

INTERNATIONAL BUSINESS MACHINES CORPORATION
CUSTOMER ENGINEERING EDUCATION DEPARTMENT
IBM EDUCATION CENTER
POUGHKEEPSIE, NEW YORK
STUDENT STUDY GUIDE
BASIC MONITOR SYSTEM (IBSYS)

COURSE OBJECTIVES:

To present to the student a detailed understanding of the need for, functions and operating aspects of the Basic Monitor System.

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Written by	Date
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REFERENCE MATERIAL

1. Reference Manual - IBM 7090 Data Processing System, Form # A22-6528-4
2. Reference Manual - Glossary for Information Processing, Form #C20-8089
3. Reference Manual - Fortran Assembly Program (FAP), Form # C28-6235
4. Reference Manual - IBM 7090/7094 Operating Systems Basic Monitor (IBSYS) - Form #C28-6248
5. Programming Systems Analysis Guide - IBM 7090/7094 Basic Monitor, (IBSYS) Form #
6. 7090/7094 Input/Output Control System Logic Diagrams
7. 7090/7094 Generalized Sorting Program Logic Diagrams

STUDY GUIDE CONTENT

BASIC MONITOR SYSTEM (IBSYS)

LECTURE SUMMARIES

I.	INTRODUCTION	52.03.05
II.	THE BASIC MONITOR SYSTEM (IBSYS)	52.03.09
III.	I/O DEVICE HANDLING	52.03.12
IV.	BASIC MONITOR CONTROL AND PROGRAM EXECUTION	52.03.17
V.	IOEX	52.03.21

ASSIGNMENTS

ASSIGNMENT #1	INTRODUCTION
ASSIGNMENT #2	THE BASIC MONITOR SYSTEM (IBSYS)
ASSIGNMENT #3	I/O DEVICE HANDLING
ASSIGNMENT #4	BASIC MONITOR CONTROL AND PROGRAM EXECUTION
ASSIGNMENT #5	IOEX

LABORATORY PROJECTS

PROJECT #1	-	RUNNING UNDER IBSYS CONTROL
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SUPPLEMENTAL INSTRUCTION MATERIAL

I.	IBSYS LIBRARY SAMPLE MAP
II.	SAMPLE IBSYS RUN ON-LINE MESSAGE PRINTOUT

LEGEND

1. R. M. Reference Manual - IBM 7090/7094 Operating Systems - Basic Monitor (IBSYS) Form # C28-6248
2. S. G. Basic Monitor System (IBSYS) Student Study Guide
3. 9IOCS 7090/7094 Input/Output Control System Logic Diagrams
4. 90SORT 7090/7094 Generalized Sorting Program Logic Diagrams
5. PSAG Programming Systems Analysis Guide IBM 7090/7094 Basic Monitor (IBSYS)

I. INTRODUCTION

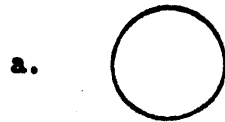
Objective: Acquaint the student with the basic objectives of the course and to condition his thinking toward programming lines. The latter will be accomplished through a review of the standard flow charting symbols and the introduction of new symbols used in the course. Simple loops will be presented for charting and symbolic coding by the student.

A. COURSE OBJECTIVES

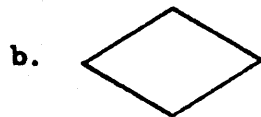
1. The course is divided into three sections
 - a. Basic Monitor System
 - (1) Basic Monitor System - (IBSYS)
 - (a) Comprised of the Basic Monitor and all participating programming systems operating under its control.
 - (2) Basic Monitor
 - (a) Main control element of IBSYS
 - b. 7090/7094 Input/Output Control System (9IOCS)
 - (1) Package Program designed to relieve programmers of the necessity of writing input and output routines.
 - c. 7090/7094 Generalized Sorting Program
 - (1) Combination program which can perform a sort, merge or sort and merge
 - (2) Extremely flexible in choice of setup desired
2. Objectives
 - a. A knowledge of the use and internal workings of the above listed programs along with an understanding of their associated terminology.
 - b. Exposure to techniques useful in the analysis of a program.
 - c. An extended opportunity to read program listings.
 - d. Form a foundation for the study of future programming systems.

