	1 to 4	Alphanumeric*	None	Installation option. Required if option selected at SYSGEN time. Identifies the user to system.
TYPE= TYP=	1	0 1 2	0	Specifies partition in which is allowed to run: 0 indicates either partition 1 indicates partition 1 2 indicates partition 2 as created at SYSGEN time or as modified by console command.
PRIORITY= PRI=	1	1-9	SYSGEN default specified by installation	As specified at SYSGEN time. Specifies the order in which the jobs run in the partition. Highest priority is 9.
HOLD= HLD=	–	YES NO	No	HOLD=YES causes the job to remain in the job queue until the operator releases it for initiation. HOLD=NO causes the job to be initiated according to its type and priority.

//EOJ Statement

No keywords				Specifies end of job.

Comment (*) Statement

No keywords		* in column 1 followed by user comment		Enters comments into job stream.

*No embedded blanks or special characters except dash; alphabetic, numeric, and dollar sign in first character position.

//EXECUTE Statement

Keyword	Operand Field		Default	Remarks
	Size	Content		
PGM=	1 to 8	Alphanumeric*	None – required entry	Specifies the name by which the program to be executed is cataloged on the load library.
NAME= NAM=	1 to 8	Alphanumeric*	None	Required if step is to be named; whenever step is to be the argument of GO keyword in the //IF statement. Specifies name by which step is known to system.
LIBRARY= LIB=	1 to 17	Alphanumeric*	Standard system library	Specifies name of library in which loadable program code resides.
TIME= TIM=	4	Numeric value in minutes	SYSGEN default specified by installation	Values in the range of 1 to 1440. Keyword specifies time in minutes the step is allowed to run. Value 1440 allows step to run indefinitely. Value 1439 allows step to run 23 hours 59 minutes before abort.
DUMP= DMP=	–	YES NO COND	Dump only for abnormal termination	DUMP=YES causes a main storage dump at end of step regardless of terminated status. DUMP=NO results in no dump being taken regardless of terminated status. DUMP=CON results in a dump only for abnormal termination.
DEBUG= DEB=	–	YES NO	No	Specifies if program is to run in Debug mode.
RESTART= RES=	Immediate – Deferred 1-3	YES NO Numeric	None	Specifies if the program can be immediately restarted. The nnn specifies location of deferred restart.

//PAR Statement

Application Dependent	Example:
	//PAR COMMAND=UPDATE,
	//PAR MTYPE=MAC,
	//PAR MEM=(,,EMULATE),
	//PAR MEM=(,,EMUCOM),
	//PAR MEM=(,,EMUEQU),
	//PAR OLIB=(LIB3,SYM),
	//PAR NEWSEQ=(1000,100)
		None	Contents of statement is application dependent.

*No embedded blanks or special characters except dash; first character alphabetic, numeric, or dollar sign.

//DEFINE Statement

Keyword	Operand Field		Default	Remarks
	Size	Content		
IDENTIFIER= IDENT= ID=	1 to 8	Alphanumeric*	None – required entry	Establishes logical relationship between program file definition and physical characteristics of file. Keyword specifies name by which file is known in step.
FILENAME= FIL=	1 to 17	Alphanumeric*	None – required entry if labeled	Cataloged name or label entry for the file. PIO for physical I/O. TP for telecommunications. DUMMY for internal handling. NULL for optional file.
STATUS= STA=	–	S T W P (P,I) (P,U) (P,O)	T O for P only	Applies only to disc. Type is Scratch, Temporary, Work, or Permanent. Input, Output, or Update usage is specified for permanent files only.
MSC=	4	EBCDIC	Blanks	Modification security code. Used by Data Management to exclude unauthorized use of file.
DEVICE= DEV=	–	Name (name , quantity) address (address,..., address)	(DISC,1)	Specifies generic name, and quantity (default quantity is 1), or unit address(es) for devices.
VOLUME= VOL=	1 to 6	Alphanumeric* volid (volid,..., volid)	Disc: central catalog Tape: none required entry	Identifies the disc pack or tape reel. Tape: required Disc: required for files not listed, or to be listed on central catalog
CSD=	–	YES NO	Yes	Specifies that common stored data format is (YES) or is not (NO) used on tape input, or disc files. Note: adds 4 to size if operand is YES.
ORGANIZATION= ORG=	1	I R S	S	I is indexed R is relative S is sequential
LABEL= LAB=	1	S N U B I		For tape files only: S is standard N is non-standard U is unlabeled B is bypass I is ignored N, B, and I can be used for tape input files only.

*No embedded blanks or special characters except dash; first character alphabetic, numeric, or dollar sign.

//DEFINE Statement (Continued)

Keyword	Operand Field		Default	Remarks
	Size	Content		
RETENTION= RET=	1 to 3	Numeric	0	Specifies the number of days a tape file is to be retained.
BUFFER= BUF=	Number 1 to 3 Size: 1 to 5	Numeric	None – required for each logical	Logical TCOM only. Specifies buffers in partition. Number range of 1 to 999. Size range of 1 to 49999.

//DEFINE Statement – Disc Space Allocation/Expansion

NUMBER= NUM=	1 to 6	Numeric	None – required to allocate a new disc file.	USE ONLY TO ALLOCATE A NEW DISC FILE. Number of records for which space is to be allocated; optionally the number of records for dynamic expansion.
SIZE= SIZ=	–	Disc record length (record length, key length) Tape record length	252	Number of bytes per logical record (maximum for variable length). For indexed files, number of bytes in the key.
BLOCK= BLK=	1 to 3	Disc data block (data block, key block) Values in the range of 1 to 255	1	Specifies blocking factor. For variable length records, specifies minimum number of records.
LOCATION= LOC=	–	1- to 3-digit numeric	No	Specifies cylinder number on which file is to begin, or that file is to (YES) or is not required to (NO) begin on cylinder boundary.
CATALOG= CAT=	–	YES NO	Yes	Specifies that file is to be (YES) or is not to be (NO) cataloged (central catalog). No is illegal for temporary and scratch files.
VERIFY= VER=	–	YES NO	No	Specifies that write-disc-check is to be (YES) or is not to be (NO) used after each WRITE or PUT.
CONTIGUOUS= CON=	–	YES NO $\left(\left\{\begin{matrix}SX\\MX\end{matrix}\right\},\left\{\begin{matrix}SP\\MP\end{matrix}\right\}\right)$	No	Specifies that allocation or expansion space is (YES) or is not (NO) to be contiguous; and whether it may be on single pack or multiple packs.
SPREAD= SPR=	1 to 2	Numeric 1 to 10	1	Indexed files only. Frequency with which consecutive logical records occur on track.

//DEFINE Statement — Disc Space Allocation/Expansion (Continued)

Keyword	Operand Field		Default	Remarks
	Size	Content		
IVOLUME= IVOL= IVO	1 to 6	Alphanumeric*	First volume of file	Indexed files only. Volume on which key index resides.
ILOCATION= ILOC= ILO	—	1- to 3-digit numeric YES NO	No	Indexed files only. Specifies cylinder number on which key index is to begin (valid only if IVOL is used), or that key index is to (YES) or is not required to (NO) begin on cylinder boundary.
EXPAND= EXP=	1 to 6	Numeric	None	Number of records by which to expand an existing sequential file; libraries cannot be expanded. See Table 2-2.

//ROUTE Statement

IDENTIFIER= IDENT= ID=	1 to 8	Alphanumeric	None — required entry	Establishes logical relationship between program file definition and external characteristics of file.
FILENAME= FIL=	1 to 17	Alphanumeric or NULL	3-byte day of year, 6-byte time of day, 1- to 8-byte identifier	Catalog name of file. FIL=NULL specifies an optional file.
DEVICE= DEV=	—	PRINTER PRT READPUNCH READERPUNCH RDRPUN device address	PRINTER	Specifies the generic name or device address of the output file for the spool function.
VOLUME= VOL=	1 to 6	Alphanumeric	None	Specifies the volume serial number(s) for the data set.

//ROUTE Statement — Disc Space Allocation/Expansion

SPOOL= SPL=	—	YES NO	YES	Specifies the file to be spooled (YES) or to go directly to the device (NO).
NUMBER= NUM=	1 to 6	Numeric	(1000,500)	Number of records for which space is to be allocated; optionally the number of records for dynamic expansion.
SIZE= SIZ=	—	Disc record length	134	Number of bytes per logical record.

*No embedded blanks or special characters except dash; first character alphabetic, numeric, or dollar sign.

//ROUTE Statement – Disc Space Allocation/Expansion (Continued)

Keyword	Operand Field		Default	Remarks
	Size	Content		
BLOCK= BLK=	1 to 3	Disc data block	1	Specifies blocking factor.
CONTIGUOUS= CON=	–	YES NO $\left(\left\{\begin{matrix}SX\\MX\end{matrix}\right\},\left\{\begin{matrix}SP\\MP\end{matrix}\right\}\right)$	NO	Specifies that allocation or expansion space is (YES) or is not (NO) to be contiguous; and whether it may be on single pack or multiple pack.

//ROUTE Statement – Spooling Information

UCS=	–	name (name,FOLD, VER) (name,NOFOLD, NOVER)	(SYSGEN name, NOFOLD, NOVER)	Specifies Universal Character Set. See **MRX/OS Utilities Reference** manual for FOLD and VER options.
HOLD= HLD=	–	YES NO	NO	Specifies whether file is or is not to be placed on the spooler hold queue.
SAVE= SAV=	–	YES NO	NO	Specifies whether the file is to be or is not to be purged after it has been printed or punched.
COPY= COP=	1 or 2	Decimal number	1	Specifies the number of copies to be printed or punched.
FORMS= FOR=	1 to 6	Alphanumeric	Standard forms	Specifies the form type for the operator to mount prior to printing or punching.

//SET Statement

DATE= DAT=	6	mmddyy	System date (at beginning of job)	Specifies month, day and year. Set for duration of job or until another //SET DATE.
SWITCH= SWI=	8	0 1 X	Zeros (at beginning of job)	Zeros change corresponding bit positions to zeros. Ones change corresponding bit positions to ones. X's leave corresponding bit positions unchanged. Set for the duration of job or until another //SET SWITCH. Switches are set to zeros at beginning of job.

//TELL Statement

OP=	–	message	None – required entry.	Message to console operator.
PAUSE= PAU=	–	YES NO	No	Specifies initiation of step is (YES) or is not (NO) to be suspended until response is received from the console operator.

//IF Statement

Keyword	Operand Field		Default	Remarks
	Size	Content		
CODE= COD=	1	Any EBCDIC character	None — required entry	Value to be tested for, set in previous program by SETIF service request.
GO=	1 to 8	Alphanumeric*	None — required entry	Name of step to be skipped to if condition CODE value is met. EOJ if skipping all remaining steps of job.

//DECLARE Statement

Procedure dependent	— —	None	Refer to DEC and CALL statements in Sections 2 and 4.

Example:

```
//CALL      PROC=XAMPLE,
                LIB=PROC1,
//              PNAM=XYZ,
//              MIN=5
Procedure   "XAMPLE"
                might be:
//DECLARE   PNAM,MIN=10
//EX        PGM=&PNAM,
//              TIME=&MIN
```

//CALL Statement

PROC= PRO=	1 to 8	Alphanumeric*	None — required entry	Name of the procedure to be included with the control language statements of this job. PROC must be the first entry.
LIBRARY= LIB=	1 to 17	Alphanumeric*	&SYSPROCLIB	Specifies the private library on which the cataloged procedure resides.

Example:

```
//CALL  PROC=EMUGEN,LIB=EMUPROCLIB,
            MACVOL=$SYSPK,
//          OBJVOL=EMUVOL,OBJLIB=EMUOBJLIB,
            LODVOL=$SYSPK,
//          LODLIB=$SYSLODLIB,SYSVOL=$SYSPK,
            NUM=2000
```

*No embedded blanks or special characters except dash; first character alphabetic, numeric, or dollar sign.

