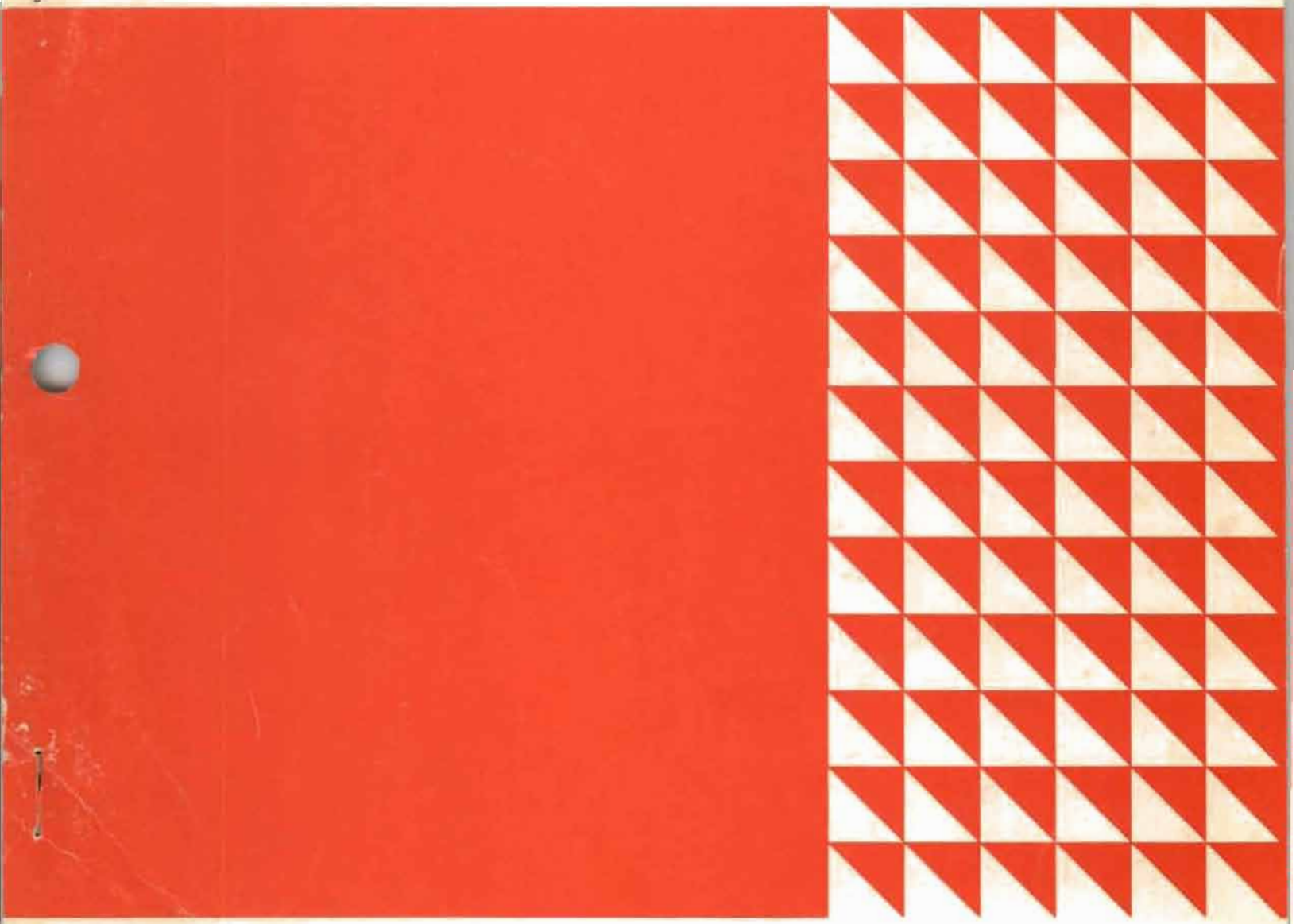
IBM

Introduction to JES3

Materials of Instruction



Education Guide

Introduction to JES3

Materials of Instruction

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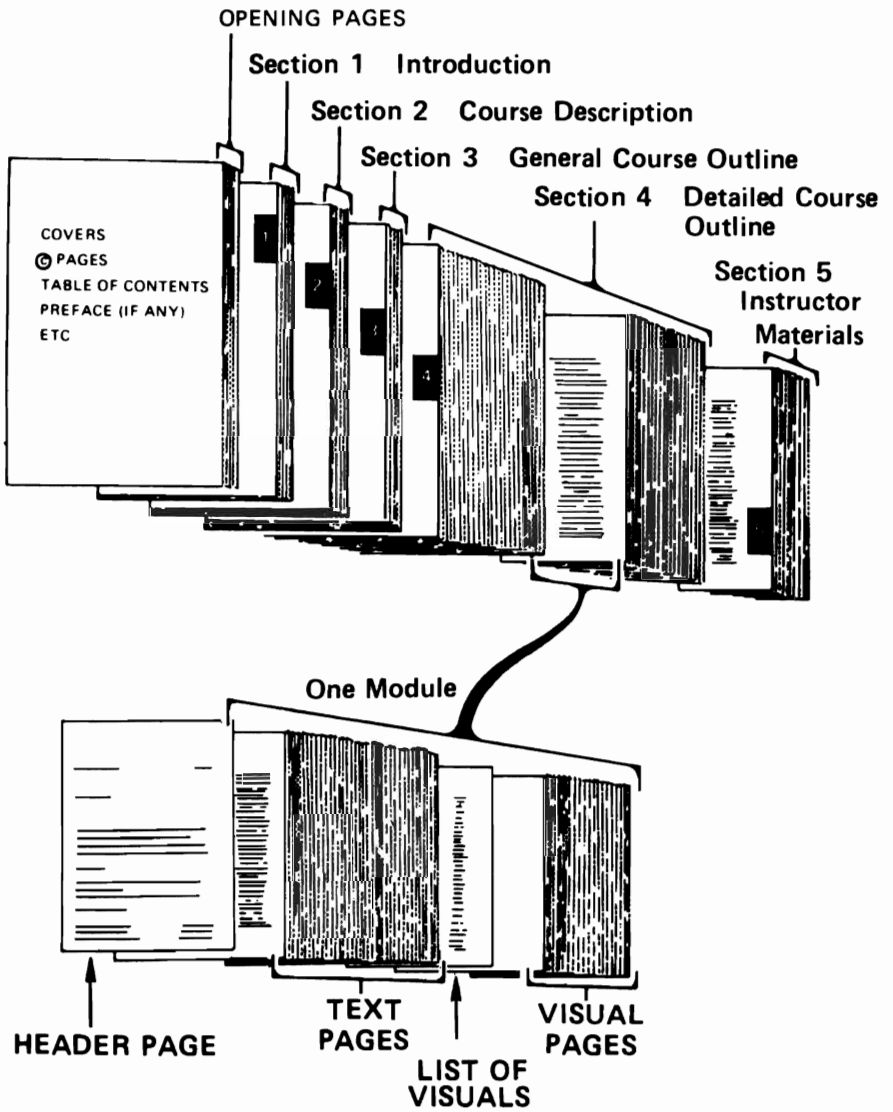
EDUCATION GUIDES

Education Guides are subdivided into five major parts. The parts are:

SECTION 1	INTRODUCTION
SECTION 2	COURSE DESCRIPTION
SECTION 3	GENERAL COURSE OUTLINE
SECTION 4	DETAILED COURSE OUTLINE
SECTION 5	INSTRUCTOR MATERIALS

All education guides contain the first four sections and, as a general rule, Section 5. The format of the first four sections is firmly established but the format of Section 5 is usually determined by the materials contained within.

TYPICAL EDUCATION GUIDE



An overview of the construction of an Education Guide and a single Module within that Education Guide.

INTRODUCTION

1

This course is designed to give the student a basic understanding of the features and functions provided by JES3. It assumes some prior exposure to operating systems in general, and Multiple Virtual Storage (MVS) in particular. The knowledge assumed is the level provided by Introduction to OS/VS Facilities (H3780).

The function and purpose of a Job Entry Subsystem in MVS is presented as a base for developing the specifics of JES3. The JES3 job flow sequence is utilized as the vehicle to relate the particular function to a processing objective. Those features and functions which do not fall within this definition are presented separately. Certain planning considerations are included for those involved in this aspect of the JES3 installation.

Self Evaluation Quizzes are provided in Section 5 of this education guide. There are six quizzes corresponding to topics 2 through 7. The instructor may use these to supplement and complement the lecture material. These quizzes are a useful technique to break up a straight lecture class.

COURSE DESCRIPTION

Title: INTRODUCTION TO JES3

Course Code: Tuition: N/C

Duration: Two Student Days

Audience: Personnel who perform the following functions in a MVS/JES3 installation:

- Application programming
- Operations (key or lead people)
- System design and analysis
- Management of user departments

Recommended Background: Introduction to OS/VS Facilities (H3780) or equivalent knowledge.

Prerequisite Test: No Final Test: No

Machine Time: None

Course Abstract: This course is designed to present the basic facilities of JES3. These include the organization of JES3, JES3 job flow, JES3 user interface, JES3 initialization functions, major JES3 functions and considerations for using JES3.

Objectives: Upon successful completion of this course, the student should be able to:

1. Describe the MVS/JES3 system configuration support.
2. Describe the MVS/JES3 control program support.
3. Describe JES3 job flow.
4. Describe JES3 user interface.
5. Describe the functions of:
   - Device setup
   - Centralized scheduling
   - Deadline Scheduling
   - Dependent Job Control
   - Remote Job Processing
   - Network Job Processing
   - Dynamic System Interchange
   - Migration Aid
   - Consoles
   - Recovery processing

- o Dynamic Support Programs

6. Identify JES3 installation planning considerations pertinent to the user environment.

Course Topics:

- o MVS/JES Overview
- o JES3 Overview
- o JES3 Job Flow
- o JES3 Facilities
- o JES3 User Interface
- o JES3 Consoles
- o Additional JES3 Features
- o Planning Considerations
- o Review and Summary

Student Materials:

Introduction to JES3 (GC28-0607)
Introduction to JES3 (Student Materials) (SR20-4543)

Instructor Materials:

Introduction to JES3 (GC28-0607)
JES3 Operator Guide (GC38-0226)
MVS Initialization and Tuning Guide (GC28-0681)
OS/VS2 Job Management (GC28-0627)
Introduction to OS/VS2 Release 2 (GC28-0661)

GENERAL COURSE OUTLINE

	TOPIC	TIME
Day One	Introduction	0.25 hrs.
	MVS/JES Overview	0.50
	JES3 Overview	1.00
	JES3 Job Flow	1.00
	JES3 Facilities	2.50
Day Two	JES3 User Interface	1.00
	JES3 Consoles	1.00
	Additional JES3 Features	1.00
	Planning Considerations	.50
	Review and Summary	.50

3

INTRODUCTION

A. Enrollment
B. Building Facilities
C. Course Objectives
D. Course Description
E. Student Materials

MVS/JES OVERVIEW

A. MVS Introduction

1. Operating System Definition
2. System 360/370 Environment
3. Operating System Extensions
4. Virtual Environment

B. MVS Overview

1. Multiple Address Spaces
2. Required Address Spaces

C. JES Overview

1. JES Functions
2. MVS/JES Choices (JES2/JES3)

D. MVS System Configuration Support

1. CPUs Supported
2. Single CPU
3. Multiple CPUs

JES3 OVERVIEW

A. System Configuration Support

1. Uniprocessors
2. Tightly Coupled MP
3. Loosely Coupled MP
4. Combinations

B. JES3 Terms and Control Program Support

1. GLOBAL
2. LOCAL
3. ASP MAIN
4. Shared SPOOL
5. CTC Usage
6. Memory Organization

C. JES3 Characteristics

1. Operation Aid
2. System Coupler
3. Resource Manager
4. System Scheduler
5. Spooling System
6. Modular Design

JES3 JOB FLOW

A. Job Flow Introduction

1. Input
2. Conversion
3. Selection
4. Execution
5. Output
6. Purge
7. Role of GLOBAL

B. Input Service

1. Input Job Stream
2. Input Devices
3. Function

C. Converter/Interpreter Service

1. Input
2. Function

D. Job Device Setup (MDS)

1. Function
2. Process

3. Volume Awareness

E. Job Selection (GMS)

1. Function
2. Selection Criteria

F. Execution Service

G. Output Service

1. Output Selection
2. Output Routing

H. Purge

I. Job Flow Review

1. Standard Jobs
2. Non-Standard Jobs

JES3 FACILITIES

A. Initialization Process and Function

1. System Configuration Environment
2. Job Related Facilities
3. Other Processing Facilities

B. System Configuration Environment

1. Processor
2. JES3 SPOOL Devices
3. JES3 Managed Devices
4. JES3 Consoles

C. Job Related Facilities

1. Input
2. Setup
3. Scheduling
4. Execution
5. Output

D. Other Processing Facilities

1. Remote Job Processing
2. Network Job Processing

E. Summary

JES3 USER INTERFACE

A. Function

1. Job Control
2. Overriding Standards
3. Special Facilities
4. Control Card Types
5. Processing Options

B. Deadline Scheduling

1. Deadline Specification
2. Deadline Usage

C. Non-Standard Jobs

1. Definition and Usage
2. Considerations

D. Dependent Job Control

1. Definition
2. Usage

E. In-Stream Data

F. Job Output Control

JES3 CONSOLES

A. JES3 Console Environment

1. MCS Requirement
2. JES3/MVS Commands
3. GLOBAL/LOCAL Communication

B. Console Facilities

1. Functional Consoles
2. Automatic Switching
3. RJP Workstation Console
4. Master Log (MLOG) Feature
5. Command Characteristics
6. Message (Response) Characteristics

C. Console Operations

1. GLOBAL Initialization
2. LOCAL Initialization
3. Operator Control
4. Background Utilities

D. Summary

1. Functional Consoles
2. Total Processor Communication
3. JES3/System Commands
4. Extensive Command Capability
5. Background Utilities

ADDITIONAL JES3 FEATURES

A. Migration Aid

1. ASP Processing
2. JES3 Processing

B. User Exits
C. System Management Facilities (SMF)
D. Recovery

1. Hotstart/Warmstart (System Software)
2. Dynamic System Interchange (DSI)
3. Failsoft

E. Service Aids

1. Console Test
2. Control Block Print
3. Display DJC Tables
4. Display JES3 Job Queue Status
5. Event Trace Facility
6. Interpreter Debug Facility
7. JES3 ABEND Dumps
8. JCL Test Facility
9. Job Setup Table Test
10. RJP Line Swap Facility

F. User Written DSPs

PLANNING CONSIDERATIONS

A. User Departments

1. Education
2. Processor Dependency
3. Recovery Processing
4. Installation Standards

B. Operations Department

1. Education
2. Functional Consoles
3. Recovery (Backup)
4. Operator Morale

REVIEW AND SUMMARY

A. JES3 Hardware Environment
B. JES3 Features
C. JES3 Job Flow
D. JES3 Advantages

    1. Single System Image
    2. Installation Management Tools
    3. Better Resource Utilization
    4. Recovery
    5. Growth

DETAILED COURSE OUTLINE

INTRODUCTION

A. Enrollment

Take care of the administrative details relative to the class - roster, additions, deletions, etc.

B. Building Facilities

This would include class hours, rest breaks, lunch breaks, etc.

C. Course Objectives

Here you may want to briefly review the course prerequisites and objectives as given in section 2 of this education guide.

D. Course Description

Here you may want to briefly present the course abstract from section 2 and the topical sequence and topical time from section 3.

E. Review Student Materials

Here you should be sure the student is aware of the materials he is receiving relative to the class.

Instructor Note: There are no visuals for the Class Introduction topic. Visuals will be provided beginning with the MVS/JES Overview and that topic will be referenced as topic 1. Also, there are no visuals for topic 8, Planning Considerations.

MVS/JES OVERVIEW

Module 1

Teaching Strategy: The intent of this topic is to present to the student the place that JES occupies in the MVS environment. The approach taken to accomplish this is a review of operating systems from MFT through MVS. The student should be aware of the general design of MVS as well as the operating system evolution that preceeded that design.

Objectives: Upon successful completion of this topic, the student should be able to:

1. Explain the concept of multiple address spaces in MVS.
2. Identify the required address spaces in MVS.
3. Name the functions of a Job Entry Subsystem in MVS.
4. Name the Job Entry Subsystems available in MVS.
5. State the hardware environment supported by MVS.

Time Estimate: Approximately 30 minutes is required to present this topic.

Outline:

A. MVS Introduction

1. Operating System Definition
2. System 360/370 Environment
3. Operating System Extensions
4. Virtual Environment

B. MVS Overview

1. Multiple Address Spaces
2. Required Address Spaces

C. JES Overview

1. JES Functions
2. MVS/JES Choices (JES2/JES3)

D. MVS System Configuration Support

1. CPUs Supported
2. Single CPU
3. Multiple CPUs

V.1.1

A. MVS Introduction

The basic concern here is to define for the student what an operating system is and present the evolution of operating systems up to and including MVS. The assumption is that the student has had prior exposure (perhaps via H3780) to operating systems and that this is not a completely new orientation.

1. Operating System Definition

The definition of an operating system given in H3780 is:

"An integrated set of programs designed to improve the total operating effectiveness of a data processing installation."

Other general definitions might be:

"A set of programs designed to interface with the user programs and the hardware."

"Programs which provide the necessary function and services to execute user jobs in an orderly fashion."

Perhaps this might best be presented by asking for definitions from the student and then writing the above or similar definition on the chalkboard.

V.1.2

a. Operating System Communication

There are different methods and different times at which we communicate to an operating system. Hopefully as we discuss these, the students can relate their particular activities to the communication process.

1) User Communication

Here, of course, we are pointing out the facility of Job Control Language (JCL) which is the way the user (application programmer) "tells" the operating system what he wants done. Accompanying the JCL into the computer room is the user written program which ultimately will be scheduled and executed under control of the operating system.

2) Operator Communication

This is another means by which communication is accomplished with the operating system. The operator may direct the activities of the system, request information from the system and monitor the status of the system relative to user work being performed. This is a direct link between the operator and the operating system.

3. Program Communication

This provides the application programmer with communication capabilities at program execution time. For example, we invoke the operating system to perform data movement for us by coding the "GET" and "PUT" type instructions. Basically we are trying to indicate the ways we communicate with the operating sytem for the express purpose of more effective utilization of our data processing resources (reference the definition of an operating system).

V.1.3

2. System 360/370 Environment

The intent here is to generally present the evolution of operating systems relative to the S/360 and S/370 environments. The choice was made to describe these various systems picturing the memory organization of each. Presenting an operating system in this fashion was introduced to the student in H3780.

a. Multiprogramming with Fixed Number of Tasks (MFT)

This operating system provided for multiple user jobs executing concurrently, but the number was fixed. The size of the separate user area was also fixed. Mention should also be made of the RDR and WTR function.

b. Multiprogramming with Variable Number of Tasks (MVT)

This operating system was similar in function to MFT. The big difference was that the ability to vary the number of concurrently executing jobs was dynamic - changeable while

the system was operating - remember that MFT was fixed and not alterable. This provided better utilization of memory relative to user jobs. Generally, then, from MFT to MVT incorporated changes designed to provide a data processing installation with better resource utilization and operational effectiveness. Mention should also be made here of the RDR and WTR function.

3. Operating System Extensions

As the above operating systems were used, functional needs arose which were not included in the base systems. From these needs two extensions to the operating system were developed - but, again, the intent was to provide more effective utilization of the data processing resources.

a. HASP

The Houston Automatic Spooling Program (HASP), developed in Houston, provided increased function primarily in the area of getting jobs in and out of the system. This system extension could be utilized in both MFT and MVT. This provided a more efficient RDR and WTR function.

b. ASP

The Attached Support Processor (ASP) system extension provided, among other things, the ability to connect CPUs and thus have additional capability not provided by basic MFT and MVT. The operating systems were still needed to provide the standard functions and both HASP and ASP were supplements to enhance the data processing installation. This included the RDR, WTR and additional system controls to improve throughput and operational capabilities. Specifics of this will be seen in JES3.

V.1.4

4. Virtual Environment

Up to this point our discussion has been limited to a non-virtual environment. Virtual concepts should not be new to the student, for this is discussed in H3780 - Introduction to OS/VS Facilities. We should now carry the presentation into the virtual environment and into MVS.

a. VS1

Virtual Storage 1 is a follow-on to MFT, that is, functionally it is MFT executing in a virtual environment. One of the components of VS1 is a Job Entry Subsystem (JES) referred to as JES1. (More about the functions of a JES later.)

b. VS2 Release 1

Virtual Storage 2 Release 1 is a follow-on to MVT, that is, functionally it is MVT executing in a virtual environment. The system extensions of both HASP and ASP may be utilized with VS2R1.

c. Multiple Virtual Storage

The student was introduced to MVS in H3780. Consequently, the term should be somewhat familiar to him. Here we should emphasize two things:

- MVS is the latest and most advanced operating system for the large system user. It incorporates features not available in other systems - features requested by users. The design of MVS permits implementation of certain functions (recovery, integrity, reliability, etc.) not found in other systems.
- One of the basic and required components of MVS is a Job Entry Subsystem (JES). Generally, the function of a JES is to bring jobs into the system and process output relative to that job. (More of the functions later.)

The primary intent here is to show the operating system migration into the virtual environment and show that MVS in design and implementation is a new and enhanced operating system.

V.1.5

B. MVS Overview

The MVS environment has certain fixed characteristics that do not change. Basically, the intent of this visual is to introduce the place of JES in MVS. The nucleus and system area serve the same purpose as we knew in other operating systems. The primary difference is the implementation of multiple address spaces - the terminology used in MVS to imply multiple

jobs executing.

1. Multiple Address Spaces

A basic concept of MVS is the use of multiple address spaces. This includes a variety of possible address spaces - both required and user chosen. This permits many users to be concurrently executing - on line, batch, etc.

Instructor Note: Be sure student understands what an address space is in MVS.

2. Required Address Spaces

Certain items including certain address spaces are required and, therefore, always present in MVS. The required address spaces are the Master Scheduler, Auxiliary Storage Manager and a Job Entry Subsystem. These three all represent certain operating system functions that are very important in the MVS environment. We are concerned primarily about the JES address space. In addition to these three required address spaces, there may be additional multiple address spaces executing user jobs and functions. The usage here is entirely up to each individual user.

In MVS, then, a Job Entry Subsystem is required. Now we need to examine more closely the functions of JES in the MVS environment.

C. JES Overview

The MVS environment requires a Job Entry Subsystem. This was pointed out earlier in the topic. At this point, we should examine the functions of a JES and the JES choices available in MVS.

V.1.6

1. JES Functions

The functions of JES have been divided into three general areas to present this overview. As JES3 is covered, more detail will be given, but here our interest is relative to the big picture.

a. System Input Source

All jobs that enter the system will enter through the JES. This includes local batch jobs, jobs submitted from a remote location, TSO LOGONs and jobs submitted by TSO users. The intent is to have one system component

that has the responsibility for entering all work into the system.

b. System Output Facility

The MVS JES is also responsible for printing and punching output relative to all jobs. When this has been accomplished, JES will purge the job from the system and return to the MVS system resources that were being used by this job. JES serves as the central facility to bring jobs into the system and control the final purge of the job from the system.

c. Total Job Awareness

JES maintains an awareness of each job while it remains within the system. When called upon to do so, he will select the proper job for executing and monitor, service and support that job during execution. This includes the processing of SYSIN/SYSOUT data on JES direct access devices.

The point over all to be made is that a MVS JES is the one component responsible for controlling all jobs from entrance to exit of those jobs in the system.

2. MVS/JES Choices (JES2/JES3)

The user may choose which JES he desires to use in MVS. This choice, however, is limited to two.

a. Job Entry Subsystem 2 (JES2)

JES2 functionally is equivalent to HASP in the MVS environment. There are some enhancements, however, to take advantage of the features provided in the design and implementation of MVS.

b. Job Entry Subsystem 3 (JES3)

JES3 functionally is equivalent to ASP in the MVS environment. There are some enhancements, however, to take advantage of the features provided in the design and implementation of MVS.

It should be pointed out that both JES2 and JES3 are based on existing function. The implementation is different, but externally

the usage of JES2 and JES3 parallels HASP and ASP respectively. Both JES2 and JES3 represent enhancements of HASP and ASP respectively.

D. MVS System Configuration Support

In concluding the overview, a brief mention of hardware support relative to MVS should be presented. This includes both the CPU support and the configuration (i.e., what makes up "the system").

V.1.7

1. CPUs Supported

The supported CPUS include the 145, 155-II, 165-II, 158, 168, 158MP and 168MP.

2. Single CPU

MVS with either JES2 or JES3 may operate in the single CPU environment.

3. Multiple CPUs

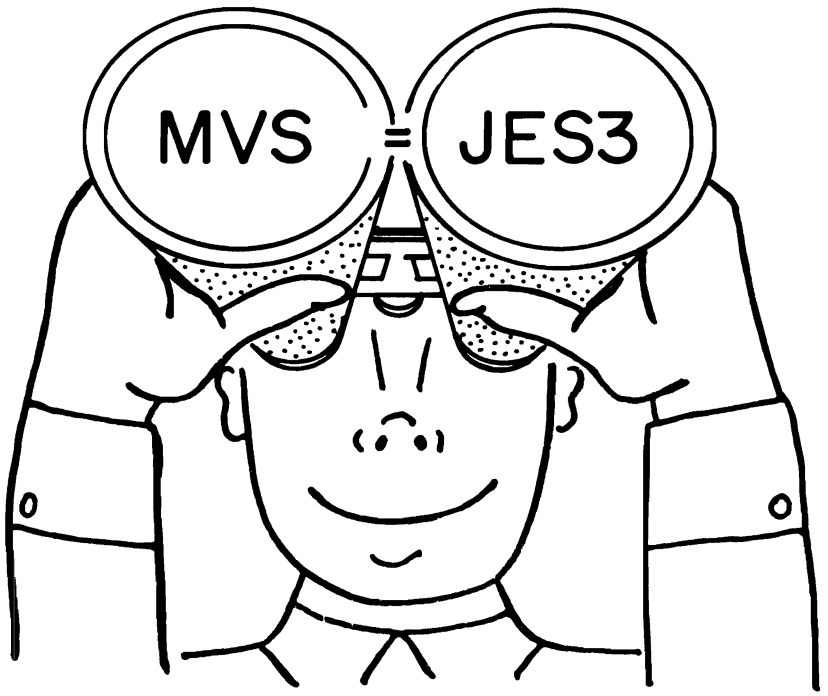
Both JES2 and JES3 support the multiple CPU installation. The support in each case is different, but the user does have a choice. Generally, any combination of CPUs is valid in either environment. The specifics of the JES3 support will be given in the following topic.

Instructor Note: Be sure the student understands that "SYSTEM" refers to all CPUs and I/O running under JES3.

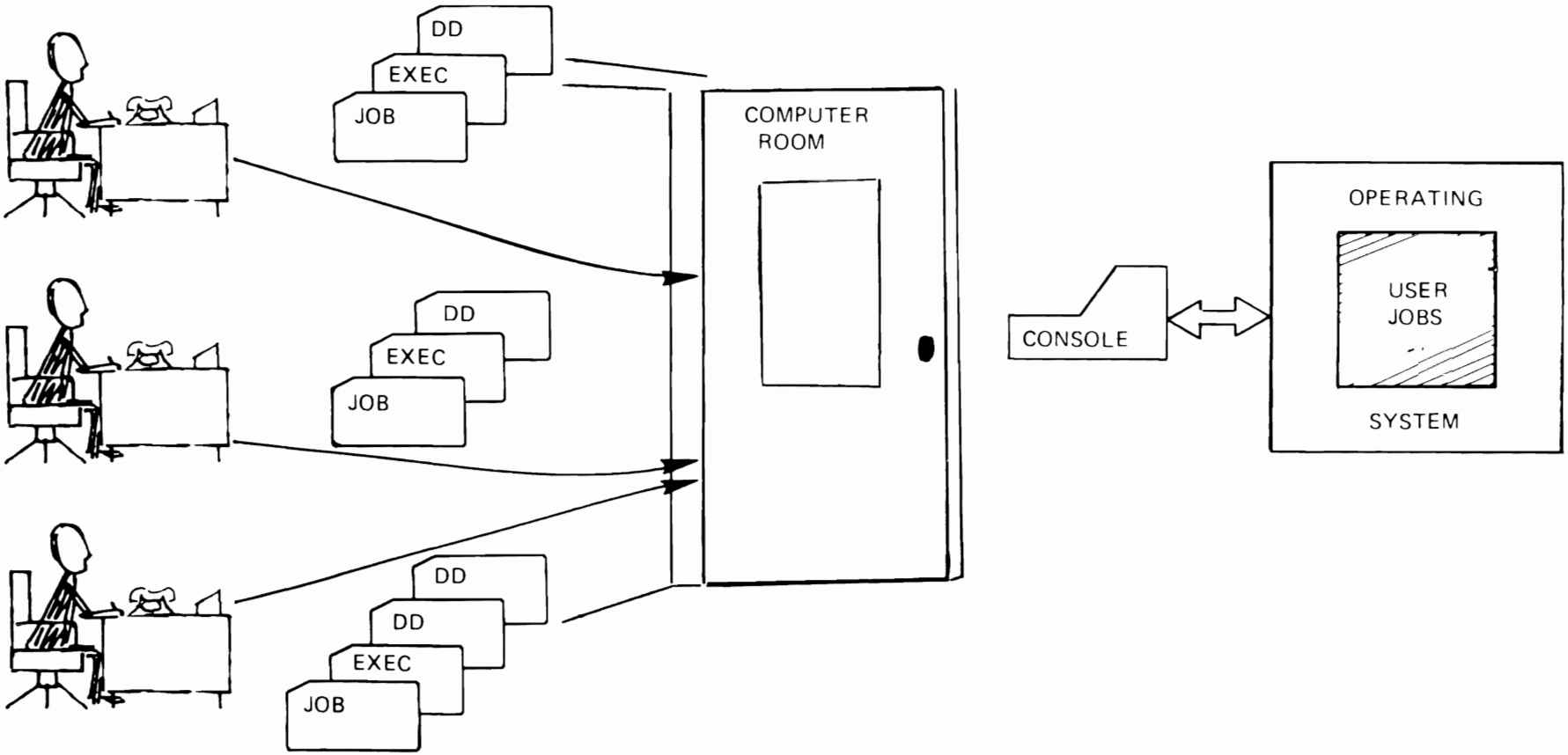
LIST OF VISUALS

VISUAL NO.	HANDOUT NO.	DESCRIPTION
V.1.1		MVS/JES3 Overview
V.1.2	H.1.1	Operating System Communication
V.1.3	H.1.2	Operating System Evaluation
V.1.4	H.1.3	Virtual Operating Systems
V.1.5	H.1.4	MVS/JES
V.1.6	H.1.5	Job Entry Subsystem
V.1.7	H.1.6	MVS Hardware Support

MVS/JES OVERVIEW



OPERATING SYSTEM COMMUNICATION



USER COMMUNICATION

OPERATOR COMMUNICATION

PROGRAM COMMUNICATION

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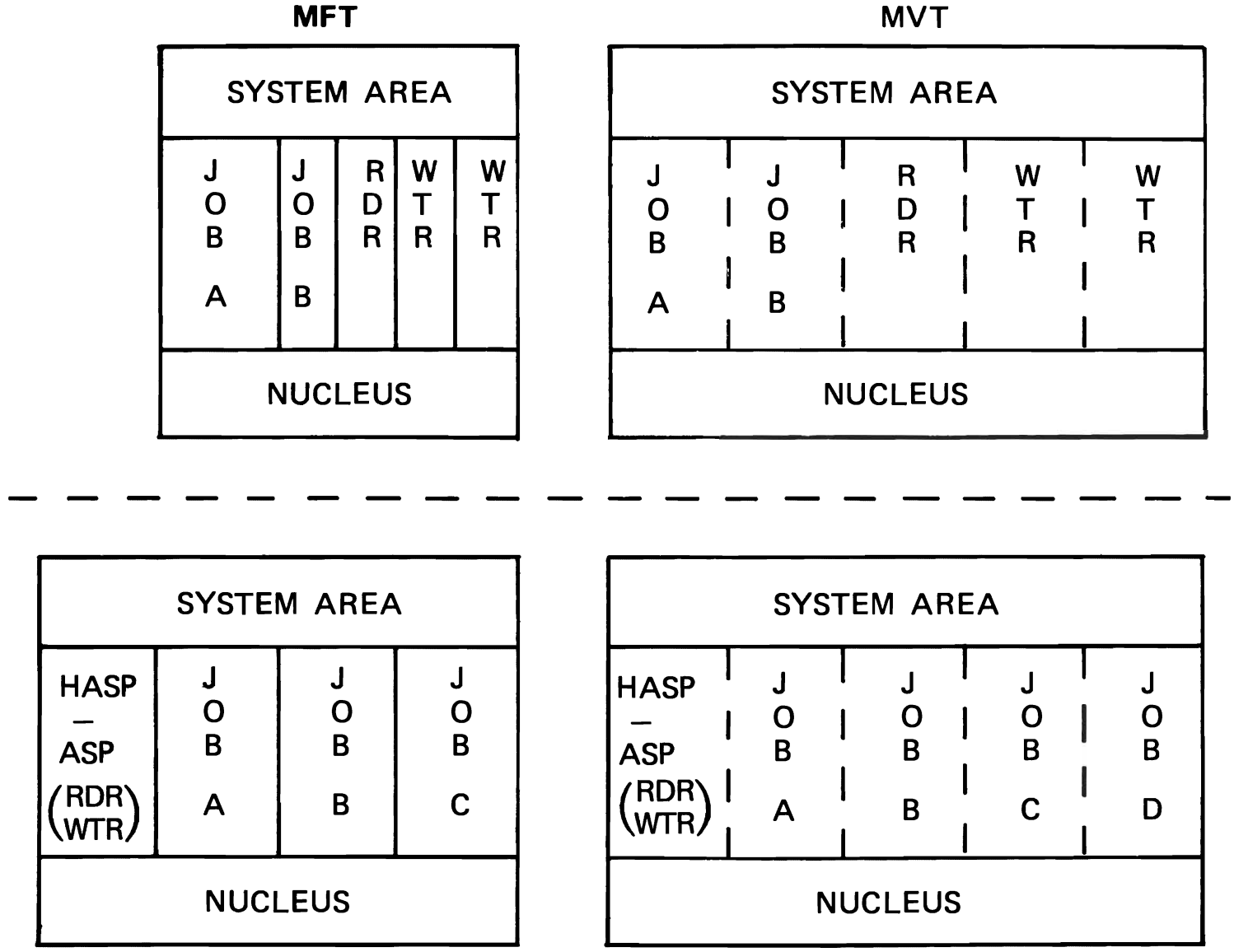
OPERATING SYSTEM EVOLUTION



V.1.3/H.1.2

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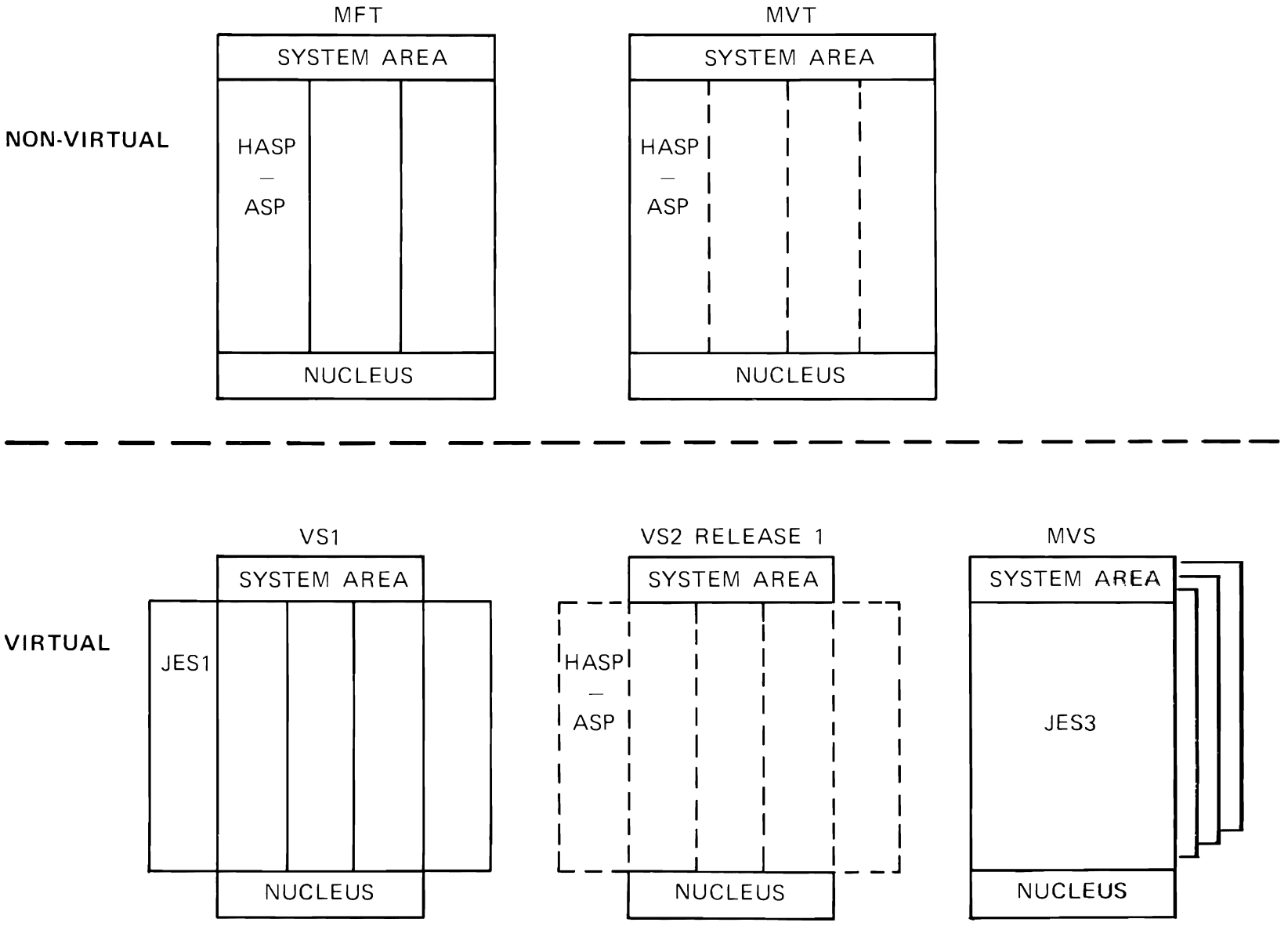
VIRTUAL OPERATING SYSTEMS



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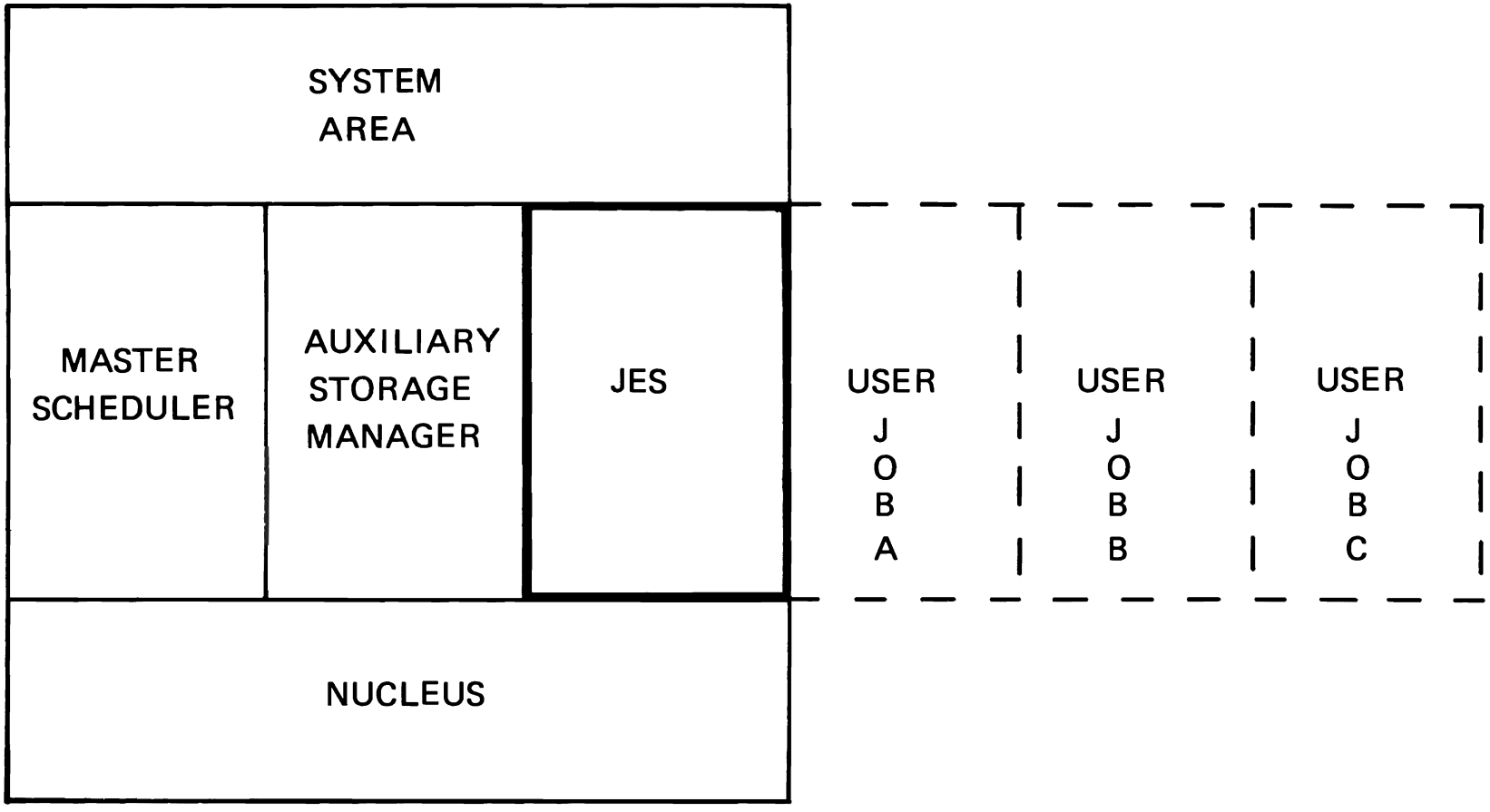
V.1.5/H.1.4

MVS/JES



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V.1.6/H.1.5

JOB ENTRY SUBSYSTEM

- FUNCTIONS
  - SYSTEM INPUT SOURCE
  - SYSTEM OUTPUT FACILITY
  - TOTAL JOB AWARENESS
- MVS JOB ENTRY SUBSYSTEM
  - JES2 (HASP)
  - JES3 (ASP)

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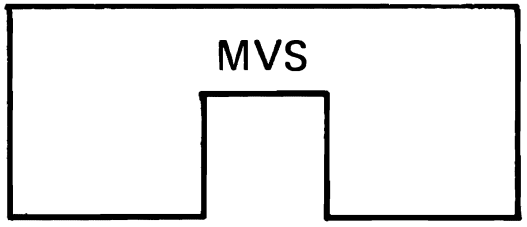
MVS HARDWARE SUPPORT

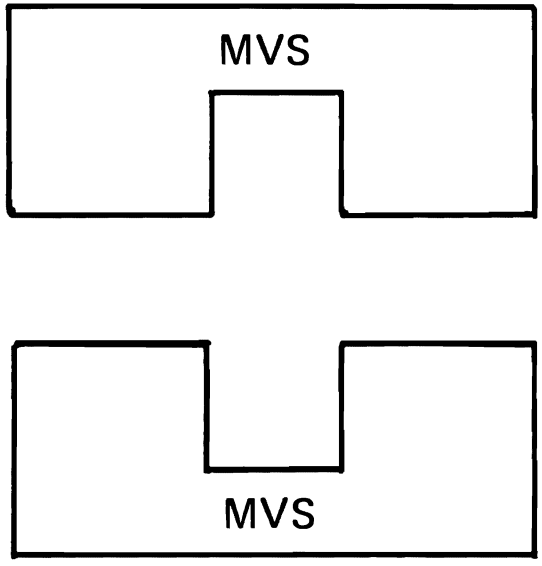
145	155-II	158	158 MP
	165-II	168	168 MP

SINGLE CPU ENVIRONMENT



MVS/JES SYSTEM

MULTIPLE CPU ENVIRONMENT



MVS/JES SYSTEM

V.1.7/H.1.6

JES3 OVERVIEW

Module 2

Teaching Strategy: This topic is designed to introduce to the student both the hardware and software supported by JES3. In addition, certain names and terms unique to JES3 will be presented. This topic should also serve to provide the student with a general understanding of the features and characteristics of JES3. The implementation of these features relative to JES3 will be covered in the following topics.