B. FLOW-CHARTING

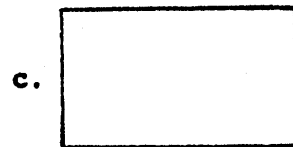
1. Basic Symbols



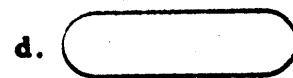
Connector - Connect between one section of a flow chart and another.



Decision - Result of some operation



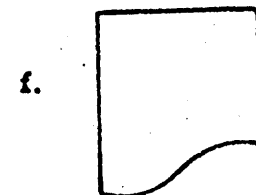
Program Step



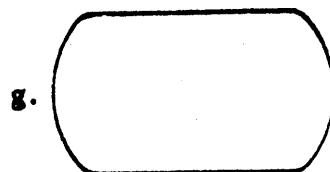
Halt



Console Operation



Document



Input/Output Operation

2. New Symbols

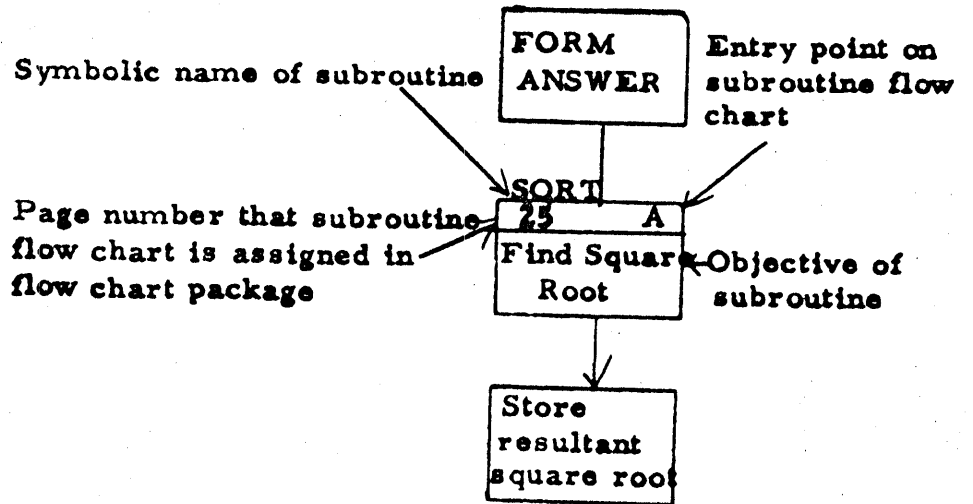
a. Subroutine Symbol

(1) Purpose

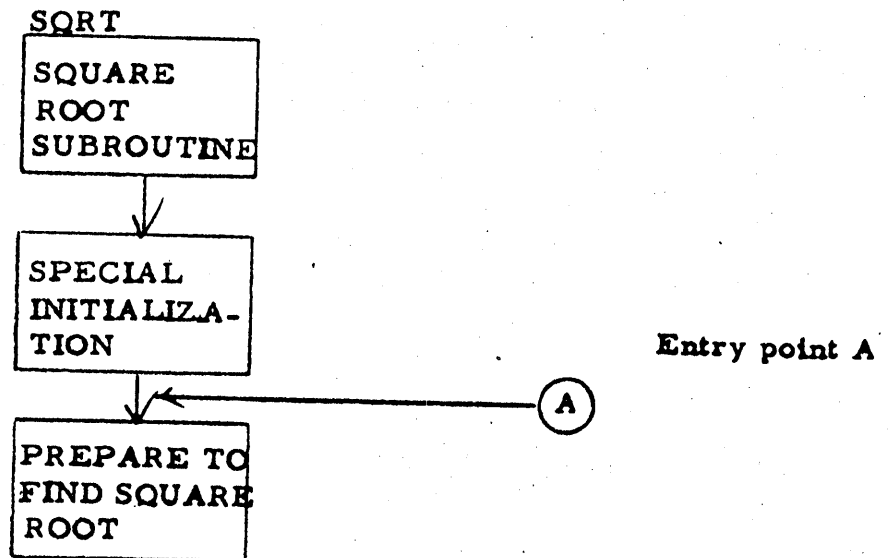
(a) Represent an entire subroutine with one block

(b) Makes flow-charting a common subroutine each time it is used unnecessary

- (c) Common subroutine flow-charted once can be referred to as required by this symbol.
- (2) An example of its use in main program follows
- (a)



- (3) An example of the subroutine flow-chart to tie in data illustrated in subroutine block follows
- (a)



3. Student Practice

a. Students are to use the above symbols to flow-chart simple problems.