//DATA Statement

Keyword	Operand Field		Default	Remarks
	Size	Content		
FILENAME= FIL=	1 to 17	Alphanumeric*	None – required entry	Names the file to be built from records which follow. Specifies filename used on input //DEFINE statement. FIL=SYSCRD if data read by program directly from card reader.
CLS=	–	YES NO	No	Keyword specifies there are (YES) or are not (NO) control language statements in following data file. Has no meaning when FIL=SYSCRD is used.
BLOCK= BLK=	1 to 2	Value in the range 1 to 12	1	Specifies blocking factor used in data spooling. Ignored when FIL=SYSCRD.
NUMBER= NUM=	1 to 5	Numeric value	1000	Specifies number of logical records for which space will be allocated. Maximum is 32,767. Ignored when FIL=SYSCRD.
CONTIGUOUS= CON=	–	YES NO	No	Keyword specifies that there is (YES) or is not (NO) the requirement of contiguous space. Ignored when FIL=SYSCRD.

*No embedded blanks or special characters except dash; first character alphabetic, numeric, or dollar sign.

Statement: /* (data delimiter)

No Keywords			

C. TABLE OF REQUIRED AND OPTIONAL KEYWORDS BY CONTROL LANGUAGE STATEMENT

JOB LEVEL STATEMENTS

Statement	Keyword	Required or Optional	Notes
//JOB	NAME= NAM=	Required	
	USER= USE=	Required/ Optional	Installation option. Required if installation requires at SYSGEN time. Optional if installation does not require it.
	TYPE= TYP=	Optional	
	PRIORITY= PRI=	Optional	
	HOLD= HLD=	Optional	
//EOJ	None	Required	End of job
* (comment)	None	Optional	

STEP LEVEL STATEMENTS

//EXECUTE
//EXEC
//EX
	PGM=	Required	

	NAME= NAM=	Optional	No default
	LIBRARY= LIB=	Optional	No default
	TIME= TIM=	Optional	
	DUMP= DMP=	Optional	
	DEBUG= DEB=	Optional	
	RESTART RES=	Optional	PGM=RESTART must be speicifed in //EXEC statement; may specify either immediate or deferred restart.
//PAR	Application dependent	Optional	No default; no continuation. Multiple statements acceptable.

//DEFINE
//DEF
for file and device use
	IDENTIFIER=
	ID=
		Required	

	FILENAME= FIL=	Required	Required for disc and tape; DUMMY, NULL, PIO can all refer to unit record.

Statement	Keyword	Required or Optional	Notes
	STATUS= STA=	Optional	Disc files only; usage for permanent files only.
	MSC=	Optional	
	DEVICE= DEV=	Optional	
	VOLUME= VOL=	Optional	Tape and disc files
	CSD=	Optional	Tape and disc files
	ORGANIZATION= ORG=	Optional	
	LABEL= LAB=	Optional	Tape files only
	RETENTION= RET=	Optional	Tape files only
	BUFFER= BUF=	Optional	Logical TCOM only. Requires 1 per line.

//DEFINE
//DEF
(for disc space allocation and expansion)
	NUMBER=
	NUM=
		Required to allocate a new disc file.	Use indicates space to be allocated.
			EXP may not be used

	SIZE= SIZ=	Required for disc if NUM is used. Optional for tape.	Keysize for indexed disc files only.
	BLOCK= BLK=	Optional	Applies to tape and disc files. Key block for indexed disc files only.
	LOCATION= LOC=	Optional	
	ORGANIZATION= ORG=	Optional	
	CATALOG= CAT=	Optional	
	VERIFY= VER=	Optional	
	CONTIGUOUS= CON=	Optional	Allocation and expansion
	SPREAD= SPR=	Optional	Indexed files only
	IVOLUME= IVOL=	Optional	Indexed files only
	ILOCATION= ILOC=	Optional	Indexed files only

Statement	Keyword	Required or Optional	Notes
//DEFINE (disc file expansion)	EXPAND= EXP=	Required to expand an existing disc file.	Use requires BLOCK equal to value specified at file allocation. Excludes NUMBER keyword.
//ROUTE RTE=	IDENTIFIER= IDENT= ID=	Required	
	FILENAME= FIL=	Optional	NULL specifies optional file.
	DEVICE= DEV=	Optional	
	VOLUME= VOL=	Optional	
	CONTIGUOUS= CON=	Optional	
	BLOCK= BLK=	Optional	
	SIZE= SIZ=	Optional	
	SPOOL= SPL=	Optional	
	NUMBER= NUM=	Optional	
	UCS=	Optional	
	HOLD= HLD=	Optional	
	SAVE= SAV=	Optional	
	COPY= COP=	Optional	
	FORMS= FOR=	Optional	
//SET	DATE= DAT=	Optional	
	SWITCH= SWI=	Optional	
//TELL= //TEL=	OP=	Required	No continuation; multiple statements acceptable.
	PAUSE= PAU=	Optional	

PROCEDURE LEVEL STATEMENTS

Statement	Keyword	Required or Optional	Notes
//DECLARE //DEC	Procedure dependent	—	Statement may contain no keywords. Operands are required only to specify defaults.
//CALL //CAL	PROC= PRO=	Required	
	LIBRARY= LIB=	Optional	
	Procedure dependent	—	Required for all keywords listed on procedure //DECLARE without operands. Otherwise, used with operands only to override defaults.

INTERSTEP LEVEL STATEMENTS

//IF	CODE= COD=	Required	
	GO=	Required	

DATA LEVEL STATEMENTS

//DATA //DAT	FILENAME= FIL=	Required	
	CLS=	Optional	No meaning when FIL=SYSCRD used.
	BLOCK= BLK=	Optional	No meaning when FIL=SYSCRD used.
	NUMBER= NUM=	Optional	Default = 1000. No meaning when FIL=SYSCRD used.
	CONTIGUOUS= CON=	Optional	No meaning when FIL=SYSCRD used.
/* (Delimiter)	None		

D. SYSTEM CONTROL INTERFACE

Control functions are provided for programs through Control Program service request macros. These macros are used in problem programs to obtain information from system and job tables, to access data that is set at run time with control language statements, to make the contents of the //PAR statement available to the executing program, and to write on the job's system output (SYSOUT) file.

The following paragraphs describe the Control Program service request macros referenced in this document. All programmers using these service requests must be familiar with the format and further explanation of the macros located in the **Control Program and Data Management Services, Basic and Extended Reference** manuals.

HALT, EHALT, AND ABEND MACROS

The problem program signals the system that it has completed its processing, and causes the Step Terminator to be loaded by executing a HALT or EHALT service request macro. The HALT macro is used to perform normal termination of a user job step; the EHALT macro requests termination of a step and causes the remaining steps of a job to be skipped. The ABEND macro requests abnormal termination of a job and passes a completion code to Control Language Services for display.

When an error occurs (such as an I/O error, memory parity error, or attempt to write beyond the end of a program area), the program terminates abnormally. The Step Terminator is then loaded by the Control Program and receives control of the partition. A memory dump may occur, depending upon the dump keyword of the //EXECUTE statement.

SDATE AND JDATE MACROS

The //SET control language statement may be used to specify the job date. This date is then used for date dependencies within the job. If the job date is not given with a //SET statement, the system date is used for these job dependencies.

The system date and the job date may be sent to the user program through the use of SDATE (system date) and JDATE (job date) macros respectively. The user may specify either the calendar date format or the Julian date format to be sent to his program. (Refer to **Control Program and Data Management, Basic Reference** manual for detailed description of these macros and formats.) If the job date has not been defined by a //SET statement it will be set to the system date by the operating system.

POST AND RPOST MACROS

The //SET control language statement may be used to specify the contents of the switch communication byte (eight switches available to the problem program for communication between steps). The POST macro can be used to change the contents of the switch communication byte from within the problem program. The RPOST macro is provided to test the switch communication byte as set by previous POST macros or //SET control language statements.

SETIF MACRO

The //IF control language statement tests the code condition of the JTIFC byte in the job control table (JCT) and conditionally executes job steps based upon the results. The SETIF macro is used to set this byte in the JCT to a code which may be tested by the //IF statement.

ACCEPT MACRO

The //PAR control language statement enters run-time parameters for a problem program into the job's system input (SYSIN) file. The ACCEPT macro provides the problem program with the ability to read the steps //PAR statements into the program from the SYSIN file.

Each execution of the ACCEPT macro loads a single input line into the specified program buffer. The line is transferred into the buffer in EBCDIC. The macro updates a pointer in the requester's JCT so that subsequent ACCEPT macro requests will acquire the next consecutive parameter line. When accepting one line past the last parameter line, control is passed to the location specified in the ACCEPT macro (or the problem program may specify the relative parameter line number for that step).

DISPLAY MACRO

The DISPLAY macro allows the problem program step to write messages directly onto the job's SYSOUT file. The message may be any length up to 132 EBCDIC characters. By using this macro, the problem program can indicate progress and internal program conditions on the SYSOUT file, which is printed at the end of the job.

MEMLIM MACRO

The MEMLIM macro returns the address of the last addressable 256-byte memory page (256 bytes) of the partition making the request. The value returned points to the beginning of the last memory page of the problem program area.

The size of the problem program area, and therefore the address returned from a MEMLIM request, can vary depending upon the size and starting address of the partition and upon the specifications given to the Linkage Editor when the relocatable program load module is constructed.

E. PARTITION LAYOUT AND USAGE

GENERAL DESCRIPTION

A partition is an area of main memory used for execution of problem programs. Two partitions (maximum) are defined at system generation time (SYSGEN). The sizes of the partitions may be changed from the console at IPL time, or by a subsequent SYSGEN. The Console Command program is used to adjust partition size at Initial Program Load (IPL) time. The procedures for this and other console operator activities are discussed in the **MRX/OS Operating Procedures** manual.

The layout of the partition at program load time is shown in Figure E-1. The fixed areas (position and size) of the partition are:

SLA – Standard Linkage Area

TCT – Task Control Table

JCT – Job Control Table

FDT SYSIN – File Description Table for the system input file

FDT SYSOUT – File Description Table for the system output file

Other areas shown in the partition layout are:

FDT PRIVATE LOAD LIBRARY – Present only when the program specified on the //EXECUTE statement resides on a library other than the standard system load library ($SYSLODLIB).

FDT DEBUG – Present whenever DEBUG=YES is specified on the //EXECUTE statement.

PROGRAM AREA – This portion of the partition varies with each step and is the size of the longest program module (offset by the root, if there are overlays to the main program). If POOLSIZ is defined at the time the program modules are link-edited, the problem program area may be longer.

PARTITION SPACE POOL – Contains: file description tables for all additional simultaneously open files, the check out debugging table when FDT DEBUG occurs, telecommunications buffers and tables when the step uses telecommunications, unused space not dedicated to any of the above listed uses.