Objectives: Upon successful completion of this topic, the student should be able to:

1. State the various hardware configurations supported by JES3.
2. Define the following terms:
   - o GLOBAL processor
   - o LOCAL processor
   - o ASP MAIN processor
3. Identify the major features of JES3.

Time Estimate: Approximately one hour is required to present this topic.

Outline:

A. System Configuration
   1. Uniprocessors
   2. Tightly Coupled MP
   3. Loosely Coupled MP
   4. Combinations

B. JES3 Terms and Control Program Support
   1. GLOBAL
   2. LOCAL
   3. ASP MAIN
   4. Shared SPOOL
   5. CTC Usage
   6. Memory Organization

C. JES3 Characteristics
   1. Operation Aid
   2. System Coupler
   3. Resource Manager
   4. System Scheduler
   5. Spooling System
   6. Modular Design

A. System Configuration Support

JES3 is capable of executing on a 145, 155-II, 158, 165-II, 168, 158MP and 168MP. The conbination of CPUs chosen for an installation is entirely up to the user.

1. Uniprocessors

JES3 may operate in a single CPU environment. This may be any one of the CPUs mentioned above. This naturally implies that jobs enter the system, are executed on the system and also exit the system via this CPU - as the visual indicates.

2. Tightly Coupled MP

The choice may be made to utilize JES3 in the 158MP or 168MP environment, and this is indeed a valid selection. Generally, the characteristics of an uniprocessor prevail (job input, job output, etc.), but the additional capability of a second CPU is the difference.

3. Loosely Coupled MP

Loosely Coupled MP defines a multiple CPU environment in which the CPUs are:

- Connected by a hardware Channel-To-Channel (CTC) Adapter, a communication link.
- Sharing a common SPOOL for holding INPUT and OUTPUT.

This visual indicates these two characteristics and more will be said later concerning these.

4. Combinations

JES3 is capable of supporting one to eight physically connected uni-processors or multi-processors with any combination of allowable CPUs mentioned earlier. For example, we may select any of the following configurations.

- 8 168MP
- 4 158MP, 1 168MP
- 3 158MP, 2 168MP
- 1 168MP, 2 158, 1 168
- 2 168, 1 158
- Any other combination of 1-8 of the supported processors.

ASP Mains are supported up to a combined total of 32 processors - which includes the MVS processors.

B. JES3 Terms and Control Program Support

The objective here would be to define some basic terms in the JES3 environment and to impart a general understanding of JES3 address space implementation relative to MVS.

V.2.3

1. GLOBAL

The processor designated as GLOBAL is responsible for all peripheral operations (input, output, Remote Job Processing), and serves as the controller and scheduler of all processors in the complex. He is the master in the master/slave arrangement.

2. LOCAL

The LOCAL plays a passive role in that he performs work as directed by GLOBAL. He then becomes the slave in the master/slave arrangement. Whereas, there may be only one GLOBAL in a JES3 complex, LOCALs may be represented by from 1-3 processors. It may be appropriate here to mention again (as the visual indicates) the CTC and Shared Spool requirement, although the following visual and supporting text covers it in greater depth.

V.2.4

3. ASP MAIN

As this visual indicates, ASP Mains will be supported as ASP Mains. This basically means that a currently operating system may be employed in the JES3 environment without any alterations. The intent of this support is for those current ASP users migrating to JES3 - and is not intended to be a standard of JES3. Notice that the ASP processors do not access the SPOOL directly, but ALL communication is via the CTC. This support is valid only for current releases of OS/MVT and VS2 Release 1.

4. Shared SPOOL

The shared spool concept is new in JES3 and the requirement states that all JES3 processors in the complex have at least one path to the JES3 SPOOL packs. For a MP processor, the requirement is that only one side have access to the SPOOL. A

failure of one of the components required to access the SPOOL results in a failure of that JES3 processor. For this reason, it is recommended that both sides of the MP have access to the SPOOL. Generally, the same reasoning prevails in a uniprocessor - multiple paths being desirable. Notice again that the ASP processors do not access the SPOOL directly; these are JES3 processors only.

5. CTC Usage

CTC usage has changed in JES3 relative to ASP. The different implementation is possible because of the shared spool requirement. Traffic on the CTC in JES3 will consist primarily of control data while the individual processors may access the SPOOL for additional job information. This should mean a reduction in CTC usage over the ASP environment. The ASP Main usage of the CTC does not change - all communication (control, SYSIN, SYSOUT) is accomplished via the CTC.

V.2.5

6. Memory Organization

Primarily the message here concerns the place of JES3 in GLOBAL and LOCAL. The point should be made that memory organization is identical in both types of processors. This includes the following:

- o A separate and complete address space for JES3.
- o The full MVS complement of function (Master Scheduler, Auxiliary Storage Manager, etc.) in each processor.
- o JES3 in the GLOBAL is refered to as being active.
- o JES3 in the LOCAL is refered to as being passive.
- o Each processor is capable of executing user jobs. (Note: Remember GLOBAL may execute user work also.)

V.2.6

C. JES3 Characteristics

The suggested approach here is to use this visual showing a JES3 complex and briefly review the environment. This would include the following:

- o GLOBAL/LOCAL Processors
- o Printers, Punches and Readers connected to GLOBAL
- o Consoles are connected to GLOBAL
- o Processors connected via the channel-to-channel adapter

- o Devices may be shared or dedicated among processors
- o SPOOL volumes must be shared

After defining and reviewing the JES3 environment, the visual may be used to discuss the following JES3 characteristics.

1. Operation Aid

   With the processing speeds of today's large IBM processors, many installations process up to 5000 jobs per day on a single system. The responsibility of the system operator to monitor and control the allocation and distribution of system resources is almost impossible. Add to this the many tasks he must perform, such as mount tapes and disk packs, and changing forms, and it becomes clear that some type of computer assistance for the operator is necessary. The implementation of JES3 functional consoles connected to the GLOBAL provides this assistance.

2. System Coupler

   The increasing complexity of system applications such as TSO, Remote Job Processing and the use of data base/data communication (DB/DC) systems makes the availability of the computing center more apparent to its users. The effects of a component failure must be contained within the center, and must not be readily apparent to the users at the terminals. A trend is to use multiple systems to provide redundancy as protection against total failure; however, there must be a method of efficiently distributing the backlog of batch work among several systems where all are operational. Coupling systems with a channel-to-channel (CTC) adapter and sharing a spool data set is the JES3 approach to this requirement.

3. Resource Manager

   In today's large multiprocessing environment, device utilization becomes an important consideration in the selection of an operating system and the design of a hardware configuration. Central processing units (CPUs) may share some direct-access storage. Tapes may be pooled among all processors or may be available to only a subset of processors. Certain production jobs may require exclusive use of a group of devices while leaving the remaining devices available for other jobs. JES3 properly

manages system devices under these circumstances.

4. System Scheduler

JES3 provides a centralized scheduling mechanism that takes into account the total resources of the interconnected systems. The user can influence the balance between efficient device scheduling and efficient job scheduling to produce optimum throughput for the installation.

5. Spooling System

JES3, operating in the GLOBAL processor, places input data, job control language (JCL) statements, and converted text on shared direct-access storage to be utilized directly by a job that is executing on any JES3 processor. Output from executing jobs is placed on the same shared spool for processing JES3 output service. Output service is designed for both performance and flexibility. JES3 output service allows priority printing of important reports while the remainder of the job's output remains in the system for later processing.

V.2.7

6. Modular Design

Here we want to introduce the concept of dynamic support programs and their place and use in JES3. The JES3 address space consists of two logical sections:

a. JES3 Nucleus

The nucleus contains functions that are commonly used by JES3. This includes the DSP scheduling function, the SPOOL access function, the console function, output service function, etc. Generally, those functions with a potential for heavy usage, will be located in the nucleus.

b. Dynamic Support Programs

Dynamic Support Programs are independent processing functions which may be invoked on an as needed basis. This includes, among other things, certain utilities such as tape-to-print, card-to-tape, tape-to-tape, etc. There are several advantages to this modular design.

- Error isolation - an error may be located easier and corrected without

affecting the total of JES3.

- Function add - functions may be added to the system without severely impacting the system or without requiring a redesign of the system.
- Function scheduling - this design also contributes to the multiple scheduling and execution of several functions concurrently within the JES3 address space.
- Resource Utilization - the scheduling of multiple functions also implies the capability of better resource utilization - device, memory, CPU.

Instructor Note: You may elect at this point to review the JES3 characteristics as presented here to serve as a summary for this topic.

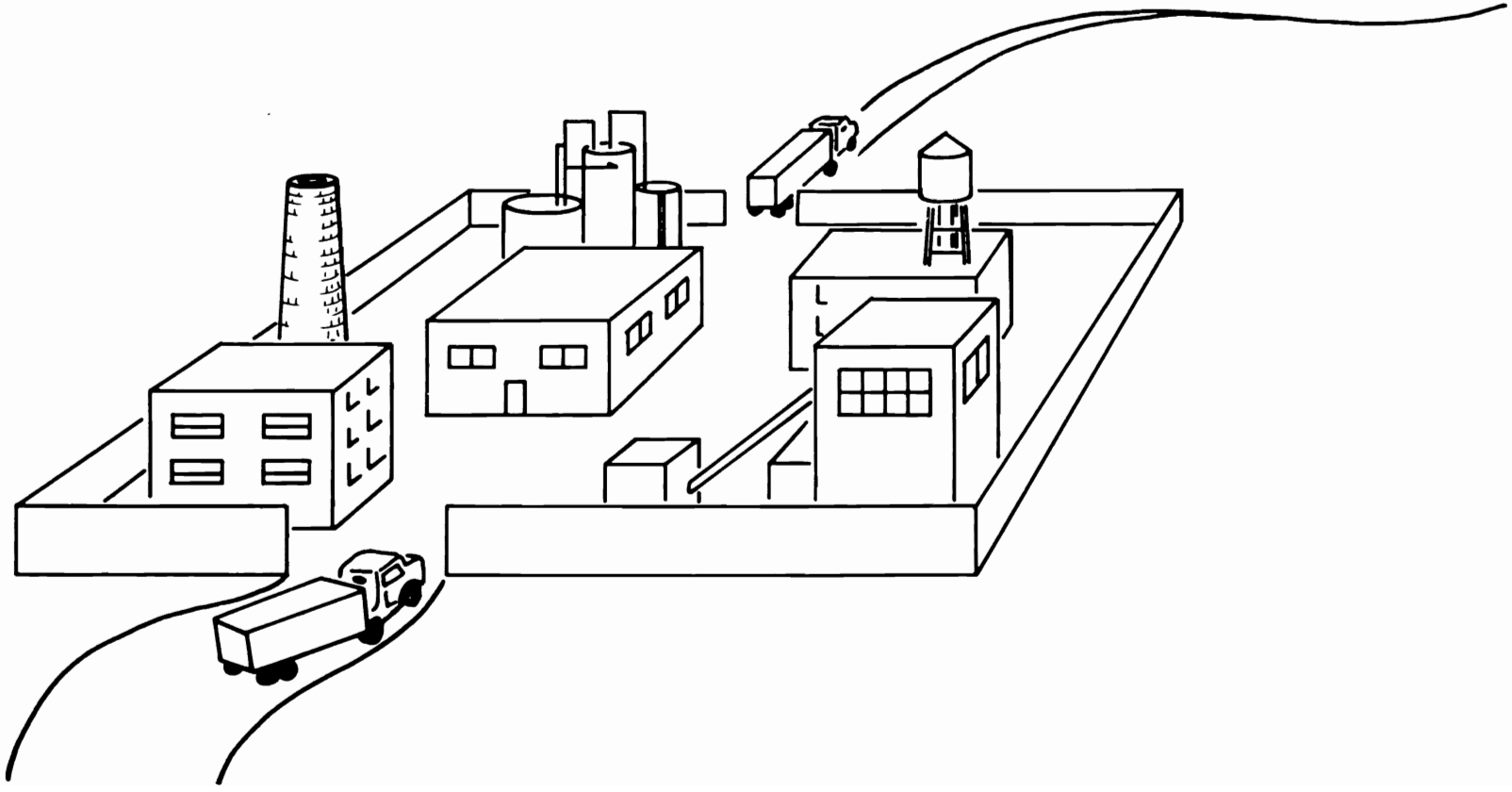
This may be the proper time to present the customer planned JES3 configuration if presenting to a single customer. Review GLOBAL/LOCAL and general configurations similar to visual V.2.6.

LIST OF VISUALS

VISUAL NO.	HANDOUT NO.	DESCRIPTION
V.2.1		JES3 Overivew
V.2.2	H.2.1	Configuration Flexibility
V.2.3	H.2.2	JES3 Terms
V.2.4	H.2.3	JES3 ASP Support
V.2.5	H.2.4	Memory Organization
V.2.6	H.2.5	JES3 Configuration
V.2.7	H.2.6	JES3 Structure

5028

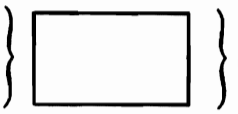
JES3
OVERVIEW



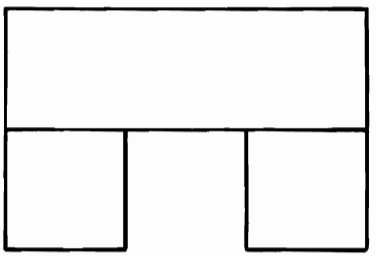
V.2.1

CONFIGURATION FLEXIBILITY

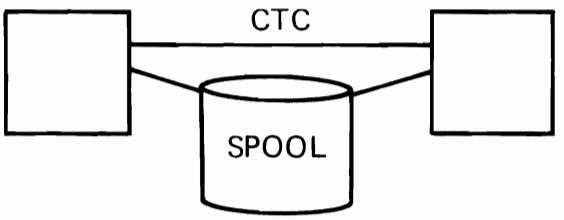
UNIPROCESSORS



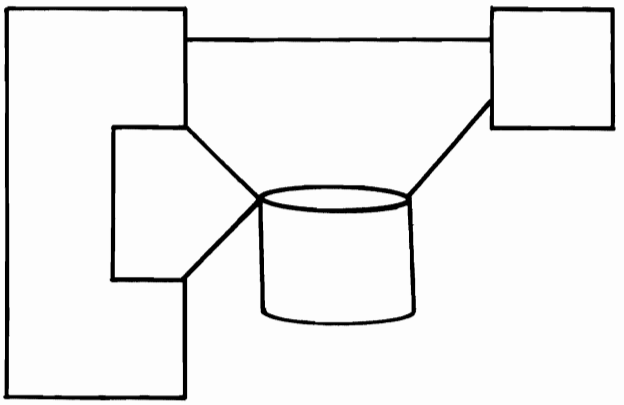
TIGHTLY COUPLED MP

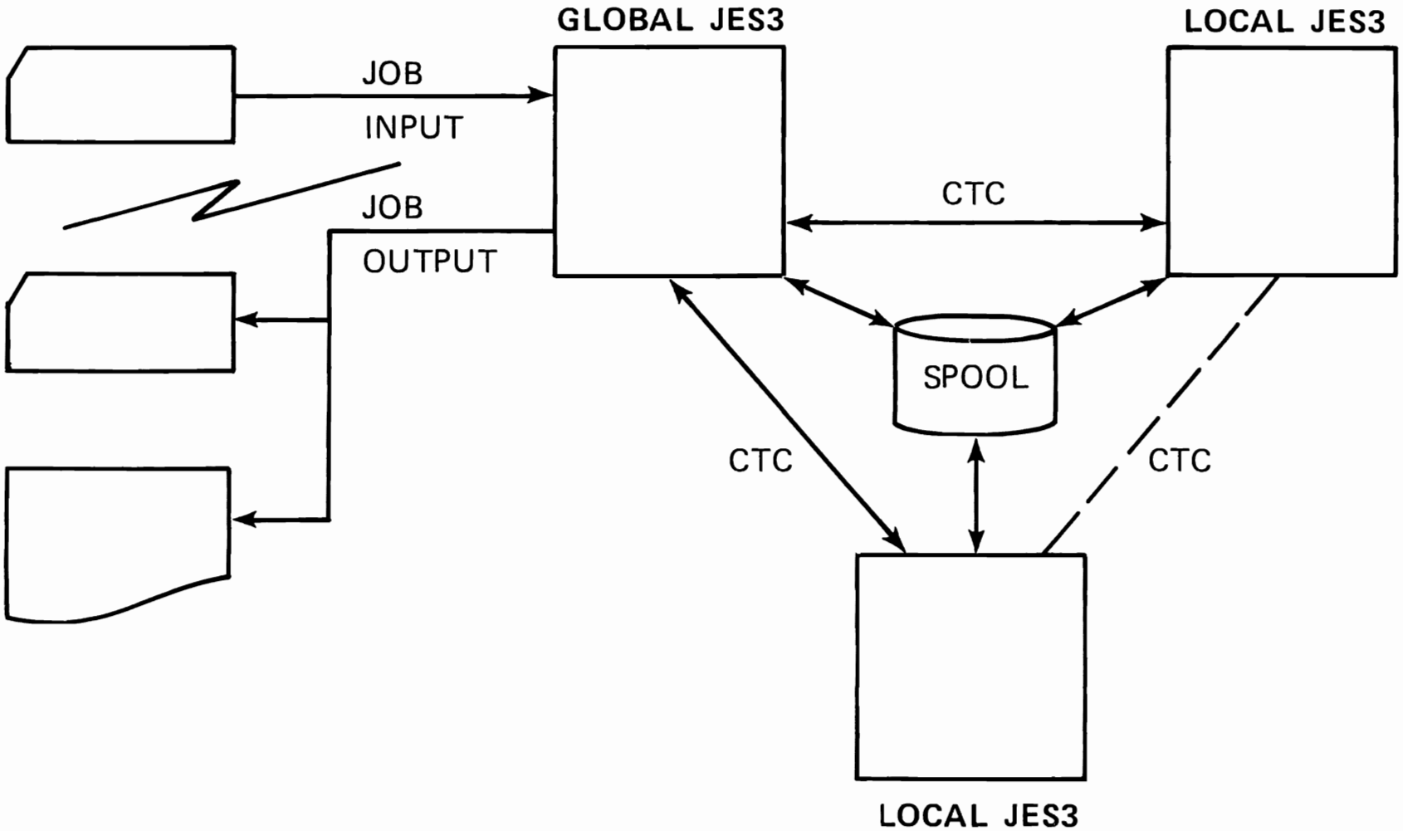


LOOSELY COUPLED MP

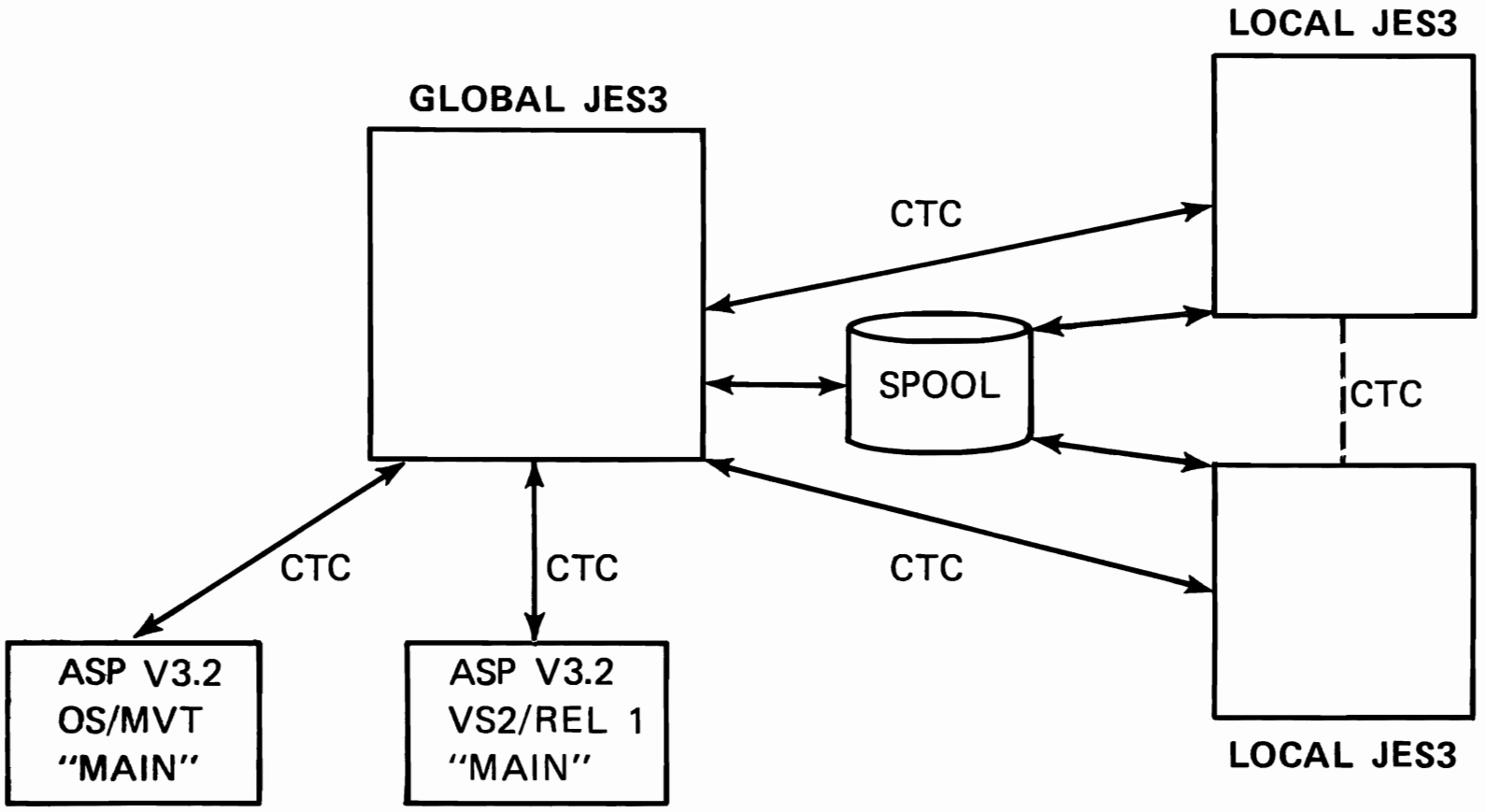


COMBINATIONS

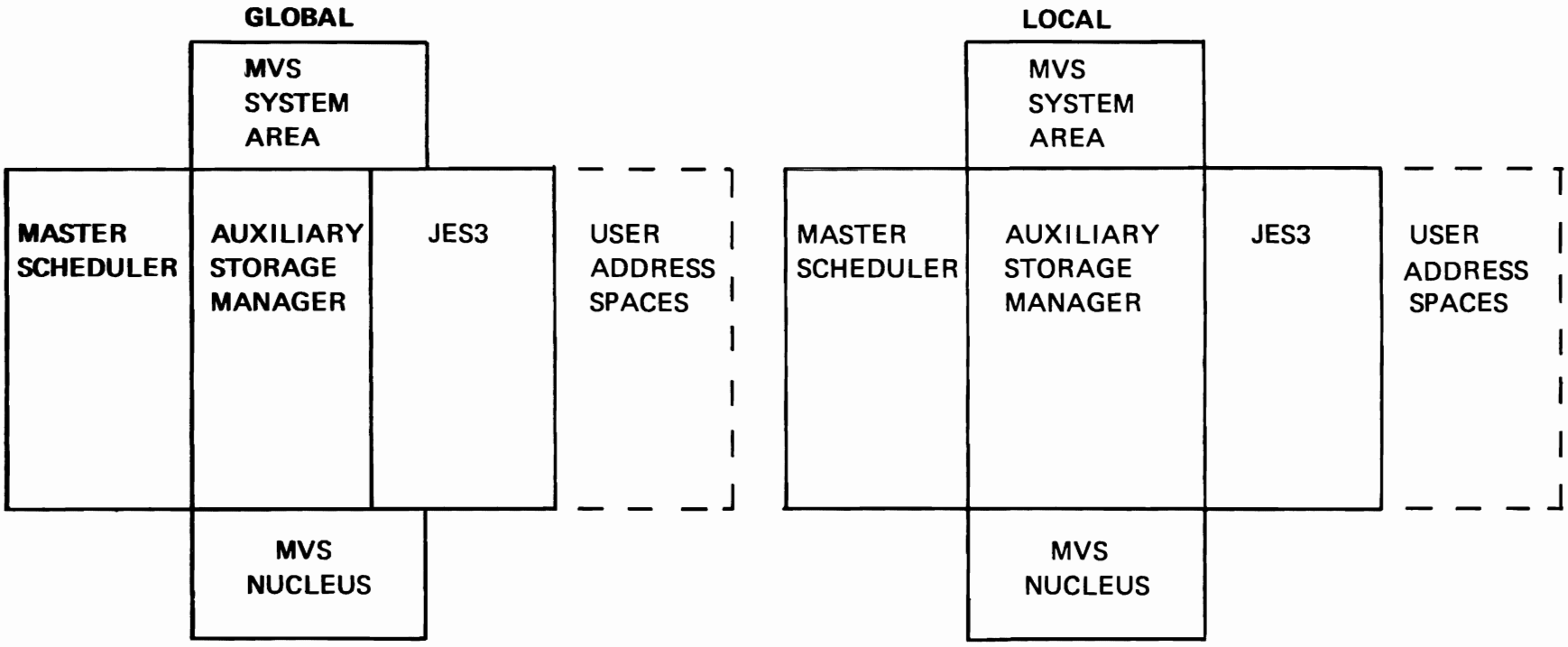



GLOBAL JES3
LOCAL JES3
JOB
INPUT
JOB
OUTPUT
CTC
SPOOL
CTC
CTC
LOCAL JES3

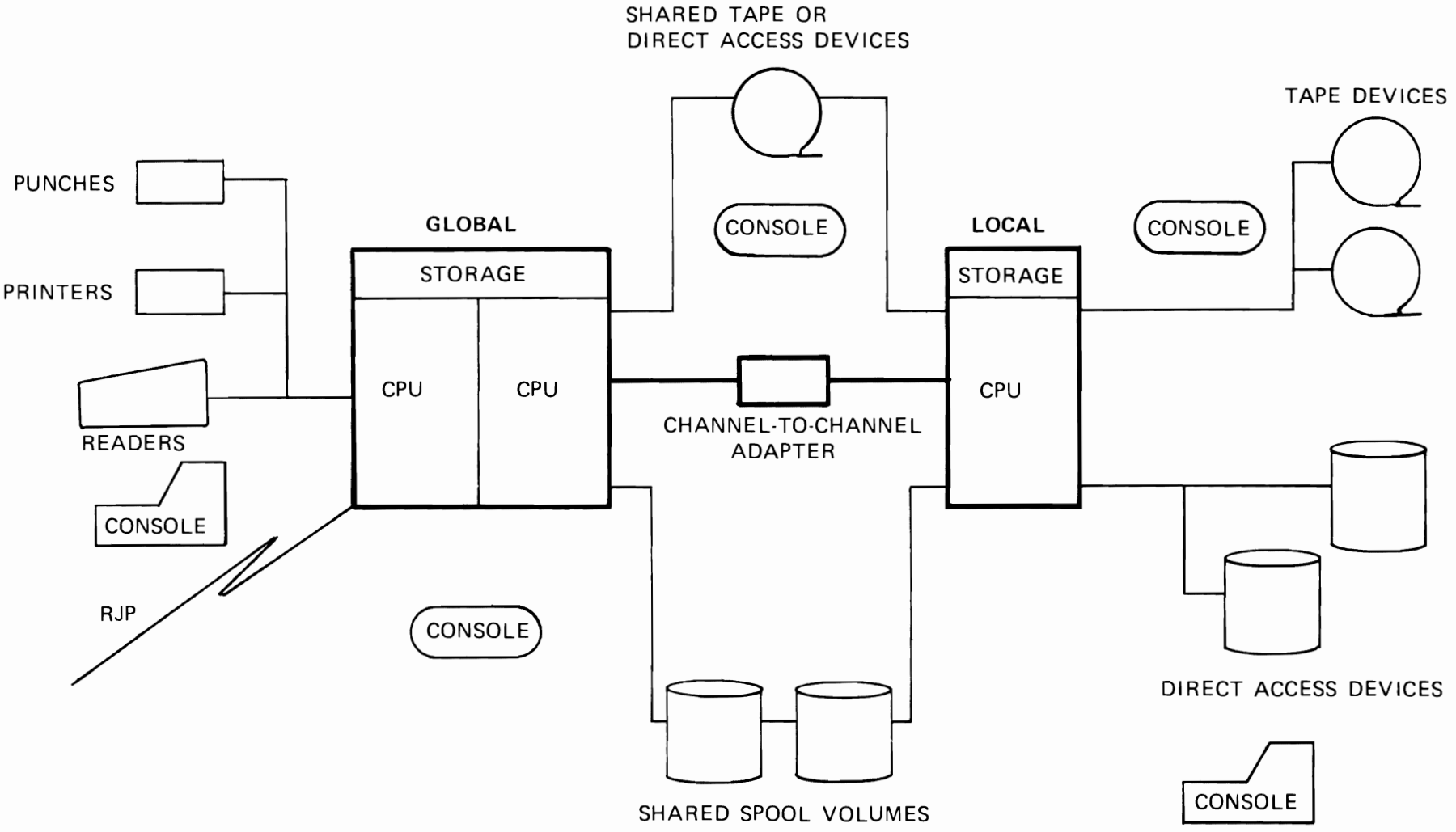
JES3 ASP SUPPORT



MEMORY ORGANIZATION



JES3 CONFIGURATION



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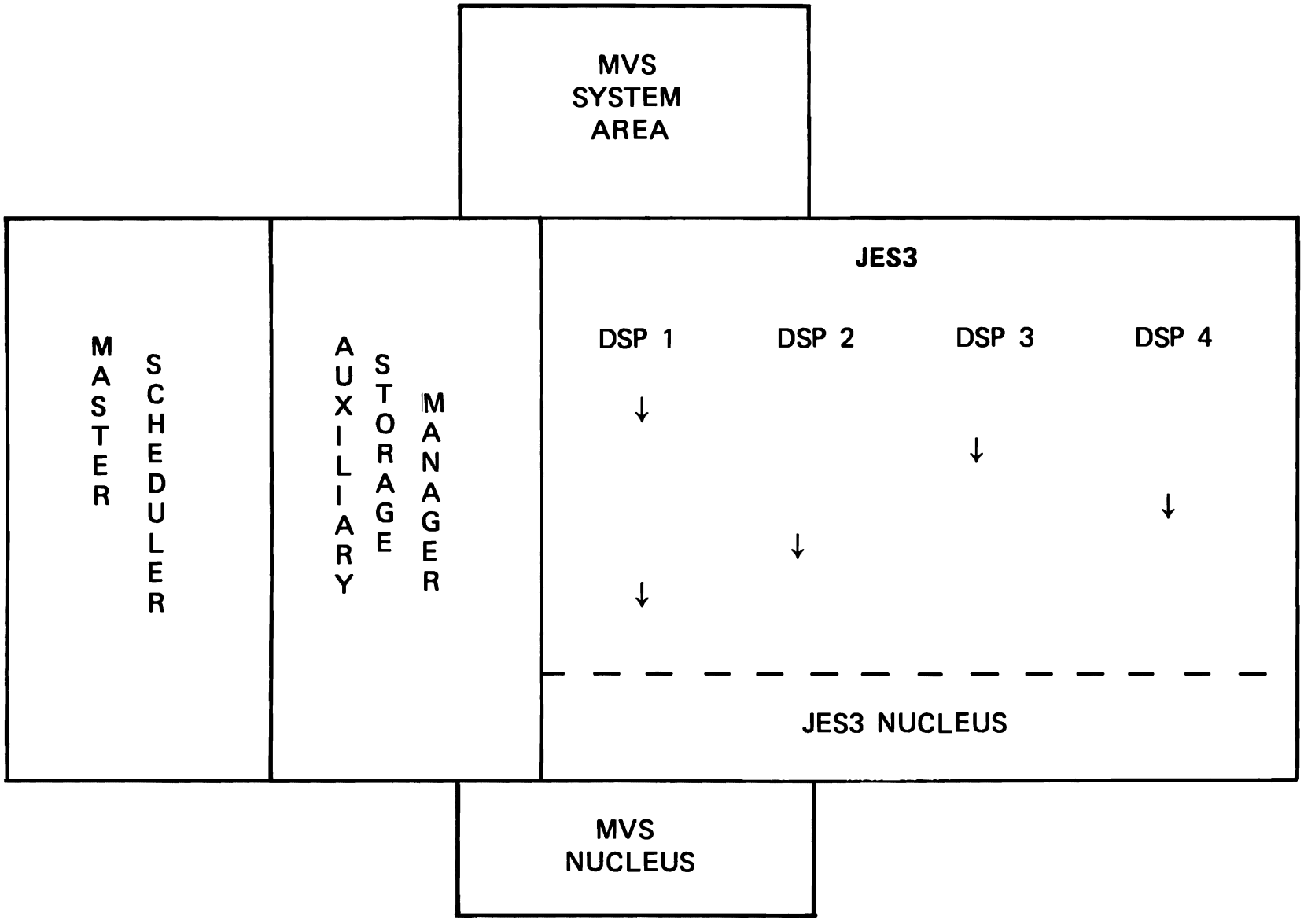
JES3 STRUCTURE



V.2.7/H.2.6

JES3 JOB FLOW

Module 3

Teaching Strategy: This topic is intended to provide the student with a general understanding of the sequence of events relative to the processing of a job by JES3. The purpose is to establish a base from which the features and functions of JES3 may be presented. Later topics will utilize the JES3 Job Flow knowledge to discuss the capabilities of JES3 and the advantages these offer relative to the individual phases of a job as it progresses through the system. The primary objective, then, is for the student to be able to name and define the JES3 Job Flow phases.

Objectives: Upon successful completion of this topic, the student should be able to:

1. Identify the major components involved in JES3 job flow.
2. State the functions of the following job flow phases:
   - o Input Service
   - o Converter/Interpreter Service
   - o Main Device Scheduling
   - o Generalized Main Scheduling
   - o Execution Service
   - o Output Service
   - o Purge
3. Differentiate between a standard and non-standard job in JES3.
4. Name and describe other JES3 functions related to job flow.

Time Estimate: Approximately one hour is required to present this topic.

Outline:

A. Job Flow Introduction
   1. Input
   2. Conversion
   3. Selection
   4. Execution
   5. Output
   6. Purge
   7. Role of GLOBAL

B. Input Service

1. Input Job Stream
2. Input Devices
3. Function

C. Converter/Interpreter Service

1. Input
2. Function

D. Job Device Setup (MDS)

1. Function
2. Process
3. Volume Awareness

E. Job Selection (GMS)

1. Function
2. Selection Criteria

F. Execution Service

G. Output Service

1. Output Selection
2. Output Routing

H. Purge

I. Job Flow Review

1. Standard Job
2. Non-Standard Job

JES3 JOB FLOW

Instructor Note: Presented in this section is the basic job flow (processing) through JES3. The reasons why we separated the next topic, "Features and Options" from this topic are as follows:

1. To avoid unnecessary confusion which might arise when we present both the job flow and features and options at the same time.
2. To insure a better understanding of the features and options based upon JES3 job flow.
3. To establish the solid basic knowledge for further development of Job Flow JES3 features.

The instructor should be aware that the presentation be kept as simple as possible (not sophisticated), and the sophisticated questions raised be discussed in the next topic. To conduct the class in this latter way, instructors can consider both topics as a single topic.

V.3.1
V.3.2

A. Job Flow Introduction

The overview of the job flow through JES3 is introduced in order to give students the total picture.

1. Input

Jobs are read through the input devices attached to the global processor onto the spool and the analysis of the JES3 control cards (//*...) are done.

2. Conversion

JCL interpretation will be done in the next stage. The information on JCLs is analyzed and converted into the internal control blocks for further processing.

If there are errors, JES3 will schedule the output and purge stages only.

3. Selection

There are two stages - Main Device Scheduling (MDS) and Generalized Main Scheduling (GMS). According to the JCL specification (// DD), MDS tries to allocate the devices (and data sets) to the job and mount messages will be issued to the operators. MDS also verifies that the proper volumes have been mounted. After that, GMS tries to select the job for exection. (Note that this does not necessarily mean that the job which has finished device setup is to be scheduled immediately. GMS may have lots of candidate (ready) jobs to be scheduled - hence generalized scheduling.)

All the processing up to now is called the pre-processing.

4. Execution

Now the job starts execution, using the data sets which have been allocated in the pre-processing; SYSIN data is retrieved from the spool volume and SYSOUT data is written on the spool volume.

5. Output

After the execution, the output operation is scheduled. SYSOUT data is transcribed on the printer and/or punch.

6. Purge

This is the final stage of the job processing in JES3. JES3 recognizes that all the processing has been done, and writes the job accounting information (on SMF). All the resources (SYSIN, SYSOUT, core, data sets, internal control blocks, etc.) are released. All information concerning the job has now been deleted from the system. The last two stages (Output and Purge) are called post-processing.

V.3.3

7. Role of Global

The global processor is vital in the JES3 environment. Reviewing the job flow (time series), some important points should be emphasized. As a system controller, the global takes the active role; pre-processing and post-processing are done by global. Communication between the global and the local is done through CTC. In addition, the global has the operator interface, that is, the global issues messages to operators and accepts commands (ex. inquiry,

modify) through the operator consoles.

B. Input Service

V.3.4

1. Input Job Stream

The structure of the input job stream is the same as traditional OS job stream except for the optional JES3 control cards between the JOB card and the first EXEC card. This means if the installation standards (initialization parameters) are well established, users need not include JES3 control cards to get the same results as in the previous OS system. Here we are not going into the detail discussion on the control cards, but just talk about the capability of the control over JES3 through the cards in the input stream (special printing, special job execution sequences, special execution requirements).

V.3.5

2. Input Devices

Such local devices as card readers, tapes and DASD will be used for input job stream. In addition to these, remote devices can be used for this. Remote Job Processing (RJP) and Network Job Processing (NJP) will be discussed in the topic "JES3 Features and Options". If the students are not familiar with the internal reader, you don't need to discuss too much, just tell them that is is a programmed, simulated reader which can accept the input job stream internally (ex. TSO) not externally (from the real reader).

3. Function

Whatever the input devices are, Input Service reads the job stream onto spool. A predetermined number (specified when the operator starts the readers) of jobs is read in at once; after physical input - batch is complete, the next stage (interpreter) proceeds. The benefits of this technique are the fast physical reading with less core requirement for this stage, which results in total resource utilization.

Then, the job is placed in the job queue and assigned a job number.

Processing the JES3 control cards is done by Input Service. These may contain information which will affect later stages (for example - the use of a particular user selected PROCLIB). In addition, Input Service writes pertinent JES3 control blocks

on the SPOOL volume.

C. Converter/Interpreter Service

The next stage following the input is interpreter. This is transparent to the users. However, a basic understanding of this process is necessary for later Features and Options topic. It is recommended that input-processing-output approach be utilized in this presentation for ease of understanding for the student.

V.3.6

1. Input

The job's JCL which was placed on the SPOOL by Input Service is the input to the interpreter function

2. Function

There are several functions performed during this phase:

a. R/I or C/I

The determination is made as to the processor or processors on which this job may execute. If it will run on a MVS processor, then the Converter/Interpreter (C/I) will be used to interpret the JCL. If the job is to be run on an ASP processor, then the JCL must be interpreted by the Reader/Interpreter (R/I). This is required because of the different implementation of the two systems. Both R/I and C/I processing is done if job is eligible to run on ASP MAIN or MVS processor.

b. JCL Interpretation

The JCL is read from the SPOOL volume and converted to internal control blocks for use by the system. If errors are detected in the JCL, the job is scheduled for Output Service and Purge. During this process, the specified procedure library (PROCLIB) can be utilized to invoke the full complement of JCL.

c. Catalog Reference

Catalog references are resolved by accessing the designated catalog.

d. Setup Information

Device setup information is extracted and written on the SPOOL for later reference by MDS. This would include the Job Summary Table (JST), Job Volume Table (JVT) and reference to the data sets to be used by this job. This should be presented relative to the function performed and not the specifics of the individual control block.

D. Job Device Setup (MDS)

V.3.7

1. Function

After the interpreter stage, MDS is scheduled. The purposes of MDS are to issue fetch messages to the operator, find the required data sets, volumes and devices for job executions. As a rule, all the setups are to be done before job execution.

2. Process

MDS utilizes the I/O requirements and the current status of I/O environment (availability). The former one was created in the interpreter stage and the latter is kept by JES3 all the time. The first step of this stage is allocation. According to the job's I/O requirement, the devices will be assigned and then setup messages will be issued to the operators to mount the volumes. (The required volume should be there because the fetch messages have been issued before.) MDS verifies whether the correct volumes are mounted. If necessary, corrective action messages will be issued. After all the setups are complete, the job execution will be scheduled (GMS).

3. Volume Awareness

At job termination (or step termination, and no further use of devices), MDS will release the devices (return to available device list), and disposition messages will be issued to operator. In this case, JES3 will inform the operators whether the volumes should be kept near by because other jobs in JES3 queue will use this volume (Total Volume Awareness).

E. Job Selection (GMS)

V.3.8

1. Function

After MDS, jobs are put in the execution queue and GMS selects one of them for execution. If we have

only one CPU, the scheduling algorithm would be less involved. Under the multiple CPU environment, it is easy to imagine that the scheduling algorithm is more complex; therefore, we will only present a portion of the selection process. Jobs requiring no operator setup go to the execution queue when JES3 determines all required data sets are available (i.e., compiles, linkedits, some test work).

2. Selection Criteria

To select a job for execution, GMS considers such factors as:

- o Job Priority (higher job would be scheduled first)
- o Processor Affinity (can the job run on any processor)
- o I/O-CPU balance (does the job fit to the balance)

There are other factors to be considered upon selection by GMS. We will discuss such in section "JES3 Features and Options".

V.3.9

F. Execution Service

Once the execution starts, Execution Service takes the role of monitoring and assisting the job execution on the global, local or ASP-main processor. SYSIN/SYSOUT data is transferred to/from the spool directly through JES3 I/O support. In ASP case the data is transferred via CTC. During execution, communication between the global and the local (or ASP main) is done through CTC. If Execution Service detects some abnormal conditions and/or exceeding output volume limitation, it takes actions necessary according to the job specifications or the installation standards (Initialization Parameters).

V.3.10

G. Output Service

1. Output Selection

During job execution, SYSOUT data sets are written on the spool. After job termination (or in case of spunoff data sets when the SYSOUT data set is released for printing) Output Services selects work based upon the following data set attributes:

- o Data set priority
- o Destination
- o Forms

- Trains

2. Output Routing

The Output Service transcribes data from the spool to:

- Printer/punch (local device)
- Remote terminal
- TSO (OUTPUT)
- External writer

Printing and punching will be done asynchroneously.

V.3.11

H. Purge

Now we come to the final stage. From the users point, it would be nothing but the formal procedure. Internally, nevertheless, it is an important stage. All the resources allocated to the job are released (ex. spool space) for reuse by other jobs. All the job-related information is removed from JES3. It is this time that the job accounting information is written on SMF.

V.3.12

I. Job Flow Review

1. Standard Jobs

When you input the normal job (MVS job and without any JES3 control cards, for example), JES3 automatically breaks down into scheduler elements (elements of work to be done for this job) and schedules one by one in predetermined sequence:

INTERPRETER-MAIN-OUTPUT-PURGE

These scheduler elements are stored on the spool and are under JES3 supervision. This is one of the JES3 implementation techniques.

The scheduler elements and sequence of a job mentioned above is called "Standard Job Flow".

2. Non-Standard Jobs

Once you have established such a scheduling mechanism, you could readily see that we could modify the standard sequence (i.e., deletion of some scheduler elements and/or addition). JES3 allows us to do so by way of:

- Notifying JES3 of the modification (JES3

control card - //*PROCESS)

- Providing JES3 with the DSP which can process the special requirement

The modified job is called "non-standard job".