(1) Suggested Problems

(a) $A + B \times C = D$ Find $A + B$, print sum using subroutine "PRNT", then multiply sum by C, print result D using subroutine "PRNT", and stop. Assume "PRNT" is written and located on page 115. Use entry point Q.

(b) Read a record from Tape A1 and one from B1. Subroutine "COMP" should be used to compare record numbers. This subroutine has 3 returns to the main program ($A1 = B1$, $A1 < B1$, $A1 > B1$). If $A1 = B1$ stop at 000. If $A1 < B1$ stop at 001. If $A1 > B1$ stop at 002.

b. On completion of the flow charts, the sample problems are to be coded with the use of symbolics.

II. THE BASIC MONITOR SYSTEM (IBSYS)

Objective: Familiarize the student with the concept of a programming system, comprised of a series of individual program packages under control of a monitor.

A. OVERALL OBJECTIVE OF THIS TYPE OF SYSTEM

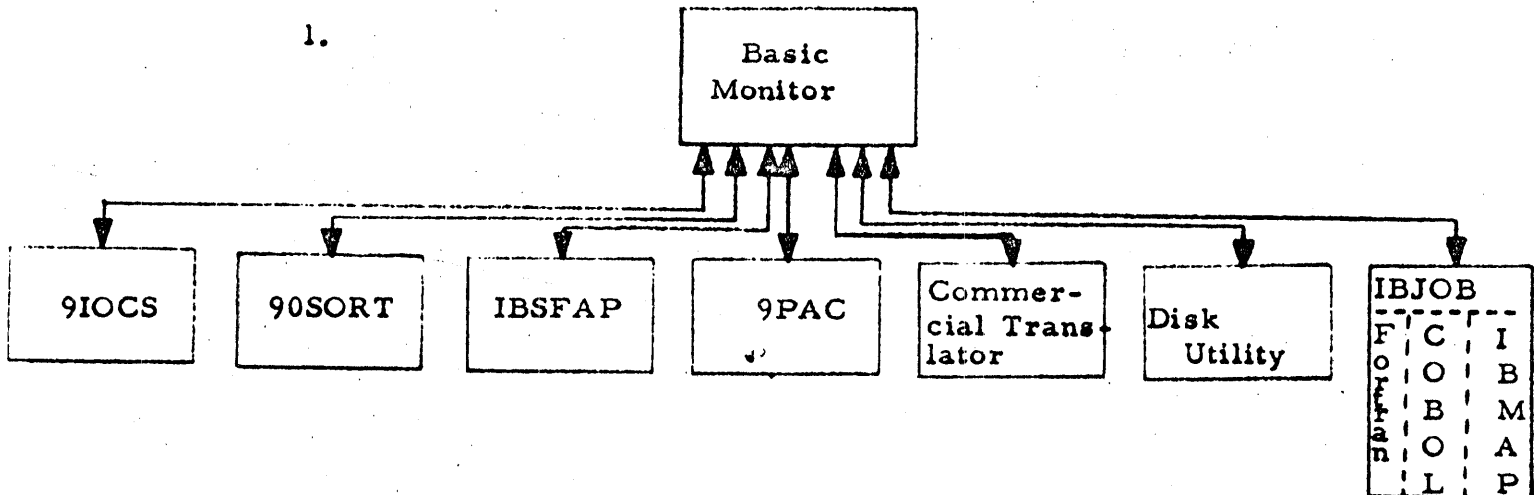
1. Provide continuous computer operation during a sequence of jobs which might involve the use of several independent programming systems. Operator intervention is to be held at a minimum!

a. Example run:

9IOCS	(JOB4)
90SORT	(JOB3)
90SORT	(JOB2)
9IOCS	(JOB1)

B. EXAMPLE OF IBSYS LAYOUT

1.