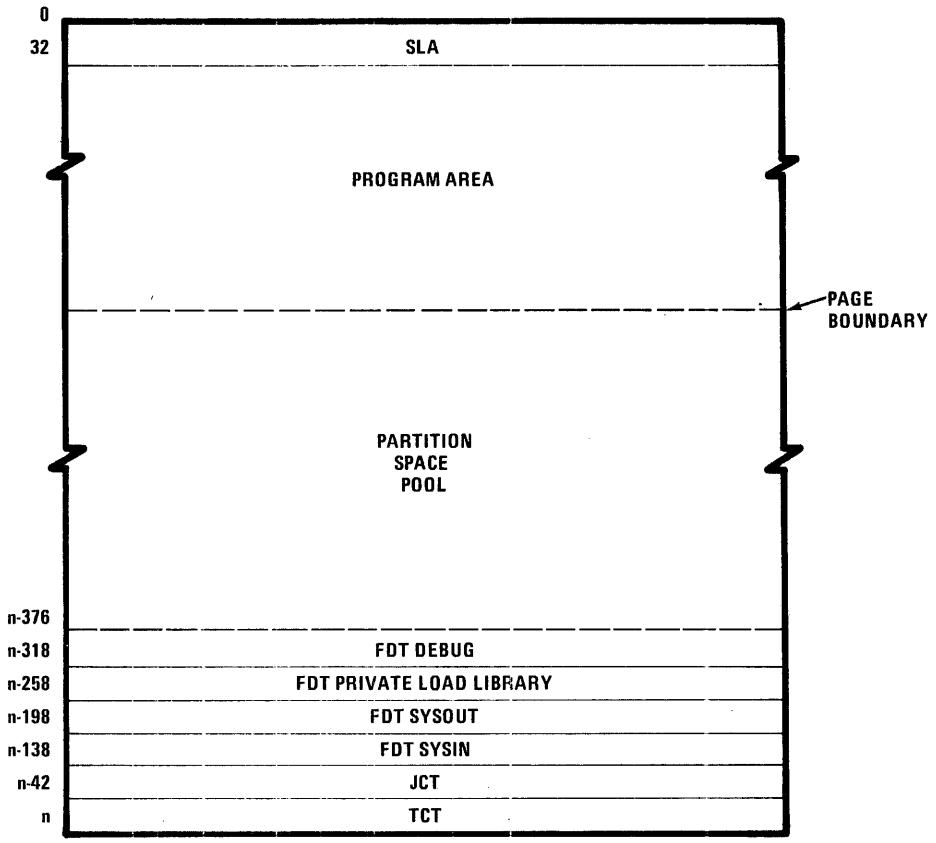


Figure E-1. Partition at Program Load Time

STANDARD LINKAGE AREA (SLA)

The Standard Linkage Area (SLA) occupies the first 32 bytes of the partition. This area immediately precedes the problem program or the executing Control Language Services module. The SLA provides for communication of parameters between system routines.

Use of the SLA is an established system convention for Memorex Operating Systems. This standard method makes the interfaces between the operating system and the executing program identical to the interface between a subroutine and the higher level calling program.

The Standard Linkage Area contains the program return address, status information, and the register save area. The layout of the SLA and a description of its contents is given later in this appendix.

TASK CONTROL TABLE (TCT)

The Task Control Table (TCT) occupies the last 46 bytes of the partition. Space for the TCT is permanently allocated and is available at IPL time. The Task Control Table contains information on threading, task status, mode, service requests, and error recovery. The TCT also includes a register save area and pointers to other tables in the partition. The information in the TCT is set and used by System Control program to coordinate system task execution. System tasks are initiated to process block I/O, supervisor service requests, and error recovery.

The layout of the Task Control Table and a description of its fields is given later in this appendix.

JOB CONTROL TABLE (JCT)

The Job Control Table (JCT) occupies space immediately preceding the Task Control Table (TCT) in the partition. Space for the JCT is permanently allocated in the partition and is available at IPL time. The length of the Job Control Table is 96 bytes. The JCT contains information on the partition, the job, the currently active step, and pointers to Control Language statements. Control information also indicates whether the problem program, or the Control Language Services program is active in the partition.

The information in the JCT is set and modified by the following system programs:

- Control Language Services
- System Control Program
- Relocating Program Loader
- Data Management Services

- Debug Program
- Dump Program

FILE DESCRIPTION TABLES (FDT)

A File Description Table is created in the partition for each file that is used in a job step. An FDT is built as a result of an OPEN request for a file. A request to CLOSE a file, except close with lock and close spooled file, releases the FDT space to the partition space pool. An FDT exists for every simultaneously open file. FDT's for files closed with lock and for closed spooled files are released at step termination.

The File Description Table contains details on the location, status, organization, and condition of the file; information on the I/O performed on the file; and pointers to preceding and following FDT's. Information is placed in the FDT's from SYSIN, the central and pack catalogs, the unit tables, and problem programs. Entries in the FDT's are made by System Control program, Block I/O, Data Management, OPEN, CLOVE, and CLOSE.

The FDT is 60 bytes in length. The common area of the FDT, is 40 bytes in length. This portion of the table applies to all types of files and contains general information. The remainder of the FDT is 20 bytes in length and is device dependent. Refer to **Control Program and Data Management Services, Basic Reference** manual for format and content of the FDT.

CHECKOUT DEBUGGING TABLE (FDT DEBUG)

A checkout debugging table is created for each step that requests the Debug routine. When the Step Initiator encounters DEBUG=YES on an //EXECUTE statement, the debug status bit is set in the JCT. The Debug routine receives control after the program is loaded and builds the checkout debugging table for the step. This table includes a header for the program and an entry for each breakpoint requested for the step. Refer to **Control Program and Data Management Services, Extended Reference** manual for format and content of the debug table.

PROBLEM PROGRAM AREA

The problem program area immediately precedes the partition space pool. The space allocated for the problem program is determined by the Relocating Program Loader. This space includes the SLA which is a permanent 32 byte offset of the program. The end of the program, like the end of the partition, is a hardware page boundary (256 byte increments). If the length of the program plus the SLA does not end at a page boundary, the area will be extended to the next page boundary by the loader.

The size of the problem program segment that occupies main memory at any given time will be affected by the coding techniques and the language processor used. For assembly language programs, the use of logical telecommunications and logical data management

facilities result in the assembly of necessary buffers and tables as a part of the program segment.

PARTITION SPACE POOL

The partition space pool extends from the end of the area allocated for the problem program to the beginning of the FDT's for files built at job and step initiation times. The partition space pool cannot be accessed by the program directly. It is available for use only by Checkout Debugging, Telecommunications, and Data Management.

The size of the partition space pool is dependent upon the size of the partition, the amount of space allocated for problem program execution, and the space required for tables at the end of the partition. The partition space pool must be large enough to contain:

- An FDT for each simultaneously open file that was opened by the program (excludes FDT's for files opened by the Step and Job Initiator, such as SYSIN, SYSOUT, DEBUG, PRIVATE LOAD LIBRARY).
- The debug directive tables for all modules in the step, if Debug is used.
- All of the buffers and tables required for the entire step, if telecommunications is used. (Refer to **Telecommunications Reference** manual for these requirements.)

TABLE AREA

System and Control Language Services Tables for the partition immediately follow the partition space pool. These tables are the TCT, JCT, and FDT's for those files opened for the job by the Job Initiator and Step Initiator.

As shown in Figure E-2, the tables area always includes at least two FDT's. These are required for SYSIN and SYSOUT which are opened at job initiation time. If opened at step initiation time, one, two, or no additional FDT's will be built, for Debug and/or a private load library. These must be specified in the control language statements for the step.

If either Debug or a private load library is used, but not both, 60 additional bytes will be available in the partition space pool. When neither Debug nor a private load library is used, an additional 120 bytes are available in the space pool.

Debug and private load library files, when used, remain open for the duration of the step and must not be closed by the problem program. The SYSIN and SYSOUT files also remain open. Therefore, the space used by their FDT's is never available for use for other file FDT's in a step.

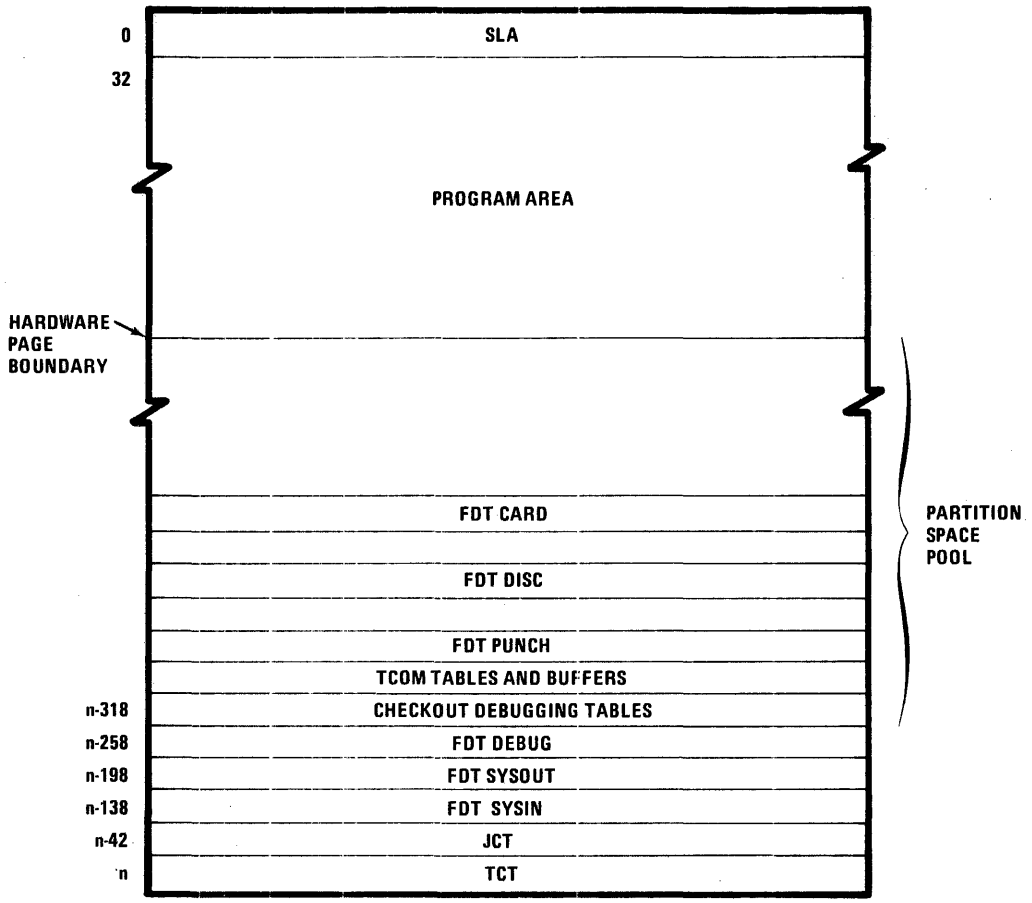


Figure E-2. Partially Filled Partition Space Pool

PARTITION SPACE MANAGEMENT

The main storage area in the partition space pool is managed by the System Control program. Requests for space in the pool are made by Data Management OPEN and CLOVE, Checkout Debugging, and Telecommunications. Space is returned to the pool via a request to System Control.

When the amount of space in the pool is near that required for FDT's, Checkout Debugging tables, and telecommunications buffers for the step, the programmer must be concerned with management of the space pool. When there is insufficient space in the pool to fill a request, OPEN or CLOVE requests return the error to the caller, other requests abort the job. If the requirement is for Telecommunications, this will happen at the beginning of the program when that space is requested. An unfilled request for space for Checkout Debugging will abort the job after the module is loaded and its requirements cannot be met. However, when a file is to be opened, late in the execution of a step, and its FDT cannot be accommodated in the partition space pool, the job is aborted.

The following paragraphs discuss, by topic, details about the entries in the space pool and how that space is managed. Optimization techniques are also included.

SPACE REQUESTS

Requests to obtain space in the pool are filled from the highest available location in the pool. This allows the largest possible block of contiguous space to exist in the pool near the end of the problem program area. A request to return space to the pool releases the space where it occurs and threads that space to the already available pool space. The pool is not reconfigured after a request to release space. That is, space fragments will occur in the pool. When an area is released that is contiguous with already available pool space, the two areas form a single block of available space in the pool.

CHECKOUT DEBUGGING

Checkout Debugging requires space in the pool for a header and for each breakpoint in a program (including those in overlays not resident in the partition). (The **Control Program and Data Management Services, Extended Reference** manual describes the operation and use of the Checkout Debugging routine.)

When Checkout Debugging is used, the number of breakpoints requested must be determined by the size of the partition available and other space requirements of the program. Once a section of code is actually debugged, the debug directive file should be removed and the //EXECUTE statement should specify DEBUG=NO. A program requiring a larger number of files simultaneously open or a larger telecommunications capability can be accommodated only when Debug is used judiciously.