Now you have another definition; if there are any //*PROCESS cards in your job, it is a non-standard job.

The detail discussion on this subject will be presented in the topic "JES3 Control Cards".

LIST OF VISUALS

VISUAL NO.	HANDOUT NO.	DESCRIPTION
V.3.1		JES3 Job Flow
V.3.2	H.3.1	JES3 Job Flow
V.3.3	H.3.2	GLOBAL Functions
V.3.4	H.3.3	Input Job Stream
V.3.5	H.3.4	Input Service
V.3.6	H.3.5	Interpreter Service
V.3.7	H.3.6	MDS
V.3.8	H.3.7	GMS
V.3.9	H.3.8	Executive Service
V.3.10	H.3.9	Output Service
V.3.11	H.3.10	Purge
V.3.12	H.3.11	Non-Standard Job

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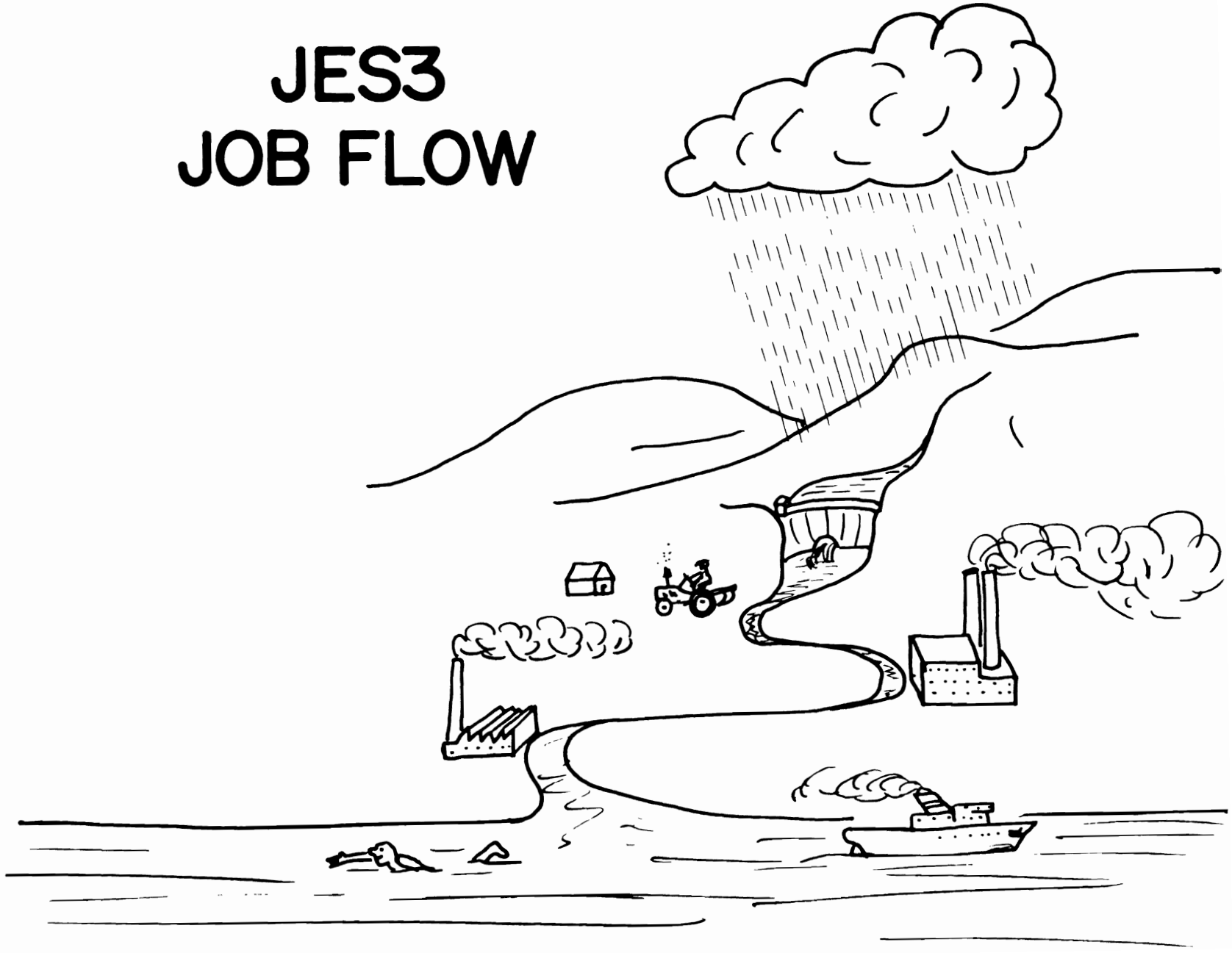
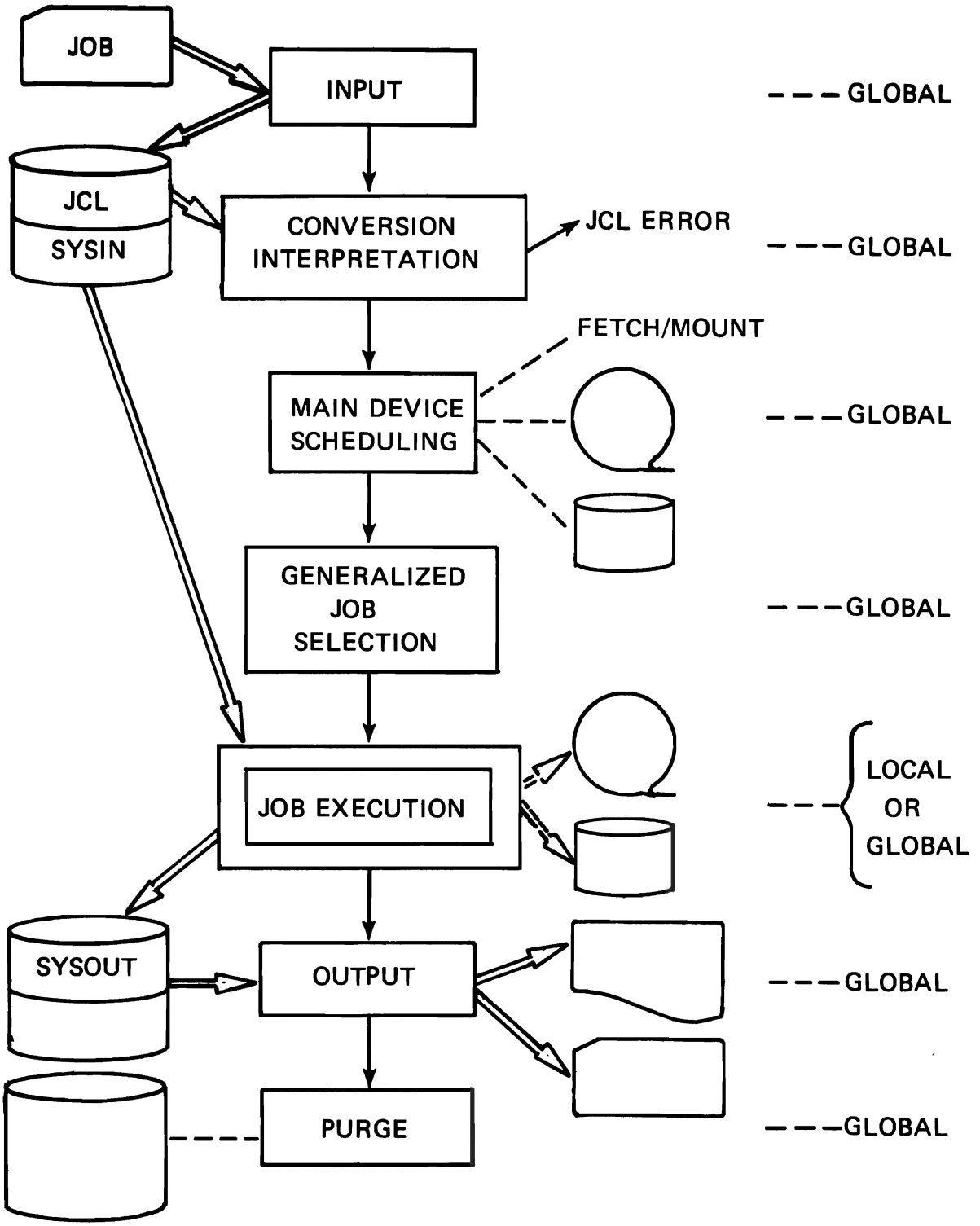
JES3
JOB FLOW

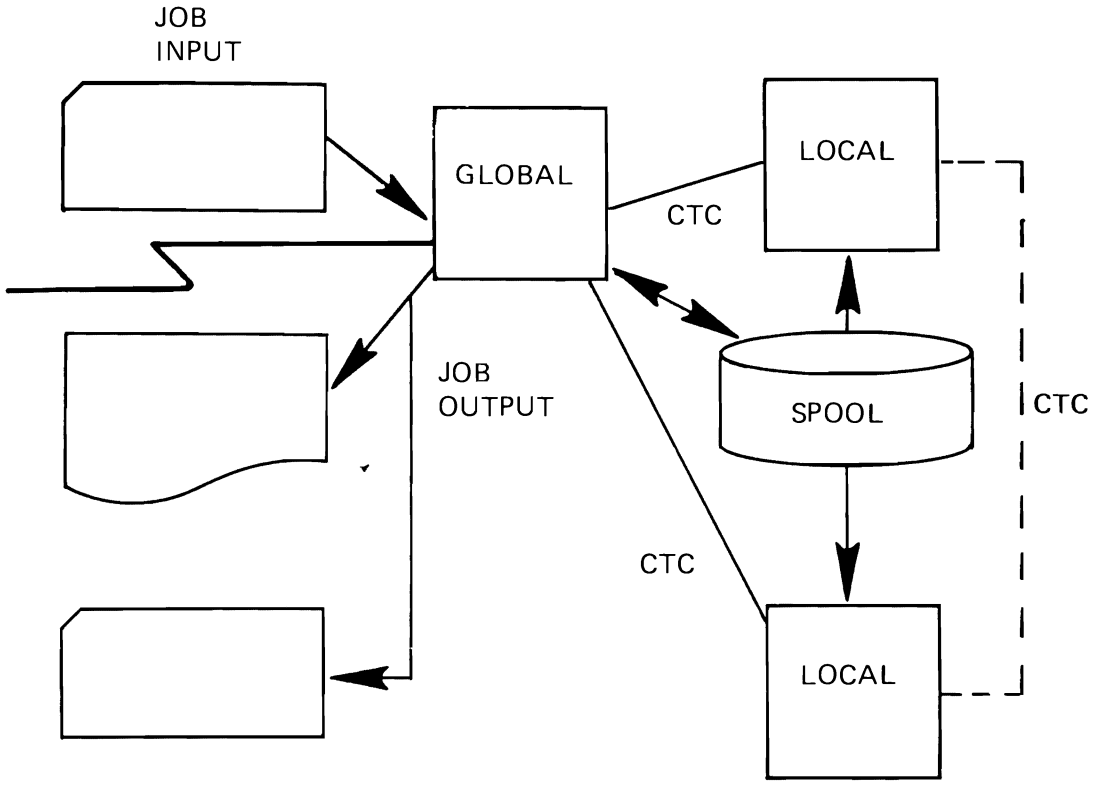


V.3.1

JES3 JOB FLOW



GLOBAL FUNCTIONS



- JES3 IS THE JOB ENTRY SUBSYSTEM IN ALL INTERCONNECTED SYSTEMS

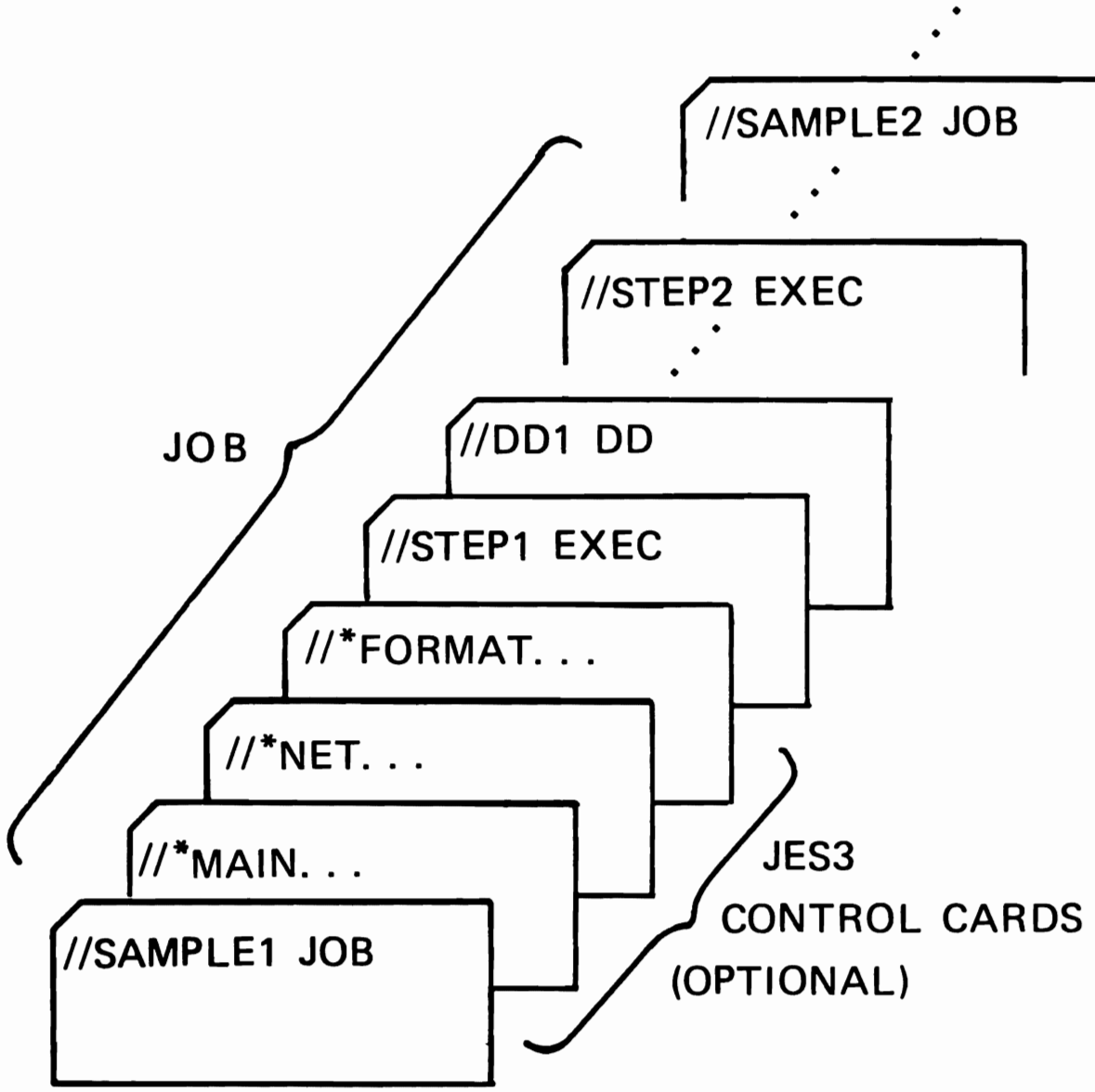
  GLOBAL : ACTIVE
  LOCAL : PASSIVE

- GLOBAL CONTROLS JES3 COMPLEX

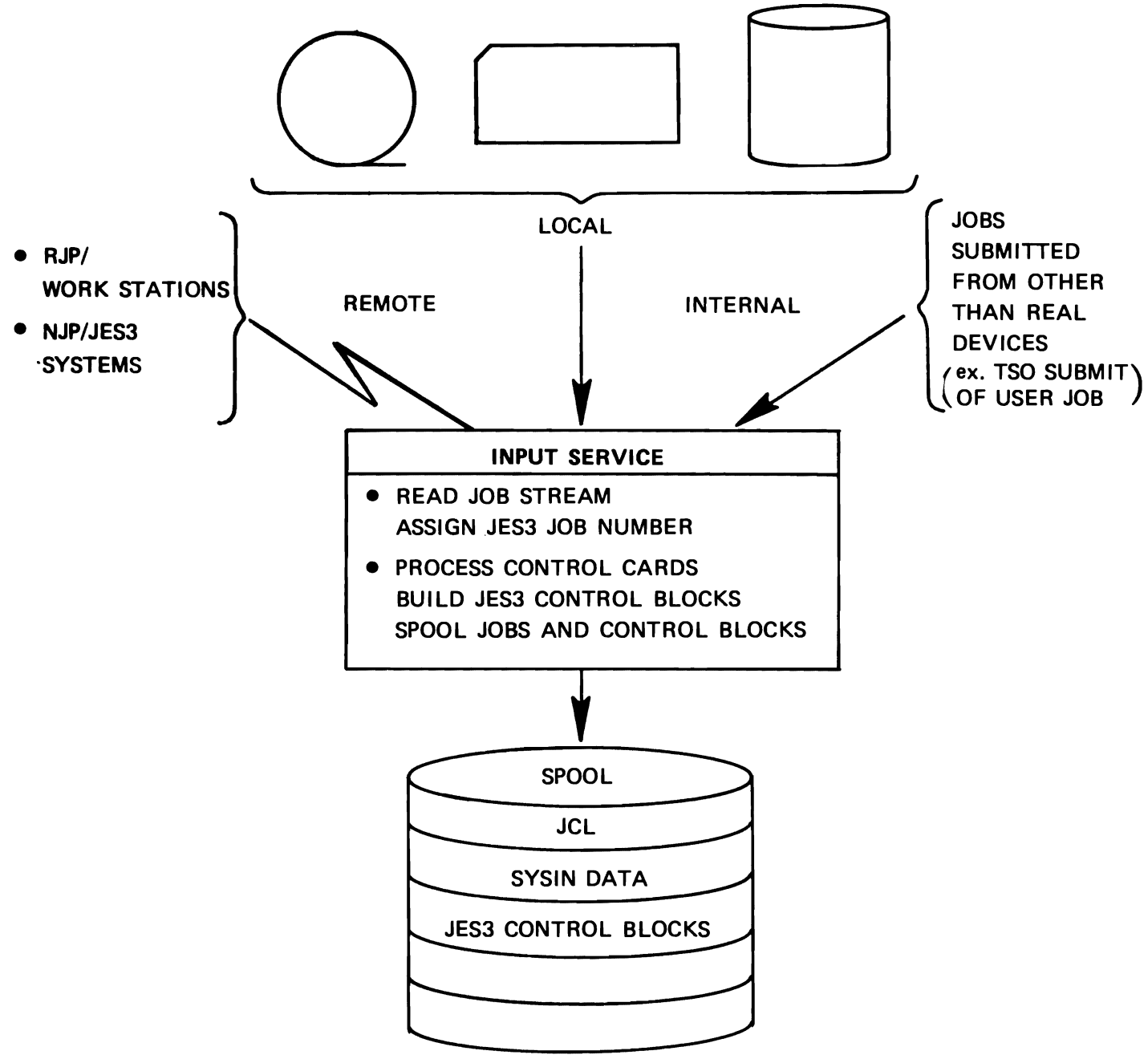
  INPUT/OUTPUT
  OPERATOR INTERFACE
  JOB SELECTION
  VOLUME MOUNTING

- CTC USED FOR CONTROL INFORMATION
- JOB DATA DIRECT TO AND FROM SHARED SPOOL

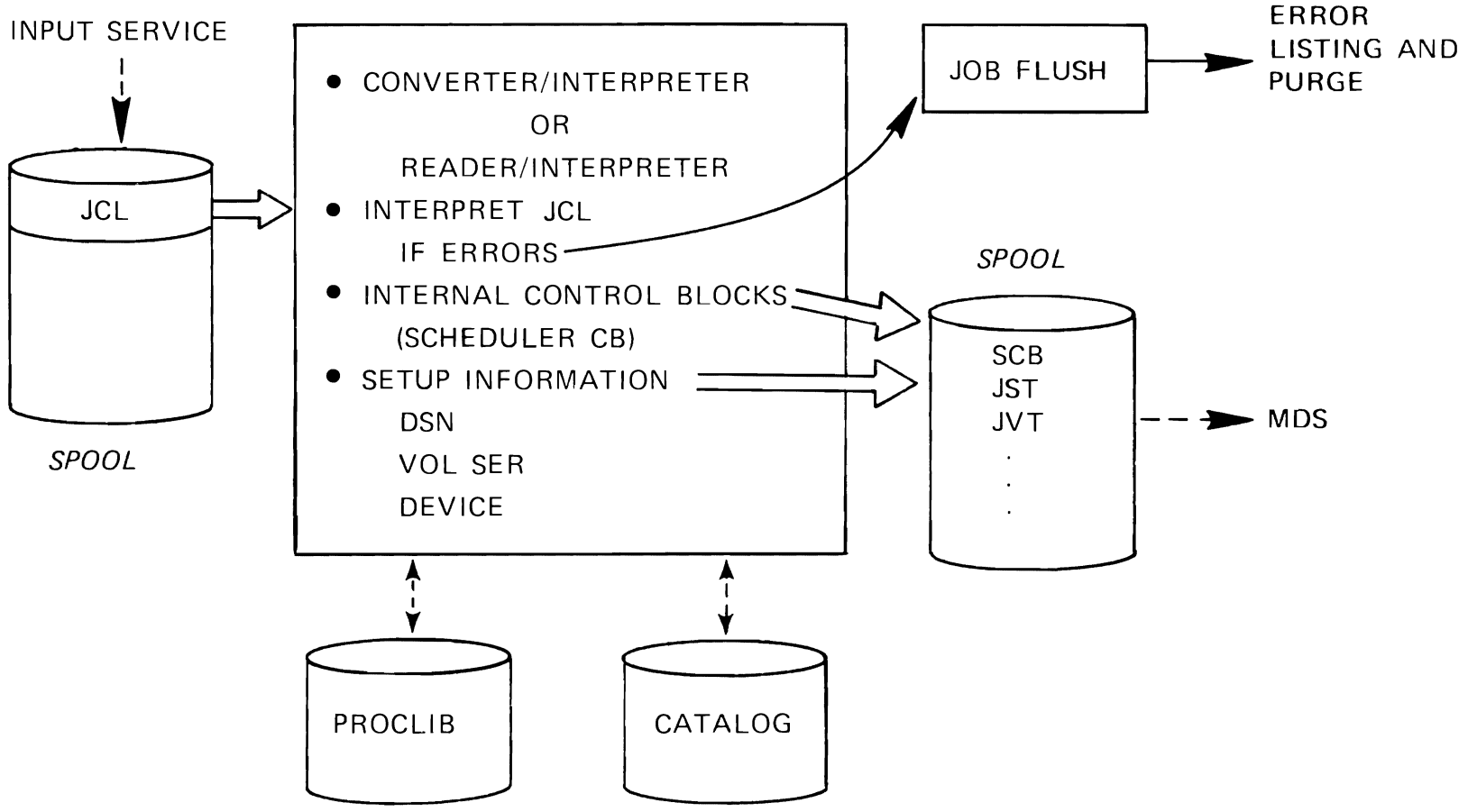
INPUT JOB STREAM

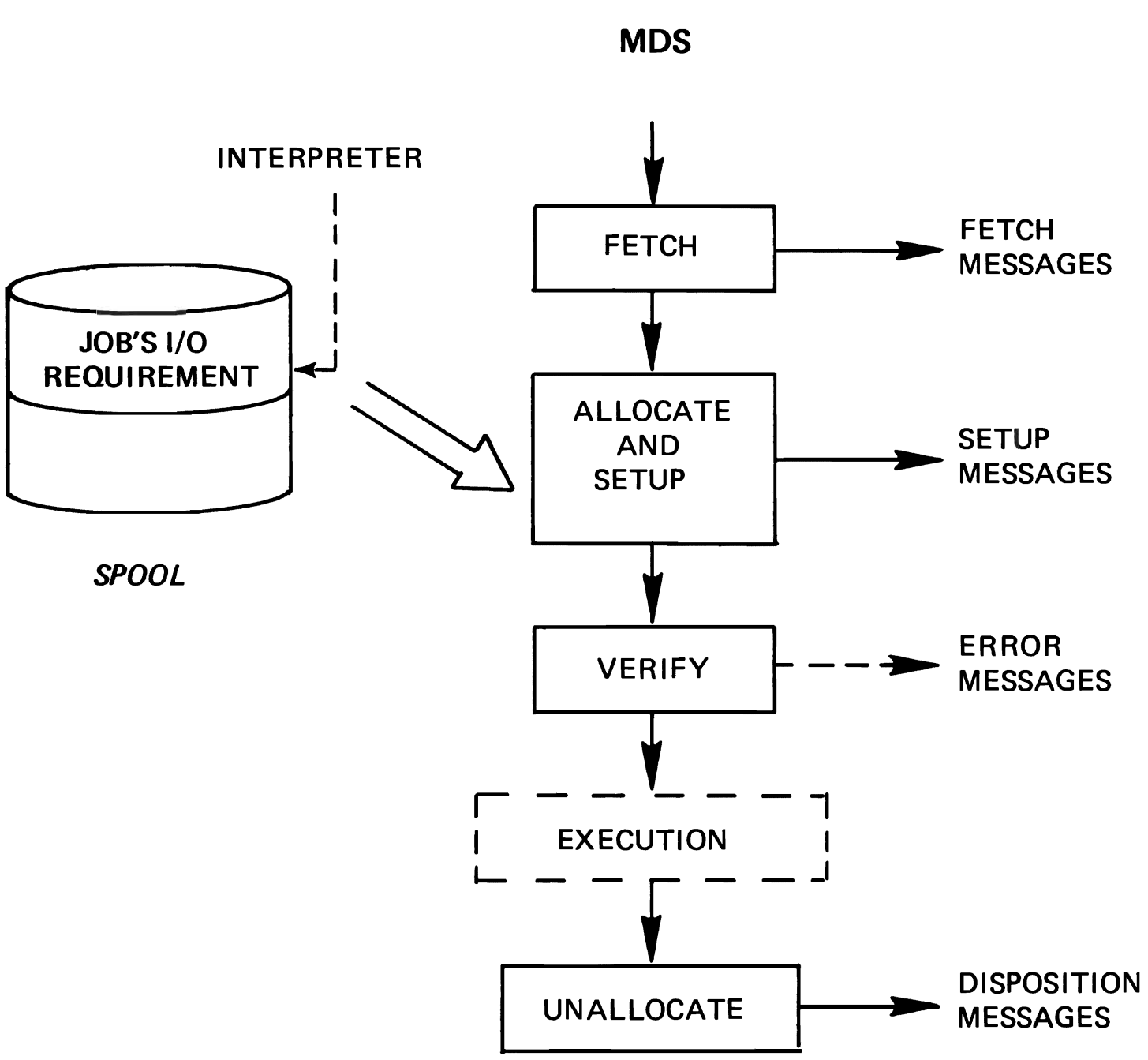


INPUT SERVICE

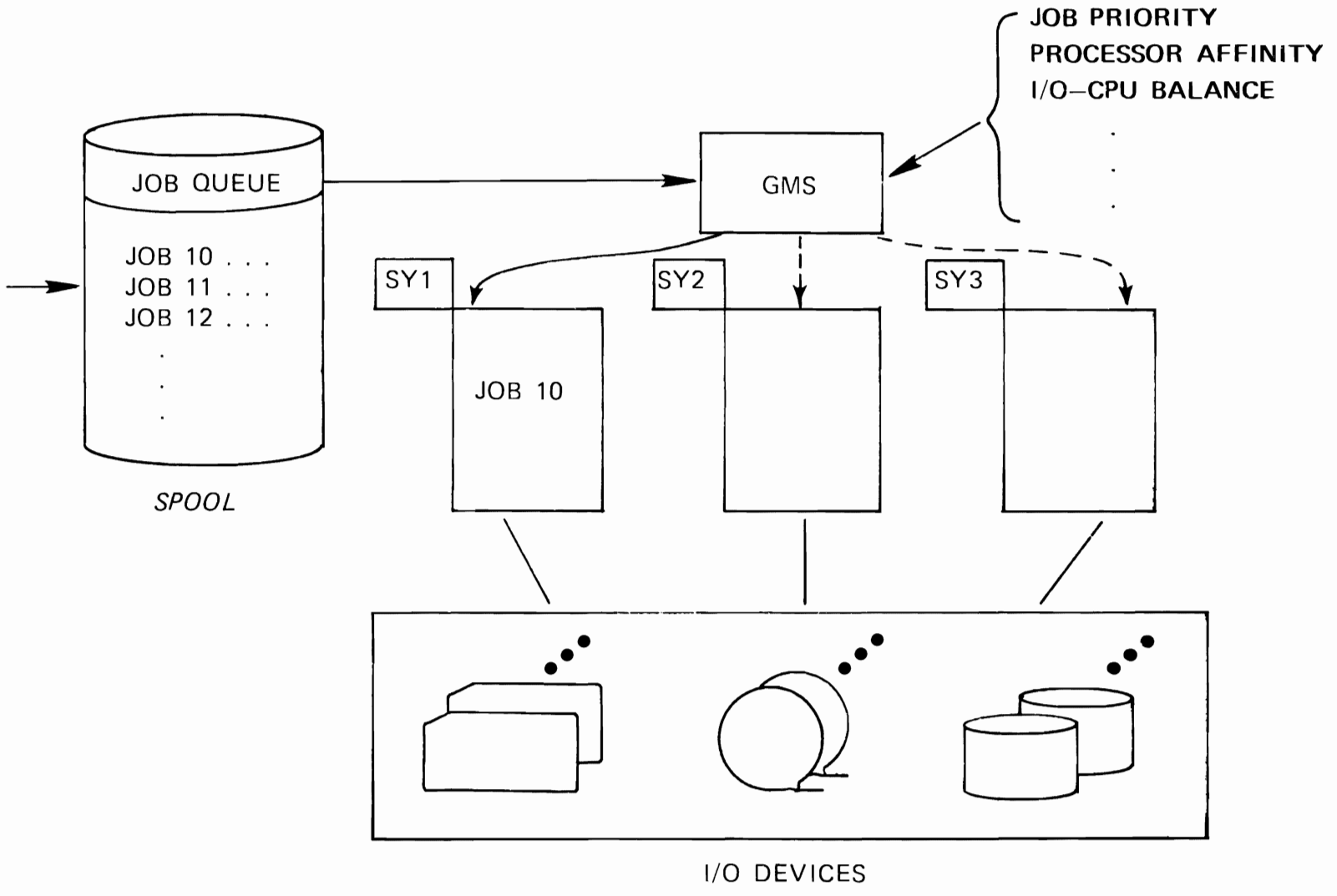


INTERPRETER SERVICE

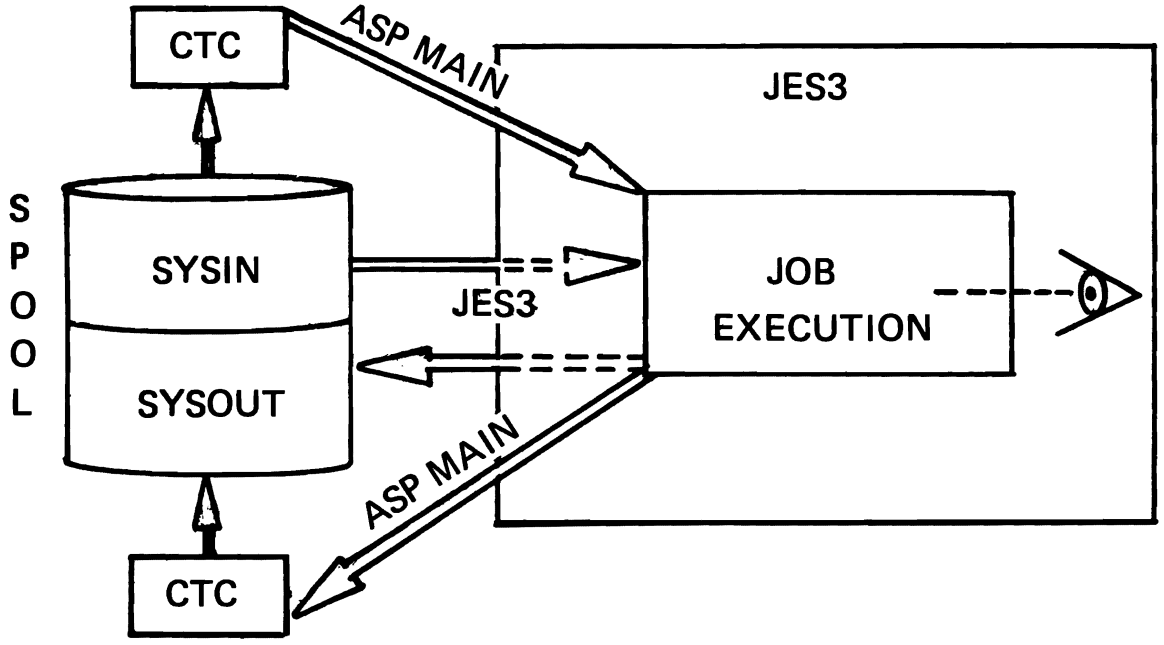



MDS
INTERPRETER
JOB'S I/O REQUIREMENT
SPOOL
FETCH
FETCH MESSAGES
ALLOCATE AND SETUP
SETUP MESSAGES
VERIFY
ERROR MESSAGES
EXECUTION
UNALLOCATE
DISPOSITION MESSAGES

GMS


JOB PRIORITY
PROCESSOR AFFINITY
I/O–CPU BALANCE
JOB QUEUE
JOB 10 . . .
JOB 11 . . .
JOB 12 . . .
GMS
SY1
SY2
SY3
JOB 10
SPOOL
I/O DEVICES

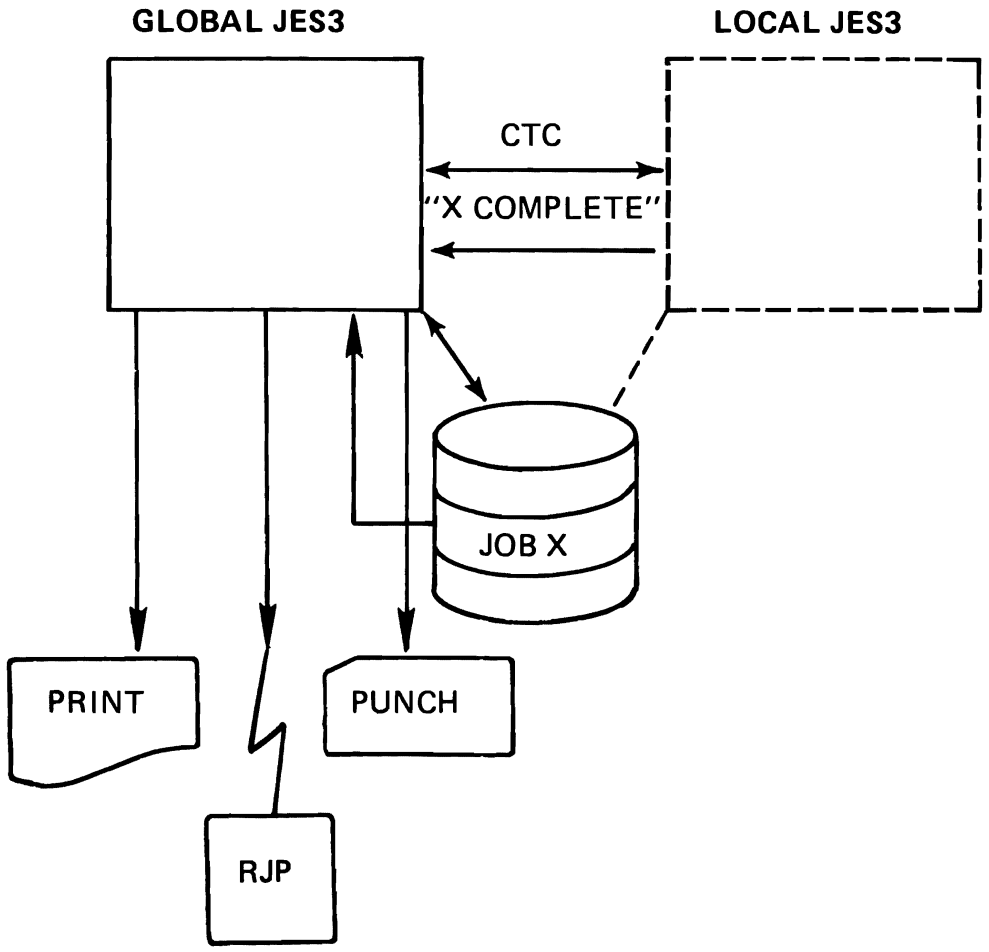
EXECUTION SERVICE



MONITORING

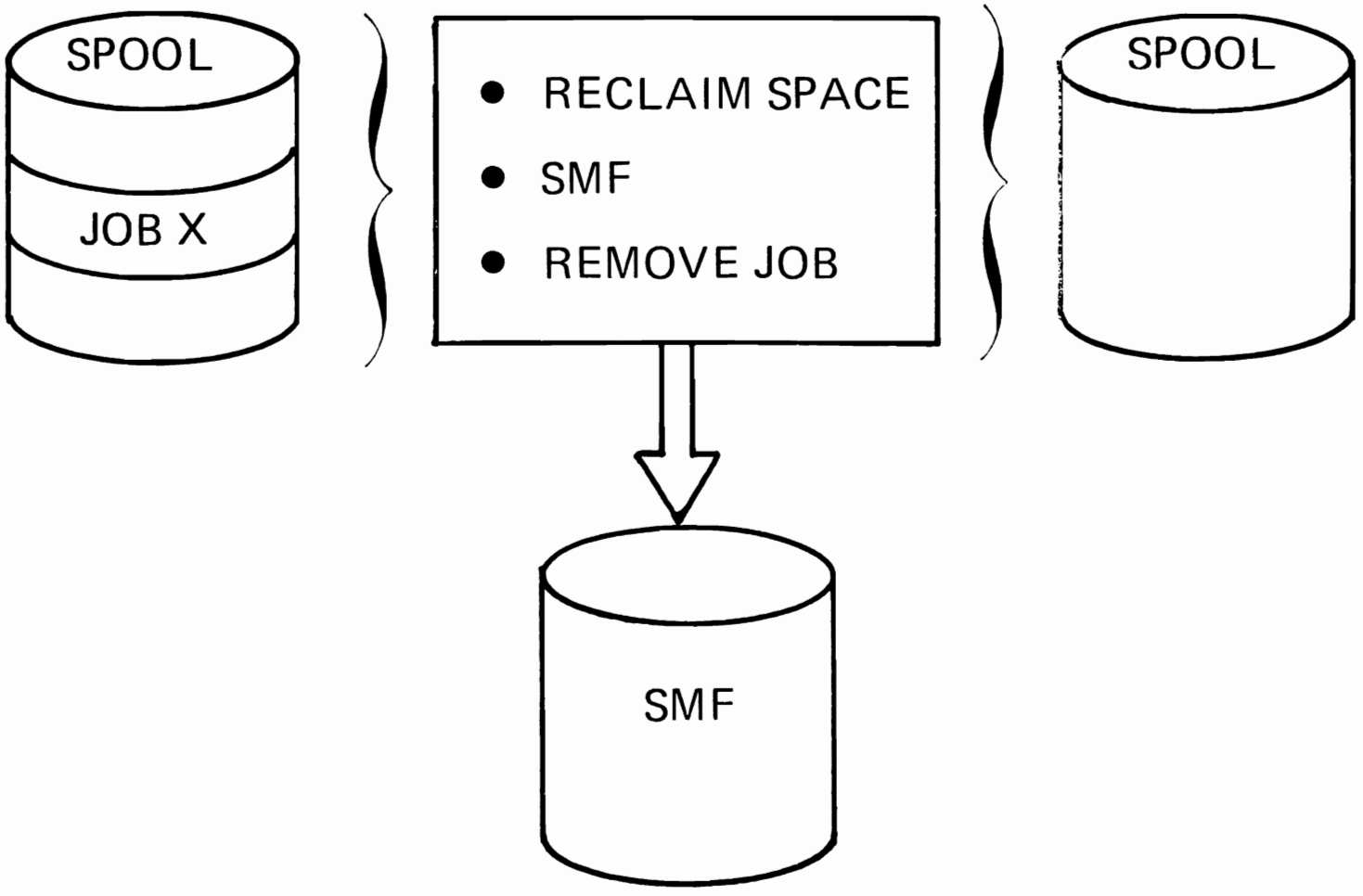
- ABNORMAL CONDITION
- OUTPUT LIMIT

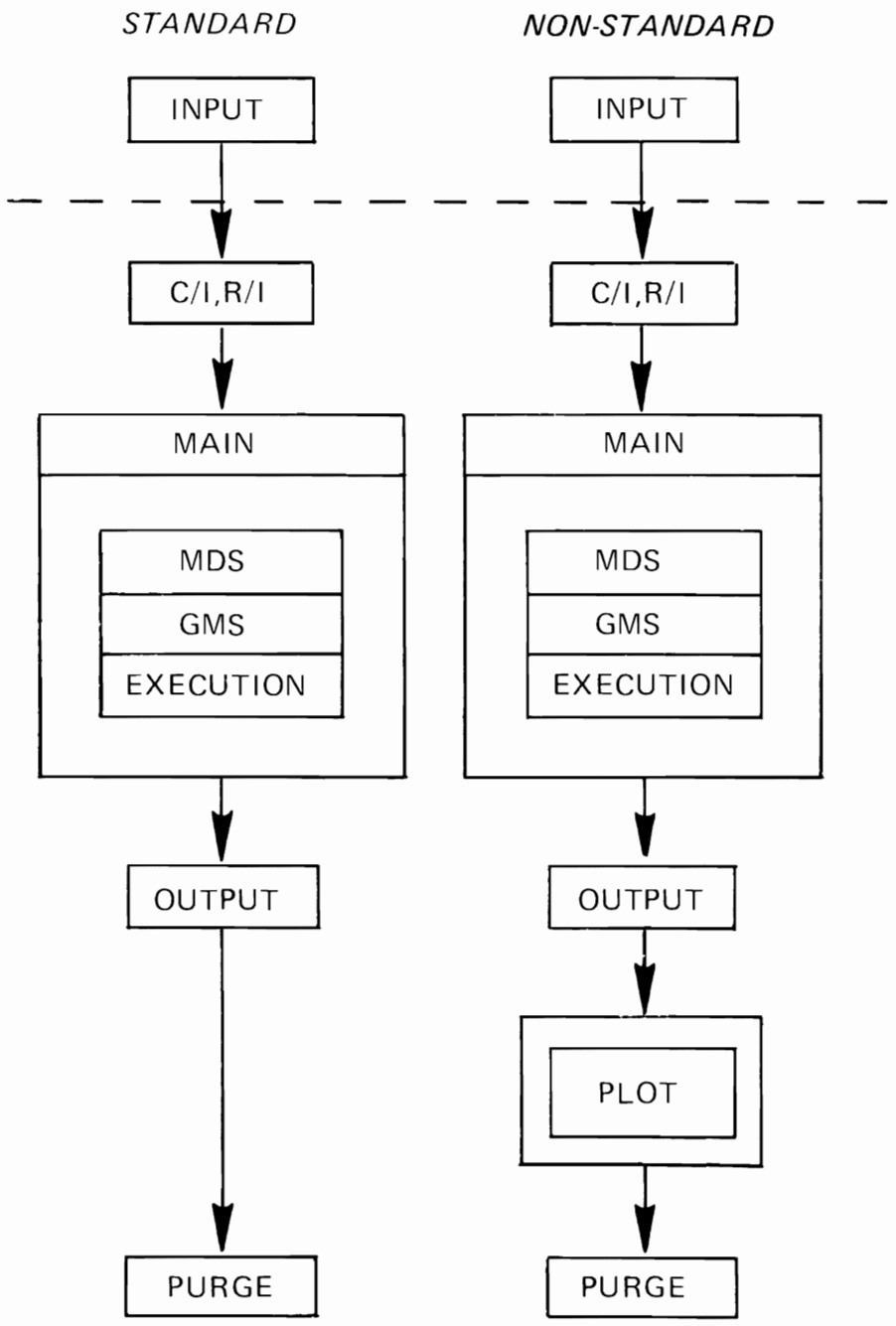
OUTPUT SERVICE



- OUTPUT SELECTION CRITERIA
- SPUN–OFF DATA SETS
- OUTPUT ROUTING
- ASYNCHRONOUS PRINT/PUNCH

PURGE




STANDARD
NON-STANDARD
INPUT
INPUT
C/I,R/I
C/I,R/I
MAIN
MAIN
MDS
GMS
EXECUTION
MDS
GMS
EXECUTION
OUTPUT
OUTPUT
PLOT
PURGE
PURGE

JES3 FACILITIES

Teaching Strategy: This topic presents many of the features and options of JES3 and therefore is probably one of the more important ones. The preceeding topic, JES3 Job Flow, is utilized and referenced to associate the various facilities of JES3 to the different stages of job processing. The intent here is to build on and relate to previous knowledge that the student has acquired. The author suggests that the presentation be oriented toward the capabilities of JES3 rather than the implementation chosen by JES3.