- a. Each participating system has included within it a monitor which controls the execution of that particular program. It can be considered a sub-monitor to the main Basic Monitor.
- b. A variety of references must be made to the Basic Monitor by a programming system operating under its control. To eliminate the need for multiple definition of pertinent Basic Monitor symbols a version of the Fortran Assembly Program (FAP), which contains these definitions in a symbol table, has been incor-

porated as the "IBSFAP" package, The symbol definitions are always at the level of the Basic Monitor under which the particular IBSFAP package operates.

2. Inclusion of C. E. Diagnostics into Basic Monitor System.
 - a. Diagnostics readily available to C. E. and customer
 - b. Familiarize C. E. with the use of the Monitor System - calling of routines, etc.

C. OBJECTIVES OF THE BASIC MONITOR (Control Element Of IBSYS)

1. Call jobs in sequence desired
2. Make tape unit assignments
 - a. Save particular tape units to be used for library, input and other similar functions (System Function Units)
 - b. Allow output of one job to be used as input to another (Reserve Units)
 - c. Keep account of tape units that are available for scratch purposes (Available Units)
 - (1) Units that are in operating condition
 - (2) Units that are not currently in use as Function or Reserve
3. Keep account of the physical characteristics of each I/O device
 - a. Model
 - b. Current position of I/O media
4. Offer set I/O routines to participating systems which
 - a. schedule initiation of desired I/O operations
 - b. Supervise channel trapping
 - c. Perform automatic tape error recovery and indicate if recovery not possible
 - d. Update tape positions and other pertinent conditions
 - e. Are completely debugged and ready for use

5. Provide an effective method of modifying and updating the library tape/s which contain/s the Monitor and all participating systems

D. FOUR SECTIONS OF THE BASIC MONITOR

Ref. R. M. -Pg. 5

1. Nucleus - IBNUC
 - a. Remains in core at all times
 - b. Consists primarily of tables
2. Trap Supervisor - IOEX
 - a. Remains in core with IBNUC
 - b. Contains all routines which are available to participating systems for I/O control
3. Supervisor - IBSUP
 - a. Brought into core between jobs
 - b. Sets up Basic Monitor for next job and then passes control to it, both via control cards
4. Editor - IBEDT
 - a. Called into core when IBSYS library is to be modified
 - b. Processes edit control cards and modifies the library tape accordingly

E. IBSYS CONFIGURATION

1. Released for immediate usage on a "Standard" 7090
 - a. 3 card machines on Channel A
 - b. 8 tape units on each of Channels A and B
 - c. 4 tape units on each of channels C and D
 - d. 2 disc frames on Channel E
2. Can be modified easily to fit any system configuration by the alteration of standards cards and then re-assembly.

III, I/O DEVICE HANDLING

Objective: Point out the methods used to keep account of the condition and function of each I/O device, in addition to those used for the generation of tape assignments.

A. UNIT CONTROL BLOCK

R. M. - Pg. 20

1. Control area four words long
2. One such area for each I/O device on the system
3. Keeps account of conditions associated with a particular I/O device

B. AVAILABLE UNITS

R. M. - Pg. 11

1. Means used to keep account of units which are available to a participating program for miscellaneous functions.
 - a. Unit Availability Table (SYSUAV)
 - (1) A block of cells consisting of one word per channel
 - (2) By referring to the appropriate position within the table the available tape units for a desired channel can be located.
 - (3) It is the responsibility of the participating programming system to refer to this table, extract the desired unit references, and update it as required. On completion of a job, all available unit references are to be restored by the user.

b. Unit Availability Chain

R. M. - Pg. 44

- (1) The concept used in conjunction with the Unit Availability Table to keep account of available tape units.
- (2) A chain is formed as follows:
 - (a) The appropriate cell of the SYSUAV table contains in its address the location of the unit control block associated with the first available tape unit on the particular channel.
 - (b) The first word address of this unit control block contains

the location of the u. c. b. associated with the next available tape unit.

- (c) This process is continued until all tape units of the channel are linked together.
- (3) By reference to the SYSUAV table cell associated with a particular channel and its chain, all available tape units can be readily found.