TELECOMMUNICATIONS

Telecommunications requires table space for the task, and for each line, terminal, size of buffer, and buffer assigned to a step. In addition all buffer space defined for telecommunications is taken from the partition space pool. (Refer to telecommunications tables in the **Telecommunications Reference** manual.)

For telecommunications, buffer size should be usable. More than two buffers per line (one for input and one for output) is wasted in the system and should not be used. The number of terminals also greatly effects the space requirement for telecommunications in the pool.

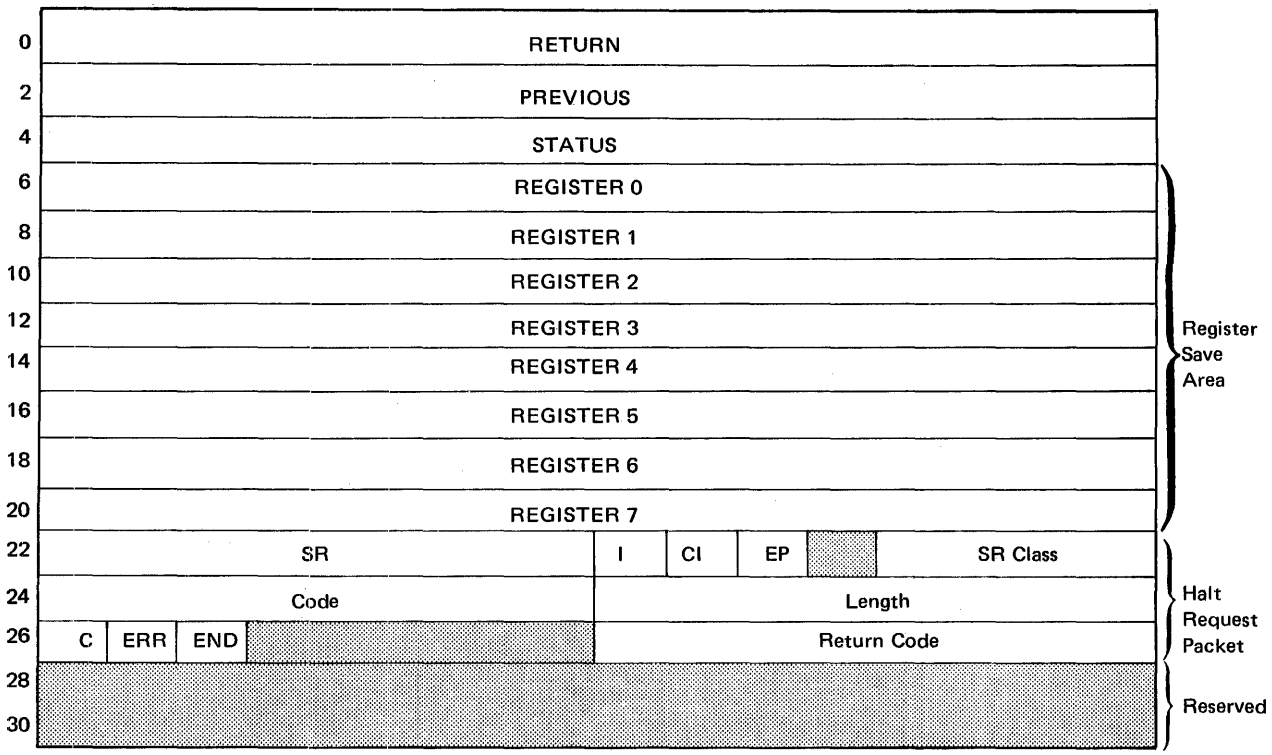
REDUCING THE SIZE OF THE SPACE POOL

The size of the partition space pool can be reduced by the programmer, increasing the size of the problem program area allocated. This is done by supplying a value for the POOLSIZ parameter at the time the program is link-edited. When this parameter is supplied to the Linkage Editor it specifically defines the largest amount of space required for all entries which will simultaneously occupy the partition space pool.

The space occupied by the tables area at the end of the partition plus that specified as POOLSIZ will be added, and rounded to the next higher page boundary (unless that sum can be evenly divided by 256, the size of a page). The program/partition space pool boundary is set at that address. The program has access to the area between the actual end of the program and the end of the allocated problem program area. The programmer obtains the information as to the bounds set by the loader in allocating that space, through the MEMLIM macro. The program can then calculate the remaining space and use it to optimize program operation. (The MEMLIM macro is described briefly in Appendix A. Refer to **Control Program and Data Management Services, Extended Reference** manual for detailed information.)

The Linkage Editor POOLSIZ parameter is intended for use by system programs, but is available to application programs as well. Use of these implied techniques requires a clear understanding of the operation of the partition space pool and of each system program obtaining space from the pool (Telecommunications, Checkout Debug, and Data Management). The programmer must also be completely familiar with the operation of Linkage Editor. (See the **Program Library Services Reference** manual, Linkage Editor section for a further description of POOLSIZ.)

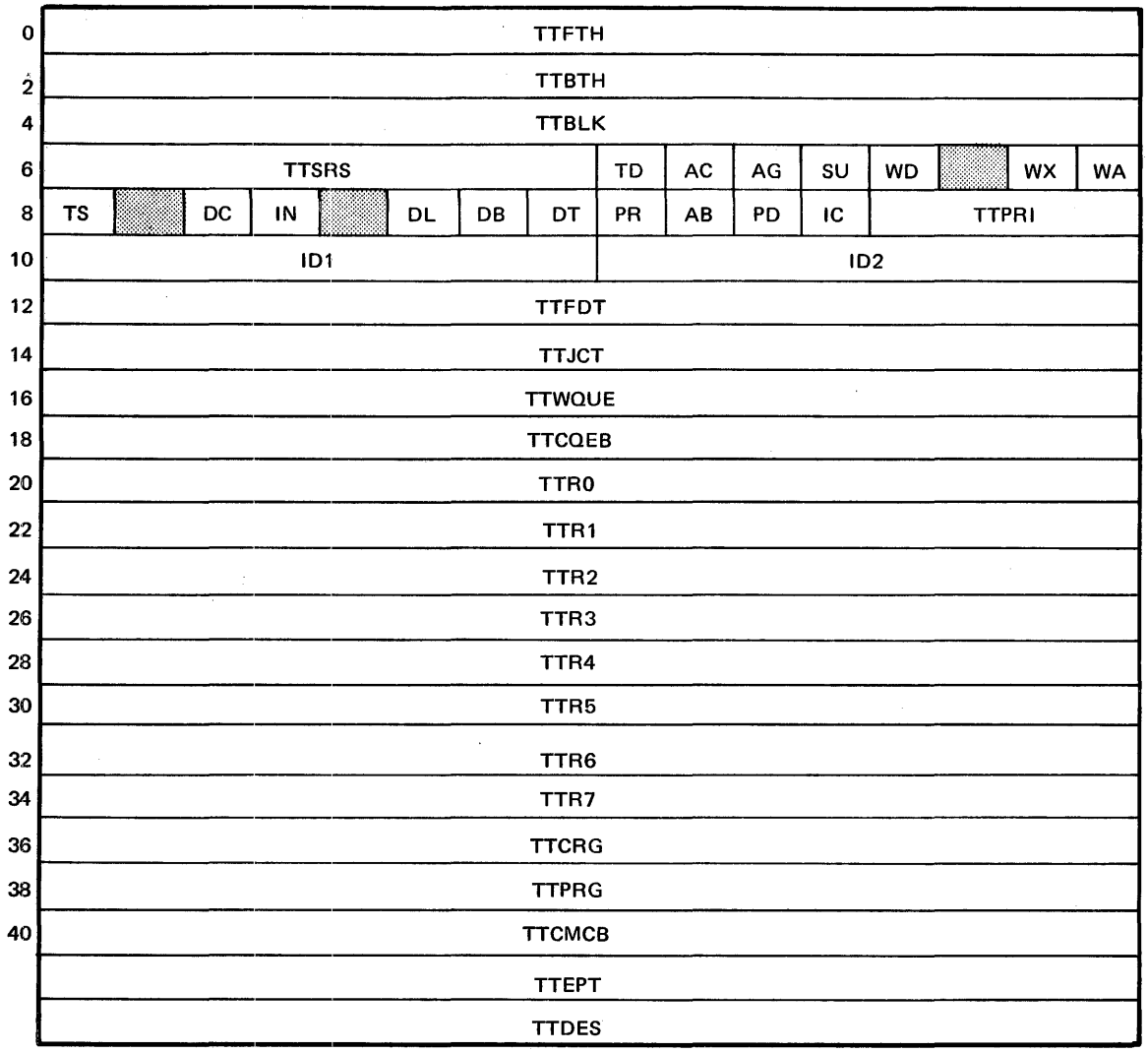
Standard Linkage Area (SLA)



Mnemonic	Bytes	Bits	Description
RETURN	0, 1	0-7	Return address in the calling program Points to Halt Request Packet (byte 22 of SLA)
PREVIOUS	2,3	0-7	Address of save area in calling program (higher level program) Zero if no higher level program exists Always zero for SLA
STATUS	4,5	0-7	Used for communication between calling program and called program Always zero for SLA
REGISTER 0	6,7	0-7	Contents of Register 0 Saved by called program in execution
REGISTER 1	8,9	0-7	Contents of Register 1 Saved by called program in execution
REGISTER 2	10,11	0-7	Contents of Register 2 Saved by called program in execution
REGISTER 3	12,13	0-7	Contents of Register 3 Saved by called program in execution
REGISTER 4	14,15	0-7	Contents of Register 4 Saved by called program in execution

Mnemonic	Bytes	Bits	Description
REGISTER 5	16,17	0-7	Contents of Register 5 Saved by called program in execution
REGISTER 6	18,19	0-7	Contents of Register 6 Saved by called program in execution
REGISTER 7	20,21	0-7	Contents of Register 7 Saved by called program in execution
SR	22	0-7	Service Request (SR) Function Code Function Code=13_{16} for SR
I	23	0	Location of parameter string 0 String immediately follows SR 1 String address contained in Register 6 Always zero for SLA
CI	23	1	Indicates when control is to be returned to requester 0 Control returned after SR is complete 1 Control returned after SR is recognized by System Control Program Always zero for disc HALT packet
EP	23	2	Indicates if requester will perform exception processing 0 Requester will not process exception completion of this request 1 Requester will process exception completion of this request Always zero for disc HALT packet
Reserved	23	3	Reserved for system use
CLASS	23	4-7	Major class in which the SR falls Class=2 for Halt Request Packet, Unrestricted System Control Service Request
CODE	24	0-7	Particular Service Request within a class Code=40_{16} for HALT
Length	25	0-7	Specifies length (in words) of the parameter string for this request Length=2 for this packet
C	26	0	0 Service Request has not completed 1 Service Request has completed
ERR	26	1	0 No error condition 1 An error condition has occurred
END	26	2	0 File End Condition has not occurred 1 File End Condition has occurred
Reserved	26	3-7	Reserved for system use
RETURN CODE	27	0-7	Further describes ERROR and END conditions
Reserved	28-31	0-7	Reserved for system use