Objectives: Upon successful completion of this topic, the student should be able to:

1. Explain the initialization process and general function of the JES3 initialization deck.
2. Describe the JES3 utilization of the various hardware devices.
3. Relate the JES3 features to the JES3 job flow stages.
4. State the functions performed by the following JES3 components:

    - Main Device Scheduling
    - Generalized Main Scheduling
    - Dependent Job Control
    - Deadline Scheduling
    - Network Job Processing
    - Remote Job Processing

Time Estimate: Approximately two and one half hours will be required to present this topic.

Outline:

A. Initialization Process and Functions

    1. System Configuration Environment
    2. Job Related Facilities
    3. Other Processing Facilities

B. System Configuration Environment

    1. Processor
    2. JES3 SPOOL Devices
    3. JES3 Managed Devices
    4. JES3 Consoles

C. Job Related Facilities

1. Input
2. CI/RI
3. Setup
4. Scheduling
5. Execution
6. Output

D. Other Processing Facilities

1. Remote Job Processing
2. Network Job Processing

E. Summary

V.4.1
V.4.2

A. Initialization Process and Functions

As seen by the non-standard job facility, JES3 is a flexible system. The users have the choice of the features and options they desire to meet their installation requirements. The different options are selected through JES3 initialization cards. JES3 is initialized based on user specifications in the JES3 initialization deck. The scope of the initialization may be divided into three areas:

- o System Configuration Environment
- o Job Related Facilities
- o Other Processing Facilities

As indicated by the visual, JES3 initialization occurs after MVS has been initialized. After JES3 initialization has completed, user's job will be processed under the defined (initialized) JES3 environment. The following points should be noted:

- o There are different types of JES3 initialization (COLD, WARM, HOT).
- o The different types will be covered in the CONSOLES topic.
- o You may have multiple initialization decks (one for first shift, another for second shift, etc.).
- o Initialization decks may be located on DASD as well as be read by a card reader.
- o Initialization decks provide an easy means for redefining the JES3 operating environment.

V.4.3

1. System Configuration Environment

The hardware definition contained in the initialization deck includes the following:

a. Processor

Here we define each processor in the complex as a GLOBAL, LOCAL or ASP MAIN. In addition, the software environment is specified - MVS, SVS, MVT.

b. JES3 SPOOL Devices

Contained in the initialization deck is the number of JES3 SPOOL devices to be used. In addition the volume may be formatted

according to JES3 specifications while indicating the bad tracks to be bypassed. This is all accomplished at JES3 initialization time.

c. JES3 Managed Devices

The user may select the devices to be controlled by JES3 and not MVS. Generally these may be grouped into two areas:

- o JES3 Devices - this type of device may be utilized by JES3 for utility type functions and/or for use by JES3 for reading jobs and printing/punching jobs.
- o Execution Device - this type of device is controlled by JES3 (not MVS) and is used by executing jobs in other address spaces.

d. JES3 Consoles

Within the JES3 initialization deck are defined those ccnsoles to be used by JES3 as opposed to MVS used consoles. The JES3 defined consoles are all physically attached to the GLOBAL processor. More concerning consoles will be presented in the JES3 Consoles topic.

2. Job Related Facilities

JES3 has been designed so that the users can select the features and options provided by JES3 to meet the installation requirements. Those features and options include the number of jobs to be read at once in input stage and automatic procedure for jobs when the system fails (CANCEL or RESTART, for example) in the exectuion stage.

a. Job Stages

These features and options are classified into each stage of the job processing; INPUT, INTERPRETER, SETUP, JOB SCHEDULING, EXECUTION and OUTPUT, for easy understanding.

V.4.4

b. Feature Selection

This visual is intended to show that options selected may be related to the stages of a job as it progresses through the system. It is not necessary here to identify these

features shown on the visual but merely to establish the fact that at JES3 initialization time, choices are made which determine how jobs are processed.

c. Feature Usage

This visual is intended to demonstrate the applying by JES3 of the selected features to the jobs when processed. Basically, there are two points to be made here - the selection of JES3 features relative to job processing and the invocation of those options by JES3 at the appropriate time.

Instructor Note: The initialization cards which specify most of the features and options are not necessarily classified as to job stage. This stands to reason because JES3 is "a system" and there are viewpoints other than job flow. For the instructors' reference, the general relation between the job stage and the initialization cards will be given later.

V.4.5

3. Other Processing Facilities

There are other processing capabilities of JES3 which generally fall outside the job related area. Primarily we are concerned with Remote Job Processing and Network Job Processing. It is sufficient here to very briefly state the purpose of each for each will again be covered later in more detail. RJP is the ability to send jobs from a remote location (terminal) to a JES3 installation to be processed. NJP is the ability for JES3 installations to communicate and thus to share work among them.

B. System Configuration Environment

V.4.6

1. Processor

Under the JES3 environment, there may be different types of processors. From the point of JES3 functions, it will be classified into the global, local or ASP-main; from the point of the operating system, MVS, VS2 Release 1 or MVT. Possible combinations are shown on the visual.

Also, you can specify the classes of jobs to run on the processor. This can be useful to realize the best job mix for performance, or to prevent the processor from running the same type (class)

of jobs while the other jobs would never be scheduled.

Instructor Note: The CLASS in the JES3 sense is quite different from non-JES3 systems. The class in OS does not have any fixed meaning, only as defined implicitely by the user. In JES3 it must be defined explicitly. Therefore, it has the specific defined attributes, such as I/O-CPU rate, job priority, failure procedure, the maximum number of jobs to run on the total JES3 complex, etc. However, you would not go into this subject. You can use the "class" as in the traditional sense; there would be no difficulty in this course. One of the reasons is that before installing JES3, the system programming staff will define the new "installation standards" on the job class.

The class - processor relation is not direct. The CLASS-GROUP-SELECT-MAINPROC initialization cards are used for this purpose.

V.4.7

2. JES3 Spool Devices

The spool volumes are a vital part of JES3 configuration. These contain information such as:

- Input Job Stream (JCL)
- SYSIN data
- SYSOUT data
- Internal Table and Control Blocks (ex. job queue)

You can specify such information according to your installation requirements as:

- Number of volumes
- Formatting
- Bad Track - to avoid unnecessary arm movement

Instructor Note: The data sets used for spool should be defined when JES3 started (and was initialized).

```
//IEFPROC     EXEC     PGM=IATINTK
//SPOOL1      DD       DSN=JES3.SPOOL,DISP=OLD
//CHKPNT      DD       DSN=JES3.CHKPNT,DISP=OLD
//JES3OUT     DD       UNIT=00E
//JES3SNAP    DD       UNIT=AFF=JES3OUT
//SYSABEND    DD       UNIT=AFF=JES3OUT
//JESABEND    DD       UNIT=AFF=JES3OUT
//IEFDATA     DD       DUMMY
//IEFRDER     DD       DUMMY
//IEFPDSI     DD       DSN=SYS1.PROCLIB,DISP=SHR
//IATPLBST    DD       DSN=SYS1.PROCLIB,DISP=SHR
//IATPLB01    DD       DSN=SYS1.PROCLIB,DISP=SHR
//IATRILB     DD       DSN=SYS1.JES3RI,DISP=SHR
//           DD        DSN=SYS1.JES3LIB,DISP=SHR
//JES3IN      DD       DSN=SYS1.PARMLIB(JES3IN00),DISP=SHR
```

This is an example of "JES3 procedure" in the second line of which the data set (JES3.SPOOL - any name) has been cataloged. Also, the checkpoint data set is defined in the third line.

V.4.8

3. JES3 Managed Devices

You can specify which I/O devices are under control of JES3 and how they are used by JES3. "JES3 managed" means JES3 will control such activities as:

- Keeping the device status (on/off line, which volume on the device, ...)
- Device allocation and messages for mounting
- Device deallocation

a. Types of Device Control

All the I/O devices in the configuration do not need to be controlled by JES3; in such case MVS job scheduler (Job Management) will control them. I/O devices under JES3 control will be:

- JES3 Device - which are used for JES3 functions such as reading the input job stream, printing SYSOUT data sets, JES3 consoles for communication between operators and JES3.
- Execution Device - which are used for the job execution (tape, deck, UR, ...).

When the job proceeds to the MDS stage, required I/O devices for job execution are selected from those execution devices defined

here.

JES3 can manage such types of devices as:

- o Unit Record
- o Graphic
- o Tape
- o DASD

b. Device Sharing

JES3 allows users to share a device between processors (physically). For example, if a device can be accessed by two processors, JES3 can schedule the job which requires a device (type) on either one of them based upon the availability, unless the job requests the processor dependency. Hence, we can get the better resources utilization and the better turnaround.

V.4.9

Visual V.4.11 is a summary of the JES3 Device Management as discussed using visual V.4.10. The author suggests this visual be used to reinforce the various aspects of this section.

Instructor Note: See the further discussion on device allocation for the job in "SETUP".

V.4.10

4. JES3 Consoles

In the JES3 environment one of the primary objectives is to present a single system image. The implementation of JES3 consoles is designed to do just that. All JES3 consoles are physically attached to the GLOBAL processor. The usage of these consoles appears as if there is only a single processor in the complex.

The visual indicates that consoles may be physically placed in a functional area (fetch area, mount area, printer area, etc.) for control and use by that particular function. This is applicable even for those devices (tapes, disks) which are associated with LOCALs. JES3 permits the user to define his own console usage. The topic of JES3 Consoles will cover in more detail.

C. Job Related Facilities

V.4.11

1. Input

The type of devices used to input for the job

stream are shown on the visual. TSO(SUBMIT) is one of the ways of input; however, it is internally processed through the internal reader facility. The internal reader is a simulated, programmed reader, which is the same function as in JES2. The batch size of input jobs is specified when the operator invokes the reader facility.

The operators can control job input operations such as START/STOP the reader and INQUIRY/MODIFY the job queue.

V.4.12

2. CI/RI

Several user options may be selected for job processing relative to the interpret function.

a. Multiple Active CI/RI

The installation may elect to activate several CI/RI tasks. This permits multiple jobs to pass through this phase of the job concurrently. This is a performance consideration.

b. Private Procedure Library

During this phase of the job the user may specify a specific procedure library that he wishes to utilize. This permits individual jobs to reference a particular procedure library designed for their exclusive use.

c. Frequent Procedure Usage

Those procedures that are frequently referenced may be pointed to by JES3 for fast access. This again is an option that may be selected by the installation to be invoked during this stage of the job.

d. Dynamic Catalog Mounting

When a job references a catalog that is currently not mounted, JES3 will call (via operator message) for it to be mounted. This is valid only for JOBCAT or STEPCAT and does not include an OS CVOL.

V.4.13

3. Setup

Before discussing JES3 device setup, it is useful for students to recognize what the traditional

setup is.

The traditional one allocates devices for a job step (not job) only. When one job step is complete, the allocation for the next job step starts. If enough devices are not available, the allocation process (scheduler) waits until devices are available (or cancel by operator). This means that the job related resources (systems initiator, core or address space, data sets, devices) are held during this time.

a. JES3 Device Allocation

JES3 allocates devices by job (not job step) before the execution begins (by MDS). Only the resources seized are JES3 address space (where MDS is running) and queue space. In addition, JES3 has been designed so that MDS can know the I/O requirements of the forthcoming jobs in the JES3 queue (jobs which have completed CI/RI stage), and more efficient allocation will be realized (total device awareness).

JES3 will release devices at the end of job step if that device is not needed by subsequent steps. This frees the devices for use by other jobs.

V.4.14

b. JES3 Allocation Types

1) Job Setup

All devices for all the job steps are allocated. Roughly speaking, this is the sum of the number of required devices for each step. This results in no mounting/demounting operation by the operators during the job execution, except multi-volume data sets.

2) High Watermark Setup (HWS)

The minimum number of devices to run the job are allocated. Roughly speaking, this is the number of the devices which are required for the largest job step. In general, HWS will allocate a lesser number of devices than "JOB", and more mounting/dismounting operations than "JOB".

3) Explicit Setup

In this case, you specify which data sets should be handled by JES3 through JES3 control card (//*MAIN). This can be called a compromise of "JOB" and "HWS". In this method, however, the early device release doesn't work.

Instructor Note: MDS parameters are specified by SETNAME/SETPARM/HWSNAME/SETRES and STANDARDS initialization cards and the programmers can choose one of them by //*MAIN SETUP= card explicitly.

V.4.15

c. JES3 Setup Considerations

Other factors considered by JES3 to accomplish device setup are:

- Does this job have any processor dependency? (ex. ASP-MAIN or LOCAL one)
- Are all the data sets (volumes) available?

JES3 manages all such factors. Some factors are related with GMS closely.

In summary, JES3 issues fetch and mount messages, verifies when the devices are ready and releases the device after step execution as early as possible. One of the other features to be mentioned is device pooling. That means for some type of jobs, JES3 allows you to reserve devices with exclusive use. A typical example is DJC.

V.4.16

4. Scheduling

Instructor Note: Visual V.4.18 reflects some general considerations relative to job selection. These should be presented as installation objectives to be realized through discrete job selection criteria. The following text represents an extended discussion in support of this visual.

A simple algorithm of job selection for execution is job's priority; the only factor to be considered is job priority. In JES3 environment, however, factors to be considered are more than one.

a. Scheduling Considerations

1) If the highest priority job in the queue does not fit to the available core size, should we wait until memory available, or schedule a lower priority job immediately? (This discussion is still true in MVS when you use 'working sets or logical storage' instead of real available core.)
2) In such a case, it could occur that all the jobs running are small jobs (for example, "test job"), and no big jobs ("production" type). This is an extreme discussion for easy understanding; the point is that whether or not we should put some restrictions on scheduling factor - fitness.
3) Even if the highest job meets the above criteria, could the job realize the best CPU-I/O balance?
4) Do you need a special algorithm that the job should be done by the specific predetermined time (3:00 p.m. for example)?

Those points do not necessarily cover the whole consideration, but will give the general area of GMS.

V.4.17

b. JES3 Scheduling Factors

Now we come to introduce what factors GMS considers for job selection. As you know GMS has a sophisticated algorithm, but you don't need to emphasize the sophistication; but rather the broad scope of selection criteria to meet his specific installation requirement. Although we don't need to mention the initialization cards to the students, some of them are put for the instructor reference.

1) PRIORITY - this is the primary factor; specified on //*MAIN or JOB JCL card. The default option will be given for installation standards (GROUP, CLASS and/or STANDARDS).
2) PROCESSOR DEPENDENCY - the user can select the specific processors (physically such as SY1 or ASP processors, for example) through //*MAIN. This would be due to the special hardware feature (emulator) or the software compatability. GMS can

manage this situation (STANDARDS).

3) LOGICAL STORAGE SIZE - this factor affects scheduling in such a way as the highest priority job will wait until enough core is available while the next highest priority one fitting in available core will be scheduled (CLASS).

4) MIX OF CLASSES - to prevent the processor from being monopolized by one type of job, you can specify the maximum number of the jobs running in this class simultaneously. This discussion is true on the total complex (all the processors). (MAINPROC-SELECT-GROUP-CLASS)

5) MIX OF IO/CPU USAGE - this attribute of the job is given through //*MAIN or class default through CLASS. GMS tries to select the job in order to realize the best balance of I/O and CPU usage on a processor (SELECT).

6) AVAILABILITY OF INITIATORS - you can specify the dedicated initiators for the classes on a processor which means no other job classes will be started by those initiators. This means you can control the number of jobs to be scheduled from the classes (GROUP) on a processor and the total complex.

7) SEQUENCING OF RELATED JOBS - you may need to have such scheduling method as a job be scheduled after others are complete, similar to step execution within the job. JES3 allows this method, and it is called "Dependent Job Control" (DJC). See the later topic "Advanced Scheduling Techniques".

8) DEADLINES FOR SPECIFIC JOBS - the user can request JES3 to monitor and control certain jobs via //*MAIN (and DEADLINE for initialization). See the later topic "Advanced Scheduling Techniques".

V.4.18

c. Other Scheduling Considerations

In addition to those scheduling features mentioned above, there are other features to control the scheduling process.

1) You can ask JES3 to increase the priority for some jobs over the other after SETUP. (Those jobs will be

scheduled earlier than others by GMS.) (SELECT).

2) Priority aging for SETUP and Job Selection - you can ask JES3 to increase the priority of some jobs while they are in SETUP queue and/or execution queue. (SELECT).

Those two techniques will enable the user to bias some jobs over others.

3) You can ask JES3 to limit the number of jobs to be the candidates for scheduling by setting up the barrier priority and/or the span of selection. In other words, jobs below the barrier priority (or out of the scope for GMS) will never be the candidates for scheduling while they are in the queue (SELECT).

4) You can ask JES3 to limit the number of jobs to be processed by MDS. By this you could avoid unnecessary device reservation and/or mounting congestion (CLASS and SELECT).

V.4.19

d. Advanced Scheduling Techniques

There are three techniques unique to JES3:

- o Dependent Job Control (DJC)
- o Deadline Scheduling (DLS)
- o Network Job Processing (NJP)

NJP allows users to send their jobs (or primarily, job segments) to other JES3 installations to have the jobs processed at that location. This will be covered later.

V.4.20

1) Dependent Job Control

There may be related jobs among which some can run parallel (Job A and Job B in the visual), and others cannot (the dependent jobs - Job A and Job C). You can control this type of job scheduling with DJC facility. To do so, you have to tell JES3:

- o Which are related (dependent) jobs? You have to specify through //*NET control cards the network identification (NETID) to which this job belongs.

JES3 identifies the NETID in the job stream and creates the special job queue for the same NETID.

- Which are dependent in the NETID? You have to specify through //*NET the dependency relation as follows:

  Job B is dependent on Job A and C
  Job D is dependent on Job B and C
  .
  .
  .

According to this information, JES3 can schedule the jobs as indicated in the net. In addition to the basic DJC processing above, JES3 also provides such features as:

- You can take the alternate path when the preceding job is completed abnormally.
- The operator has the ability to inquire the status of the DJC net (which has finished, for example), to modify the process (hold the succeding jobs for a moment) and to release a job before preceding job's completion (spun off file for succeding job, for example).

For efficient device setup for DJC, JES3 allows the users to reserve some device for its exclusive use (device pool/fencing) through //*NET card.

Instructor Note: There are no initialization cards concerning this technique, except for the use of device pooling (SETNAME).

V.4.21

2) Deadline Scheduling

You can ask JES3 that a job should be done by specific clock time. JES3 manipulates this request by priority control (Aging). You have to tell JES3:

a) By what time should the job be done? (//*MAIN)
b) Specific date or cyclic one (Monday every week, for example)? (//*MAIN)
c) How will the job's priority be

increased to meet the deadline? (DEADLINE)

- o Lead Time - when the supposed start time reaches, JES3 raises the priority to the predetermined one.
- o Increment after Lead Time - JES3 raises the priority every predetermined time by predetermined increment.

  Note that JES3 does not commit that a job would be complete by the deadline time, but try to do it.

V.4.22

5. Execution

During the job execution, JES3 monitors and if unusual conditions occur, JES3 handles as users specification.

- o When system failure occurs, JES3 takes action as cancel, hold, print and cancel, or restart.
- o When output volume goes beyond the limitation, cancel, dump or warning occurs.

Instructor Note: The initialization cards concerned are CLASS and STANDARD.

V.4.23

6. Output

During the job execution, the SYSOUT data sets are written on the spool. The output processing transcribes them on printers, punches, RJP terminals or TSO terminals, after the job execution.

a. Output Routing

The printing and punching operations are scheduled simultaneously if possible. The destination of the output can be controlled by the initialization cards (GROUP or DEVICE group). Generally speaking, the jobs submitted from a device group (defined by DEVICE) are routed to the original location (local or remote, for example).

b. Output Selection

The selection of output operation from the

queue can be controlled by the following factors (STANDARDS).

- o Job Priority
- o Destination
- o Device Type
- o Forms
- o Carriage Tape
- o Line Limit
- o SYSOUT Class

The order shown above is the defaulted hierarchy to the selection algorithm. The users may put the device type over the job priority. Spun off data sets will be scheduled when the data sets are closed rather than at job termination.

After the output processing SMF record will be written.

V.4.24

c. Output Service Operation

As to print service, it will try to minimize the operator's intervention; that is, once the printers are set up, the data sets with the same attribute will be processed continuously. On the other hand, the users have the option to control (start/stop) the output operation. Because output service has the checkpoint-restart facility, (when the system failure occurs), the users can restart the printing operation. All the printing operation options can be specified at initialization time and also be overridden by the programmer (//*FORMAT) or the operators. The same discussion can be applied to the punch service.

Instructor Note: The initiatization cards are SYSOUT/STANDARD/DEVICE.

V.4.25

D. Other Processing Facilities

1. Remote Job Processing

RJP is a logical extention of reader/printer/console at local facilities (i.e., local reader). The user can input the jobs, can get the output and can control the job processing through the RJP stations. Generally speaking, the functions offered are the same as JES2.

a. Terminal - both programmable and

non-programmable terminals are supported; the programmable terminal is called remote workstation.

b. Transmission - the operation of job input and output operation is done at the same time with the programmable terminal. It is called multileaving mode.

c. Password Protection - when the remote operator starts the line connection, he can specify the password.

d. Remote Console and Control - JES3 can support one console at the remote terminal. Through the console, the operator can send commands and receive the messages from JES3 (for example, cancelling the jobs and inquiring the job status). If the remote location does not have dedicated console, JES3 allows the reader and printer to be used as a console.

Instructor Note: The initialization cards:
RJPLINE/RJPTERM/DEVICE

V.4.26

2. Network Job Processing

This is one of the unique JES3 facilities. If there are other JES3 installations connected by communication lines, you can send jobs to those installation. You can control what stages of the job processing (interpreter/execution/ output) should be done in the other installation. This feature will be used for workload balancing between JES3 installations.

When you want to send the job, you do it by specifying the JES3 control card (//*PROCESS NJPIO) in the job stream or by operator control.

There are some restrictions on NJP; for example you cannot send a job which belongs to DJC net. There is another consideration of the availability of data sets, catalog, procedure library, etc.

The details of //*PROCESS will be presented in the next section, "JES3 Control Cards".

Instructor Note: The initialization cards; NJPTERM/DEVICE

E. Summary

Upon closing this topic, it may be appropriate to summarize the items which we have discussed:

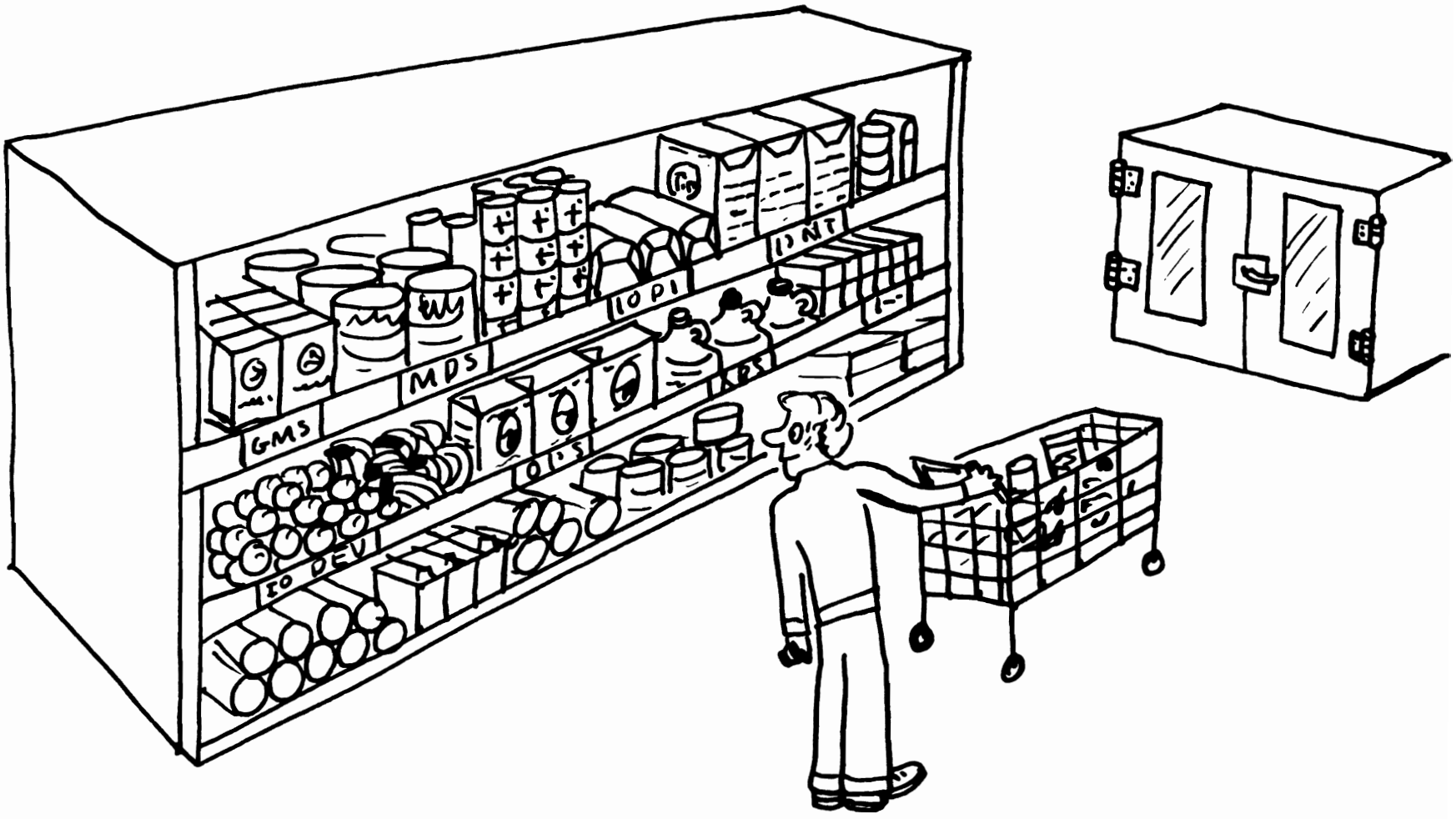
o What are the features and options?

- Hardware configurations and Job Related Options.

- How to be selected?
  - To meet your unique installation requirements.
- Who to select them?
  - Your system programmers.
- When are they built in?
  - At initialization time.
- How do they affect the programmer?
  - As long as the programmer is consistent with the installation standards, they don't need to do anything special. Normal JCL preparation is sufficient.
- Can the programmers change the job related options for their program?
  - Yes, through the JES3 control statement.
- Can we change the initialized JES3 after the cold start?
  - Yes. The warm start initialization is provided. You may have different initialized JES3 for each shift.
- Can we see the initialized system and change (modify) the options during JES3 execution?
  - Yes, both of them to some effect. The operators can inquire and modify them through the consoles.

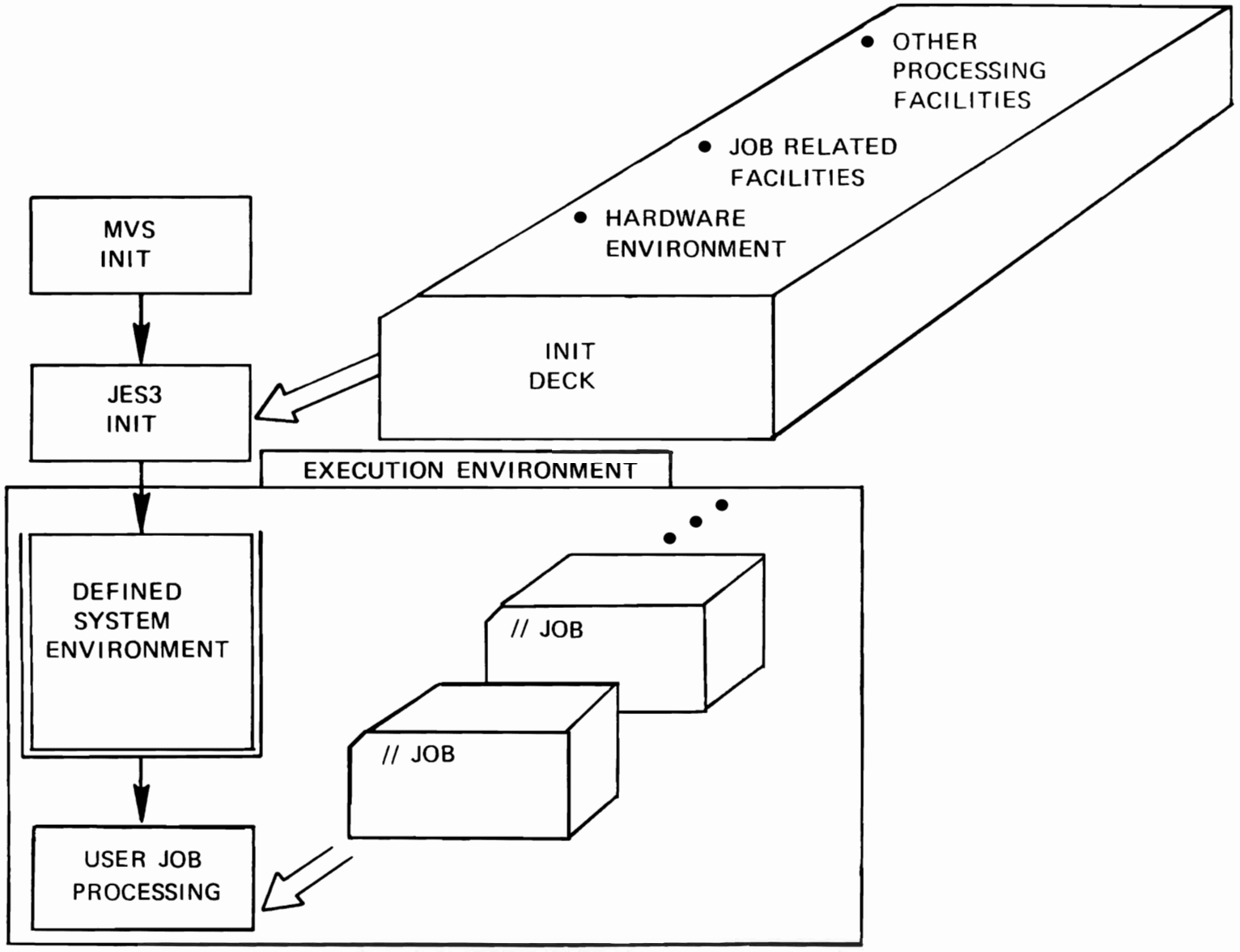
LIST OF VISUALS

VISUAL NO.	HANDOUT NO.	DESCRIPTION
V.4.1		JES3 Facilities
V.4.2	H.4.1	Initialization Process
V.4.3	H.4.2	Configuration Definition
V.4.4	H.4.3	Job Related Facilities
V.4.5	H.4.4	Remote Job Processing
V.4.6	H.4.5	Processor
V.4.7	H.4.6	Spool
V.4.8	H.4.7	JES3 Managed Devices
V.4.9	H.4.8	JES3 Device Management
V.4.10	H.4.9	Console Functions
V.4.11	H.4.10	Input Service Features
V.4.12	H.4.11	CI, RI Features
V.4.13	H.4.12	JES3 Device Allocation
V.4.14	H.4.13	JES3 Setup
V.4.15	H.4.14	Main Device Scheduling
V.4.16	H.4.15	Generalized Job Selection
V.4.17	H.4.16	Generalized Job Selection
V.4.18	H.4.17	JES3 Fine Tuner
V.4.19	H.4.18	Advanced Scheduling Techniques
V.4.20	H.4.19	Dependent Job Control
V.4.21	H.4.20	Deadline Scheduling
V.4.22	H.4.21	Execution Monitoring
V.4.23	H.4.22	Output Processing
V.4.24	H.4.23	Print Service
V.4.25	H.4.24	Remote Job Processing
V.4.26	H.4.25	Network Job Processing



JES3 FACILITIES

INITIALIZATION PROCESS



CONFIGURATION DEFINITION

- PROCESSOR

  GLOBAL/LOCAL/ASP MAIN
  MVS/SVS/MVT

- SPOOL

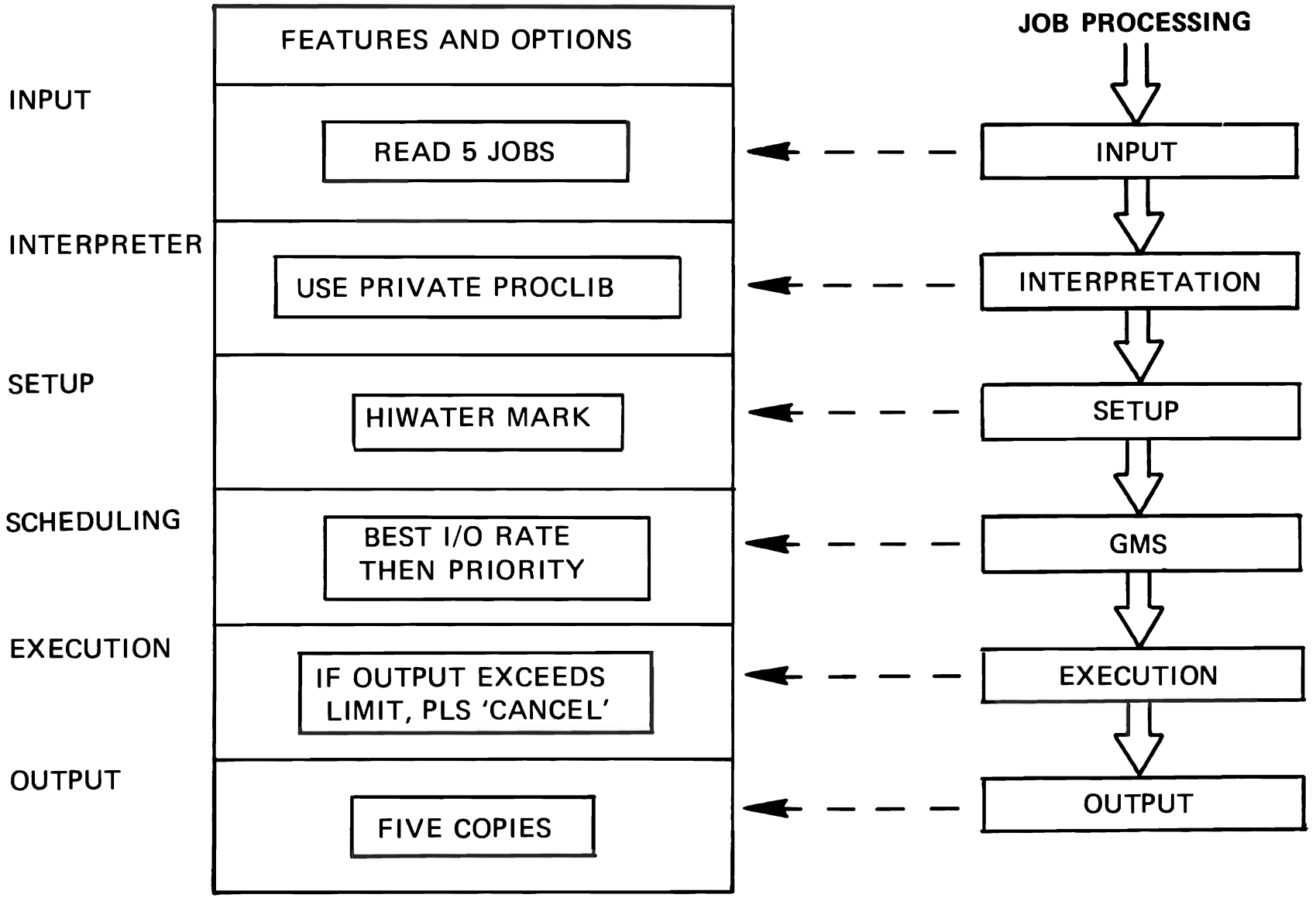
  NUMBER OF VOLUMES
  FORMATTING OF NEW VOLUMES
  BAD TRACK EXCLUSION

- IODEVICE MANAGEMENT

  JES3 DEVICE ON GLOBAL
  EXECUTION DEVICE ON GLOBAL OR LOCAL

- CONSOLES

JOB RELATED FACILITIES



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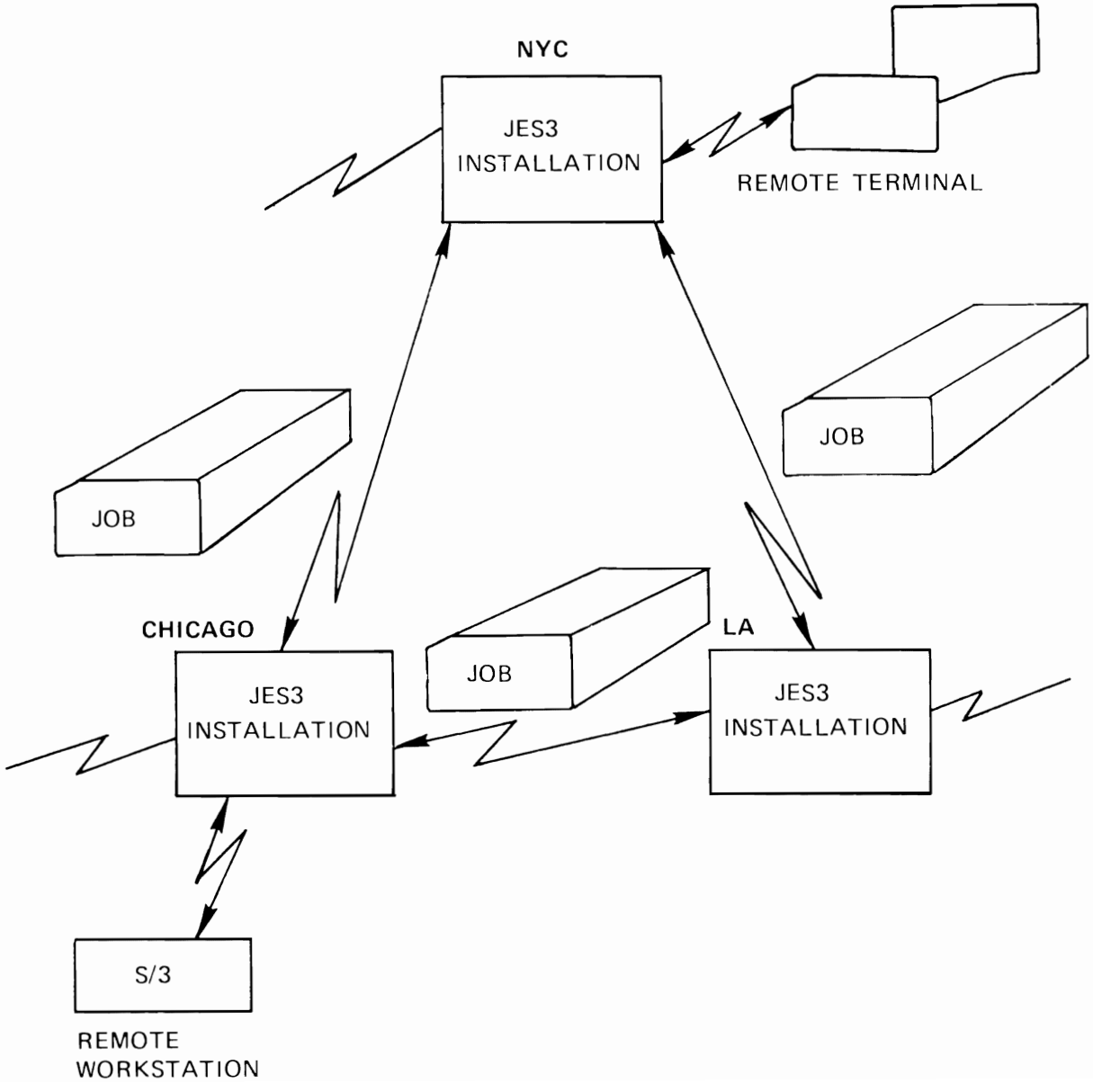
REMOTE JOB PROCESSING (RJP)
NETWORK JOB PROCESSING (NJP)