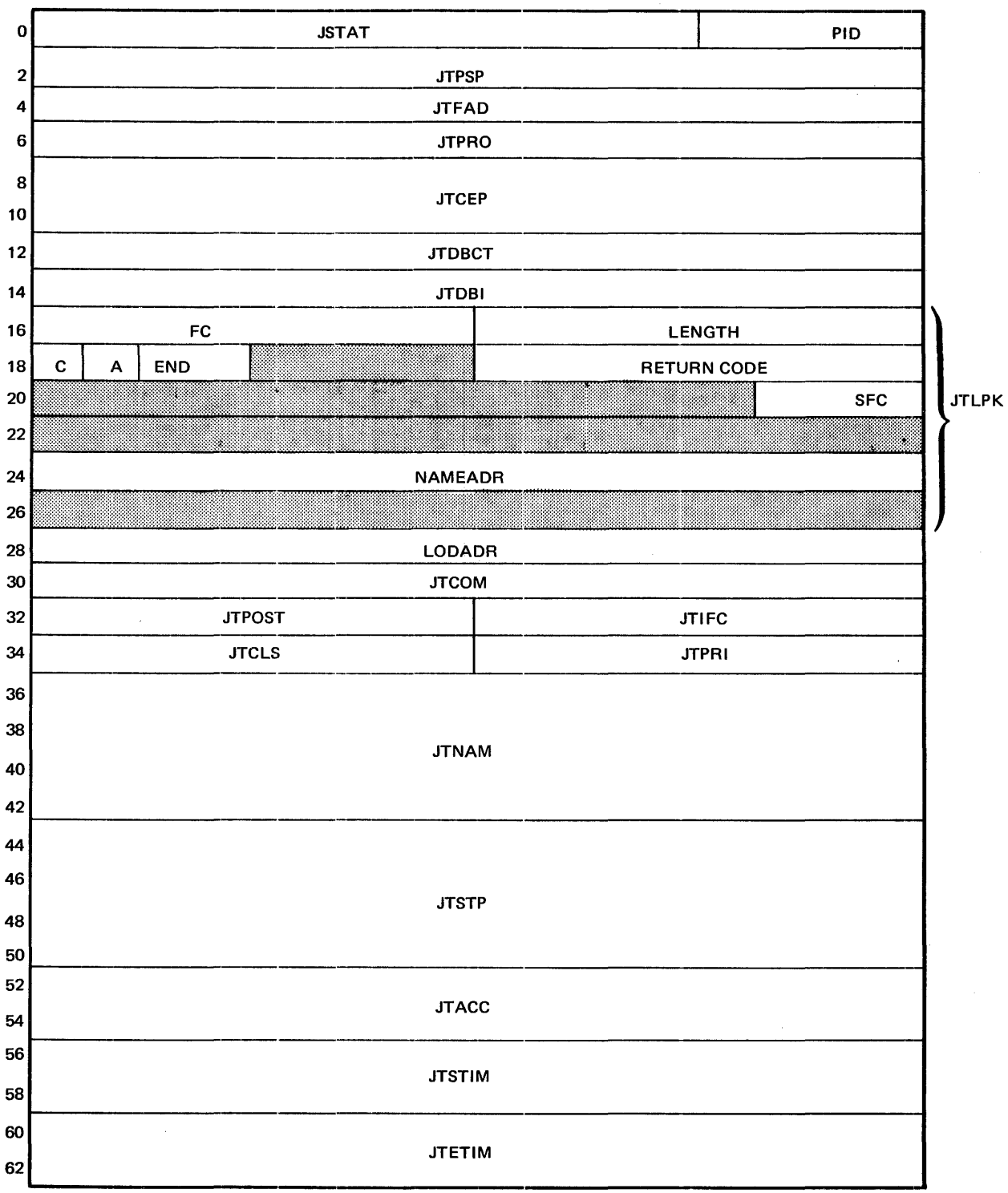
TASK CONTROL TABLES (TCT)

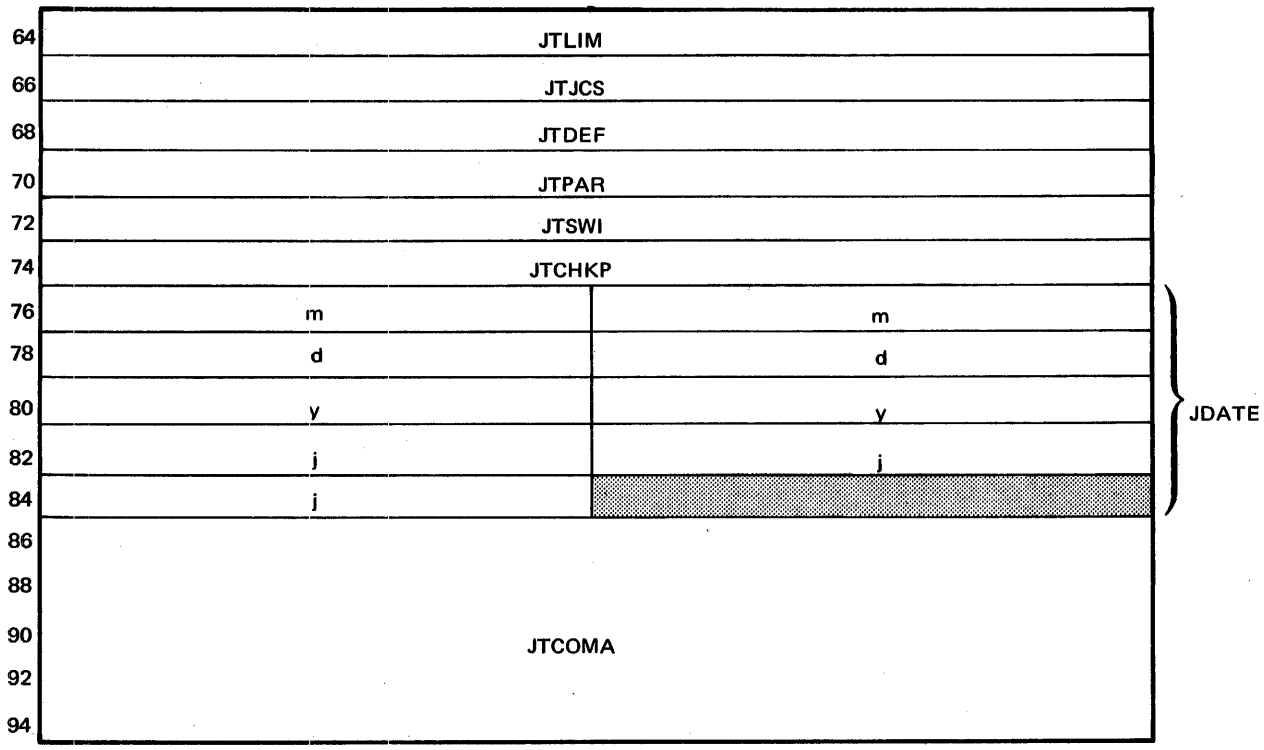


Mnemonic	Bytes	Bits	Description
TTFTH	0,1	0-7	Forward thread Used for general threading
TTBTH	2,3	0-7	Backward thread Used for DELAY threading
TTBLK	4,5	0-7	Blocking pointer value Used for blocking condition information
TTSRS	6	0-7	Count of outstanding SR's
TTTD	7	0	Indicates TCT table (if set)
TTAC	7	1	Indicates that the task is active (if set)
TTAG	7	2	Indicates that the task is assigned to a processor (if set)
TTSU	7	3	Indicates task suspension (if set)
TTWD	7	4	Indicates a WAIT blocking condition (if set)
Reserved	7	5	Reserved for system use
TTWX	7	6	Indicates WAIT for completion of any outstanding SR's (if set)
TTWA	7	7	Indicates WAIT for completion of all SR's (if set)
TTTS	8	0	Indicates termination sequence (if set)
Reserved	8	1	Reserved for system use
TTDC	8	2	Indicates cycle-down at a displaced Debug instruction (if set)
TTIN	8	3	Indicates that INFORM mode is requested (if set)
Reserved	8	4	Reserved for system use
TTDL	8	5	Indicates task is in a DELAY blocking condition (if set)
TTDB	8	6	Indicates DELAY "break"; the completion of any outstanding SR will satisfy the DELAY (if set)
TTDT	8	7	Indicates the type of DELAY 0 means delay in seconds 1 means delay in 1/60 seconds
TTPR	9	0	Indicates privileged mode (if set)
TTAB	9	1	Indicates that this task is being aborted (if set)
TTPD	9	2	Indicates a partition (not system) TCT (if set)
TTIC	9	3	Indicates instruction cycle-down mode (if set)
TTPRI	9	4-7	Indicates task priority
TTID1	10	0-7	Task identification fields
TTID2	11	0-7	If TTPDBIT=0 TTID1 and TTID2 provide for system task identification If TTPDBIT=1 TTID2 provides PID for partition task identification

Mnemonic	Bytes	Bits	Description
TTFDT	12,13	0-7	Pointer to first FDT associated with the tasks instance of execution
TTJCT	14,15	0-7	Pointer to an associated JCT
TTWQUE	16,17	0-7	Provides a task QEB request queue
TTCQEB	18,19	0-7	Pointer to the current QEB
TTR0	20,21	0-7	Save area for Register 0
TTR1	22,23	0-7	Save area for Register 1
TTR2	24,25	0-7	Save area for Register 2
TTR3	26,27	0-7	Save area for Register 3
TTR4	28,29	0-7	Save area for Register 4
TTR5	30,31	0-7	Save area for Register 5
TTR6	32,33	0-7	Save area for Register 6
TTR7	34,35	0-7	Save area for Register 7
TTCRG	36,37	0-7	Save area for Condition Register
TTPRG	38,39	0-7	Save area for Program Register
TTCMCB	40,41	0-7	Pointer to Communications Master Control Block
TTEPT	42,43	0-7	Program entry point
TTDES	44,45	0-7	Program descriptor

JOB CONTROL TABLE (JCT)




64
JTLIM
66
JTJCS
68
JTDEF
70
JTPAR
72
JTSWI
74
JTCHKP
76
m
m
78
d
d
80
y
y
82
j
j
84
j
86
88
90
JTCOMA
92
94
JDATE

Mnemonic	Bytes	Bits	Description
JSTAT	0	0-7	Used to convey information among systems programs.
	1	0-3	Modified by System Control Program, Control Language Services, and computer operator. Used by Relocating Program Loader, System Control Program and Control Language Services
	0	0	User Active
	0	1	Job Monitor Active
	0	2	User Blocked
	0	3	Job Monitor Blocked
	0	4	Private Library Indicator (Loader)
	0	5	Halt Job at Step End
	0	6	System Card Reader Assigned
	0	7	Operator Attention
	1	0	Debug Mode
	1	1,2	Dump Indicator 00 = Dump if abnormal 01 = Never dump 10 = Always dump
	1	3	Private Library Indicator (Master)
PID	1	4-7	Partition Identifier. Set by System Control Program. Used by Control Language Services and Program Loader.
JTPSP	2,3	0-7	Partition Space. Pointer to the first entry in the chain of available memory space. Modified by System Control Program and Program Loader. Used by Control Language Services, Data Management Services, Program Loader, and System Control Program.
JTFAD	4,5	0-7	First Address Available to Loader. Conveys to the Program Loader the first memory location where the program may be loaded. Modified by Control Language Services. Used by Program Loader.
JTPRO	6,7	0-7	Program Load Address. Gives the address of the beginning of the problem program. Set and used by Program Loader.
JTCEP	8-11	0-7	Composite Entry Pointer. Disc block pointer to the Load Library block at which the Composite Entry Point List begins. Set and used by Program Loader.
JTDBCT	12,13	0-7	Debug Control Table Pointer. Pointer to storage address of Debug Control Table. Set and used by Debug program.