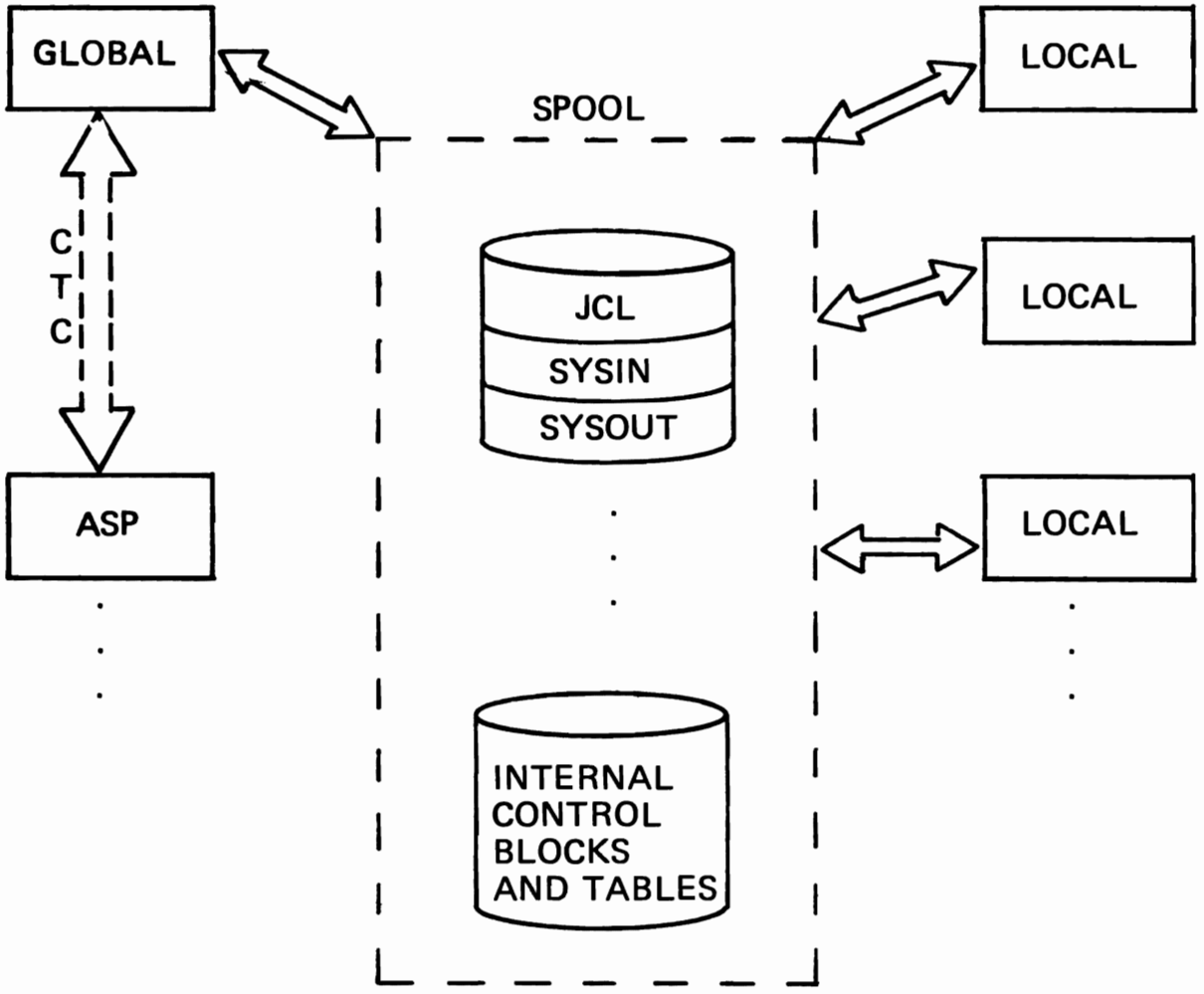
V.4.5/H.4.4

PROCESSOR

GLOBAL	LOCAL	ASP MAIN
MVS	MVS	VS2R1,MVT
A,B,E	A,B,C,G	A,E,F

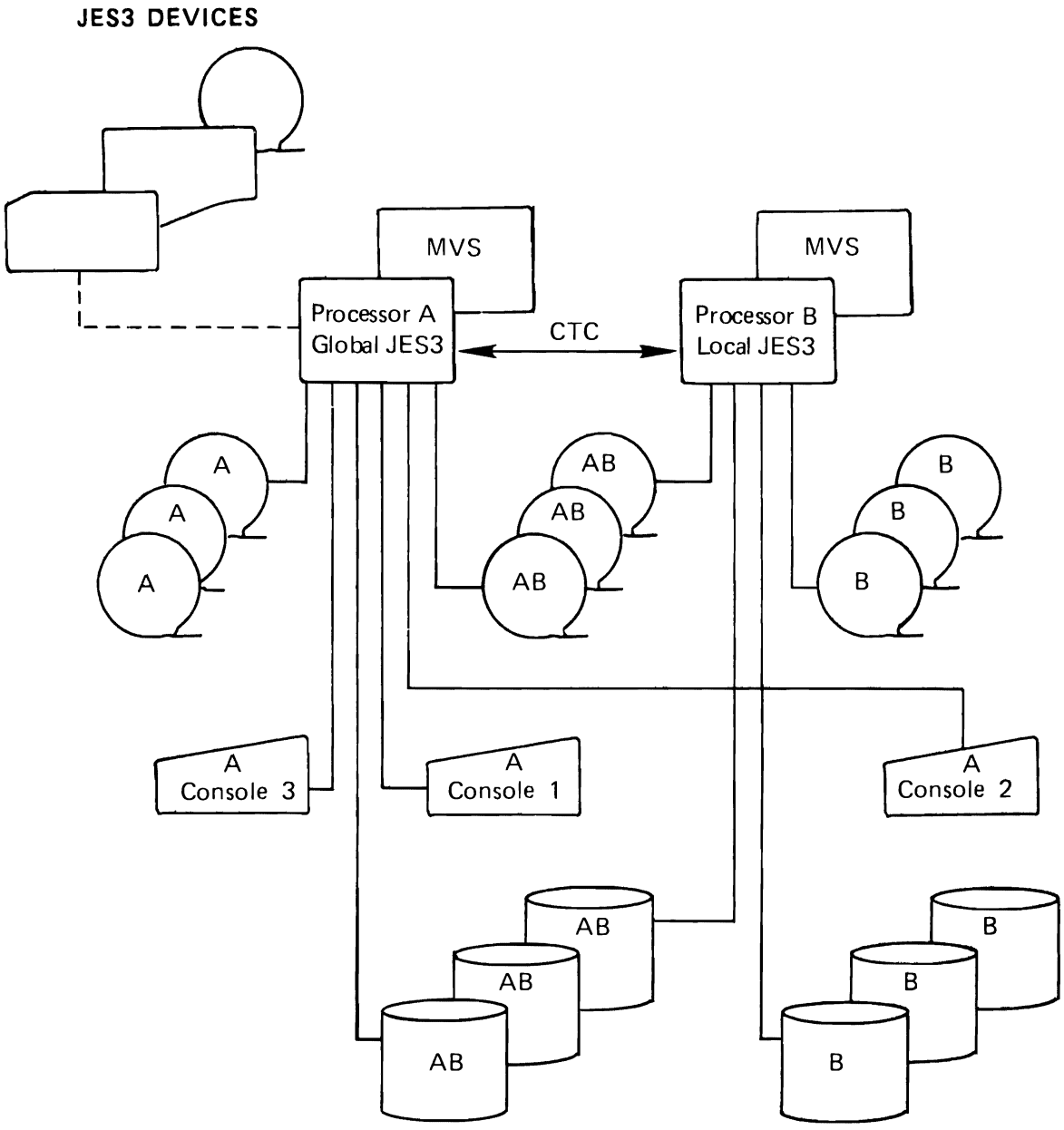
A – COMPILE WORK, HIGH I/O RATE
B – TEST, LESS THAN 5 MINUTES
C – PRODUCTION, HEAVY CPU REQUIREMENT
E – NON SETUP, MAXIMUM 5000 PRINT LINES
F – NON MVS JOB
G – NORMAL PRODUCTION WORK

SPOOL



- DEVICE 3330/3340
- UP TO 31 VOLUMES
- SPOOL FORMATTING
- BAD TRACKS EXCLUSION

JES3 MANAGED DEVICES



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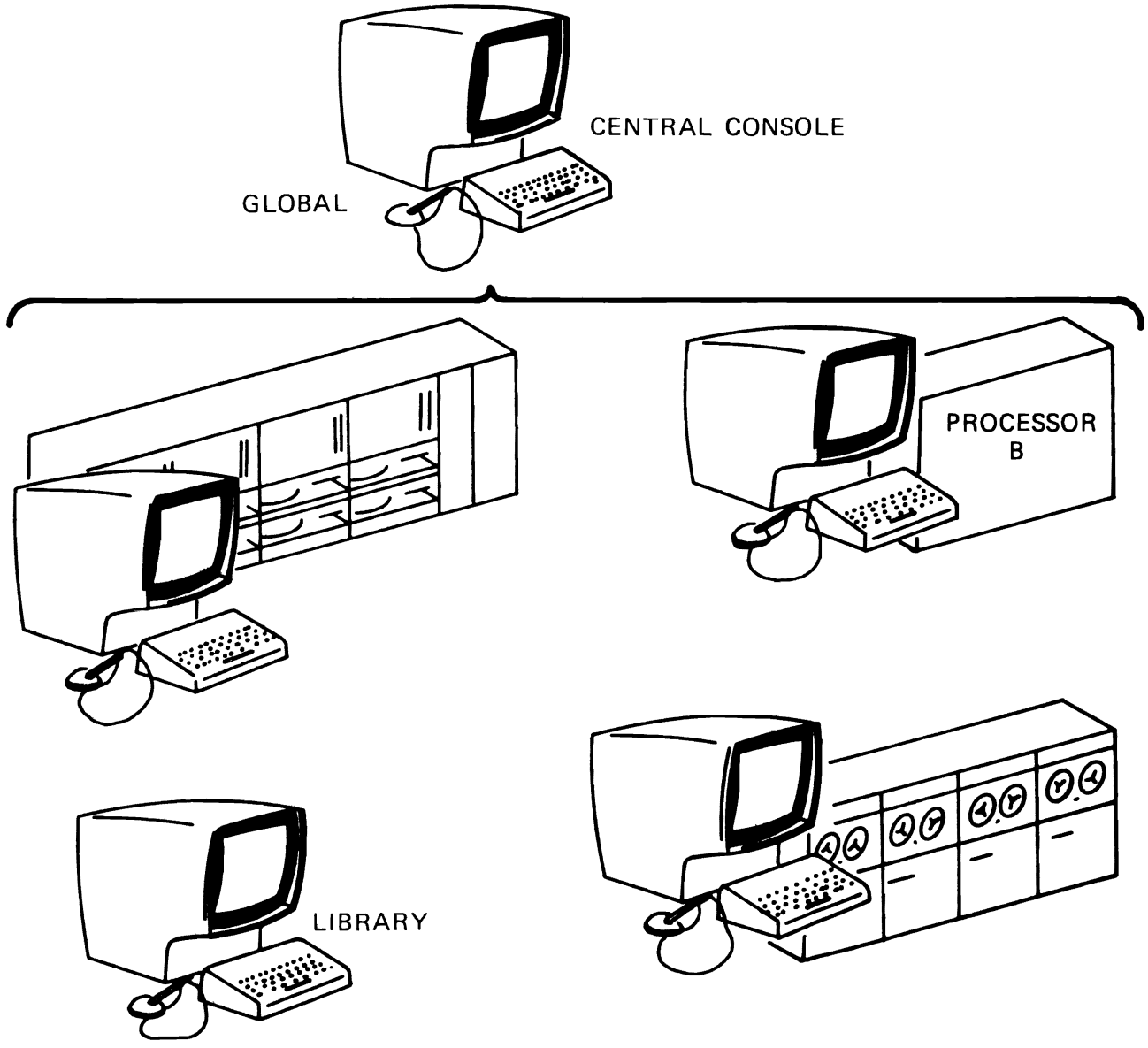
JES3 DEVICE MANAGEMENT

- JES3 MANAGED DEVICES
  - FUNCTION
    - JES3 DEVICES
    - EXECUTION DEVICES
  - TYPE
    - UNIT RECORD
    - GRAPHIC
    - TAPE
    - DASD
- JES3 MANAGEMENT
  - DEVICE STATUS
  - ALLOCATION
  - DEALLOCATION

V.4.9/H.4.8

CONSOLE FUNCTIONS



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INPUT SERVICE FEATURES

- TYPE OF DEVICE
  - UNIT RECORD
  - TAPE
  - DASD
  - REMOTE TERMINAL
  - TSO (SUBMIT)
  - INTERNAL READER
- BATCH SIZE BY OPERATOR
- OPERATION CONTROL BY OPERATOR
  - START
  - STOP
  - INQUIRY
  - MODIFY

V.4.11/H.4.10

C/I, R/I FEATURES

- MULTIPLE ACTIVE C/I, R/I
- PRIVATE PROCEDURE LIBRARY
- FREQUENT PROCEDURE USAGE
- DYNAMIC CATALOG MOUNTING

JES3 DEVICE ALLOCATION

TRADITIONAL ALLOCATION

- ALLOCATION BY JOBSTEP
- DEVICES UNAVAILABLE (WAIT OR CANCEL)
- HELD RESOURCES (DATASETS, INITIATOR, ETC.)

JES3 ALLOCATION

- ALLOCATION BY JOB
- PRIOR TO JOB EXECUTION
- RESOURCES NOT HELD
- EARLY DEVICE RELEASE

JES3 SETUP

JOB

- ALL REQUIRED DEVICES
- NO MOUNTING/DEMOUNTING

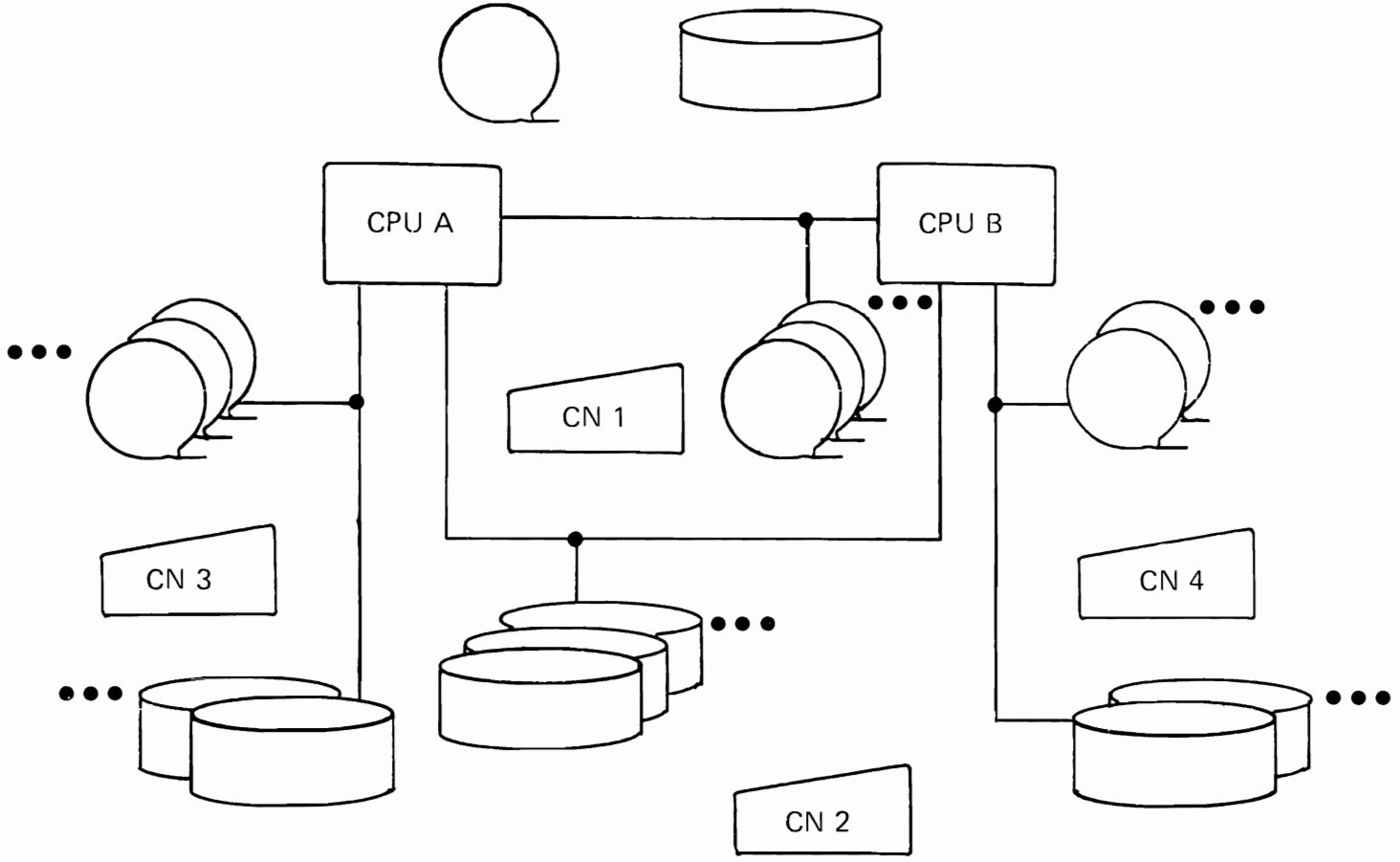
HIGH WATERMARK (HWS)

- MINIMUM REQUIRED DEVICES
- FEWER DEVICES THAN "JOB"

EXPLICIT

- USER SPECIFIED
- COMPROMISE OF "JOB" AND "HWS"

MAIN DEVICE SCHEDULING (SETUP)



- FETCH and MOUNT messages
- VERIFICATION WHEN DEVICE READIED
- EARLY DEVICE RELEASE
- DEVICE POOLING

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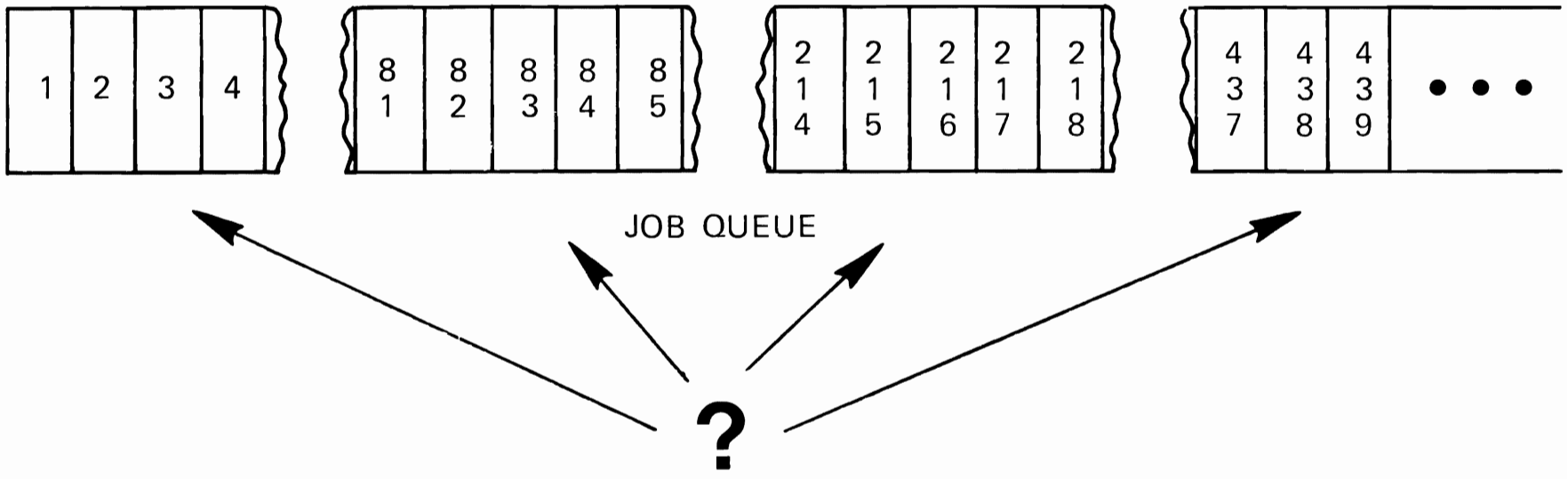
GENERALIZED JOB SELECTION



WHICH JOB SHOULD RUN NEXT?

- CONTROL OF WORKLOAD
- MAXIMIZE THRUPUT
- TIMELINESS OF CRITICAL OUTPUT
- OPTIMUM USE OF RESOURCES
- PERFORMANCE

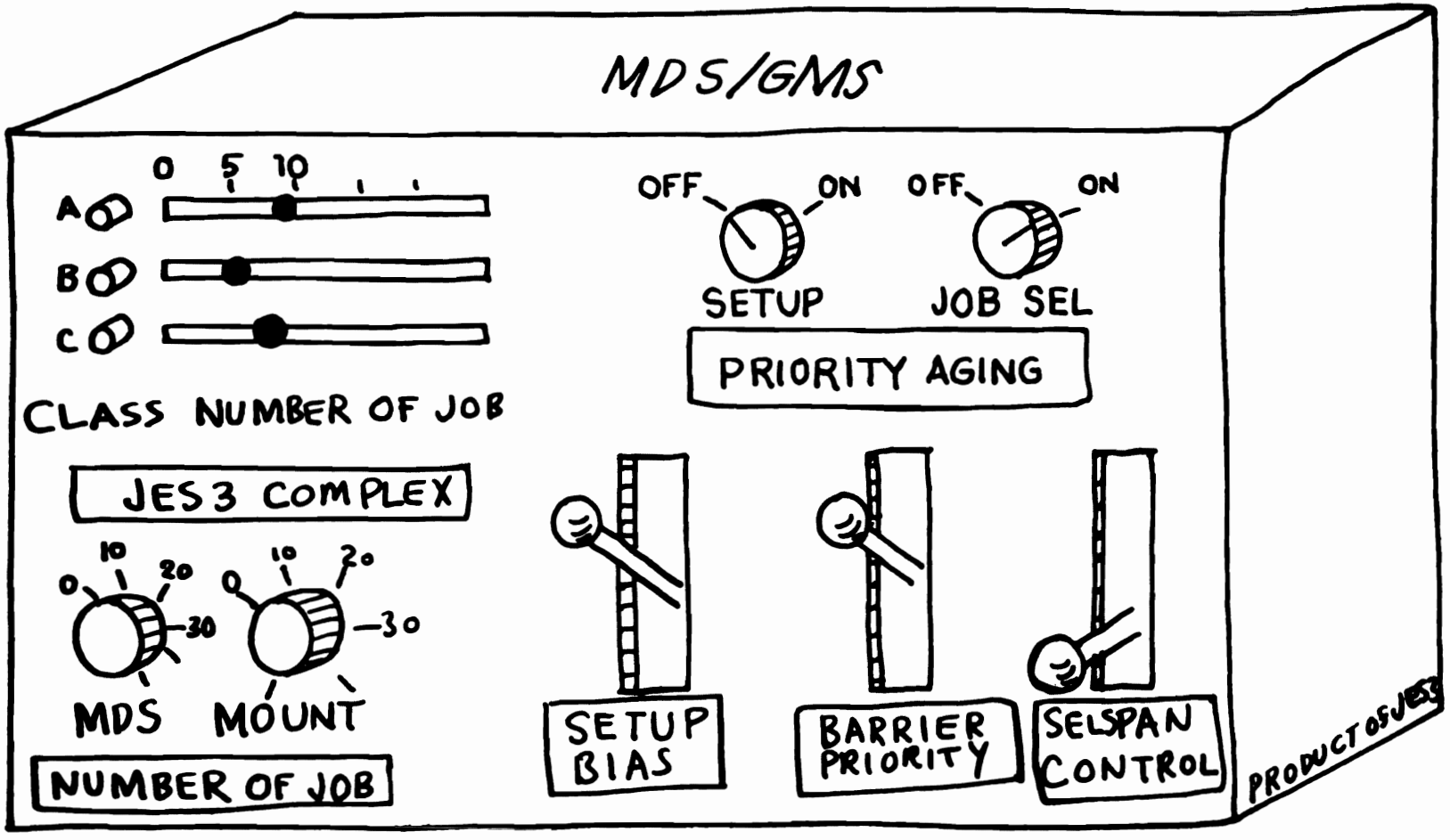
i.e. HOW SHOULD "SELECTION" WORK?

V.4.16/H.4.15

GENERALIZED JOB SELECTION

- PRIORITY
- PROCESSOR DEPENDENCY
- LOGICAL STORAGE SIZE
- MIX OF CLASSES
- MIX OF IO/CPU USAGE
- INITIATOR AVAILABILITY
- SEQUENCING OF RELATED JOBS
- DEADLINES FOR SPECIFIC JOBS

JES3 FINE TUNER



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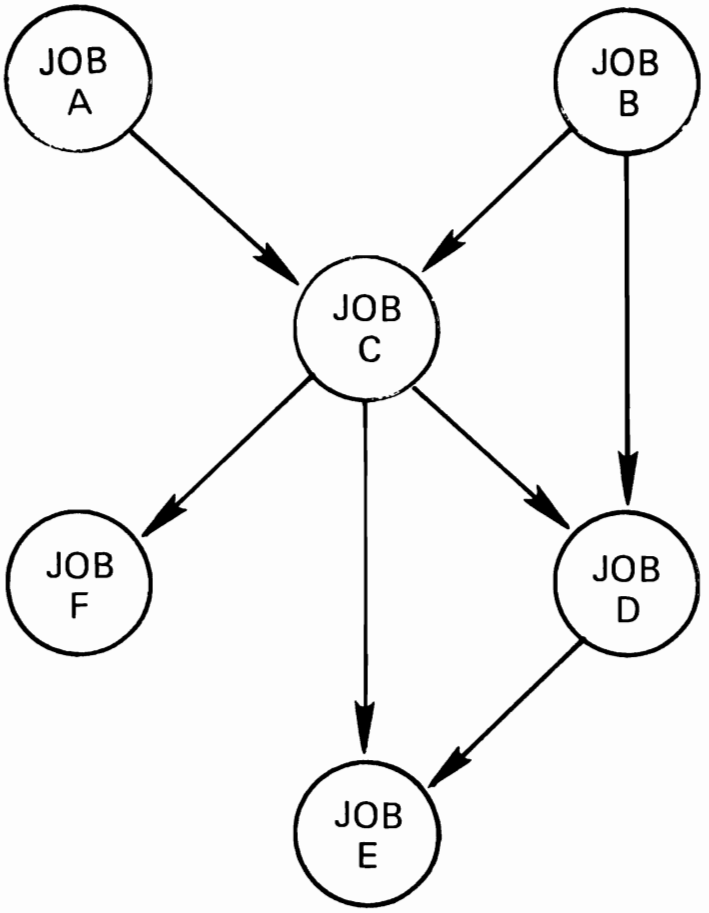
V.4.19/H.4.18

JES3
ADVANCED SCHEDULING TECHNIQUES

- DEPENDENT JOB CONTROL
- DEADLINE SCHEDULING
- NETWORK JOB PROCESSING

DEPENDENT JOB CONTROL

NETID=MONTHEND



- DJC NETWORKS
- NORMAL/ABNORMAL PATHS
- OPERATOR INQUIRY/CONTROL
- EARLY RELEASE VIA WTO

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DEADLINE SCHEDULING

- DEADLINE TYPES

  HOW CRITICAL
  "AGEING" RATE

- BY CLOCK TIME

BY 10:00, MONDAY
PLEASE

- BY ELAPSED TIME

- AUTOMATICALLY MONITORED

- OPERATOR NOTIFICATION

V.4.21/H.4.20

EXECUTION MONITORING

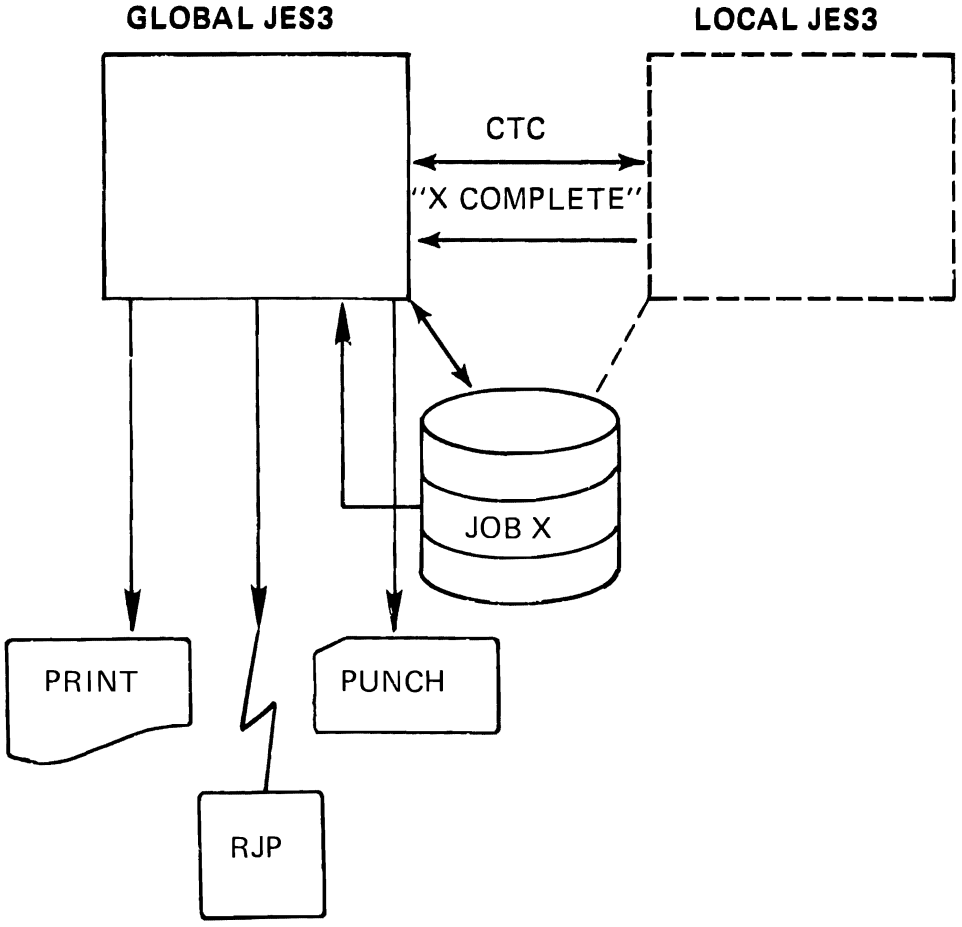
AUTOMATIC FAILURE PROCEDURE

- CANCEL
- HOLD
- PRINT
- RESTART

OUTPUT VOLUME LIMIT (CARDS/LINES)

- CANCEL
- DUMP
- WARNING

OUTPUT PROCESSING



- ASYNCHRONOUS PRINT/PUNCH
- DESTINATION BY GROUP, STATION, DEVICE
- OUTPUT SELECTION BY LINES, FORMS, DESTINATION,...
- SPUN–OFF DATA SETS
- SMF

PRINT SERVICE

- MINIMIZE OPERATOR INTERVENTION
  OR
  USE FIRST DEVICE

- PRINTER CHECKPOINTS
  AND
  RESTART

- SPECIAL FORMS, PRINT TRAINS, ETC.

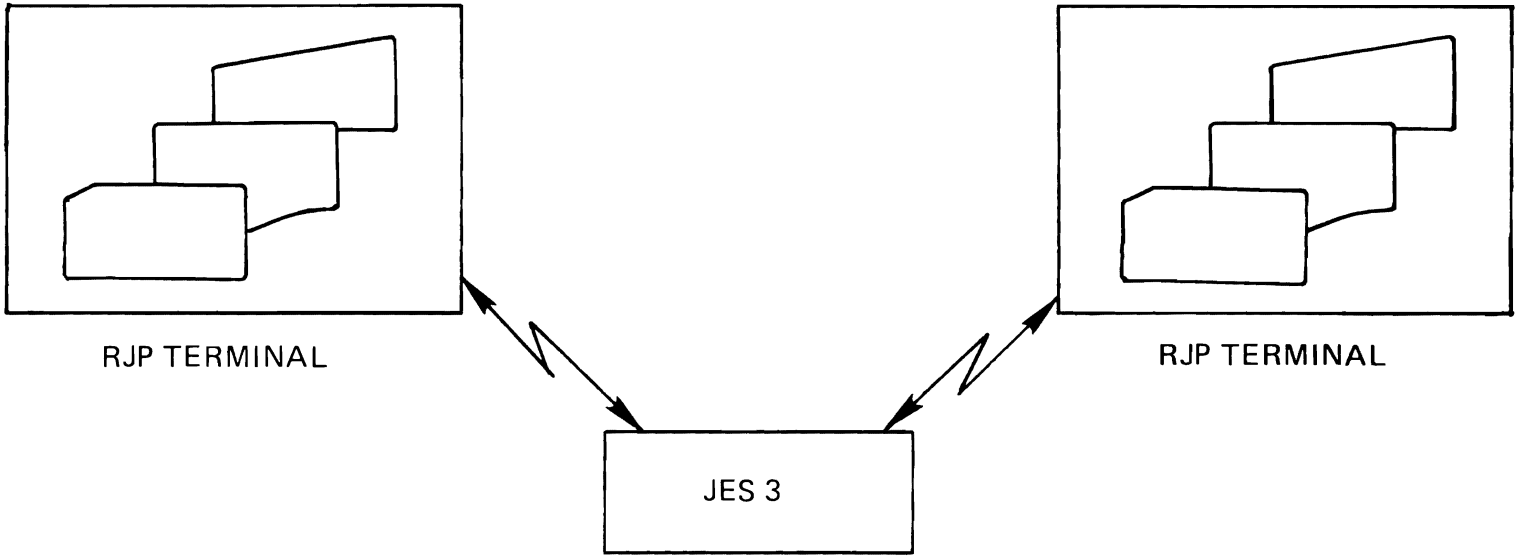
- MULTIPLE COPIES

PUNCH SERVICE

- SPECIAL CARD FORMS

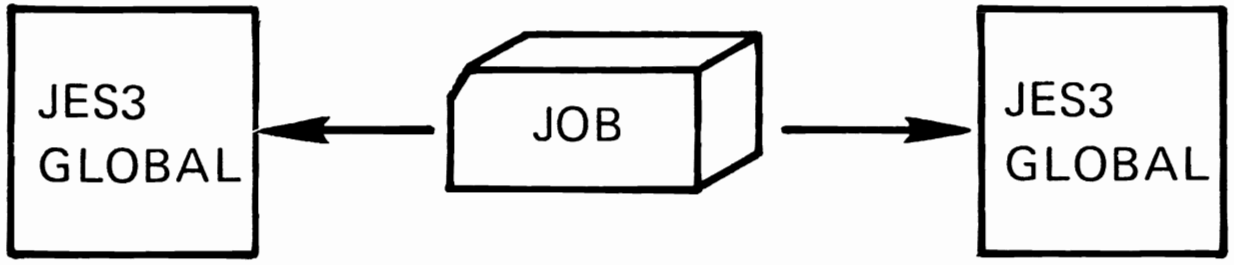
- MULTIPLE COPIES

REMOTE JOB PROCESSING



- LOGICAL EXTENTION OF READER/PRINTER/CONSOLE AT LOCAL FACILITY
- NONPROGRAMMABLE (2770, 2780) AND PROGRAMMABLE (S/3, S/370) TERMINAL
- INTERLEAVING MODE
- PASSWORD PROTECTION
- REMOTE CONSOLE SUPPORT
- REMOTE OPERATOR CONTROL

NETWORK JOB PROCESSING



- JES3–to–JES3
- ENTIRE JOB OR PORTION OF IT
- OPERATOR INITIATED

JES3 USER INTERFACE

Module 5

Teaching Strategy: The intent here is to define the use of the JES3 control cards and to present the functions provided. There should be no effort to demonstrate how to "code" the individual parameters on the control statements. The control card illustrations on the visuals are designed to present the function and not the particulars of usage.

Objectives: Upon successful completion of this topic, the student should be able to:

1. Identify the job control cards relative to JES3 processing.
2. State the general functions of the JES3 control cards.
3. Describe the attributes of a non-standard job.
4. Describe JES3 control cards to invoke and manage:

    - o Deadline Scheduling
    - o Dependent Job Control
    - o In-Stream Data
    - o Job Output

Time Estimate: Approximately one hour is required to present this topic.

Outline:

A. Functions

1. Job Control
2. Overriding Standards
3. Special Facilities
4. Control Card Types
5. Processing Options

B. Deadline Scheduling

1. Deadline Specification
2. Deadline Usage

C. Non-Standard Job

1. Definition and Usage
2. Considerations

D. Dependent Job Control

1. Definition

2. Usage

E. In-Stream Data

F. Job Output Control

JES3 USER INTERFACE

Instructor Note: The objectives are to have students understand what and how they can control the job through the input job stream, not how to specify the JES3 control cards. The same approach as the previous section, 'Features and Options' will be applied. Therefore, the kind of control information we can give to JES3 is emphasized.

Although JES3 control cards are an important tool to control, the use of some of them would be rare if the installation has well defined standards; the dependent job and the deadline job are examples which must have the JES3 control cards.

The topic is arranged in sequence by the introduction of the control cards at first, and then the application (functions) of them by showing some typical examples.

For instructor's easy preparation, some sections contain the detail description of the control cards and corresponding initialization cards. The instructors should take care that the presentation is not confusion due to too much (detail) explanation. For further information to instructors, JCL and Job Management manual are available.

V.5.1

A. Functions

As mentioned in the previous section, JES3 will have a lot of options through the initialization process. Sometime, however, it is desirable to modify the selected options. Some features like DJC are not specified in the initialization, but the user can take advantage of them through preparing the JES3 control cards. For the instructor's reference, the initialization specification will be given.

V.5.2

1. Job Control

When the user submits the non-standard jobs, the user has to inform JES3 of it by //*PROCESS cards. Picking up this information in the input

stream, JES3 constructs the designated job scheduler element internally.

Examples of non-standard job (i.e., job control) are:

- o Network Job Processing (//*PROCESS NJPIO and //*FORMAT NJPIO)
- o Scheduling user's DSPs (//*PROCESS)
- o Omitting some of the standard segments (CBPRINT)

2. Overriding Standards

It may be necessary for the programmer to override the installation standards which have been established at initialization.

Examples are:

- o Print Form (//*FORMAT)
- o Setup Method (//*MAIN)
- o Failure Procedure (//*MAIN)

3. Special Facilities

Invoking the JES3 facilities below is this type of the control card usage.

- o Dependent Job Control (//*NET)
- o Deadline Job Scheduling (//*MAIN)
- o Network Job Processing (//*PROCESS NJPIO)

V.5.3

4. Control Card Types

There are ten types of JES3 control cards.

a. //*MAIN - processor dependency and a variety of processing options such as output volume limitation, setup method and I/O rate.

   Deadline scheduling is invoked by this card, also.

b. //*FORMAT - output options to override the initialization specification, such as forms, trains, number of copies, etc.

c. //*DATASET and DATASETEND - creation of additional input data in the job stream.

d. //*PROCESS and ENDPROCESS - specifies a non-standard job. The only parameter is the name of DSP to process the stage. If there

are any //*PROCESS cards in the job stream, JES3 will create non-standard job scheduler segments. The standard job consists of the following segments:

```
//*PROCESS   CI (or RI)
//*PROCESS   MAIN
//*PROCESS   OUTSERV
//*PROCESS   PURGE
```

e. //*NET - specifies dependent job control. All the jobs which have the same NETID will be grouped and JES3 controls the sequence of job execution as specified.

f. Other Control Cards

1) Command - except DUMP and RETURN users can put any JES3 commands in the job stream before the first job card. No specific time of execution for the command should be anticipated.
2) OPERATOR - the entire text from col 1 to 80 will be displayed on LOG console for the operator's reference. (LOG is a destination class to which certain JES3 messages are to be routed.)
3) PAUSE - used to halt the input reader for operator reply; primarily used for checkout and test, and placed before the JOB card.

V.5.4

5. Processing Options

The processing options other than output operation, are specified by //*MAIN card.

a. Processor Dependency - the job should be executed on specific processor and/or operating system (specified by CLASS initialization card).

```
SYSTEM=ANY,JGLOBAL,JLOCAL,ASP
       or specific processor name(s);
       which also has "not"-option.
TYPE=ANY,MVT,VS2/1 or VS2
```

b. Overriding Standards (specified by STANDARDS initialization card)

```
LINES=   output volume limitation
CARDS=
```

c. Job Related Attributes

SETUP=JOB,HWS,DHWS,THWS or ddname(s)
which also has "not"-option.
(STANDARDS)

IORATE=MED,HIGH or LOW (CLASS)

Invoking the Processing Feature -
such as:

DEADLINE= this job is a deadline job (corresponds to DEADLINE initialization card.)

Other parameters are shown below for instructor reference:

HOLD - job to hold queue
CLASS(CLASS) - job class
FAILURE(STANDARDS) - failure processing
JOBSTEP(STANDARDS) - checkpoint at every job step.
NJPCLASS(STANDARDS) - class for NJP
HOTJOB(STANDARDS) - endless job (ASP)
ORG(DEVICE) - original device which job comes from
FETCH(SETPARM) - fetch messages at setup time
JPRTY(CLASS) - job priority (ASP)
LREGION(CLASS) - working set size
PROC(PROC) - procedure library used
UPDATE - if proclib update
RINGCHECK - if ringcheck on tapes

V.5.5

B. Deadline Scheduling

The concept of Deadline Scheduling has been introduced in the previous topic. Here we will discuss about how such scheduling options can be specified; this is one of the JES3 control card applications.

JES3 tries to complete the job by the specified time, but as mentioned before, this is attained by taking advantage of job priority manipulation. Sometimes it will be complete at the specified time, before that time or after that time.

1. Deadline Specification

JES3 allows users to define up to 36 different types (A-Z, 0-9) of the algorithm through the initialization cards (DEADLINE). The different types define the different algorithms (exactly

speaking, the same algorithm but the different parameters to be affected) such as:

- Initial Priority - when the stated leadtime arrives, the job priority will be raised as specified. The users can specify either the absolute new priority or an increment value to be added to the original one.
- Leadtime - by definition, how many hours before the deadline time. The initial priority should be set. From the user's point of view, it could say the job's expected execution time.
- Another Priority Control - after the initial priority setting, the users have more control techniques, if necessary. At every defined interval, the users can increase the priority by the defined increment, until it reaches its limit priority (which is specified by the CLASS/GROUP initialization cards).

2. Deadline Usage

Once the users have defined the types of deadline scheduling through the initialization process (the operator can modify them dynamically, in addition), the users can specify their requirement through JES3 control card. The //*MAIN DEADLINE has such parameters as:

- Type - which type to be applied to this job.
- Deadline Time - self explanatory.

These parameters below are optional:

- Date - when job to be scheduled, or cycle and nth day of the cycle - for example, the user can schedule the job on the second day (Tuesday by JES3 definition) every week.

V.5.6

For a better understanding of the algorithm and, the initialization and DEADLINE parameter on the //*MAIN card, this visual might be of help. It is simply another way to present the DEADLINE facility.

V.5.7

C. Non-Standard Job

As mentioned in the "JES3 Job Flow" topic, JES3 has been designed to define the job scheduler segments and to schedule each segment (also called a "function") one by one in defined sequence. This concept leads to the idea that if you can define your segments and sequence, JES3 will process accordingly.

1. Definition and Usage

//*PROCESS cards tell JES3 what segments to be defined and the program (DSP) which handles the segment. The general format is:

```
//*PROCESS   dsp-name
```

Some of the DSPs are provided by IBM (ex. CI, MAIN, OUTSERV, PURGE, etc.); others must be defined by the users and be a member of DSP directory in JES3 job library.

The primary purpose of these DSPs is for job processing control, not job execution; CI for the interpretation of the JCLs and building the internal control blocks for later processes; MAIN for the device setup and the job selection for execution; therefore, //*PROCESS cards will be used as:

```
//*PROCESS   CI
//*PROCESS   CBPRINT (IBM Supplied DSP)
```

This example is three segment job (PURGE is automatically included), which enables the users to get information of the interpreted control blocks on JES3OUT data set (which is defined at the JES3 initialization time for JES3 job, not for users' - see JES3 Procedure).

In this case, neither MAIN nor OUTSERV is scheduled because of absence of these segments. (One of the other typical examples is NJP processing.)

Sequencing is the other point. JES3 job processing has the implicit sequence, that is CI-MAIN-OUTSERV-PURGE. Although some of them may be omitted, some DSPs may be added among them and may replace the IBM supplied DSPs (for example, your MYMAIN instead of MAIN).

In summary:

- //*PROCESS cards tell JES3 that this is a non-standard job
- In this case, you have to include all the //*PROCESS cards you want to process explicitly, except PURGE which will be included by JES3 as a last segment automatically, and
- Dependency among some cards - implicit

sequence should be observed. In NJP, //*FORMAT NJP must follow immediately after the //*PROCESS NJPIO.

2. Considerations

Although the primary purpose of the non-standard job is for job processing control, not for job execution, the users can take advantage of the feature for job-execution-like purpose. The visual shows that after the normal output processing, the additional function to be processed by user's DSP (PLOT) will be scheduled. The parameters for the DSP will also be included according to the DSPs convention.

Note that PLOT DSP will be executed in JES3 address space and not the user's address space. The user could do this PLOT, for example, as an additional job step in the job.

Some of the considerations are:

- Normally JES3 has higher priority
- In addition, DSP will be scheduled more efficient than the job execution - that is, faster processing
- However, the users' DSP failure could cause the system failure, not users' job failure, which might be catastrophic.

D. Dependent Job Control

There will be a lot of installations that want to have such a scheduling technique as a job should be scheduled after others are complete (dependency). One of the typical examples is the monthly closing operation in the business administration.

V.5.8

1. Definition

JES3 provides this facility and the users can apply by specifying the //*NET cards in the input job. The important information on the //*NET card:

- This job is a member of related (dependent) job group (NETID or ID).
- What the proceeding jobs are (RELEASE or RL) and how many (NHOLD or HC).

V.5.9

2. Usage

It is an easy way to define the jobs in the

network and write //*NET card for each job. In this visual, the job network in the previous visual is shown in the representation of //*NET card. The first job (which has no predecessors) has HC=0 specification; the final jobs have no RL specification (which means no successors will be scheduled after those jobs). When JES3 reads input job stream, it will pick up the jobs with the same NETID and will group them. According to the information on the //*NET cards, each job will be scheduled by JES3. (This facility does not relate with any initialization specification, exactly speaking, except DEVPOOL).

For the instructor's reference, the complete operands on //*NET will be given below:

- NETID(ID) - network identification
- RELEASE(RL) - what are the preceeding jobs (predecessor)
- NHOLD(HC) - number of predecessors
- NORMAL - what kind of action when predecessors complete normally (Decrement NHOLD, Flush this job or Retain this job)
- ABNORMAL - same as NORMAL except completed abnormally
- OPHOLD - whether operators release or automatic
- RELSCHCT - setup before all the predecessors are complete
- NETREL - inter-relation with other nets
- DEVPOOL - allocate device from this pool
- DEVRELSE - and when devices are released

V.5.10

E. In-Stream Data

This is an additional facility to include data in the input job stream.

Usually, the input data in the job stream will be specified in the form of //ddn DD *(or DATA). In-Stream Data can do the same functions - through //*DATASET and //*ENDDATASET cards. This would be useful when:

- The users do not want to change JCL specification but need to change temporarily (one time)
- The data is to be processed by a DSP other than by users' job

The example on the visual shows how //*DATASET will be placed in the job stream. In this case, the In-Stream Data will be processed by a DSP (OUTSERV) and will be printed by Output Service.

F. Job Output Control

If you will follcw the installation standards specified by the initialization deck, nothing additional need be indicated. However, it may be possible that you want to apply different output specifications (temporarily) without changing any JCLs. By using //*FORMAT cards, you can accomplish this.

There are four types of FORMAT.

AC - TSO user data set on ASP
NJP - used for NJP
PR - printing
PU - punch

Each of these has own parameters - PR parameters will be used as an example.

CONTROL(SYSOUT) - line spacing control
COPIES(SYSOUT) - number of copies
FORMS(STANDARDS) - forms for printing
FCB(STANDARDS) - lines/inch
CARRIAGE(STANDARDS) - lines/inch
TRAIN(STANDARDS) - printer train used
OVFL(SYSOUT) - overflow control
DEST(SYSOUT) - destination devices for output

There are a lot of information sources to define the options. The hierarchy is as follows:

//*FORMAT

// DD

CLASS

JCL

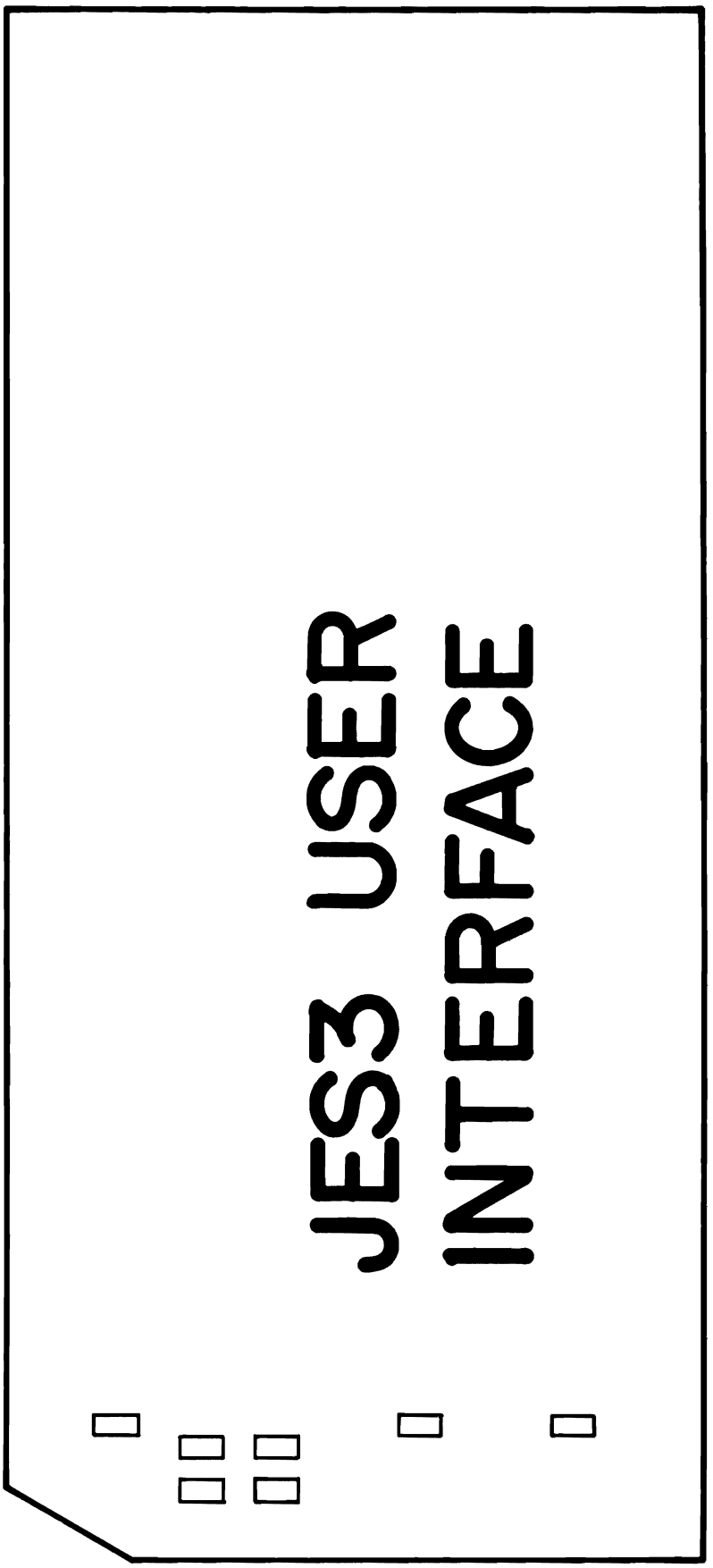
STANDARDS

This means that if there is no specification in //*FORMAT card, JES3 tries to find them in DD cards, etc. FORMS specification may also be in the SYSOUT card.

Instructor Note: In concluding this topic, you may choose to use visuals V.5.2 and V.5.3.

LIST OF VISUALS

VISUAL NO.	HANDOUT NO.	DESCRIPTION
V.5.1		JES3 User Interface
V.5.2	H.5.1	JES3 Control Cards
V.5.3	H.5.2	Control Card Types
V.5.4	H.5.3	Processing Options
V.5.5	H.5.4	Deadline Scheduling
V.5.6	H.5.5	Deadline Scheduling
V.5.7	H.5.6	Non-Standard Jobs
V.5.8	H.5.7	Dependent Job Control
V.5.9	H.5.8	Dependent Job Control
V.5.10	H.5.9	In-Stream Data
V.5.11	H.5.10	Job Output Control


JES3 USER
INTERFACE

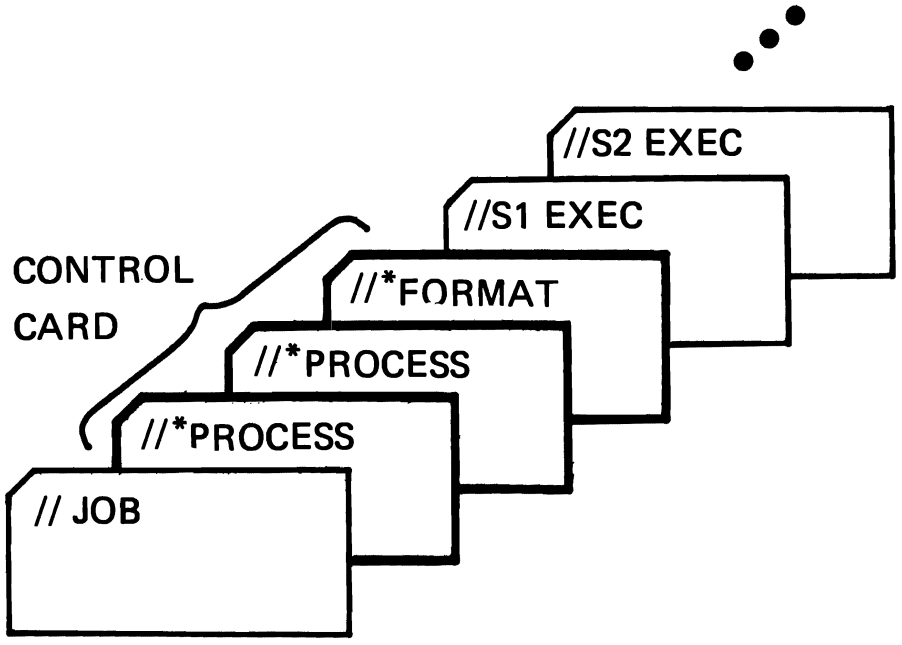
JES3 CONTROL CARDS

SPECIFIED BY THE USER FOR:

- SPECIALIZED CONTROL OF A JOB
  (EX: NON-STANDARD JOB)

- OVERRIDING INSTALLATION DEFAULTS
  (EX: PRINTER FORMS)

- INVOKING OPTIONAL JES3 FACILITIES
  (EX: DEPENDENT JOB CONTROL)



CONTROL CARD TYPES

//*MAIN	– PROCESSING OPTIONS
//*FORMAT	– OUTPUT OPTIONS
//*DATASET	– INPUT STREAM DATA SET
//*PROCESS	– NON-STANDARD JOB
//*NET	– DEPENDENT JOB CONTROL
//*OPERATOR	– OPERATOR MESSAGE
//*PAUSE	– HALT INPUT READER
//*command	– COMMAND EXECUTION

PROCESSING OPTIONS

//*MAIN

- PROCESSOR DEPENDENCIES
- OVERRIDE SYSTEM STANDARDS
- JOB RELATED ATTRIBUTES
  - DEADLINE SCHEDULING
  - FETCH
  - I/O ACTIVITY

EXAMPLE

```
//FIRST   JOB  . . .
//*MAIN   SYSTEM=JLOCAL,TYPE=VS2,CLASS=LOWIO,ORG=TESTGP

//SECOND JOB  . . .
//*MAIN   SYSTEM=SY1,LINES=(20,CANCEL),IORATE=HIGH,
                  JOBSTEP=CHKPNT,PROC=02

//THIRD   JOB  . . .
//*MAIN   SYSTEM=ANY,FAILURE=CANCEL,FETCH=MYDD
        .
        .
        .
        .
//MYDD    DD   DSN=MYDATA,UNIT=3330,VOL=SER=MY3330,
                                  DISP=OLD
```

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DEADLINE SCHEDULING

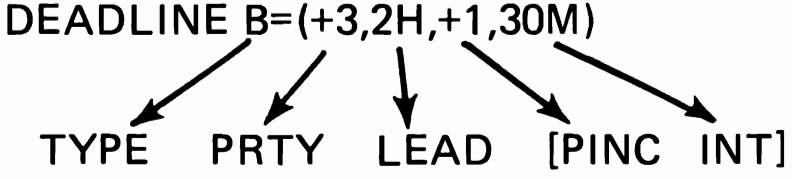
ENHANCE A JOB'S OPPORTUNITY FOR SCHEDULING
BY A SPECIFIED DEADLINE TIME

UP TO 36 DIFFERENT DEADLINE TYPES

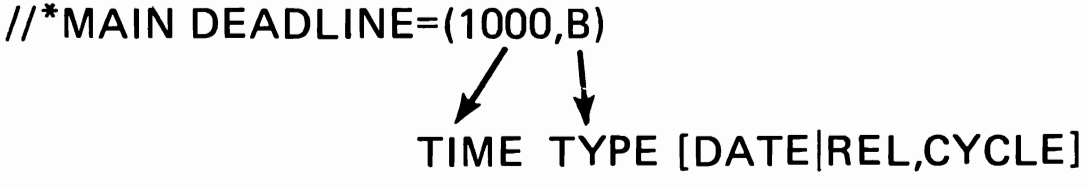
USER SPECIFIES DEADLINE TIME AND TYPE

V.5.5/H.5.4

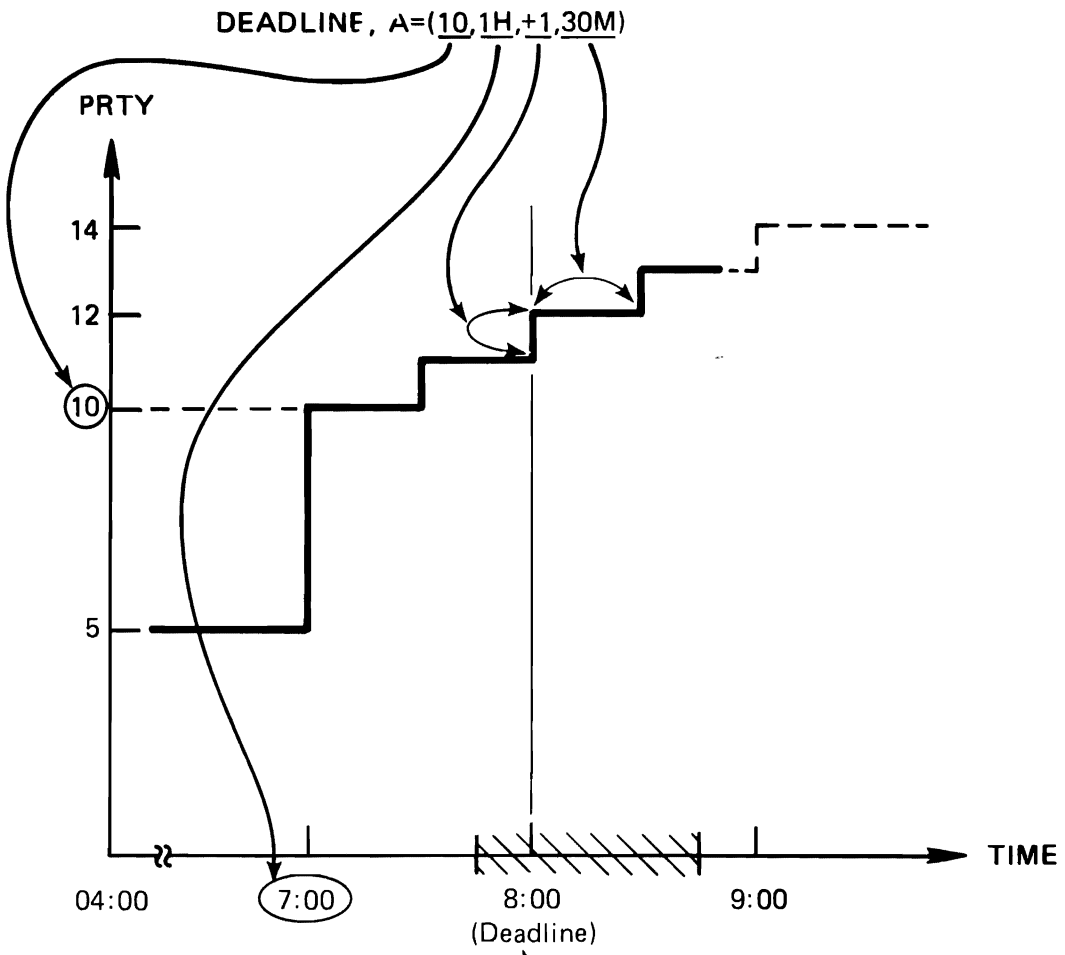
INIT CARD EXAMPLE



USER EXAMPLE



DEADLINE SCHEDULING



(SUPPOSE JOB STARTED 7:40 AND FINISHED 8:45)

NON-STANDARD JOBS

```
//*PROCESS
```

INCLUSION OF PROCESS CARD(S) DEFINES A NON-STD JOB
USER MUST SPECIFY EACH FUNCTION, EXCEPT PURGE, WHICH
IS TO PROCESS THE JOB
SOME CARDS ARE SEQUENCE DEPENDENT

EXAMPLE

```
//EXAM5  JOB  . . . . . .
//*PROCESS CI
//*PROCESS MAIN
//*PROCESS OUTSERV
//*FORMAT PR,DDNAME=DATA1, . . . . . .
//*PROCESS PLOT                              (A USER WRITTEN DSP)
PARM1,PARM2,PARM3, . . . . . .
//*ENDPROCESS
//         EXEC  PGM=MYPGM
//DATA1   DD   SYSOUT=A
//DATA2   DD   SYSOUT=P
//INPUT   DD   . . . . . .
```

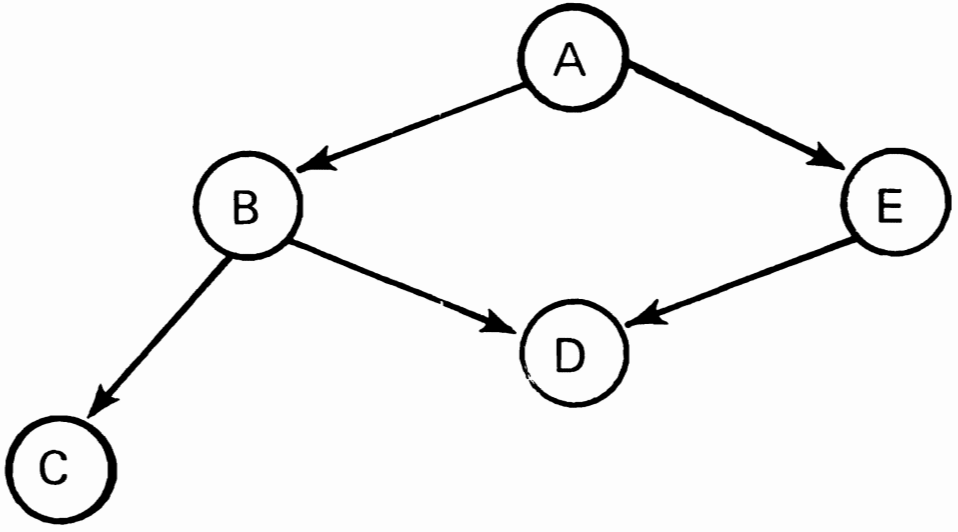
DEPENDENT JOB CONTROL

//*NET

DEFINE A JOB WITHIN A NETWORK OF JOBS

SPECIFY THE RELATIONSHIPS OF THE DEPENDENT JOBS

ACCT NET



EXAMPLE ON NEXT VISUAL FOR THIS NODE DIAGRAM

DEPENDENT JOB CONTROL

DJC EXAMPLE

```
//A  JOB . . . . . .
//*NET HC=0,RL=(B,E),ID=ACCT
          .
          .
//B  JOB . . . . . .
//*NET HC=1,RL=(C,D),ID=ACCT
          .
          .
//C  JOB . . . . . .
//*NET HC=1,ID=ACCT
          .
          .
//D  JOB . . . . . .
//*NET HC=2,ID=ACCT
          .
          .
//E  JOB . . . . . .
//*NET HC=1,RL=(D),ID=ACCT
          .
          .
```

IN-STREAM DATA

//*DATASET

- ALLOW USER TO SUPPLY SET OF IN-STREAM DATA FOR SPECIAL USAGE
- OS JCL IS ALLOWED IN THE DATA
- DATA MAY BE PROCESSED BY EITHER AN OS JOB OR A DSP:

A SINGLE TIME, OR
MULTIPLE TIMES

```
//*DATASET    DDNAME=MYPRINT
            data cards
//*ENDDATASET
//*PROCESS OUTSERV
//*FORMAT     PR,DDNAME=MYPRINT,COPIES=5
```

JOB OUTPUT CONTROL

//*FORMAT

ADDITIONAL OR OVERRIDE CONTROL OF OUTPUT:

DESTINATION

FORMS, CARRIAGE, TRAIN

SPECIAL HANDLING FOR:

NETWORK JOB PROCESSING

TIME SHARING OPTION

EXAMPLE

```
//EXAM2     JOB . . . . . .
//*FORMAT PR,DDNAME=OUTPUT,FORMS=ABCD,COPIES=4
//STEP1     EXEC  . . . . . .
//INPUT     DD  . . . . . .
//OUTPUT    DD  SYSOUT=C
//INPUT2    DD  . . . . . .
```

JES3 CONSOLES

Module

Teaching Strategy: JES3 Consoles was included as a stand-alone topic because of its relevance to the total system and also because of the amount of time to be given to the topic. Also, it does not conveniently fit into the job flow sequence organization used in presenting other JES3 features. The design of JES3 consoles extends far beyond the normal MCS implementation - hopefully the student will appreciate those operational aspects of JES3 console support relative to his prior knowledge of operating system consoles.

Objectives: Upon successful completion of this topic, the student should be able to:

1. Describe the following features and facilities of JES3 Consoles:
   - o Functional Consoles
   - o Automatic Switching
   - o RJP Workstation Console
   - o Master Log
   - o Message Characteristics
   - o Command Characteristics
2. State the operational procedure involved in GLOBAL initialization.
3. State the operational procedure involved in LOCAL initialization.
4. Explain the operational control features provided by JES3 consoles.
5. Name and describe the function of certain JES3 background utilities.

Time Estimate: Approximately one hour will be required to present this topic:

Outline:

A. JES3 Console Environment
   1. MCS Requirement
   2. JES3/MVS Commands
   3. GLOBAL/LOCAL Communication

B. Console Facilities
   1. Functional Consoles
   2. Automatic Switching

3. RJP Workstation Console
4. Master Log (MLOG) Feature
5. Command Characteristics
6. Message (Response) Characteristics

C. Console Operations

1. GLOBAL Initialization
2. LOCAL Initialization
3. Operator Control
4. Background Utilities

D. Summary

1. Functional Consoles
2. Total Processor Communication
3. JES3/System Commands
4. Extensive Command Capability
5. Background Utilities

V.6.1-
V.6.2

A. JES3 Console Environment

The intent of visual V.6.2 is to point out three aspects of the MVS/JES3 console environment and to provide an overview relative to the implementation of JES3 consoles.

Instructor Note: You may desire at the beginning of the topic to outline on the chalkboard the areas to be discussed in the topic. The four areas are:

- o JES3 Console Environment
- o Console Facilities
- o Console Operations
- o Summary

As you document these on the chalkboard, you should very generally mention what these areas will address.

1. MCS Requirement

Each processor in the MVS environment must have a minimum of one MCS console physically attached to it. This provides a means to IPL, invoke the DSI feature of JES3 and also to utilize consoles for certain application purposes if desired. Notice that ASP Main does not have this requirement.

2. JES3/MVS Commands

There is a distinction made between a JES3 command and an MVS command from a system standpoint. Perhaps here we should introduce the functional console concept provided by JES3, although in the following section it will be discussed more.

As the visual indicates, attached to the GLOBAL processor are functional consoles. Generally, these consoles communicate with JES3 while the MCS consoles communicate with MVS. There are, however, exceptions to this.

a. JES3 Commands

JES3 commands are proceeded by an * to distinguish it from a MVS command if on a JES3/MCS console. JES3 only consoles do not

require the * preceeding the command. This command will be routed to the JES3 address space and be processed by JES3.

b. MVS Commands

These commands are routed to MVS, not JES3, and are processed by the MVS system. An example of this would be a D A (Display Active).

You see, then, that there are two distinct kinds of commands as well as two kinds of consoles. The overriding objective is to utilize the total of these resources to the benefit of the entire system.

3. GLOBAL/LOCAL Communication

From an operational standpoint, there is a need for communication among processors. JES3 has implemented this relative to the functional consoles. The capability exists to send a MVS command from a JES3 functional console to any MVS processor (GLOBAL or LOCAL) and to also have the response (if any) routed back to the console of origin. The communication from an operational standpoint within the JES3/MVS environment is all inclusive.

V.6.3

B. Console Facilities

This visual presents an overview of a JES3 installation with the consoles highlighted. The intent is to discuss several of the features of JES3 consoles utilizing this visual.

1. Functional Consoles

System-wide functions for all processors are controlled from consoles attached to the global processor. The installation can allow system commands to be entered and system messages to be received at these JES3 consoles, reducing or eliminating the need to have an operator stationed at system consoles on each separate processor. The implementation of multiple JES3 operator consoles, the separation of JES3 global functions, and the two-way operator communication with JES3 support functions cause the loosely coupled complex to appear as a single system rather than one comprised of several separate and independently operated computer systems.

JES3 provides an installation with flexibility in the location of machine room equipment. By using additional operator consoles, JES3 installations can physically separate the operational functions (card input/output, printing, and tape setup), locating them in areas more convenient to the local work flow. When necessary, messages can be sent between JES3 consoles. Card readers, card punches, and printers can be located in the job dispatching area where programs are submitted for execution and to where output is returned. The mountable input/output units can be placed in an area convenient to the tape and disk library. In addition, an operator console can be placed at the tape and disk librarian's desk to receive volume fetch requests. The central processing units can then be placed in some other area that is free of the congestion that often surrounds peripheral units.

2. Automatic Switching

At initialization time, an alternate console may be designated to receive messages destined for another console if:

- The original console has a queue of messages that exceeds the buffers assigned for that console
- The original console develops an unrecoverable error

This switch is automatic and the operator is informed that the switch has occurred. The original console may also be designated as the alternate if desired. This, in essence, negates the switch capability. In the absence of a designated alternative, JES3 will locate a console to serve as the alternate if either of the two conditions mentioned above happen.

3. RJP Workstation Console

Support is provided for the remote terminal console as a full-function JES3 operator console, as a console to control work originating from that terminal, or as an inquiry-only console. Terminals that do not have a real hardware console may be defined as having a simulated console. In this case, the console commands are entered through the card reader, and console messages are printed on the terminal printer.

4. Master Log (MLOG) Feature

JES3 provides the capability of logging all system activity (including all processors) in a central log. This log may be either a console device or located on DASD or both. The designation is made at initialization time as to which option is desired. This provides a complete history of activity by time for all processing within the complex.

If the instructor considers it appropriate, there are several miscellaneous items that could be presented:

- o MCS Route Code Mapping

  MCS has 16 route codes and JES3 has 96. JES3 has the ability to map these such that a message may be delivered to any destination (JES3 or MCS).

- o Multiple PFK Tables

  This provides multiple program function key tables or selector pen tables that relate to the 12 keys on a graphics console.

- o ENABLE/DISABLE support for all JES3 console types.

V.6.4

5. Command Characteristics

The intent here is to present general characteristics relative to JES3 commands. The point should be made, as indicated by the visual, that the discussion is relative to JES3 functional consoles. The consoles are physically attached to GLOBAL although the communication may be among all processors as presented earlier.

a. Format

JES3 commands are distinguished from system commands by placing an asterisk (*) before the command itself. As an alternate, the lower case (8) is also acceptable.

b. Console Authority

The system provides four levels of console authority. This simply means that control may be exercised over what commands are permitted from each console. It may be desirable to only allow information display

type commands as opposed to the ability to alter job attributes from a console.

c. Multiple Commands/Line

The installation may specify a character to serve as a command delimiter. This will permit multiple commands to be entered per line when separated by the defined character. This is specified at JES3 initialization time.

d. Logical Backspace

There is a fixed logical backspace character (#) which allows deletion of characters within an input line. This is for use by 1052, 3210, 3215. The 2740 backspace key is supported.

6. Message (Response) Characteristics

The intent here is to present general characteristics relative to JES3 messages (responses). Again, the discussion is pertinent to JES3 functional consoles.

a. Message Routing

JES3 messages may be routed to any one of the 96 destination classes. Typically a class is associated with a function such as card readers, printers, setup tapes, etc. Additionally, MCS route codes may be associated with JES3 functional consoles such that these messages will also be routed to JES3.

b. Message Format

A JES3 message will always be preceeded by a message ID with the following format:

- IAT - the three characters IAT identify it as a JES3 message
- IAT30 - the next two characters identify the JES3 component that issued the message. In this case (30) the message belongs to JES3 Initialization.
- IAT3011 - the last two characters provide a unique number for this message.

c. System Activity Logging

All messages are routed to the designated Master Log or Centralized Hardcopy Log - two names for the same thing. This provides a record of all activity within the complex. This logging may be routed to a console or DASD or both.

d. Action Message

JES3 messages that require an operator response will be preceeded by an asterisk (*). The intent is to highlight this message among other message for ease of location by the operator since it does require some action on his part.

C. Console Operations

This section will generally address some operational aspects of JES3. The intent is not to discuss specific commands and/or formats but to present the capabilities provided.

V.6.5

1. GLOBAL Initialization

This visual is meant to illustrate the process and function of a GLOBAL initialization. The points to be made are as follows:

- JES3 initialization begins with a START command.
- The operator in response to a WTOR selects the type of initialization.
- The GLOBAL initialization reads the INIT decks and builds a checkpoint record for LOCAL to access during initialization.

The initialization program receives control and performs the system initialization by reading the JES3 initialization control cards and performing the required tasks. One or more WTORs will be received. The first, IAT3011, asks you to specify the type of initialization to be performed (L, H, W, WA, or C). If you are bringing up a local processor, specify L and no other messages will require response. If you are bringing up a global processor:

- Specify H for hotstart
- Specify W for warmstart
- Specify WA for warmstart with JES3 queue analysis
- Specify C for coldstart

If you reply H, no more messages will require responses. If you reply C, message IAT3033 will be issued, asking you to confirm a coldstart. A reply of U confirms the coldstart; any other response will cause message IAT3011 to be re-issued.

If you reply W, WA, or C, message IAT3012 will be issued, asking you to specify the source of the JES3 initialization control information. Valid responses are N, M= and U=. Normally, you will reply N (no change) to indicate that the JES3 procedure correctly specifies the initialization deck to be used. However, if you specify M=xx, this references another initialization deck. If the JES3 initialization information is to be read from a card deck, specify U=cuu where cuu is the unit address of an available card reader.

The JES3 configuration and processing options are specified with this initialization control card deck. Because many options will affect the overall performance of the system, initialization control cards should be provided by your installation's system programmer.

a. Coldstart Initialization

Besides signifying that the global processor is to be started with all its queues empty, a coldstart requires that all JES3 local processors be IPLed after JES3 on the global processor has been initialized. (JES3 is initialized when message IAT3100 is issued at the completion of global initialization. This message will indicate whether a cold, warm, or hotstart was performed.)

Note: A coldstart is normally required only when a new system is being brought up or after a catastrophic JES3 failure during hotstart or warmstart that cannot be corrected.

b. Warmstart Initialization

Warmstart signifies that the global processor should resume execution of the jobs in its queues, if possible. All jobs executing in the JES3 complex will be handled based on the option selected on the job's MAIN statements (FAILURE option). The internal numbering of jobs resumes where it ceases when the system

was stopped, and all space on the JES3 direct access storage device that was allocated to existing jobs remains allocated.

c. Warmstart Initialization with Analysis

Whenever JES3 is terminated abnormally, the event should be noted and WA should be specified for the next system start.

Analysis means that the JES3 job queue should be validated during the warmstart processing and any jobs that would result in an inability to restart the system are to be deleted. You will be informed of the action taken and snap dumps will be taken of the bad data to assist the system programmer. Using warmstart without analysis is quicker, and may be attempted first. If normal warmstart fails, the system can then be reinstated to warmstart with analysis.

Note that if JES3 processing was terminated abnormally, due to equipment or system failure, it is possible that a job that was being executed on the local processor did not terminate correctly and will not be processed correctly when restarted. In this case, the job must be returned to the programmer for corrective action. Whenever JES3 is terminated abnormally, the event should be noted and ANALYZE=YES should be specified with WARMSTART response for the next system restart.

d. Hotstart Initialization

The hotstart response signifies that the JES3 global processor is to resume processing. In addition, all jobs active on the processor at the time of the hotstart will resume their execution.

The completion of JES3 initialization is indicated by the issuance of message IAT3100 JES3 x.x.x SYSTEM type START ON yy.ddd where x.x.x is the program level of JES3, type is COLD, WARM, or HOT, and yy.ddd is the Julian date.

V.6.6

2. Local Initialization

Local processors are IPLed stand-alone, independent of the global processor. Message

IAT3011 will be issued, asking you to indicate the initialization mode. (On a local processor, you should specify L.) JES3 initialization will continue on the local processor, using the initialization control cards from shared spool specified by the global processor. Once JES3 has completed initialization on local, it will automatically initiate communication with the global processor via the channel-to-channel adapter and the processors will be connected.

During initialization, JES3 makes certain checks to maintain the validity of the complex - that is, do not permit two GLOBALs to be initialized. JES3 maintains a Complex Status Record (CSR) which provides information about all processors in the complex.

3. Operator Control

The intent here is to present the capabilities of JES3 relative to operator control. A detail discussion of any of the commands is not intended.

V.6.7

a. Commands

This visual shows the commands for both JES3 and the system. The points to be made are:

- Most commands have one or two character abbreviation
- JES3 commands are preceeded by an *
- A comparison could be made relative to the number of commands for each
- Perhaps discuss individual commands of JES3 if there are particular questions
- Highlight the Inquiry and Modify commands - these will be presented on the following visual

V.6.8

b. INQUIRY/MODIFY

The purpose of this visual is to illustrate the operational capabilities implemented via these two JES3 commands. Listed on the visual are the functions that may be processed by the Inquiry and Modify commands. The point is to demonstrate the multiple varied possibilities of these commands rather than the specific details. The instructor may choose to pick out a few of the individual functions for illustrations. More detail concerning the

commands may be found in the JES3 Operator SRL.

V.6.9

c. JES3/MCS Consoles

The purpose of this visual is to depict the various communication possibilities within the multiple processor, JES3/MCS environment. This should serve also to reinforce the functional console concept and to summarize the Operator Control section.

1) JES3 Only

This shows a console that may only communicate with GLOBAL JES3. This was accomplished by not generating it as an MCS console, but including it in the JES3 initialization deck as a JES3 console.

2) JES3/MCS GLOBAL

This shows a console that may communicate with both JES3 and MVS on GLOBAL. This is accomplished by generating it as an MCS console and including it as a JES3 console.

3) JES3/MCS - GLOBAL/LOCAL

This shows a console that may communicate with all processors in the system. This is accomplished through the MVS SYSGEN and proper parameters in the JES3 initialization deck.

4) MCS Only

This shows a console that may only communicate with MVS on GLOBAL. This is accomplished by generating it as a MCS console but not including it in the JES3 initialization data set.

V.6.10

4. Background Utilities

JES3 supports a number of special background utility programs that are executed in parallel with the other support functions of JES3. The operator may initiate these programs from a console. The unit record and tape devices to be used for input and output can generally be specified. This visual shows the utilities

provided by JES3. Again, the intent is not to explain the function of each utility, but to present the capabilities of JES3. If more detail is required for the individual utilities, it may be found in the Introduction to JES3 SRL or the JES3 Operators SRL.

As a rule the operator invokes the utility via the CALL command and after devices are readied, he issues the START command.

V.6.11

D. Summary

The following points serve as summary items for this topic if the instructor so chooses.

1. Functional Consoles

   The implementation of JES3 physically attaches the console to the GLOBAL processor and allows for physical distribution of these consoles into functional areas.

2. Total Processor Communication

   JES3 permits operator communication among all processor although the functional consoles are physically attached to GLOBAL.

3. JES3/System Commands

   JES3 allows definition of the functional consoles in such a manner that both JES3 and MVS system commands may be issued.

4. Extensive Command Capability

   The various options of the Inquiry and Modify commands illustrate the validity of this statement.

5. Background Utilities

   JES3 allows utility type programs to execute within the JES3 address space concurrent with other JES3 functions. The operator invokes and controls these background utilities.

LIST OF VISUALS

VISUAL NO.	HANDOUT NO.	DESCRIPTION
V.6.1		JES3 Consoles
V.6.2	H.6.1	JES3 Console Environment
V.6.3	H.6.2	JES3 Configuration
V.6.4	H.6.3	Command/Message Characteristics
V.6.5	H.6.4	GLOBAL Initialization
V.6.6	H.6.5	LOCAL Initialization
V.6.7	H.6.6	Commands
V.6.8	H.6.7	Operator Control Capabilities
V.6.9	H.6.8	JES3/MCS Consoles
V.6.10	H.6.9	Background Utilities
V.6.11	H.6.10	JES3 Console Summary

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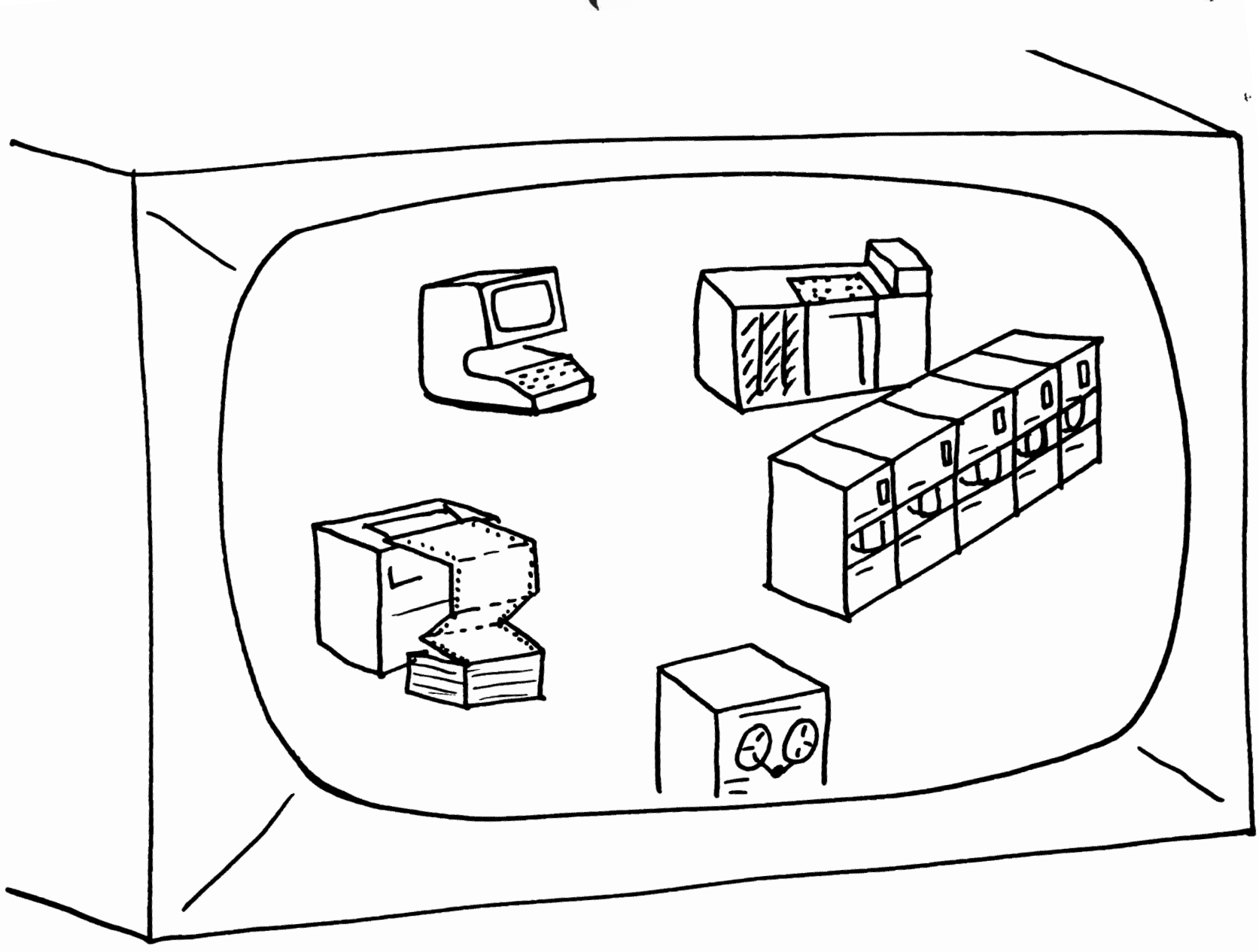
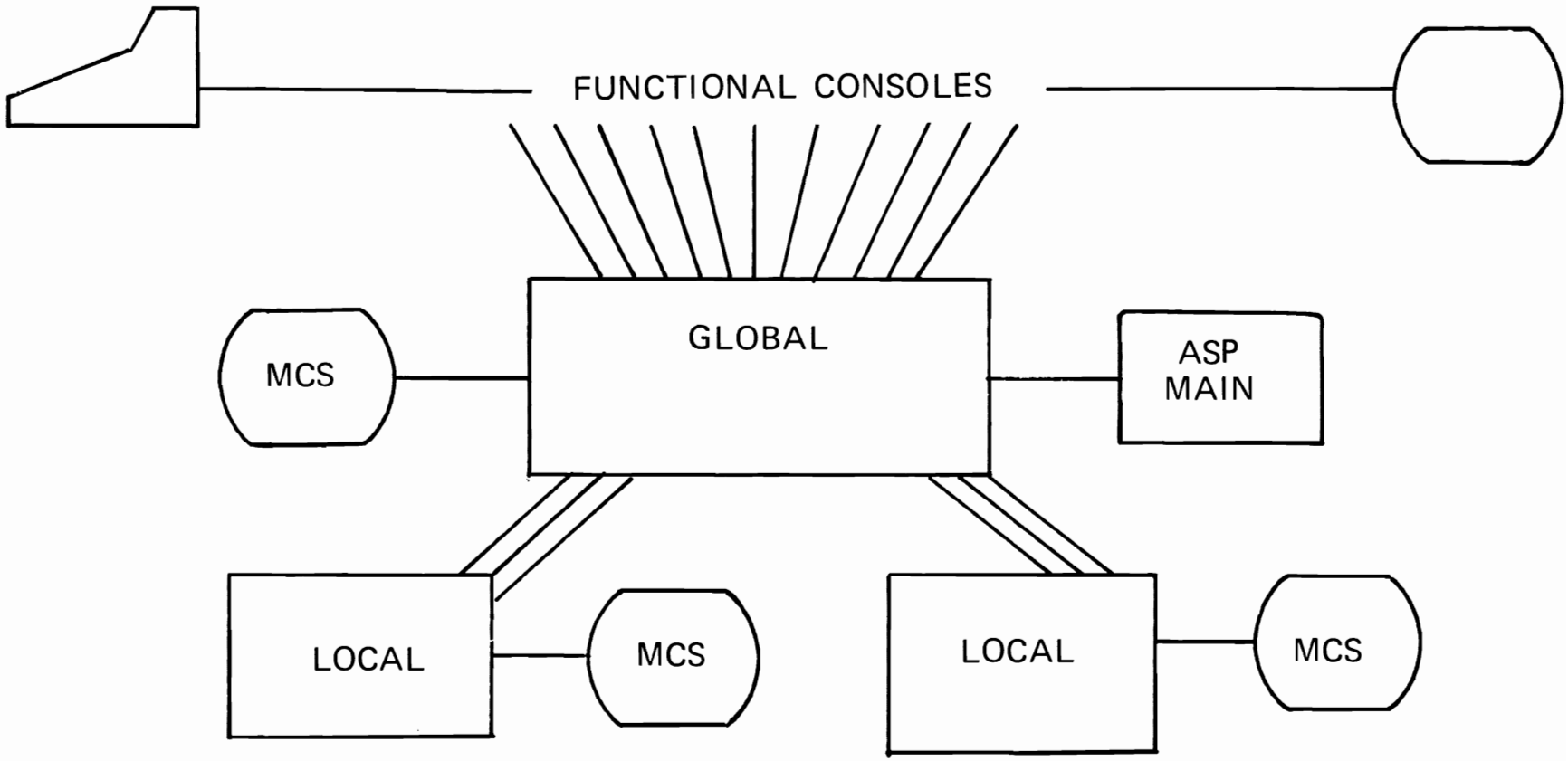