Mnemonic	Bytes	Bits	Description
JTDBI	14,15	0-7	Debug Instruction. First two bytes of the instruction overlaid by the Debug service request. Set by Debug program. Used by System Control Program.
JTLPK	16-27	0-7	Loader Packet. Required for calling Program Loader. Modified by Control Language Services, System Control Program, and Program Loader. Used by System Control Program and Program Loader; and divided as follows:
FC	16	0-7	Function Code 10_{16}
LENGTH	17	0-7	Length of this Packet 7 words
C	18	0	Request Complete Indicator 0 Request has not completed 1 Request has completed
A	18	1	Completion Status Indicator 0 Normal Completion 1 Abnormal Completion
END	18	2	END bit 0 File End Condition has not occurred 1 File End Condition has occurred
Reserved	18	0-7	Reserved for system use
RETURN	19	0-7	Return Code 1 I/O Error 2 Cannot locate module via Entry Point List 3 Cannot locate module via library catalog 4 Module exceeds Partition limits 5 Invalid Load Address
Reserved	20 21	0-7 0-4	Reserved for system use.
SFC	21	5-7	Subfunction Code 0 Load by Entry Point 1 Load by Entry Point at Load Address 2 Load by Module Name 3 Load by Module Name at Load Address 4 Fetch by Entry Point 5 Illegal 6 Fetch by Module Name 7 JMSI Fetch Request (Control Language Services only)
Reserved	22,23	0-7	Reserved for system use.
NAMEADR	24,25	0-7	Address pointing to 8 byte Module or Entry Point Name.
Reserved	26,27	0-7	Reserved for system use.
LOADADR	28,29	0-7	Relative load address (if SFC = 1 or 3 only).
JTCOM	30,31	0-7	Completion Code. Conveys completion status of problem program. Set by System Control Program. Used by Control Language Services, Dump, and System Control Program.

Mnemonic	Bytes	Bits	Description
JTPOST	32	0-7	Program Option Switch Table. Provides inter-program switch testing and setting capabilities. Set by Problem Program and Control Language Services. Used by Problem Program.
JTIFC	33	0-7	Job IF Code. Any EBCDIC value that is set by a Problem Program via an SR. Tested by the Control Language //IF statement.
JTCLS	34	0	Internal switch for Job Initiator abort condition.
		1	Immediate restart requested.
		3-7	Job Class. Used to indicate in which partition the user wants a job to run. Set and used by Control Language Services.
JTPRI	35	0-7	Job Priority. Conveys priority of job, 1-9, as specified on the //JOB statement. Set and used by Control Language Services.
JTNAM	36-43	0-7	Eight character job name (left justified space filled if less than eight characters) specified on the //JOB statement. Set by Control Language Services. Used by Data Management and Control Language Services.
JTSTP	44-51	0-7	Eight character step name (left justified space filled if less than eight characters) specified on the //EXECUTE statement. Set and used by Control Language Services.
JTACC	52-55	0-7	Account Number. Specified as user account number on //JOB statement. Used for accounting purposes. Set and used by Control Language Services.
JTSTIM	56-59	0-7	Step Start Time. Packed decimal form HHMMSS. Set and used by Control Language Services.
JTETIM	60-63	0-7	Step Elapsed Time. Packed decimal form HHMMSS. Set and used by Control Language Services.
JTLIM	64,65	0-7	Step Time Limit. Maximum number of minutes the user wishes to allow his program to run. Set by Control Language Services. Modified and used by System Control Program.
JTJCS	66,67	0-7	Next Job Control Statement. Block number of next record in SYSIN. Set and used by Control Language Services.
JTDEF	68,69	0-7	First DEFINE. Block number of first DEF record in the SYSIN file for a step. Set by Control Language Services. Used by Data Management and Control Language Services.
JTPAR	70,71	0-7	Next Parameter. Block number of next PAR record in the SYSIN file for a step. Set by Control Language Services. Used by System Control Program.

Mnemonic	Bytes	Bits	Description
JTSWI	72	0	EOF switch for Accept macro.
		1	ABORT switch for Accept macro.
		2-7	Reserved for system switches.
	73	0-7	Reserved for system switches.
JTCHKP	74,75	0-7	Checkpoint Number.
JDATE	76-84	0-7	Job Date. Date specified for this job (need not be current date) used for date-dependencies in problem program. Form MMDDYYJJJ MMDDYY set by Control Language Services from system data or from DATE keyword of //SET statement if specified. JJJ calculated from //SET statement. Used by problem program. Divided as follows:
	76,77	0-7	Calendar Month.
	78,79	0-7	Calendar Day.
	80,81	0-7	Calendar Year.
	82-84	0-7	Julian Date.
Reserved	85	0-7	Reserved for system use.
JTCOMA	86-95	0-7	Communications Area. Provides for communication between steps. Cleared by the Job Initiator module of Control Language Services. Set and used by executing program via SR.

F. INDEX—BLOCK SIZE FOR INDEXED FILES

CALCULATING BY TABLE

The minimum index block size and optimum block size may be calculated by Tables F-1 through F-4. Refer to the **MRX/OS Control Program and Data Management Services, Extended Reference** manual for the layouts of the index portion of indexed files.

MINIMUM INDEX BLOCK

There is a *minimum index block size* for every indexed file depending on key size and file size. The user may utilize any index block size larger than the minimum, if he has memory space for a larger index block. The larger the index block the better retrieval becomes on random processing. If the user goes below the minimum index block size there is the possibility of not being able to create the file size as planned.

OPTIMUM INDEX BLOCK

When planning the creation of indexed files, the user must decide whether he wants to process the directory-directory, which resides on mass storage, in a main memory buffer. This option speeds up random processing, but requires extra space for the buffer. If the mode of processing is with a main-memory buffer there is a well-defined *optimum index block size* which minimizes memory space for the index buffer and directory-directory buffer.

Once the user has determined his mode of processing, Table F-1 is used to determine minimum-keys/block and Table F-2 is used to determine optimum keys/block. Note that in using Table F-1 and Table F-2, the larger of the two values in the file size is the determining factor. Also note that these tables were computed for consistency for maximum key size and one million records as the upper limit. There will be some index block sizes generated that exceed one track in number of bytes. This exceeds the system limit for block sizes (limit is 7294 bytes). The user will have to choose a smaller key size or smaller file size.

PROGRAMMING CONSIDERATIONS

The keys/block is entered in the Control Language //DEFINE statement along with key size. The corresponding minimum or optimum index block size can be calculated from Table F-3. The resulting index block size is then entered in the source program.

If the user has determined to calculate the optimum keys/block and optimum index block size, Table F-4 is used to calculate the number of bytes for the main-memory buffer for the directory-directory entries.

The user must be careful not to exceed the file maximum at creation time when using the optimum block size – when he utilizes the main-memory buffer to hold the directory-directory entries for random processing, the buffer would not be able to hold all the entries, thus writing over the user program. Thus, when choosing an index block size other than the optimum and the main-memory buffer is used to process the directory-directory entries, the buffer size should be the size of the index block, as the system checks for overflow at creation time.

EXAMPLES

The following examples illustrate how to calculate the minimum index block size, the larger than minimum index block size, and the optimum index block size.

MINIMUM INDEX BLOCK SIZE

The minimum index block size can be calculated with the following steps.

1. In Table F-1 locate the number of records in the file and the key size. For example, if the number of records is 20,000 and the key size is 10, the minimum keys per block is 24.

2. The keys/block is entered in the Control Language //DEFINE statement along with the key size.

3. The corresponding minimum index block size is calculated from Table F-3 using the minimum block size formula. For this example with minimum keys/block of 24 and key size of 10; the minimum index block size is 384 bytes.

4. The minimum index block size is then entered into the source program.

LARGER THAN MINIMUM INDEX BLOCK SIZE

Similar to the minimum index block size, an index block that is larger than the minimum may be calculated with the same steps. The difference is found in estimating the keys/block, it must be greater than or equal to the minimum keys/block selected.

OPTIMUM INDEX BLOCK SIZE

The optimum index block size can be calculated with the following steps.

1. In Table F-2 locate the number of records in the file and the key size. For example, if the number of records is 20,000 and the key size is 10, the optimum keys per block is 30.

2. The keys/block is entered in the Control Language //DEFINE statement along with the key size.

3. The corresponding optimum index block size is calculated from Table F-3 using the optimum block size formula. For this example with optimum keys/block of 30 and key size of 30, the optimum index block size is 475 bytes.

4. The optimum index block size is then entered into the source program.

5. For optimum keys/block and optimum index block size, Table F-4 is used to calculate the main-storage buffer for the directory-to-the-directory entries. For this example, the number of bytes required for the buffer for the directory-to-the-directory is 250.

Table F-1. Minimum Keys/Block

Records in File	Key Size in Bytes														
	2	3	4	5	6	7	8	9	10	11 to 15	16 to 20	21 to 25	26 to 35	36 to 50	51 to 100
0 - 5,000	13	14	14	14	15	15	15	15	15	16	16	16	16	17	17
5,000 - 10,000	16	17	18	18	18	19	19	19	19	20	20	20	21	21	21
10,000 - 15,000	19	20	20	21	21	21	22	22	22	23	23	23	23	24	24
15,000 - 20,000	20	21	22	23	23	23	24	24	24	25	25	26	26	26	26
20,000 - 25,000	22	23	24	24	25	25	25	26	26	27	27	27	28	28	28
25,000 - 30,000	23	24	25	26	26	27	27	27	28	28	29	29	29	30	30
30,000 - 35,000	25	26	27	27	28	28	28	29	29	30	30	31	31	31	32
35,000 - 40,000	26	27	28	28	29	29	30	30	30	31	32	32	32	33	33
40,000 - 45,000	27	28	29	30	30	31	31	31	31	32	33	33	34	34	34
45,000 - 50,000	28	29	30	31	31	32	32	32	33	34	34	34	35	35	36
50,000 - 60,000	29	31	32	32	33	34	34	34	35	36	36	37	37	37	38
60,000 - 70,000	31	32	34	34	35	35	36	36	36	37	38	38	39	39	40
70,000 - 80,000	32	34	35	36	36	37	37	38	38	39	40	40	41	41	42
80,000 - 90,000	34	35	36	37	38	38	39	39	40	41	41	42	42	43	43
90,000 - 100,000	35	36	37	38	39	40	40	41	41	42	43	43	44	44	45
100,000 - 125,000	37	39	40	41	42	43	43	44	44	45	46	47	47	48	48
125,000 - 150,000	40	41	43	44	45	45	46	46	47	48	49	49	50	51	51
150,000 - 175,000	42	44	45	46	47	48	48	49	49	50	51	52	53	53	54
175,000 - 200,000	44	46	47	48	49	50	50	51	51	53	54	54	55	56	56
200,000 - 250,000	47	49	51	52	53	54	54	55	55	57	58	58	59	60	61
250,000 - 300,000	50	52	54	55	56	57	58	58	59	61	61	62	63	64	64
300,000 - 350,000	52	55	57	58	59	60	61	62	62	64	65	65	66	67	68
350,000 - 400,000	55	57	59	61	62	63	63	64	65	67	68	68	69	70	71
400,000 - 450,000	57	60	62	63	64	65	66	67	67	69	70	71	72	73	74
450,000 - 500,000	59	62	64	65	67	68	68	69	70	72	73	74	74	75	76
500,000 - 600,000	63	66	68	69	71	72	73	73	74	76	77	78	79	80	81
600,000 - 700,000	66	69	71	73	74	75	76	77	78	80	81	82	83	84	85
700,000 - 800,000	69	72	74	76	78	79	80	81	81	84	85	86	87	88	89
800,000 - 900,000	72	75	77	79	81	82	83	84	85	87	88	89	91	91	93
900,000 - 1,000,000	74	78	80	82	84	85	86	87	88	90	92	93	94	95	96