JES3 CONSOLES

JES3 CONSOLE ENVIRONMENT



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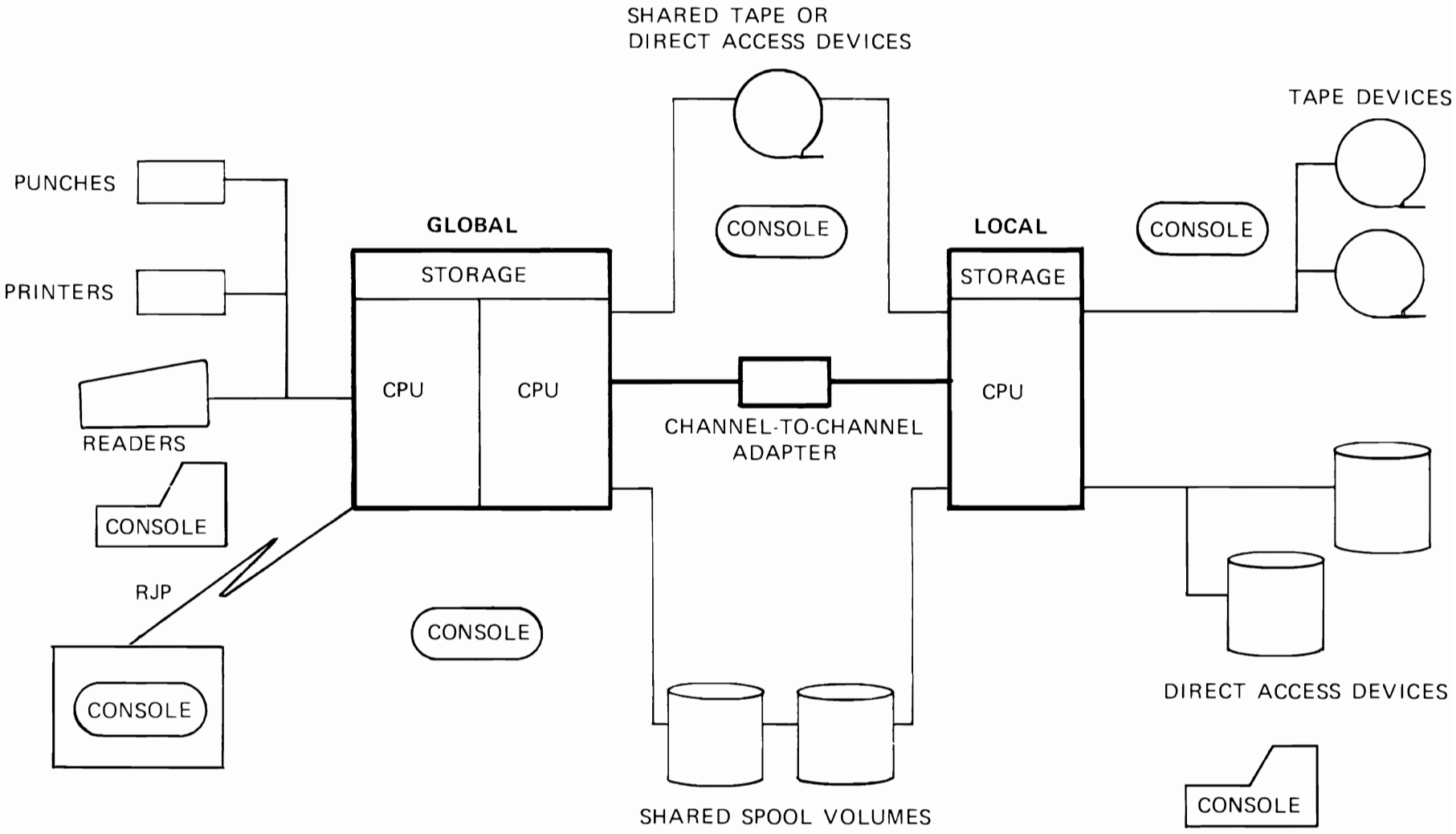
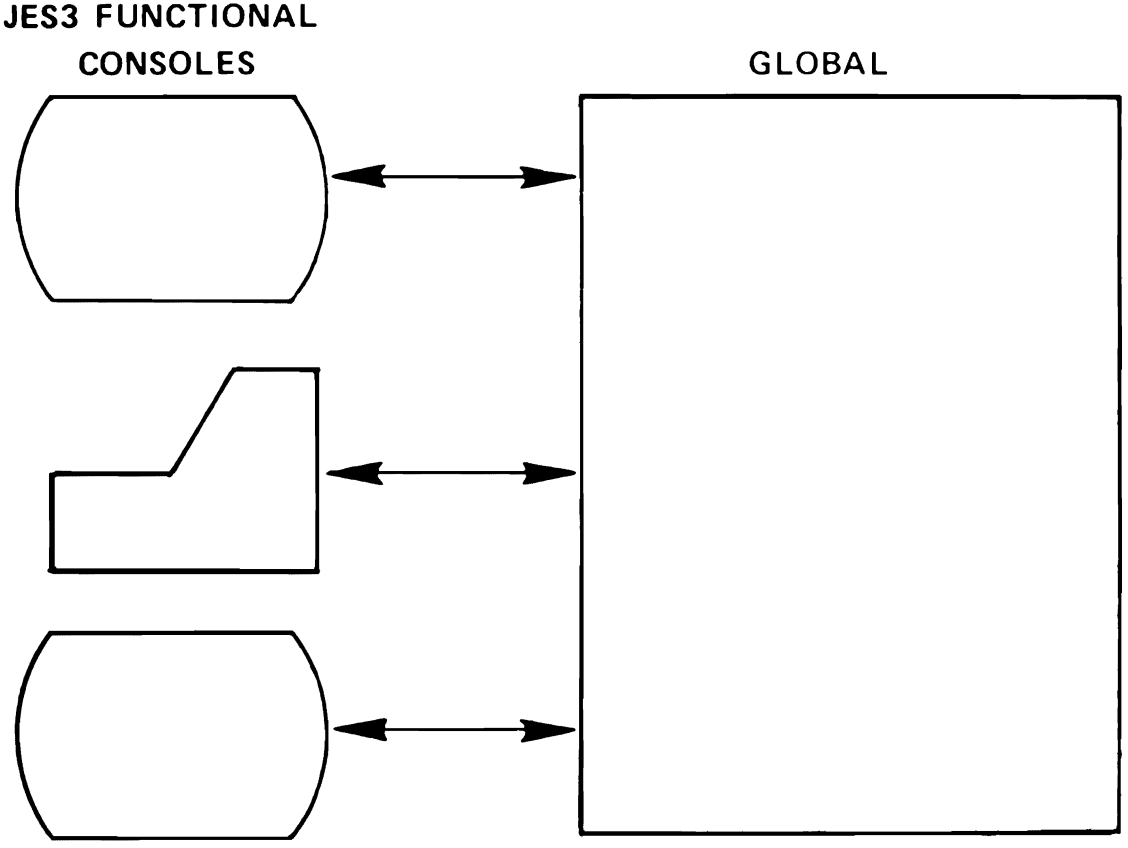
V.6.3/H.6.2

JES3 CONFIGURATION



COMMAND/MESSAGE CHARACERISTICS



COMMANDS

- FORMAT (*,8)
- CONSOLE AUTHORITY
- MULTIPLE COMMANDS/LINE
- LOGICAL BACKSPACE

MESSAGES (RESPONSES)

- MESSAGE ROUTING
- MESSAGE FORMAT – IAT3011
- SYSTEM ACTIVITY LOGGING
- ACTION MESSAGE (*)

GLOBAL INITIALIZATION

MVS IPL

START JES3

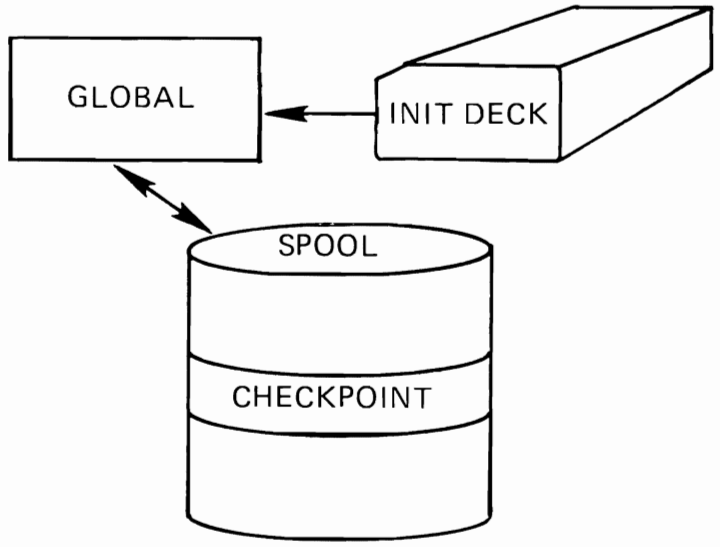
IEF403I JES3 – STARTED – TIME=HH.MM.SS

*nn IAT3011 SPECIFY JES3 START TYPE=(L H W WA OR C)

REPLY

*nn IAT3012 JES3 SELECT INISH ORIGIN (N M= OR U=)

REPLY



LOCAL INITIALIZATION

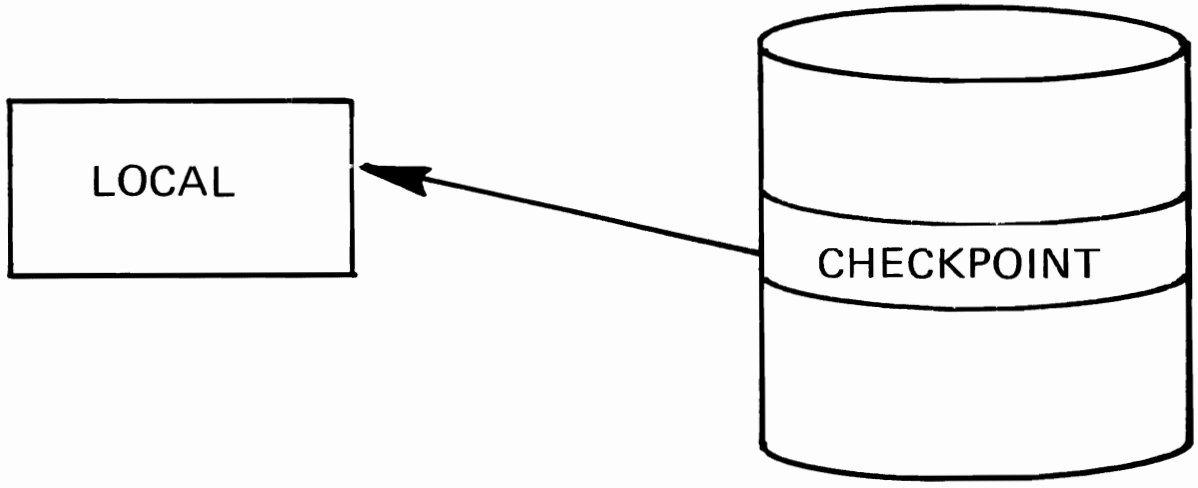
MVS IPL

START JES3

IEF403I JES3 – STARTED – TIME=HH.MM.SS

*nn IAT3011 SPECIFY JES3 START TYPE=(L H W WA OR C)

REPLY (ALWAYS L)



SYSTEM COMMANDS

CANCEL	C
CHNGDUMP	CD
CONTROL	K
DISPLAY	D
DUMP	–
HALT	Z
LOG	L
MODE	–
MODIFY	F
MONITOR	MN
MOUNT	M
MSGRT	MR
QUIESCE	–
REPLY	R
RESET	E
SEND	SE
SET	T
START	S
STOP	P
STOPMN	PM
STOPTR	PT
SWAP	G
SWITCH	I
TRACE	–
TRACK	TR
UNLOAD	U
VARY	V
WRITELOG	W

JES3 COMMANDS

*CALL	*X
*CANCEL	*C
*DELAY	*D
*DISABLE	*H
*DUMP	–
*ENABLE	*N
*ERASE	*E
*FAIL	–
*FREE	–
*INQUIRY	*I
*MESSAGE	*Z
*MODIFY	*F
*RESTART	*R
*RETURN	–
*SEND	*T
*START	*S
*SWITCH	–
*VARY	*V

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OPERATOR CONTROL CAPABILITIES

INQUIRY (*I)	MODIFY (*F)
JOB QUEUE	
PRIORITY	√
ACTIVE	
BACKLOG	
SETUP	√
I/O DEVICES	√
RJP LINES	√
TERMINALS	√
ERROR STATISTICS	
CONSOLE	
PFK	√
MSG ROUTING TABLE	√
OUTSTANDING REPLY	
GMS SPECIFICATIONS	√
DJC NET	√
DEADLINE STATUS	√
OUTPUT QUEUE	√
DSP USE COUNT	√

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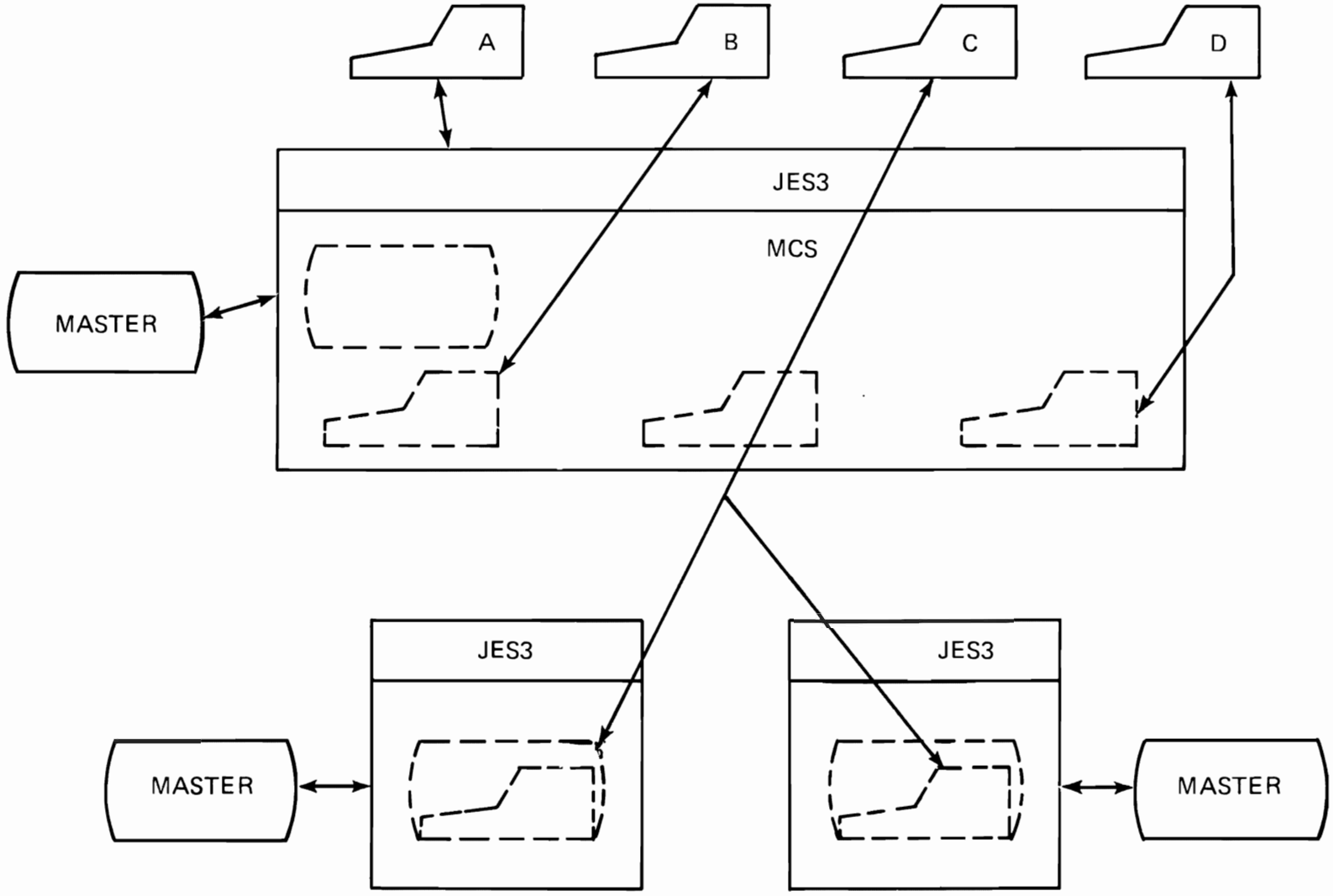
V.6.9/H.6.8

JES3/MCS CONSOLES



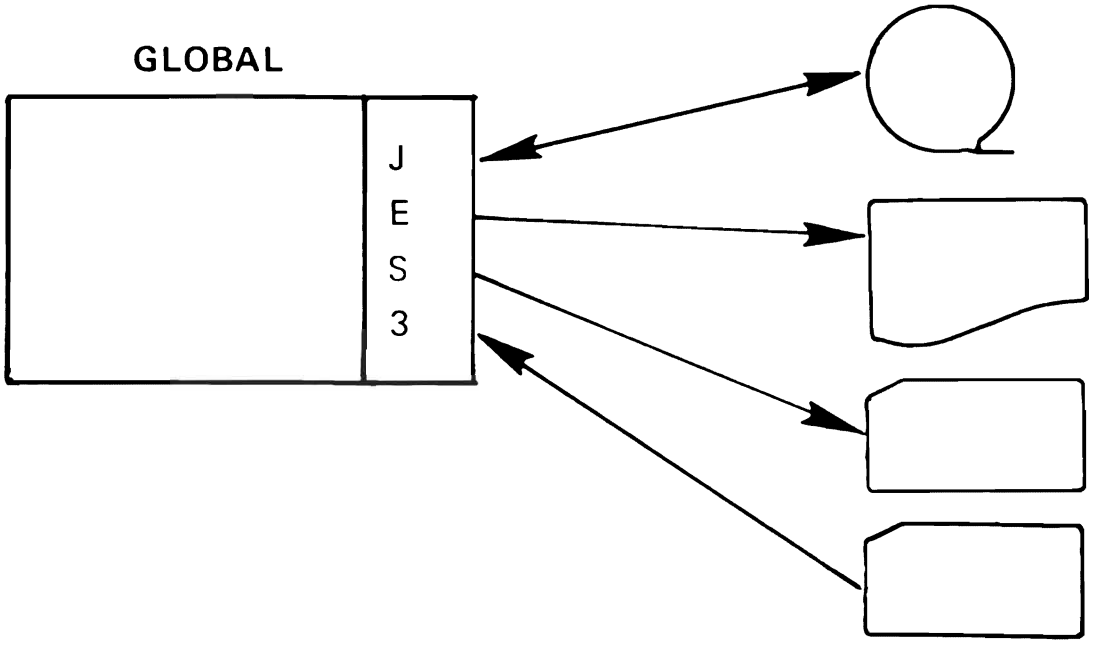
A JES3 ONLY

B JES3/MCS GLOBAL

C JES3/MCS GLOBAL/LOCAL

D MCS ONLY

BACKGROUND UTILITIES



CARD-TO-CARD
CARD-TO-PRINTER
CARD-TO-TAPE
DUMP JOB
TAPE DUMP
TAPE LABEL
TAPE-TO-CARD
TAPE-TO-PRINTER
TAPE-TO-TAPE

*CALL,CC,IN=RD1,OUT=PU1

*S,CC

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V.6.11/H.6.10

JES3 CONSOLE SUMMARY

- FUNCTIONAL CONSOLES
- COMMUNICATION WITH ALL PROCESSORS
- BOTH JES3/SYSTEM COMMANDS
- EXTENSIVE COMMAND CAPABILITY
- BACKGROUND UTILITIES

ADDITIONAL JES3 FEATURES

Module 7

Teaching Strategy: This topic contains a conglomerate of JES3 features that generally fall outside the job flow area. The intent is to expose the student to the various capabilities provided by JES3 and not to pursue in detail any of the individual items. Generally, these features will be utilized by the system programming staff, but to the benefit of other users; therefore, a topic to discuss these was included. Again, the purpose is to make the student aware of these additional functions - not experts in their use.

Objectives: Upon successful completion of this topic, the student should be able to:

1. Define the function and state the purpose of the following JES3 features:
   - o Migration Aid
   - o User Exits
   - o System Management Facilities
   - o Hotstart/Warmstart
   - o Dynamic System Interchange
   - o Failsoft
2. Name and describe the functions of the JES3 Service Aids.
3. Identify the place of user written DSPs in JES3.

Time Estimate: Approximately one hour is required to present this topic.

Outline:

A. Migration Aid
   1. ASP Processing
   2. JES3 Processing

B. User Exits

C. System Management Facilities

D. Recovery
   1. Hotstart/Warmstart (System Software)
   2. Dynamic System Interchange (DSI)
   3. Failsoft

E. Service Aids

1. Console Test
2. Control Block Print
3. Display DJC Tables
4. Display JES3 Job Queue Status
5. Event Trace Facility
6. Interpreter Debug Facility
7. JES3 ABEND Dumps
8. JCL Test Facility
9. Job Setup Table Test
10. RJP Line Snap Facility

F. User Written DSPs

V.7.1
V.7.2

A. Migration Aid

The ASP to JES3 migration aid available with an appropriately updated level of ASP allows access of an ASP Support Processor to a GLOBAL JES3 MVS processor. It allows production testing of a JES3 system while the balance of the work is handled by the ASP system. When a job terminates, output can be printed by the JES3 GLOBAL Processor or returned to the ASP Support Processor. The aid consists of two callable DSPs. One executes under ASP on an existing ASP support processor and the other executes under JES3 on the GLOBAL Processor. CTC support routines are also provided. Each DSP will communicate with the oppcsite processor by a common CTC device.

1. ASP Processing

The ASPAID DSP permits the operator on the ASP system to select jobs to be routed to the JES3 system based on class, point of origin, user specified parameter or exit routine.

2. JES3 Processing

The jobs are routed to JES3 for input processing, execution and output processing, or may be routed for execution only and returned to the ASP system for output processing.

V.7.3

B. User Exits

Many user exits are provided for the system programmer's use in major functional areas of JES3. The basic intent is to provide exits to minimize the need for user modifications to the system. The visual summarizes the exits by function. The author did not consider it necessary to illustrate each individual exit. Listed below, for the instructor's use, is a brief description of each:

- JES3 Initialization

  IATUX15 - Initialization card exit.

- Input Service

  IATUX16 - Main processor resolution for conflicting types

IATUX17 - respecify standard scheduler elements

IATUX24 - DJC device requests

IATUX28 - Job card accounting information analysis

IATUX29 - Continued processing based on jobs ccntrol blocks analysis

- Interpreter Service

  IATUX01 - Internal text exit (R/I subtask)

  IATUX02 - FIND exit (C/I or R/I subtask)

  IATUX03 - Internal text exit (C/I subtask)

  IATUX04 - Job level exit

  IATUX05 - Step level exit

  IATUX06 - DD level exit

  IATUX07 - LOCATE fail exit

  IATUX08 - Job setup exit

  IATUX09 - Interpreter DSP completion exit

  IATUX10 - Message subroutine exit

  IATUX11 - LOCATE write exit

  IATUX26 - Examination of MVS control blocks prior to SWA create

- Setup

  IATUX25 - Non-standard tape label handling

- Output Service

  IATUX19 - Output Service Element (OSE) analysis

  IATUX20 - Job header exit

  IATUX21 - Data set header exit

  IATUX22 - Forms alignment exit

  IATUX23 - Job trailer exit

- Miscellaneous Exits

IATUX18 - Console authority check

IATUX27 - *CALL dsp, job control block analysis

IATUX30 - TSO STATUS, CANCEL, OUTPUT requests analysis

IATUX31 - Output Message Check

V.7.4

C. System Management Facilities

System Management Facilities (SMF) is a feature of OS/VS that provides the means for gathering and recording information that can be used for billing customers or evaluating system usage. Information is collected by SMF data-collection routines and user-written exit routines.

JES3 creates the following types of SMF records:

- Type 6 - Output writer contains output data set and input writer information and is written when output service has finished processing a SYSOUT class or form within a class for a job.
- Type 25 - Subsystem setup contains information about a job's setup requirements. It is created by the JES3 MDS function.
- Type 26 - Job purge contains job accounting information and is written by the JES3 purge function after the job has completed processing.
- Type 43 - Subsystem start contains JES3 start up information and is written by JES3 during initialization.
- Type 45 - Subsystem stop contains JES3 information at the time JES3 is stopped and is written at JES3 termination.
- Type 47 - SIGNON/Start line contains information about a JES3 RJP line and is written when the operator issues a START Line command or when a remote user signs on.
- Type 48 - SIGNOFF/Stop Line contains line and terminal information, such as line error statistics and sense information, and is written when the operator issues a CANCEL line command or when a remote user signs off.
- Type 49 - Subsystem integrity is a record that is written as a result of an unsuccessful RJP sign on attempt.

Information about OS/VS SMF can be found in "OS/VS System Management Facilities", GC35-0004.

D. Recovery

JES3 enhances the reliability, availability and serviceability (RAS) of the MVS environment. Recovery from program and hardware failures in the complex MVS environment must minimize the impact on the efficient flow of the work being done. This section discusses the recovery support provided by JES3.

The author recommends that the recovery processing be divided into three areas - system software, hardware, and JES3 DSPs (Failsoft).

V.7.5

1. Hotstart/Warmstart (System Software)

   In the area of software, we are primarily concerned with two aspects of recovery - JES3 and MVS. What processing is invoked when the JES3 address space fails or MVS fails. The basic concern here is the effect this situation has on user jobs. The types of JES3 starts that are applicable in this environment are the HOTSTART (H) and WARMSTART (W or WA).

Instructor Note: The following documentation contains more information than should be presented, but it should provide additional help for the instructor. The thrust of the presentation should center around the impact on user jobs and the operational implications during recovery processing.

In this section, we want to discuss the individual recovery situations relative to JES3 and MVS failures.

a. JES3 GLOBAL Recovery

   In this particular case we have a hit in the JES3 address space such that recovery was not possible. MVS continues to function and the LOCALs continue to function, but the GLOBAL JES3 address space has failed.

   Perhaps here would be a good place to briefly review the options available at JES3 initialization time.

   1) Initialization Options

      a) COLD (C)

         This implies an IPL of each processor, and an empty job Q.

b) WARM (W)

This implies an IPL of each processor, but using the existing job Q.

c) WARM with Analysis (WA)

This implies an IPL of each processor and using the existing job Q. But, it also involves doing an analysis of each job's control block structure to insure its validity.

d) HOTSTART (H)

This may or may not require an IPL of GLOBAL. The existing job Q is used.

e) LOCAL (L)

This may or may not require an IPL of LOCAL. Generally, the existing job Q is used. Any start of a LOCAL requires the "L" reply.

2) HOTSTART Features

The items indicated here are those pertinent to HOTSTART processing in this situation.

a) The JES3 Address Space is initialized without rebuilding all JES3 control blocks. The checkpoint record is accessed for JES3 options rather than the initialization data set.
b) Certain tables and Control Blocks in CSA are validity checked. This includes, among others, the SSVT, MAINPROC and MEMDATA.
c) All jobs in the entire complex continue to execute. This includes all processors and not just GLOBAL. In this case, then, the JES3 address space may ABEND and be restarted without losing any executing jobs.
d) JES3 support devices (printers, etc.) are restarted from the last

checkpoint position.

b. GLOBAL MVS Recovery

In this case, the MVS system has failed. There are two possibilities here relative to JES3 initialization options (HOT or WARM). In any event, a GLOBAL IPL is required.

1) GLOBAL HOTSTART

a) A GLOBAL IPL is required
b) JES3 support devices are restarted from the last checkpoint position.
c) Device status will be given to MDS of all MDS managed devices relative to this processor. This includes online - offline status and volumes currently mounted.
d) User jobs on the failing GLOBAL will be restarted based on their restart options.

- The jobs will be restarted if the OS Checkpoint/Restart facility was used, and if the job was journaled.
- The JES3 failure option will be honored, if used, and OS Checkpoint/Restart was not selected.

Jobs on the LOCALs continue to execute, and if GLOBAL service is required, the job is put in a WAIT state. When GLOBAL JES3 is initialized, those requests will be serviced and LOCAL jobs, in this situation, do not require restart.

2) GLOBAL WARMSTART

There are considertaions in this case for both GLOBAL and LOCAL because, as you may recall, a WARMSTART implies an IPL of each processor in the entire complex.

a) GLOBAL Processing

- All LCCALs should be disabled to prevent them accessing the SPOOL volumes. Each LOCAL

must be IPLed after the GLOBAL is initialized.

- o This requires an IPL of GLOBAL.
- o A WARMSTART implies a reading of the initialization data set rather than accessing the checkpoint data set. This basically is the reason for the requirement to IPL all LOCALs.
- o The GLOBAL builds the checkpoint record to be accessed by LOCAL during initialization.
- o JES3 support devices are restarted from the last checkpoint position.
- o Device status will be given to MDS of all MDS managed devices relative to this processor.

b) LOCAL Processing

- o The LOCAL must be IPLed after GLOBAL.
- o The LOCAL will read the checkpoint record created by GLOBAL.
- o Device status will be given to MDS of all MDS managed devices relative to this processor.
- o User jobs on the failing LOCAL will be restarted based on their restart options (same as HOTSTART).

c. JES3 LOCAL Recovery

The only initialization option that is valid for LOCAL is "L", although there are different implications. If the address space fails, the processing in this situation is very similar to a GLOBAL HOTSTART.

1) The JES3 address space is initialized with a START command, and the selection of the "L" option. Restart processing recognizes that the system was not IPLed, and therefore, invokes a HOTSTART type initialization.
2) Certain Tables and Control Blocks in CSA are validity checked.
3) All jobs in the entire complex continue

to execute.

d. LOCAL MVS Recovery

This is the case of an MVS failure on LOCAL.

1) The LOCAL must be IPLed.
2) The LOCAL will read the checkpoint record created by GLOBAL.
3) Device status will be given to MDS of all MDS managed devices relative to this processor.
4) User jobs on the failing LOCAL will be restarted based on their restart options (same as HOTSTART).

V.7.6

2. Dynamic System Interchange

The second area that concerns us is a hardware failure and the JES3 features invoked in this process. The JES3 recovery facility provided here is Dynamic System Interchange (DSI).

Dynamic System Interchange (DSI) provides the capability to assign the global function of JES3 to a capable, active local processor. DSI is used to sustain the operation of the JES3 complex when a long term global system failure occurs. Such a failure might be the result of a hardware failure of the CPU, channel, or control unit on the global processor.

The local processor assuming the global function must have channel-to-channel paths to all other local and ASP processors in the complex. Any processors for which no path exists cannot be supported by the new global processor.

Hardware switching of global devices to the temporary global processor is necessary to allow continued operation of such global functions as RJP, console service, output service, and callable DSPs. These global devices are defined at initialization for all local processors that may assume the global function.

DSI is invoked by operator command on the processor that is to assume the global function.

V.7.7

3. Failsoft

JES3 failsoft support improves total system reliability by reducing system restart time through automatic job recovery based on

installation-supplied or programmer-supplied restart parameters. In case of system failure, all output through the last complete job step can be recovered. JES3 reliability may be reduced for those installations with many user modifications and user-written DSPs. Failsoft support minimizes the impact of abnormal termination that occurs as a result of a DSP program check. At the time of a JES3 failure, an operator message is issued identifying the failure. In addition, detailed information relating to the failure will be displayed on the master (MLOG) console.

Multiple "tasks" are being processed concurrently within the JES3 address space. In JES3 these are known as Dynamic Support Programs (DSPs). JES3 provides a recovery mechanism for the individual DSP - Failsoft. The intent is to isolate errors to a particular function and only impact that function rather than JES3 or the entire system. The implementation of Failsoft is such that when a DSP encounters a problem the following steps are taken:

a. Failure Logout

   Two permanent records are provided for the failure. An entry is made in LOGREC and JES3 MLOG. Pertinent items relative to the failure are in the logout.

b. Operator Message

   A message will be sent to JES3 error consoles showing certain aspects of the error. Generally, this is the same data as appears in the MLOG failure logout.

c. Recovery Attempted

   At this point, failsoft will examine the error condition and attempt to recover - that is, correct the error condition and continue DSP processing. If unable to correct the situation, the DSP will be terminated.

d. JES3 Processing Continues

   The overall objective is to isolate the error such that other components are not affected. Hopefully, failsoft will buffer the problem condition and other JES3 functions may continue.

V.7.8

E. Service Aids

JES3 service aids generally are programs to help the system programmer and IBM programming representatives to diagnose and correct failures; however, some have been written to aid the application programmer.

The following list is not all inclusive, but it should provide the student with an appreciation for the tools provided by JES3 in this area.

1. Console Test

The console test (CNT) program allows simultaneous online testing of as many as five JES3 consoles. It is designed primarily as a mechanical test for typewriter-like consoles but may be used to issue test messages to any JES3 console. Test messages are issued directly to a specified console and ignore the switched status of the console. The program is callable by the operator. After the program is loaded, a message is issued to the calling console indicating that the test facility is operational. The operator then initiates testing of the console by issuing a message that specifies the test console and any desired parameters. The operator can specify the test message or allow the program to print a standard message, and also controls the number of times the test message is issued.

2. Control Block Print

The control block print (CBPRINT) DSP is invoked using JES3 control cards included in the job stream, and causes output service to print out selected JES3 and/or MVS control blocks at any stage in the processing of a job.

3. Display Dependent Job Control Tables

The display dependent job control (DISPDJC) program is a callable DSP designed to print a report on the status of a dependent job net on a high-speed printer. The report gives information concerning the net, including identification, job count, and the number of jobs completed. In addition, the name and status of each job in the net is listed with information concerning its dependencies on other jobs.

4. Display JES3 Job Queue Status

The display JES3 job queue status (DISPLAY)

callable DSP creates a data set for output service containing the status of all jobs in the JES3 job queue.

5. Event Trace Facility

The event trace facility is available to all JES3 functions and provides diagnostic information to the system programmer in the event of a JES3 system failure. This information includes trace identifier, module identifier, time of day, and register information at previously selected points in the execution of job. The JES3 operator may dynamically dump all or selected trace entries to an operator console. The trace facility may be turned on or off by operator command.

6. Interpreter Debug Facility

The interpreter debug (DEBUG) facility, a function of the reader/interpreter or converter/interpreter, uses output service to print selected JES3 control blocks. It shows the order in which JES3 control blocks are built and modified as OS or VS control blocks are read.

7. JES3 ABEND Dumps

Through ABEND dumps, selected MVS and JES3 control blocks and areas of storage can be formatted and printed if a JES3 failure occurs.

8. JCL Test Facility

The JCL test (JCLTEST) facility checks for errors in JCL. No devices are set up, and the job is not processed. This facility is invoked with the EXEC card.

9. Job Setup Table Test

The job setup test (JSTTEST) facility allows the user to obtain a formatted printout of the job summary table (JST) created by the interpreter DSP. JSTTEST is invoked using an EXEC card. JSTTEST prevents the job itself from being scheduled for execution. After the user has examined the JST, he may remove the EXEC statement specifying JSTTEST and rerun the job.

10. RJP Line Snap Facility

The RJP line snap facility allows a user to generate RJP logic traces on the message log

console and to generate snap dumps of RJP information to enable the gathering of debugging data.

V.7.9

F. User Written DSPs

The design and implementation of JES3 provides for the concurrent execution of multiple functions within the JES3 address space. Dynamic Support Programs (DSPs) are the means by which this is accomplished.

JES3 has extended this capability to the user. An interface has been provided to enable the user to implement his own DSPs for function that is unique to his processing requirements. As the visual indicates, this added function may be directed to the flow of a job through the system or perhaps a background utility to be invoked when needed.

The point to be made is that the facilities provided by JES3 may be extended in a modular fashion by the user to satisfy his individual requirements.

LIST OF VISUALS

VISUAL NO.	HANDOUT NO.	DESCRIPTION
V.7.1		Additional JES3 Features
V.7.2	H.7.1	Migration Aid
V.7.3	H.7.2	JES3 Exits
V.7.4	H.7.3	SMF Records
V.7.5	H.7.4	JES3 Recovery
V.7.6	H.7.5	DSI Environment
V.7.7	H.7.6	JES3 Failsoft
V.7.8	H.7.7	Service Aids
V.7.9	H.7.8	User Written DSPs

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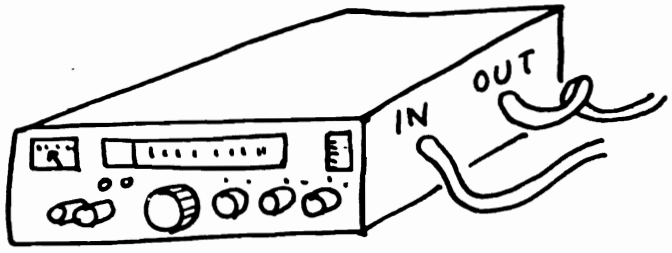
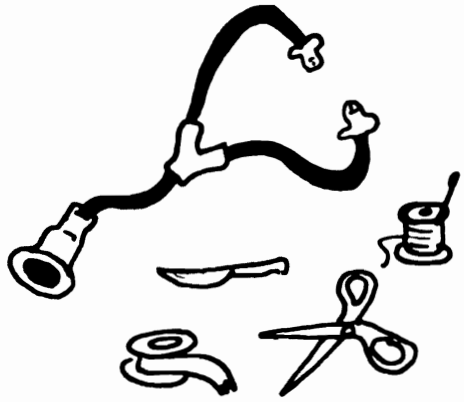
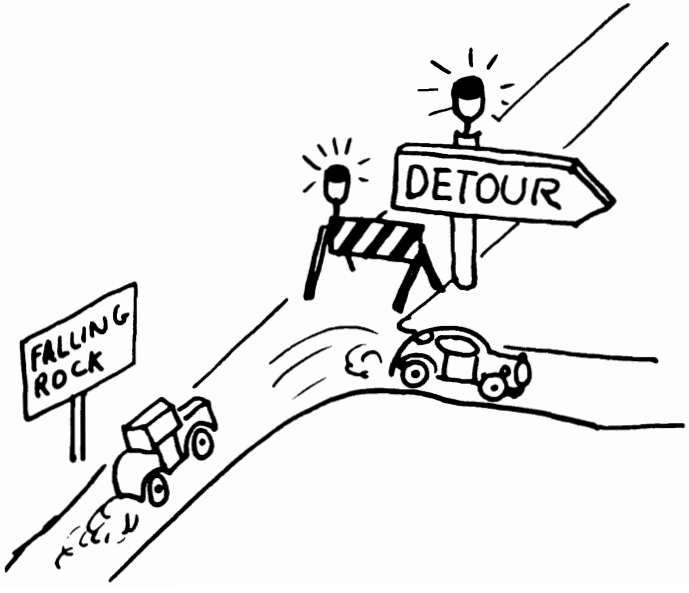
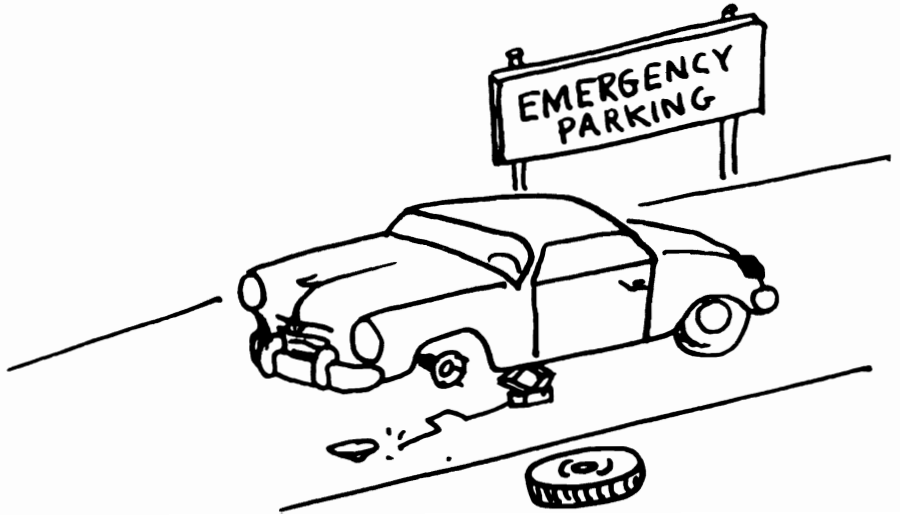




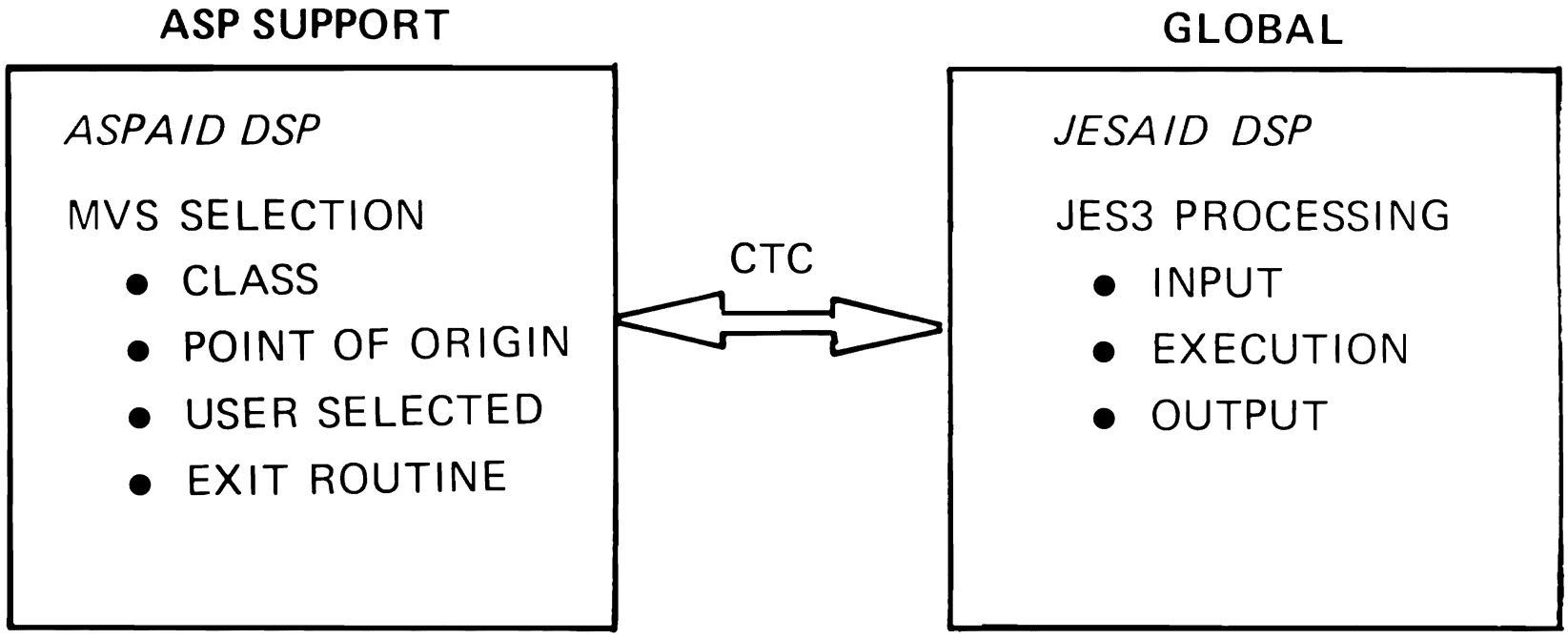
ADDITIONAL JES3 FEATURES



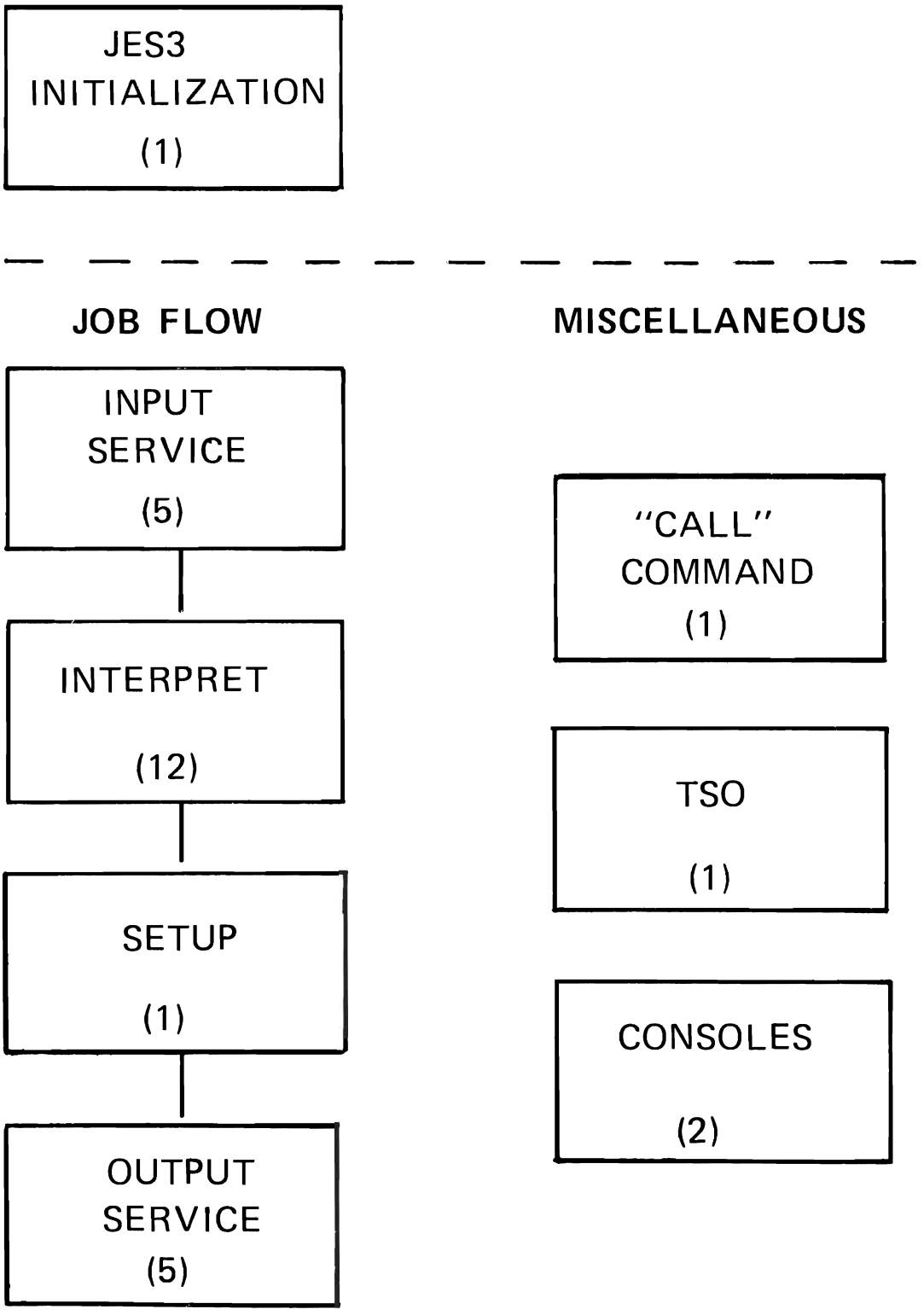


V.7.1

MIGRATION AID



JES3 EXITS


JES3
INITIALIZATION
(1)
JOB FLOW
MISCELLANEOUS
INPUT
SERVICE
(5)
INTERPRET
(12)
SETUP
(1)
OUTPUT
SERVICE
(5)
"CALL"
COMMAND
(1)
TSO
(1)
CONSOLES
(2)

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V.7.4/H.7.3

SMF RECORDS

- INITIALIZATION
- MAIN DEVICE SCHEDULING
- OUTPUT SERVICE
- PURGE
- REMOTE JOB PROCESSING
- TERMINATION

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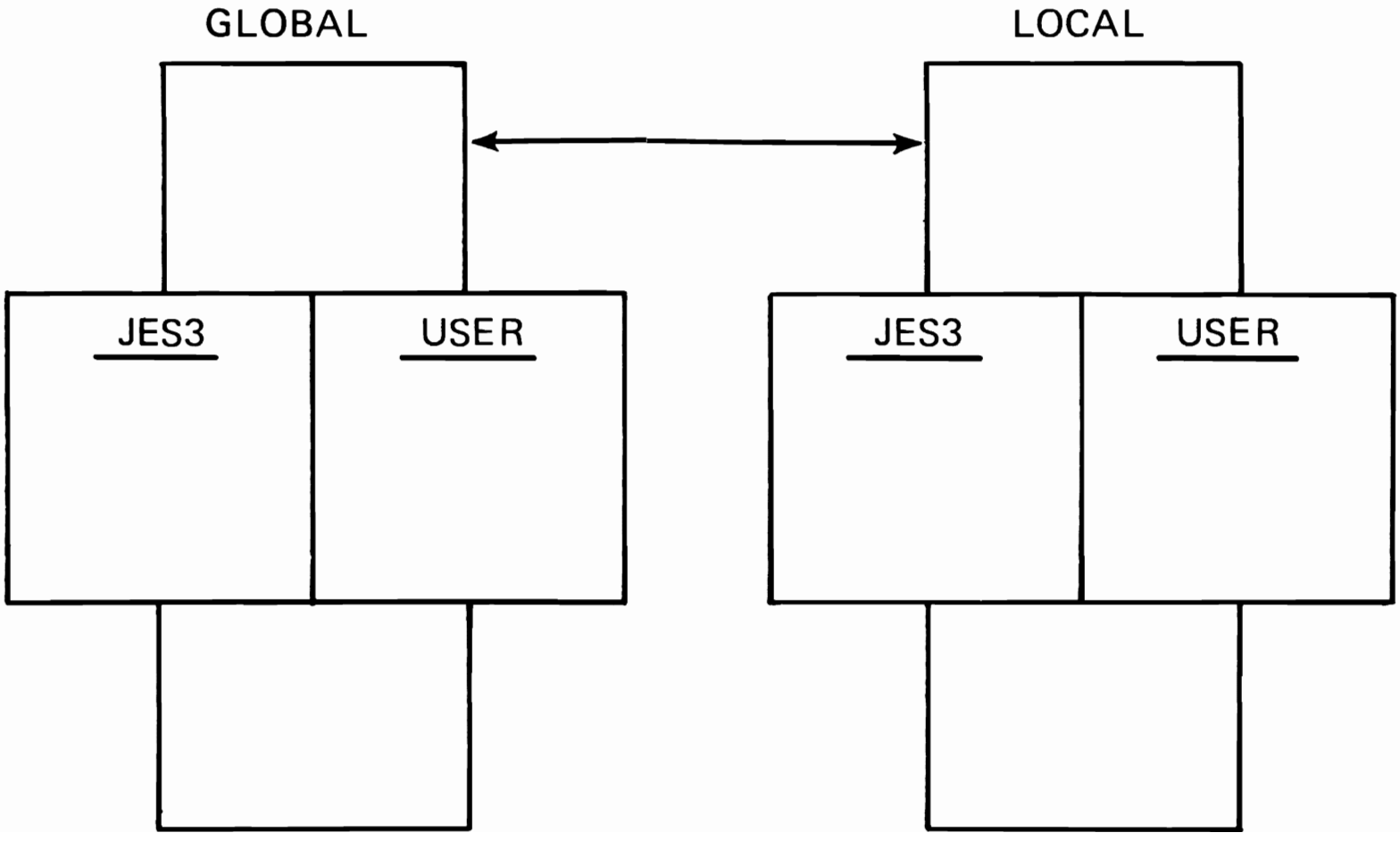
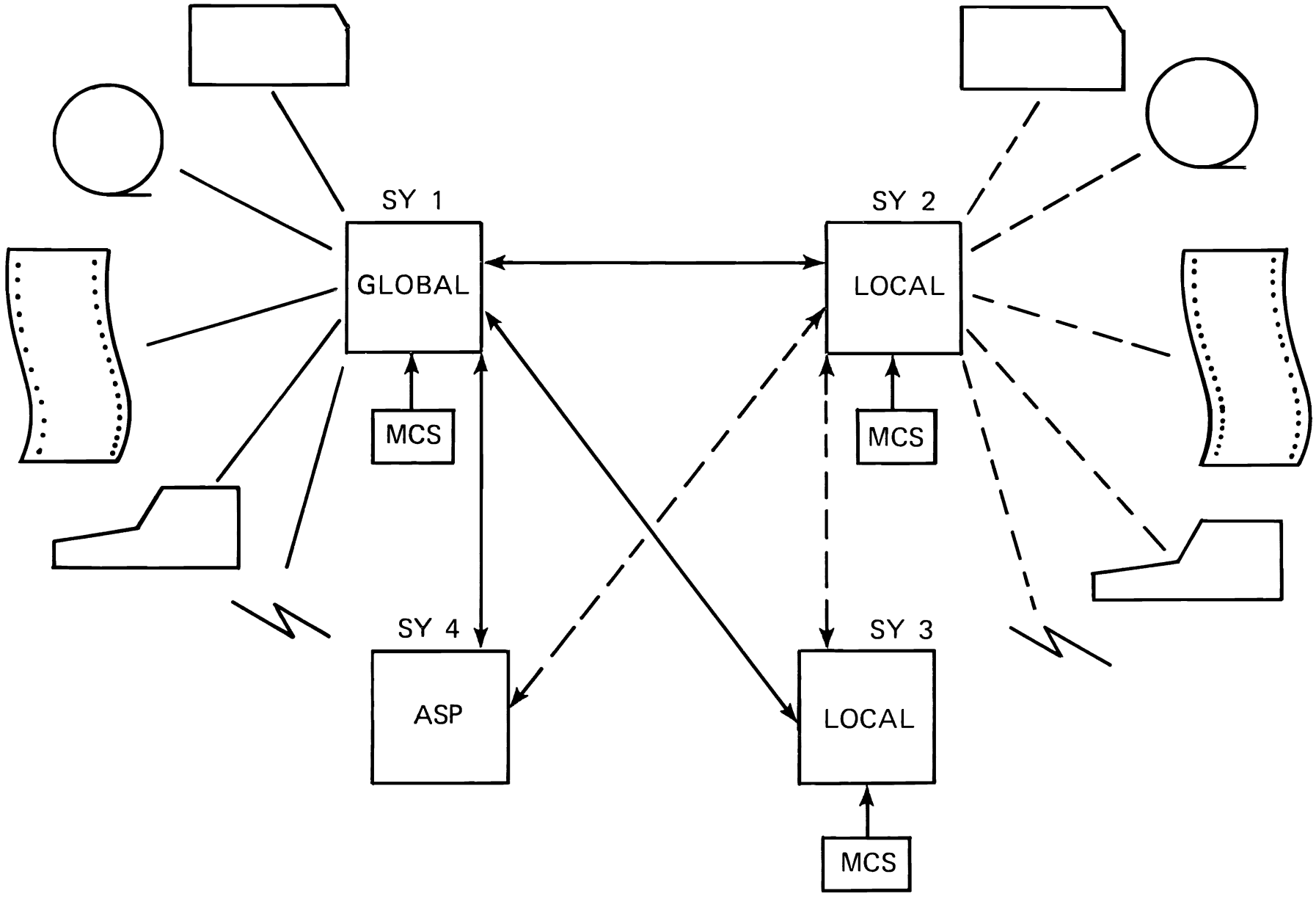
JES3 RECOVERY



V.7.5/H.7.4

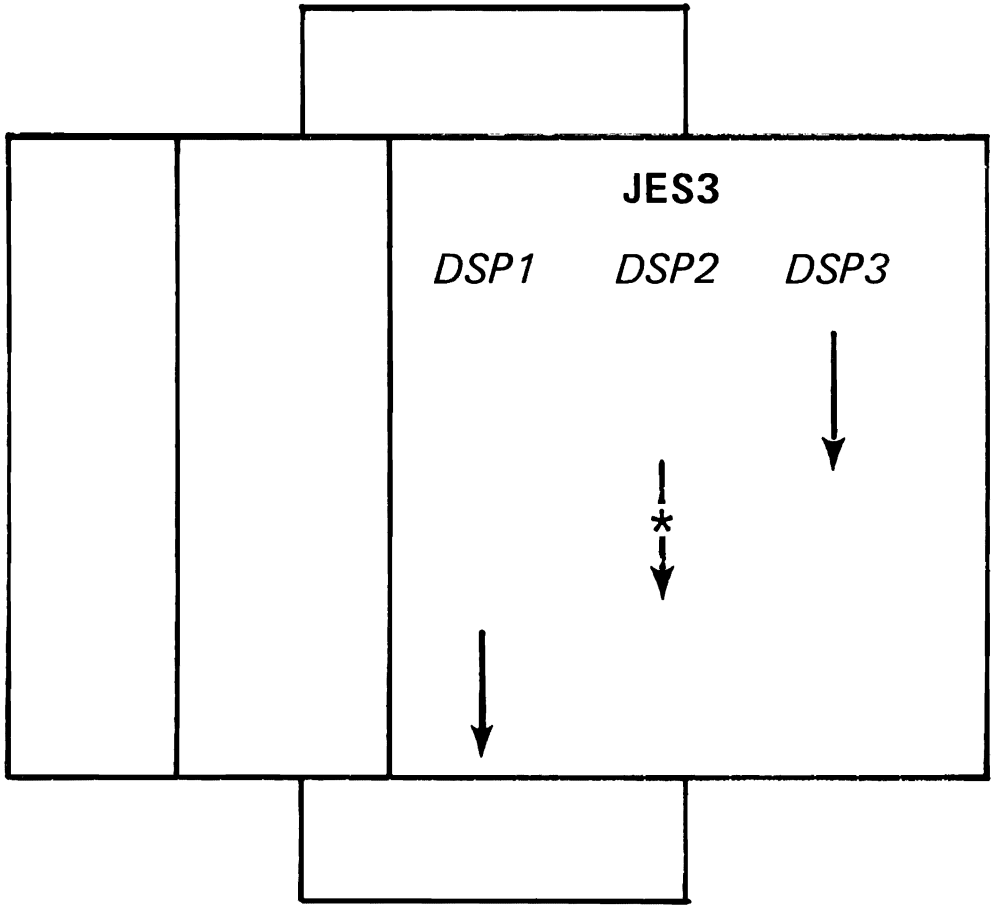
5009

DSI ENVIRONMENT



V.7.6/H.7.5

JES3 FAILSOFT



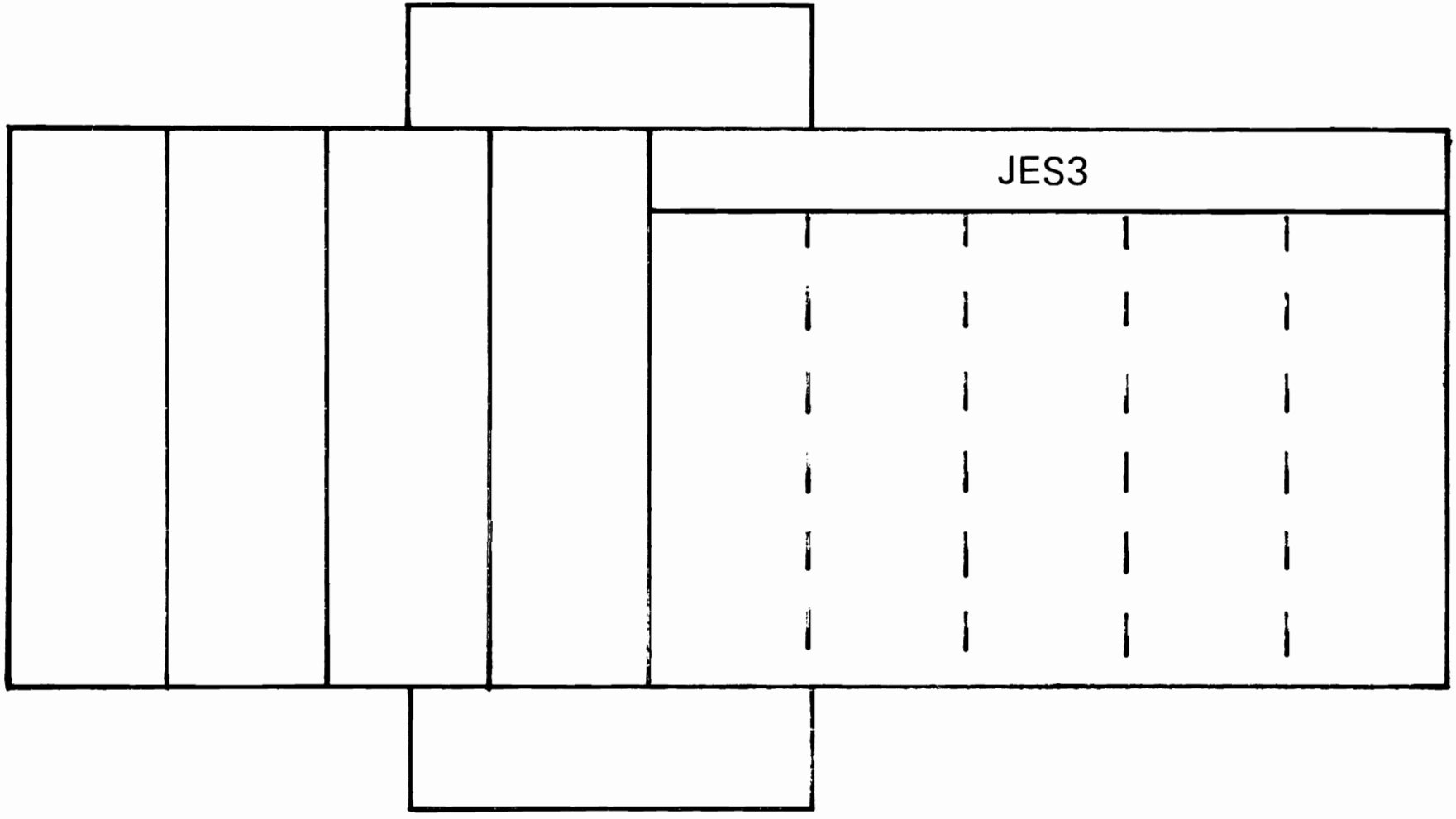
FAILSOFT PROCESSING

- FAILURE LOGOUT
- OPERATOR MESSAGE
- RECOVERY ATTEMPTED
  - DSP CONTINUES
  - DSP TERMINATED
- JES3 PROCESSING CONTINUES

SERVICE AIDS

- CONSOLE TEST
- CONTROL BLOCK PRINT
- DISPLAY DJC TABLES
- DISPLAY JES3 JOB QUEUE STATUS
- EVENT TRACE FACILITY
- INTERPRETER DEBUG FACILITY
- JES3 ABEND DUMPS
- JCL TEST FACILITY
- JOB SETUP TABLE TEST
- RJP LINE SNAP FACILITY

USER WRITTEN DSPs



- JOB EXECUTION
- BACKGROUND FUNCTION

Teaching Strategy: This topic should be geared by the instructor as much as possible to the audience. If the students represent only one or perhaps two installations, the presentation could be oriented to fit the specific needs of the group. If it is being conducted as an on-site class by an instructor with knowledge of the installation plans, then it is suggested that certain detail relative to dates and other installation objectives be discussed. The overriding point to be made is that planning for a JES3 installation is a must.

Objectives: Upon successful completion of this topic, the student should be able to:

1. Identify and relate JES3 processing characteristics that are applicable to user departments for installation planning purposes.
2. Identify and relate JES3 processing characteristics that are applicable to operations personnel for installation planning purposes.

Time Estimate: Approximately thirty minutes is required to present this topic.

Outline:

A. User Departments

1. Education
2. Processor Dependency
3. Recovery Processing
4. Installation Standards

B. Operations Departments

1. Education
2. Functional Consoles
3. Recovery (Backup)
4. Operator Morale

PLANNING CONSIDERATIONS

A. User Departments

The intent here is to present some possible areas of consideration for planning purposes. These items are not meant to be all-inclusive nor will they be applicable to each installation. The ideal situation would be to generate discussion among the students related to their own known environment. This means they are making a correspondence between JES3 facilities and the implementation of those - plus the other students receive the benefit of these observations.

1. Education

Perhaps an abbreviated version of a class similar to this one might be appropriate. The users must to some degree be aware of the machine room capabilities: CPUs, tape and disk usage, shared devices, restrictions, etc. In general, the configuration must be known by the user. Also, the features of JES3 and the invocation of these via JES3 control cards must be presented to the user. There are many possibilities available to the user through this method - and he should know the proper usage of them.

2. Processor Dependency

Perhaps this item is a subset of education, but the point is this - to submit work to the system, the user must know if there are CPU dependencies such as data set access, emulator access, tape and/or disk drive access, etc.

3. Recovery Processing

Here the consideration is what to do if the system fails while the job is executing. The user has two possibilities and the intent is not the discuss which of the two ways is best, but to be aware of the situation. The user has available to him all the facilities of OS Checkpoint/Restart. Also, he may choose the JES3 restart feature - the selection of one of four job actions if the job is executing during a system failure.

4. Installation Standards

The user departments must be aware and follow the installation standards and procedures. This

includes job class usage, setup features, priority usage, output data set size and distribution, etc. The user will be well aware of these kinds of things and hopefully can contribute to the discussion to the benefit of all users represented in the class.

B. Operations Department

The same general comments made relative to the user departments is also appropriate here.

1. Education

The installation must be concerned with educating the operations staff because JES3 represents a different mode relative to the machine. Not only are JES3 commands new and different, but the functions performed by the operators may be somewhat changed.

2. Functional Consoles

This relates to operator education, but the implementation of JES3 functional consoles places the operator in a somewhat different position. He now is not concerned with an individual job as it progresses through the system, but rather the processing control of a single function of all jobs within the system. His station and activities relate now to job function and not specific and individual jobs.

3. Recovery (Backup)

There are many operational procedures that will be documented and kept within the machine room. Prime among these could well be the ones related to JES3 type recovery. This includes DSI consideration as well as JES3 address space initialization and individual job recovery processing. Operations personnel should be familiar with all the installation procedures related to recovery - this may include some rehersal sessions.

4. Operator Morale

In some previous ASP installations, one of the major areas of concern was operator morale. The implementation of functional consoles and the subsequent removal of operator intervention presented a morale problem among operators in some installations. This should be mentioned as a

caution - something to keep in mind as the installation is planned.

Hopefully discussion has been generated among the students relative to specific installation planning considerations. If the students have been sufficiently motivated to be concerned about the JES3 installation and see the need for some advance planning, the purposes of this topic have been achieved.

Teaching Strategy: This topic is simply meant to be a brief review. Nothing new will be presented. The visuals will be ones that have been used in previous topics. The author suggests a discussion type approach with student participation and perhaps a use of the chalkboard to list the JES3 features as these are reviewed.

Objectives: Upon successful completion of this topic, the student should be able to:

1. Describe the JES3 hardware environment.
2. Name the major features of JES3.
3. Trace the flow of a job through JES3.

Time Estimate: Approximately thirty minutes is required to present this topic.

Outline:

A. JES3 Hardware Environment

B. JES3 Features

C. JES3 Job Flow

D. JES3 Advantages

1. Single System Image
2. Installation Management Tools
3. Better Resource Utilization
4. Recovery
5. Growth

V.9.1-
V.9.2

A. JES3 Hardware Environment

Visual V.9.2 was used in the JES3 Overview topic. The instructor should refer back to that section. The following points should be reviewed.

- o GLOBAL is the controlling CPU.
- o JES3 supports from 1 - 3 LOCALs.
- o JES3 supports the 145, 155-II, 165-II, 158, 168, 158MP and 168MP.
- o GLOBAL/LOCAL must have CTC connection.
- o All processor must have access to the SPOOL volumes.
- o All job input/output is via the GLOBAL.
- o JES3 supports ASP Mains

V.9.3

B. JES3 Features

This visual was used in the JES3 Overview topic. The instructor should refer back to that section. The following JES3 features should be reviewed:

- o Operation Aid
- o System Coupler
- o Resource Manager
- o System Scheduler
- o Spooling System

V.9.4

C. JES3 Job Flow

This visual was used in the JES3 Job Flow topic. The instructor should refer back to that section. The following JES3 job flow stages should be reviewed:

- o Input Service
- o Converter/Interpreter Service
- o Main Device Scheduling
- o Generalized Main Scheduling
- o Execution Service
- o Output Service
- o Purge

D. JES3 Advantages

The preceeding part of the review should not require much time because it all has been covered at least once - and in some cases more than once. The author suggests now that the instructor use the chalkboard and ask the student to categorize the JES3 facilities under five titles. The following five headings should be

written on the chalkboard.

- Single System Image
- Installation Management Tools
- Better Resource Utilization
- Recovery
- Growth

The student with his JES3 knowledge should be asked to place the JES3 features in one of the five categories. Hopefully, this will generate discussion in addition to presenting the facilities of JES3 in a somewhat different manner.

1. Single System Image

   - Single Job Queue
   - Centralized Operator Interface
   - Total Device Overview
   - Functional Machine Room Arrangement

2. Installation Management Tools

   - Dependent Job Control
   - Deadline Scheduling
   - Generalized Job Scheduling
   - System Management Facility (SMF)

3. Better Resource Utilization

   - Pooled Tape Devices
   - Shared DASD
   - Projected Fetch/Mount
   - Tailored, Controllable Selection

4. Recovery

   - Dynamic System Interchange
   - DSP Failsoft
   - MP Advantages
   - Full OS Checkpoint/Restart Support
   - JES3 Job Restart Options

5. Growth

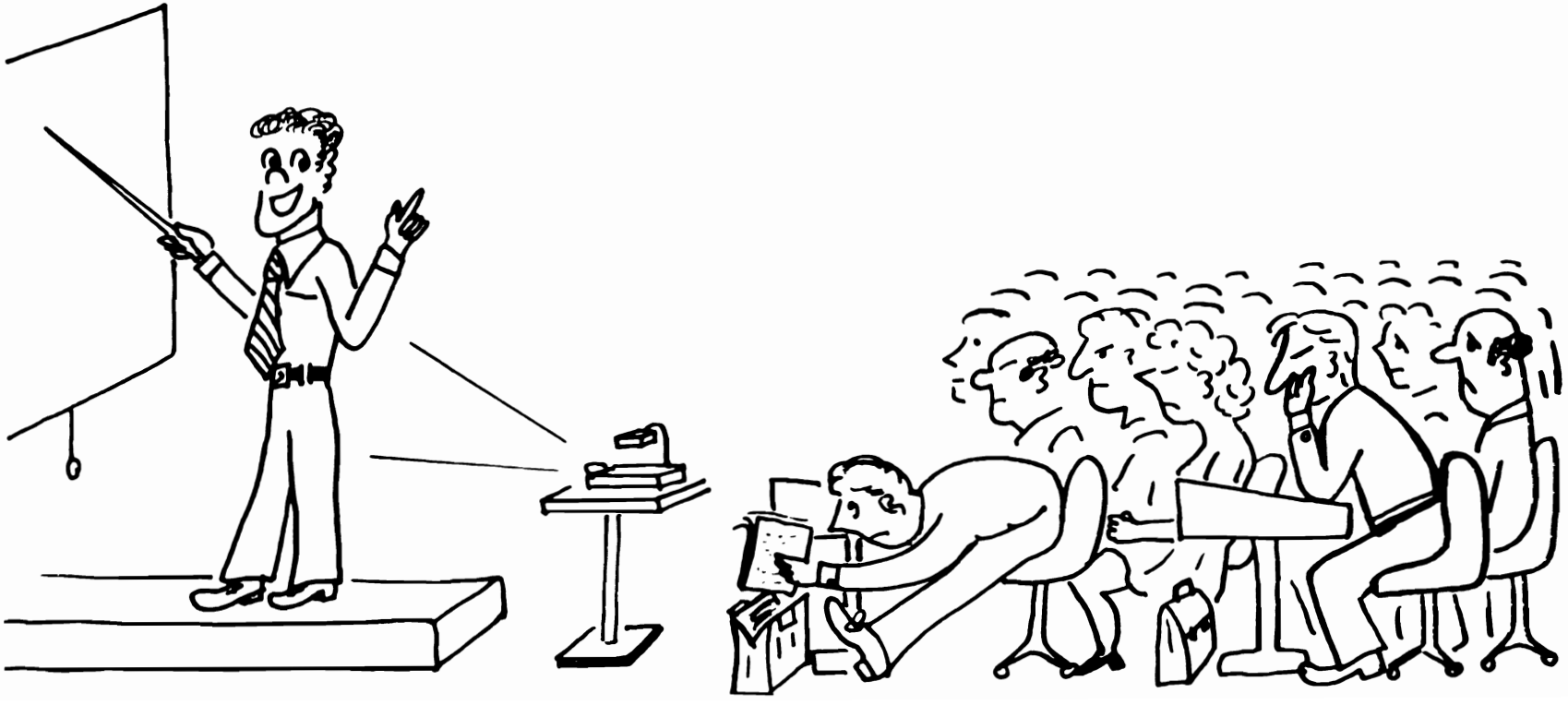
   - Memory Growth
   - Incremental Horsepower
   - Non-Disruptive

LIST OF VISUALS

VISUAL NO.	HANDOUT NO.	DESCRIPTION
V.9.1		Review and Summary
V.9.2	H.9.1	JES3 GLOBAL/LOCAL
V.9.3	H.9.2	JES3 Configuration
V.9.4	H.9.3	JES3 Job Flow

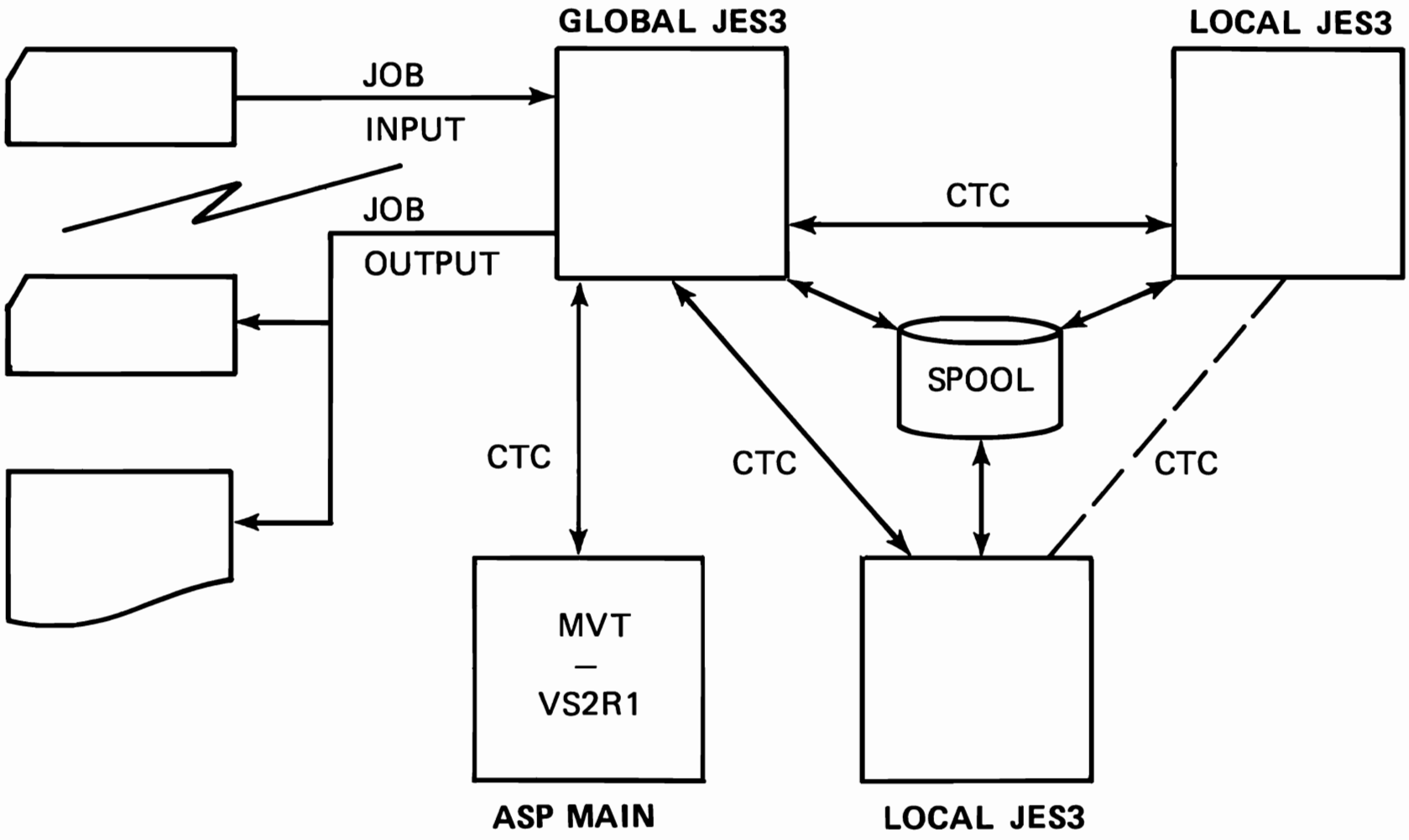
5028

REVIEW AND SUMMARY



V.9.1

JES3 GLOBAL/LOCAL



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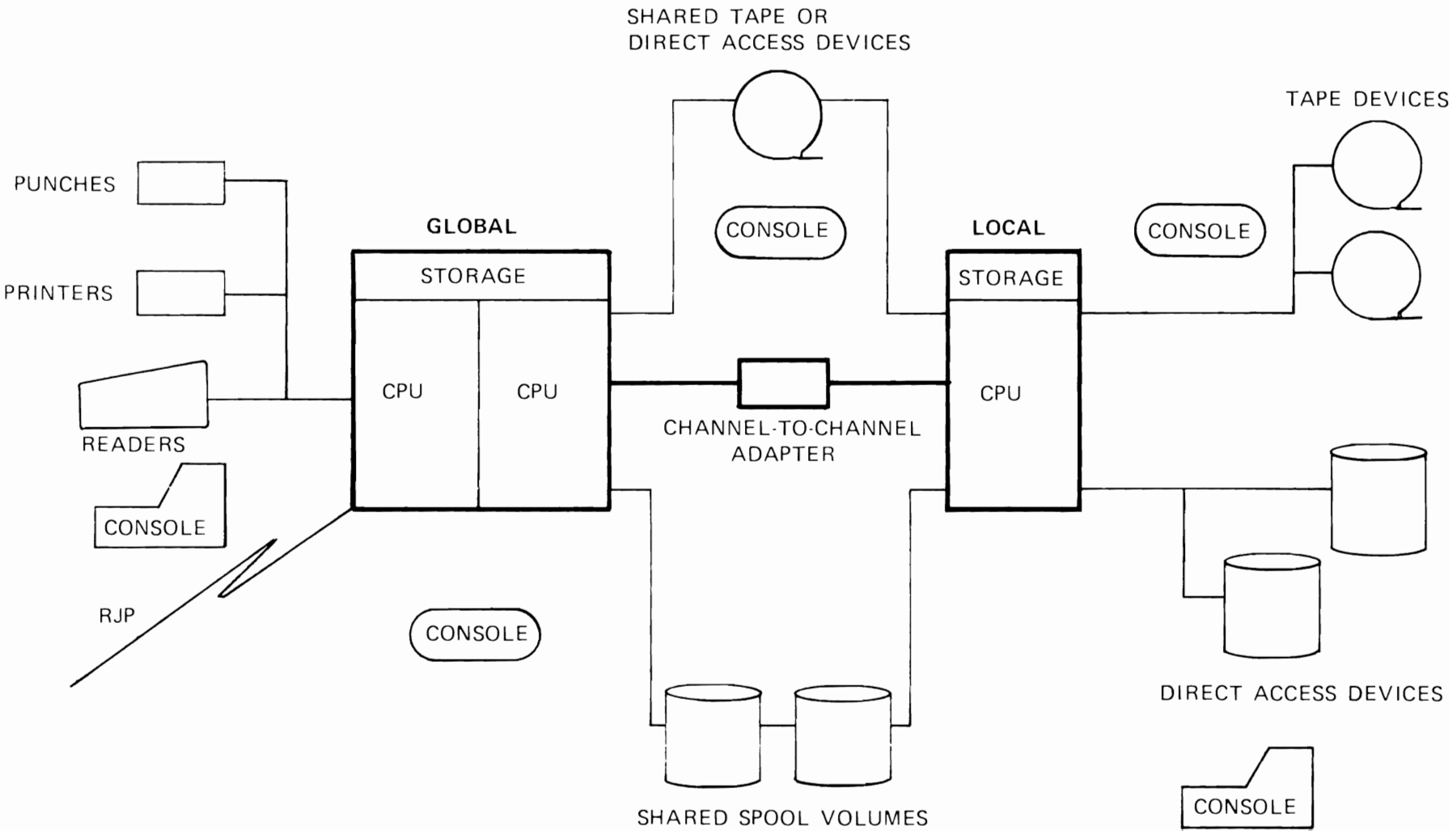
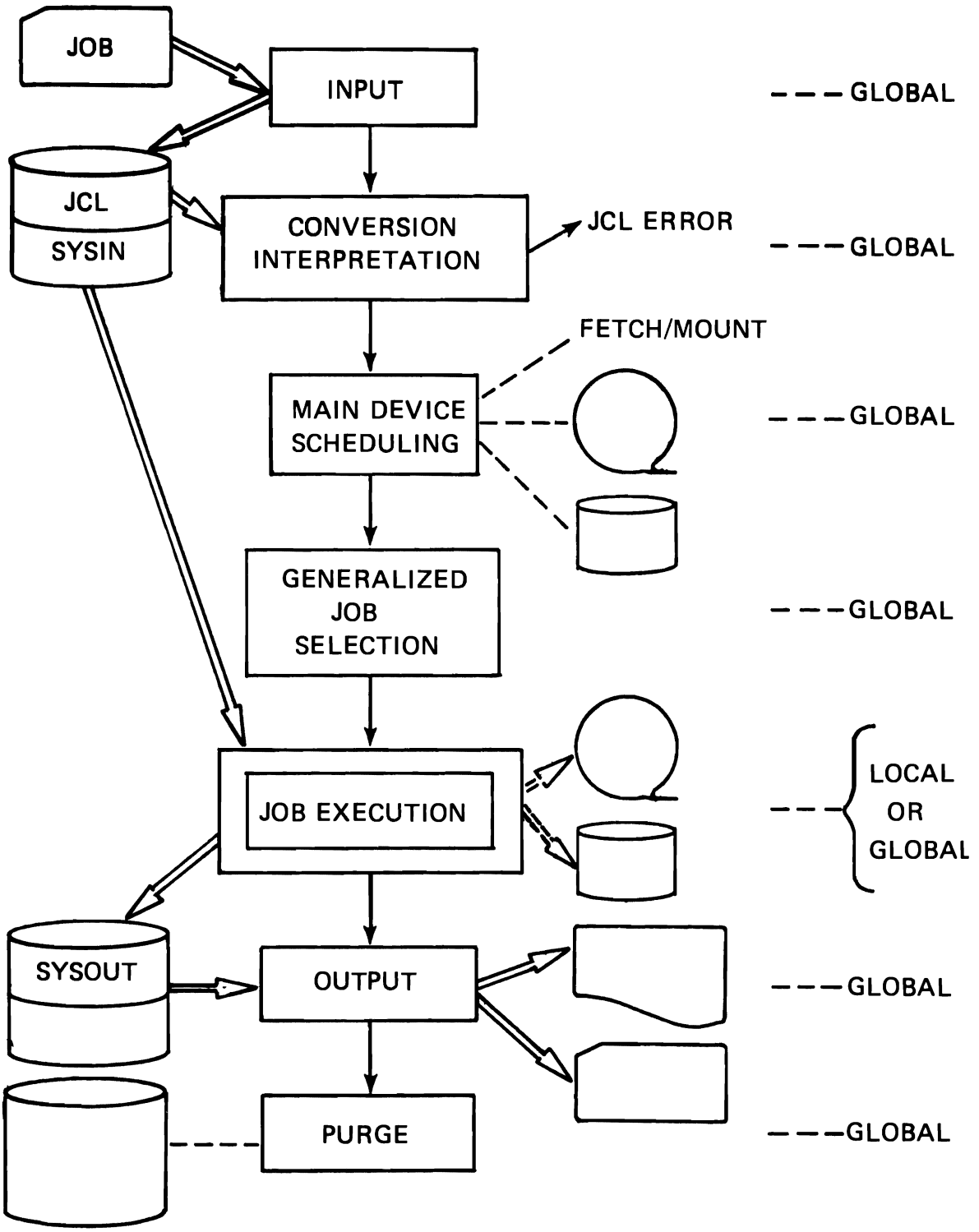
V.9.3/H.9.2

JES3 CONFIGURATION



JES3 JOB FLOW



INSTRUCTOR MATERIALS

SELF EVALUATION QUIZ 1 - JES3 OVERVIEW

1. Match the JES3 term with the proper description.

ASP MAIN _____	a. A single processor configuration
GLOBAL _____	b. A processor responsible for all peripheral operations
LOCAL _____	
UNIPROCESSOR _____	c. A processor executing with OS/MVT or VS2 Release 1
MULTIPROCESSOR _____	d. A processor executing work with MVS and no readers or printers attached
	e. Two processors sharing the same resources

2. The GLOBAL processor may execute user jobs.

   a. True
   b. False

3. JES3 is NOT one of the following:

   a. Resource Manager
   b. System Scheduler
   c. Operational Aid
   d. System Usage Manager

4. Routines in JES3 that perform specific functions are called _____.

5

SELF EVALUATION QUIZ 2 - JES3 JOB FLOW

1. Which element of JES3 job processing analyzes user JCL?

   a. SELECTION
   b. INPUT
   c. CONVERSION
   d. EXECUTION

2. Which element of JES3 job processing attempts to allocate devices to a job?

   a. SCHEDULING
   b. INPUT
   c. CONVERSION
   d. EXECUTION

3. Output printing may be started before the job has finished execution if the user used the SYSOUT _____ feature of MVS.

4. While a user job is executing, JES3 is monitoring the execution for _____ and _____.

5. Non-standard jobs in JES3 are jobs which require a //*_____ JES3 control card to describe the JES3 scheduler elements.

6. _____ is responsible for device setup messages as well as device allocation for user jobs.

SELF EVALUATION QUIZ 3 - JES3 FEATURES AND OPTIONS

1. JES3 managed devices are devices that are

   a. Attached to the GLOBAL processor
   b. Attached to the LOCAL processor
   c. Attached to the ASP MAIN
   d. All of the above

2. Devices managed by JES3 may be shared between the GLOBAL processor and LOCAL processor.

   a. True
   b. False

3. High Watermark Setup (HWS)

   a. Eases the machine room mounting and demounting of devices
   b. Is a method to minimize the number of devices needed for a job
   c. Must apply to all DASD and tape devices in the system
   d. Requires control card specification

4. The job selection algorithm is set at JES3 initialization and cannot be changed without reinitialization of JES3.

   a. True
   b. False

5. Dependent Job Control

   a. Requires no JES3 control cards
   b. Specifies a time when the job should complete
   c. Forces jobs to execute in a specific sequence
   d. All of the above

6. The JES3 operating environment is determined by the _____.

7. With JES3/RJP, the remote station may have ability to have JES3 consoles.

   a. True
   b. False

SELF EVALUATION QUIZ 4 - JES3 CONTROL CARDS

1. The //*FORMAT card can be used to select

   a. Printer forms
   b. Override installation standards for output
   c. Determine the number of copies to print
   d. All of the above

2. The //*PROCESS cards are used to describe the _____ required for JES3 to process a job.

3. If a job could only run on a specific processor, the user would add a //*_____ card to the JCL deck.

4. To invoke Deadline Scheduling, a Deadline card must be in the initialization deck and the user must add a //*_____ card to the job's JCL.

5. Deadline Scheduling assures the completion of a job by a specific time.

   a. True
   b. False

6. The //*NET card defines a job's _____ with other jobs for JES3 to control for proper sequence of execution.

7. JES3 commands may be entered in the input stream.

   a. True
   b. False

8. To override installation standards for device setup the user includes the setup parameter on a //*_____ card.

SELF EVALUATION QUIZ 5 - JES3 CONSOLES

1. Each MVS processor must have a minimum of _____ console.

2. The two types of commands entered from consoles on the GLOBAL processor are a._____, b._____

3. Functional consoles allow for _____ of operational functions within the machine room.

4. Remote work stations without consoles may not have console capability.

   a. True
   b. False

5. List two JES3 console features which aid operators when entering commands:

   a. _____
   b. _____

6. If operations wanted to change the criteria for job scheduling, they would use a JES3 _____ command.

7. To determine what jobs were active in the system, an operator could use the JES3 _____ command.

8. Background utilities under JES3 may be invoked by an operator using the _____ command.

SELF EVALUATION QUIZ 6 - ADDITIONAL JES3 FEATURES

1. The migration aid provides for job execution on

   a. ASP systems only
   b. JES3 systems only
   c. JES3 and ASP systems
   d. Psuedo JES3 systems

2. User exits are provided in JES3 to

   a. Assist in problem determination
   b. Minimize modifications to JES3
   c. Provide job access to JES3 functions
   d. Required by JES3 to support ASP MAINs

3. System Management Facilities (SMF) under JES3 is

   a. An inquiry/status facility
   b. A "Self-Tuning" system for JES3
   c. Not supported
   d. A technique of recording information for billing and evaluation

4. Dynamic System Interchange (DSI) provides the capability to

   a. Assign the GLOBAL function to a LOCAL processor
   b. Allow interchange between ASP MAINs and MVS LOCALs
   c. Retrieve new JES3 modules when a failure occurs
   d. Run MVS and MVT within the same processor

5. Which of the following NEED NOT occur when a JES3 DSP fails

   a. The failure is recorded in an error log (LOGREC)
   b. A message is sent to the operator
   c. JES3 stops and must be restarted
   d. Recovery is attempted

SELF EVALUATION QUIZ ANSWERS

QUIZ 1 - JES3 OVERVIEW

1. c, b, d, a, e
2. True
3. d
4. Dynamic Support Programs

QUIZ 2 - JES3 JOB FLOW

1. c
2. a
3. Spinoff
4. Abnormal Conditions
   Excessive Output
5. PROCESS
6. Main Device Scheduling (MDS)

QUIZ 3 - JES3 FEATURES AND OPTIONS

1. d
2. True
3. b
4. False
5. c
6. Initialization Deck
7. True

QUIZ 4 - JES3 CONTROL CARDS

1. d
2. Scheduler Elements (SE)
3. MAIN
4. MAIN
5. False
6. Dependencies
7. True
8. MAIN

QUIZ 5 - JES3 CONSOLES

1. One MVS
2. JES3
   MVS
3. Separation
4. False
5. Multiple Commands/line
   Logical Backspace

6. Modify
7. Inquiry
8. Call

QUIZ 6 - ADDITIONAL JFS3 FEATURES

1. c
2. b
3. d
4. a
5. c

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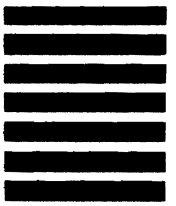

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