Table F-2. Optimum Keys/Block

Records in File	Key Size in Bytes														
	2	3	4	5	6	7	8	9	10	11 to 15	16 to 20	21 to 25	26 to 35	36 to 50	51 to 100
0 - 5,000	16	17	18	18	18	19	19	19	19	20	20	20	21	21	21
5,000 - 10,000	20	21	22	23	23	23	24	24	24	25	25	25	26	26	26
10,000 - 15,000	23	24	25	26	26	27	27	27	27	28	29	29	29	30	30
15,000 - 20,000	26	27	28	28	29	29	29	30	30	31	32	32	32	33	33
20,000 - 25,000	28	29	30	31	31	32	32	32	33	34	34	34	35	35	36
25,000 - 30,000	29	31	32	32	33	34	34	34	35	36	36	37	37	37	38
30,000 - 35,000	31	32	33	34	35	35	36	36	37	37	38	38	39	39	40
35,000 - 40,000	32	34	35	36	36	37	37	38	38	39	40	40	41	41	42
40,000 - 45,000	34	35	36	37	38	38	39	39	40	41	41	42	42	43	43
45,000 - 50,000	35	36	37	38	39	40	40	41	41	42	43	43	44	44	45
50,000 - 60,000	37	39	40	41	42	42	43	43	43	45	45	46	46	47	48
60,000 - 70,000	39	41	42	43	44	44	45	45	46	47	48	48	49	49	50
70,000 - 80,000	40	42	44	45	46	46	47	47	48	49	50	50	51	52	52
80,000 - 90,000	42	44	45	47	47	48	49	49	50	51	52	52	53	54	54
90,000 - 100,000	44	46	47	48	49	50	50	51	51	53	54	54	55	56	56
100,000 - 125,000	47	49	51	52	53	54	54	55	55	57	58	58	59	60	61
125,000 - 150,000	50	52	54	55	56	57	58	58	59	61	61	62	63	64	64
150,000 - 175,000	52	55	57	58	59	60	61	61	62	64	65	65	66	67	68
175,000 - 200,000	55	57	59	61	62	63	63	64	65	67	68	68	69	70	71
200,000 - 250,000	59	62	64	65	67	68	68	69	70	72	73	74	74	75	76
250,000 - 300,000	63	66	68	69	71	72	73	73	74	76	77	78	79	80	81
300,000 - 350,000	66	69	71	73	74	75	76	77	78	80	81	82	83	84	85
350,000 - 400,000	69	72	74	76	78	79	80	81	81	84	85	86	87	88	89
400,000 - 450,000	72	75	77	79	81	82	83	84	85	87	88	89	91	91	93
450,000 - 500,000	74	78	80	82	84	85	86	87	88	90	92	93	94	95	96
500,000 - 600,000	79	82	84	87	89	90	91	92	93	96	97	98	100	101	102
600,000 - 700,000	83	87	90	92	94	95	96	97	98	101	102	103	105	106	107
700,000 - 800,000	87	91	94	96	98	99	100	102	102	105	107	108	110	111	112
800,000 - 900,000	90	94	97	100	102	103	105	106	106	110	111	112	114	115	116
900,000 - 1,000,000	93	98	101	103	105	107	108	109	110	113	115	116	118	120	121

Table F-3. Optimum or Minimum Index Block Size

$$\text{Optimum block size} = 10 + \left\{ \frac{(10)\ (0KB)\ (KS+4)}{9} \right\}$$

0KB = Optimum keys/block

KS = Key size

$$\text{Minimum block size} = 10 + \left\{ \frac{(10)\ (MKB)\ (KS+4)}{9} \right\}$$

MKB = Minimum keys/block

KS = Key size

NOTE: $\{\ \}$ = Round up if result not whole integer.

Table F-4. Bytes Required in Buffer for Directory-Directory Entries

$$\text{Usage} = \left[\frac{9(0BS-10)}{10} \right] = US$$

$$\text{Number keys/primary index block} = \left[\frac{US}{KS+4} \right] = NKP$$

$$\text{Number keys/directory block} = \left[\frac{US}{KS+2} \right] = NKD$$

Total number keys represented/ directory block = (NKP) (NKD) = NKRD

$$\text{Number entries in Directory-directory block} = \left\{ \frac{\text{file size}}{NKRD} \right\} = NKDD$$

Number of bytes required for buffer for directory-directory entries = 10 + (KS+2) (NKDD)

NOTE: $\{\ \}$ = Round up if result not whole integer.

$[\ ]$ = Round down if result not whole integer.

CALCULATING BY FORMULA

If the user wishes to calculate keys/block based on a different file maximum than given in Tables F-1 and F-2, the following algorithms, along with Table F-5, can be used to compute minimum and optimum keys/block. The constants Ko and Km are taken from Table F-5 based on key size.

$$\text{Optimum (OKB)} = \left\{ \sqrt[3]{\frac{FS}{Ko}} \right\}$$

$$\text{Minimum (MKB)} = \left\{ \sqrt[3]{\frac{FS}{Km}} \right\}$$

FS = Maximum File Size

NOTE: $\{\ \}$ = Round up if result not whole integer.

Table F-5. Constants for Alternate Algorithm

KS	K_o	K_m	KS	K_o	K_m
2	1.2500	2.5000	52	.5975	1.1950
3	1.0888	2.1776	53	.5967	1.1934
4	.9877	1.9753	54	.5959	1.1918
5	.9184	1.8367	55	.5952	1.1904
6	.8681	1.7361	56	.5945	1.1890
7	.8299	1.6598	57	.5939	1.1878
8	.8000	1.6000	58	.5932	1.1864
9	.7759	1.5518	59	.5926	1.1852
10	.7562	1.5124	60	.5920	1.1840
11	.7396	1.4792	61	.5914	1.1828
12	.7256	1.4512	62	.5908	1.1816
13	.7136	1.4272	63	.5903	1.1806
14	.7031	1.4062	64	.5897	1.1794
15	.6940	1.3880	65	.5892	1.1784
16	.6859	1.3718	66	.5887	1.1774
17	.6787	1.3574	67	.5882	1.1764
18	.6722	1.3444	68	.5878	1.1756
19	.6664	1.3328	69	.5873	1.1746
20	.6612	1.3224	70	.5868	1.1736
21	.6564	1.3128	71	.5864	1.1728
22	.6520	1.3040	72	.5860	1.1720
23	.6480	1.2960	73	.5856	1.1712
24	.6443	1.2886	74	.5852	1.1704
25	.6409	1.2818	75	.5848	1.1696
26	.6378	1.2756	76	.5844	1.1688
27	.6348	1.2696	77	.5840	1.1680
28	.6321	1.2642	78	.5837	1.1674
29	.6296	1.2592	79	.5833	1.1666
30	.6272	1.2544	80	.5830	1.1660
31	.6249	1.2498	81	.5827	1.1654
32	.6228	1.2456	82	.5823	1.1646
33	.6209	1.2418	83	.5820	1.1640
34	.6190	1.2380	84	.5817	1.1634
35	.6172	1.2344	85	.5814	1.1628
36	.6156	1.2312	86	.5811	1.1622
37	.6140	1.2280	87	.5808	1.1616
38	.6125	1.2250	88	.5805	1.1610
39	.6111	1.2222	89	.5802	1.1604
40	.6097	1.2194	90	.5800	1.1600
41	.6084	1.2168	91	.5797	1.1594
42	.6072	1.2144	92	.5794	1.1588
43	.6060	1.2120	93	.5792	1.1584
44	.6049	1.2098	94	.5789	1.1578
45	.6038	1.2076	95	.5787	1.1574
46	.6028	1.2056	96	.5785	1.1570
47	.6018	1.2036	97	.5782	1.1564
48	.6009	1.2018	98	.5780	1.1560
49	.6000	1.2000	99	.5778	1.1556
50	.5991	1.1982	100	.5776	1.1552
51	.5983	1.1966			

G. CONTROL LANGUAGE STATEMENTS FOR 2 SAMPLE JOBS

This appendix presents two jobs, a sample call on a COBOL compile-link-and-go procedure plus the job which entered that procedure on its library. They are working jobs actually executed in a particular installation, but they do not necessarily represent the only or ideal way to perform a compile-and-go task. Obviously, they are not meant to be comprehensive samples of all the CLS features, either. However, at least one of each control language statement type appears here, and the jobs do serve as an illustration of the power of the Control Language.

The PROCIN example shows the CLS required to enter a procedure in a private library. The member name, as identified in the MEM operand on the //PAR card, is the name by which the procedure may be called. The procedure code is loaded to a spooled data file PROCEDUR (choice of name is arbitrary, so long as it corresponds to a foregoing //DEF), referenced through the SEQIN //DEF required by the librarian. The LIST //DEF, also required by the librarian, identifies the list output device as a printer. The third //DEF identifies the library file on disc to which the procedure is to be entered. Since a private library has been specified here, the call must name that library with a LIB keyword-operand. If the user wished to make the procedure available to all systems users, he could replace this //DEF with a //DEF for the standard system load library, $SYSLODLIB. Another possibility here would be to dedicate the system reader by use of SYSCRD, and avoid spooling. In this case the SEQIN //DEF and the //DATA cards would read:

```
//DEF    ID=SEQIN,DEV=SYSCRD

//DATA   FIL=SYSCRD
```

(The /*LIB is required in any case, being the librarian terminator.)

As to the procedure itself, note the use of ampersands throughout the code, to show the occurrence of run-time variables. Each of these variables is formally identified in the //DECLARE at the head of the procedure. All are shown with default values except PGM: this implies that the PGM value must be supplied in the call, whereas the others may be defaulted. The comment cards indicate the significance of the variables. Note also the use of //IF statements to abort rest of job if fatal errors should occur in the compile step (compiler would set if-code of "F") or in the link-edit step (linkage editor would set if-code of "F").

Job CALL1 is a sample call on the procedure. Its PROC and LIB keywords are coded first on the //CALL, as required by the Job Monitor, PROC=CBLEEX identifying the procedure by its library member name, and LIB=COBOLSRC identifying the private library in which it appears. (As noted earlier, if the $SYSLODLIB had been chosen, the LIB keyword-operand could be omitted here.)

PGM=EXT001 is coded as required, being used in the procedure to identify both input and output member name to the compiler. The SYSRES VOLID DEV100 is used to replace the default (RLS100) held by the procedure. Similarly, SPTV03 is specified as the volume used for I/O files and for COBOL work files. Note, however, that by omission of the SIZE, SRCFIL, SVOL, and DUMP keyword-operands on the //CALL, the user selects the working defaults on the procedure, taking 1000 as maximum number of source statements, selecting his source from the COBSRC library on SPTV01, and choosing DMP=NO on the execute of the "go" step.

By coding a //TELL with PAU=YES after his call, the user ensures that execution of his go-step will not proceed until the operator has responded to his //TELL message, which requests use of 3-part paper. In like manner, the user may append additional //PAR cards, //DEF cards, etc., to be applied to the last named step of a //CALL.

```
//JOB      NAME=PROCIN
//EX       PGM=LIBUTIL
//PAR      COM=UPDATE,MTYPE=PRO,MEM=CBLEEX,OLIB=COBSRC
//DEF      ID=LIST,DEV=PRT
//DEF      ID=COBSRC,FIL=COBOLSRC,STA=(P,O)
//DEF      ID=SEQIN,FIL=PROCEDUR
//DATA     FIL=PROCEDUR,CLS=YES
//DECLARE PGM,VOL=SPTV01,SRCFIL=COBSRC,SVOL=SPTV01,CBWRK=SPTV01,
//         SYSRS=RLS100,DUMP=NO
*        PROCEDURE:  CBLEEX
*        I.E.        COBOL COMPILATION
*                    LINK EDIT
*                    EXECUTE
*----------------
*         VARIABLES      REQUIRED   DEFAULT     DESCRIPTION
*-------------------------------------------------------------
*         PGM            YES        NONE        PROGRAM AND SOURCE MEM
*         VOL            NO         SPTV01      ALLOC OF I/O FILES
*         SRCFIL         NO         COBSRC      SOURCE FILE NAME
*         SVOL           NO         SPTV01      VOLUME FOR ABOVE
*         CBWRK          NO         SPTV01      ALLOC OF COBOL WORK
*         SYSRS          NO         RLS100      SYSRES VOL ID
*         DUMP           NO         NO          DUMP PARM ON //EX
*-------------------------------------------------------------
//EX     PGM=COBOL
//PAR    OBJECT=YES,DMAP=YES,PMAP=YES,XREF=YES,OMEM=&PGM,IMEM=&PGM
//DEF    ID=OUTPUT,FIL=SPT--CB--OBJ--MOD,STA=T,NUM=1000,SIZ=256,
//       BLK=1,CSD=NO,VOL=&VOL,CON=YES
//DEF    ID=INPUT,FIL=&SRCFIL,STA=(P,I),VOL=&SVOL,CAT=NO
//DEF    ID=LIST,DEV=PRT
//DEF    ID=MRSIFIL,FIL=DUMMY,VOL=&CBWRK
//DEF    ID=MRELFIL,FIL=DUMMY,VOL=&CBWRK
//DEF    ID=MRTEXT01,FIL=DUMMY,VOL=&CBWRK
//DEF    ID=MRVIRTAL,FIL=DUMMY,VOL=&CBWRK
//DEF    ID=MRXRFFIL,FIL=DUMMY,VOL=&CBWRK
//DEF    ID=MRERRFIL,FIL=DUMMY,VOL=&CBWRK
//IF     CODE=F,GO=EOJ
//EX     PGM=LNKEDT
//PAR    PGM=&PGM,LST=XREF
//DEF    ID=LIB1,FIL=$SYSOBJLIB,STA=P,VOL=&SYSRS
//DEF    ID=INPUT,FIL=SPT--CB--OBJ--MOD,VOL=&VOL
//DEF    ID=OUTPUT,FIL=SPT--CB--REL--MOD,NUM=1000,SIZ=256,BLK=1,
//       CSD=NO,CON=YES,VOL=&VOL
//DEF    ID=LIST,DEV=PRT
//IF     CODE=F,GO=EOJ
//EX     PGM=&PGM,LIB=SPT--CB--REL--MOD,DMP=&DUMP
//DEF    ID=$LODLIB,FIL=SPT--CB--REL--MOD,VOL=&VOL
/*LIB
/*
//EOJ
```

SAMPLE PROCEDURE-CALL, AS SUBMITTED

```
//JOB       NAME=CALL1
//CALL      PROC=CBLEEX,LIB=COBOLSRC,PGM=EXT001,VOL=SPTV03,CBWRK=SPTV03,SYSRS=DEV100
//TELL      PAU=YES,OP=READY PRINTER WITH 3-PART PAPER AND REPLY "GO"
//EOJ
```

SAMPLE PROCEDURE-CALL, AS LISTED ON SYSOUT

```
JOB CALL 1        ENTERED SYSTEM ON 110972/72314 AT 070227 BY $JMOIR 6.2 – 09/20/72
//JOB        NAME=CALL1
JMJI0960       070308      JOB CALL1        QUEUED
JMJI0980       070316      JOB CALL1        INITIATED
//CALL       PROC=CBLEEX,LIB=COBOLSRC,PGM=EXT001,VOL=SPTV03,CBWRK=SPTV03,SYSRS=DEV100
*          PROCEDURE: CBLEEX
*          I.E.                    COBOL COMPILATION
*                                  LINK EDIT
*                                  EXECUTE
* ------------------------------
*          VARIABLES          REQUIRED          DEFAULT          DESCRIPTION
* ------------------------------------------------------------------------
*          PGM                YES               NONE             PROGRAM AND SOURCE MEM
*          SIZE               NO                1000             MAX # OF SOURCE STATEMENTS
*          VOL                NO                SPTV01           ALLOC OF I/O FILES
*          SRCFIL             NO                COBSRC           SOURCE FILE NAME
*          SVOL               NO                SPTV01           VOLUME FOR ABOVE
*          CBWRK              NO                SPTV01           ALLOC OF COBOL WORK
*          SYSRS              NO                RLS100           SYSRES VOL ID
*          DUMP               NO                NO               DUMP PARM ON //EX
* ------------------------------------------------------------------------
//EX       PGM=COBOL
//PAR      OBJECT=YES,DMAP=YES,PMAP=YES,XREF=YES,
//PAR      OMEM=EXT001,IMEM=EXT001,MAXSIZ=1000
//DEF      ID=OUTPUT,FIL=SPT–CB–OBJ–MOD,STA=T,NUM=1000,SIZ=256,
//         BLK=1,CSD=NO,VOL=SPTV03
JMSI0230       ALLOCATED SPT–CB–OBJ–MOD          WITH BLK SIZE 0256
//DEF      ID=INPUT,FIL=COBSRC,STA=(P,I),VOL=SPTV01,CAT=NO
//DEF      ID=LIST,DEV=PRT
//DEF      ID=MRSIFIL,FIL=DUMMY,VOL=SPTV03
//DEF      ID=MRELFIL,FIL=DUMMY,VOL=SPTV03
//DEF      ID=MRTEXT01,FIL=DUMMY,VOL=SPTV03
//DEF      ID=MRVIRTAL,FIL=DUMMY,VOL=SPTV03
//DEF      ID=MRXPRFIL,FIL=DUMMY,VOL=SPTV03
//DEF      ID=MRERRFIL,FIL=DUMMY,VOL=SPTV03
JMST0210       PURGED MRERRFIL
JMST0210       PURGED MRSIFIL
JMST0210       PURGED MRTEXT01
JMST0210       PURGED MRVIRTAL
JMST0210       PURGED MRXRFFIL
JMST0210       PURGED MRELFIL
JMST0190       PGM NAME: COBOL          IF CODE:          COMPLETION CODE: 0
JMST0160       STEP START TIME      07:03:49
JMST0170       STEP STOP TIME       07:05:53
JMST0150       STEP ELAPSED TIME    00:02:04
//IF       CODE=F,GO=EOJ
//EX       PGM=LNKEDT
//PAR      PGM=EXT001,LST=XREF
//DEF      ID=LIB1,FIL=$SYSOBJLIB,STA=P,VOL=DEV100
//DEF      ID=INPUT,FIL=SPT–CB–OBJ–MOD,VOL=SPTV03
//DEF      ID=OUTPUT,FIL=SPT–OB–REL–MOD,NUM=1000,SIZ=256,BLK=1,
//         CSD=NO,VOL=SPTV03
JMSI0230       ALLOCATED SPT–CB–REL–MOD          WITH BLK SIZE 0256
//DEF      ID=LIST,DEV=PRT
JMST0210       PURGED LNKEDTVTFLE
JMST0190       PGM NAME: LNKEDT         IF CODE:          COMPLETION CODE: 0
JMST0160       STEP START TIME      07:06:14
JMST0170       STEP STOP TIME       07:06:38
JMST0150       STEP ELAPSED TIME    00:00:24
//IF       CODE=F,GO=EOJ
//EX       PGM=EXT001,LIB=SPT–CB–REL–MOD,DMP=NO
```

```
//DEF     ID=$LODLIB,FIL=SPT-CR-REL-MOD,VOL=SPTV03
//TELL    PAU=YES,OP=READY PRINTER WITH 3-PART PAPER AND REPLY "GO"
JMST0190        PGM NAME:  EXT001     IF CODE:        COMPLETION CODE:  0
JMST0160        STEP START TIME       07:06:47
JMST0170        STEP STOP TIME        07:06:51
JMST0150        STEP ELAPSED TIME:    00:00:04
//EOJ
JMJT0000        PURGED SPT-CR-OBJ-MOD
JMJT0000        PURGED SPT-CR-REL-MOD
JOB CALL1           COMPLETED ON 110972/72314 AT 070701 RY $JMJ1 6.2 - 09/20/72
```

H. VARIABLE REPLACEMENT RULES

LONGEST VARIABLES REPLACED FIRST

All variables supplied on either the //CALL or the //DEC are placed in a variable table. Entries in this table are made in the order of diminishing length: for example, VARI will appear in the table prior to VAR or CAT. A field in a procedure which contains &VARILOG is capable of being replaced by a value attached to any of seven variables (V, VA, VAR, etc.); but will be only replaced by the value attached to the longest of the variables. Thus, one should insure that each of the variables in a procedure is not a beginning portion of some other variable within the same procedure.

EXAMPLE

```
//CALL PROC=TEST,VAR=SYSTEM
```

PROCEDURE – TEST:

```
//DEC  VARERR=TEST

//EXEC  PGM=UTIL63

//PAR  FILE=&VARERRLOG,OPT=FULL
```

RESULTING CONTROL LANGUAGE:

```
//EXEC  PGM=UTIL63

//PAR  FILE=TESTLOG,OPT=FULL
```

The caller had presumably intended the //PAR to appear as follows:

```
//PAR  FILE=SYSTEMERRLOG,OPT=FULL
```

This would, indeed, have been the result if the variable, VARERR, had not also been in the replacement table; or if the table had been ordered by increasing lengths rather than by diminishing lengths.

VARIABLES TERMINATED BY A COMMA, BLANK, OR EQUAL SIGN

A variable that is terminated by an equal sign will be entered in the replace table along with its associated value. A variable that is terminated by a comma or a blank is not entered in the replace table, because it has no associated value to be used in the replacement procedure. A comma as a variable delimiter indicates that more variables exist and the PROC scanning routine proceeds to look for the next variable. If a blank delimits a variable, then no more variables are expected and the PROC scanning routine terminates its search for more variables.

EXAMPLES

1) //CALL PROC=TEST,VAR=SYS,VOL=YPAK

   Two variables, VAR and VOL, are entered in the replace table.

2) //DEC VAR,DEV=DISC,VOL

   A variable, DEV, is entered in the replace table.

3) //CALL PROC=TEST,VAR ,VOL=DEV100

   No variables are entered in the replace table. The blank stops the scan so that VOL=DEV100 is not found.

4) //CALL PRO=TEST,VOL=DEV100,VAR,D=DOG

   Two variables, VOL and D, are entered in the replace table.

Currently, no diagnostic appears for a variable that does not have a value associated with it.

VALUES TERMINATED BY A COMMA OR A BLANK

The PROC scan routine searches for values in the following manner. The cursor is positioned to the column immediately following the equal sign. The scan routine then moves the cursor to the first non-blank character which is the start of the value character string. The value character string is terminated by a blank or a comma whichever occurs first. A comma as an ending delimiter indicates that further variables are expected. A space indicates that no further variables are to be processed.

EXAMPLES

1) //DEC VAR=SYS,VOL=YPAK

   Two values, SYS and YPAK, are entered in the replace table.

2) //CALL PRO=TEST,VAR= SYS,VOL= YPAK

Two values, SYS and YPAK, are entered in the replace table.

3) //DEC VAR=SYS ,VOL=SYSPAK

One value, SYS, is entered in the replace table. The blank terminates the scan so that the variable, VOL, is not found.

4) //DEC VAR=SYS,VOL= ,D=DISC,TYP

Three values, SYS, the null string, and DISC, are entered in the replace table.

SIZE LIMITATIONS

REPLACE TABLE

The replace table is 512 bytes long and is filled according to the following formula:

$$512 \leq RTS = \sum_{i=1}^{n} (Xi + Yi + 4)$$

where n = number of variables having associated value

x = length of variable character string

y = length of value character string

RTS = replace table size

An overflowed replace table produces the message, TOO MANY PROC VARIABLES.

SCAN BUFFER

The scan buffer is used to hold the scanned variable or value. Its size is 17 bytes. Therefore, a variable or value is restricted to seventeen characters.

CONTINUATION STATEMENTS

The PROC routine will build a continuation statement when the substitution of values for variables causes the length of the original statement to exceed 71 column positions. A comma or blank is used as a separation point for moving characters to a continuation statement.

EXAMPLE

```
//DEF    F=EXTRALONGFILENAME

//DEF    ID=IDENT,VOL=SYSRES,FIL=&F

 C                                  C
 O                                  O
 L                                  L
 1                                  6
                                    5
```

The substitution of the value, EXTRALONGFILENAME, for the variable, &F, would cause the //DEF statement to go beyond column 71 so the following two statements are produced.

```
//DEF    ID=IDENT,VOL=SYSRES

// FIL = EXTRALONGFILENAME
```

If the portion of the original statement that is being moved to a continuation statement is comments, then a * statement is built rather than a // statement.

The continuation statements for //PAR, //TELL, and * are //PAR, //TEL, and * respectively.

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