C. DETACHED UNITS

- 1. Although a particular tape unit may normally be attached to a system, provision must be made to remove it from that status, if for example, mechanical failure occurs.
 - a. This can be accomplished by using the "Detach" Basic Monitor control card
 - b. The control block for the unit still exists but is flagged "detached"
 - c. When the unit is repaired it can be returned to "attached" status by use of the "Attach" Basic Monitor control card.

D. FUNCTION UNITS

R. M. - Pg. 11

- 1. I/O devices associated with a particular function such as SYSLBI (System Library), SYSINI (System Input), etc.
 - a. These functions are common to all participating systems. Therefore, a means of locating the I/O device currently associated with these functions must be provided.
 - (1) The System Unit Function table (SYSUNI) is provided for this purpose.
 - (a) One cell for each function
 - (b) Each cell contains in its address the location of the UCB of the device currently assigned to that function.
 - (c) I/O function assignments are set up initially via assembly parameters and can later be altered by

- Basic Monitor control cards.
(d) Review "Function Table" entries
in reference manual.

R. M. - Pg. 11

E. RESERVE UNITS (INTERSYSTEM UNITS)

1. Since tape units are selected by a participating program from the availability chains, no physical unit addresses can be specified.
 - a. Assuming that the output of a job is to be used as input to a later job in the same run, a method must be provided, using logical unit designations, to refer to its location.
 - (1) The units thus desired are considered to be located on logical channels J through Q and are called "reserve" units.
 - (a) If, for example, J is specified as the output unit of the first job an available tape unit would be selected and tagged symbolically as J₁. Reference to input J₁ by the second job would result in the application of the device initially selected.

F. SUMMARY OF UNIT CLASSIFICATIONS

1. Attached Units
 - a. System Function Units (card or tape)
 - b. Reserved Units (tape only)
 - c. Available Units (tape only)
 - d. Card Units (card only)
2. Detached Units (Card or tape)

G. SUGGESTED SYMBOLIC SPECIFICATIONS FOR UNIT ASSIGNMENT

R. M. - Pg. 43

1. These specifications would normally be given in file control cards of the participating programming system to be executed.
 - a. It is the function of that system to interpret the specification, interrogate the unit availability chains in Basic Monitor and make unit assignments accordingly.

- b. Primary and Secondary Units
 - (1) Two units usually assigned to a specific file for reel switch purposes.
 - (a) Primary - First unit to be used
 - (b) Secondary - Alternate unit

2. Notation

a. Channel Designations

- (1) A through H - denotes real channel
- (2) S through Z - symbolic channel
 - (a) Allow unit specifications bearing the same channel designation for a job to be assigned to the same physical channel, if possible.
- (3) J through Q - symbolic channel
 - (a) Used to specify an intersystem reserve unit

b. Unit Designations

- (1) 0 through 9
 - (a) Used to specialize unit requests within a particular channel designation.
- (2) IN, OU, PP, etc.
 - (a) Used to specify system function units.

c. Miscellaneous Designations

- (1) Blank
 - (a) Any available unit is assigned
- (2) *
 - (a) Alternate (secondary) unit designation only - a unit of the same model on the same channel as the primary unit is assigned, if possible.

d. Model Designation

- (1) II or IV - denotes tape unit model
 - (a) II is synonymous with V
 - (b) IV is synonymous with VI

e. Sample Designations

- (1) A1 II - The first model II in the availability chain for Channel A is assigned
- (2) A - any available unit on Channel A is assigned.
- (3) AII - Any model II unit on Channel A is assigned.

Note: If unit designations cannot be satisfied, a substitution is automatically made.

4. Order of Assignment
 - a. System units
 - b. Units for real channel specifications - Model II's first, then IV's
 - c. Units on symbolic channels - Model II's first, then IV's
 - d. Units with "blank" specification
 - e. Secondary units designated with an *

H. COMMUNICATION REGION AND ONE-WORD ENTRY TABLE

R. M. - Pg. 11

1. Located in core at the beginning of IBNUC (Nucleus)
2. Content
 - a. Cells which locate various tables within Nucleus, some of which were discussed earlier (Ex. - SYSUNI)
 - b. Cells which contain constants of value to all participating programming systems (Ex. - SYSDAT - system date)
3. Examine the content of each cell in class as a group

R. M. - Pg. 11

R. M. - Pg. 45-46

IV. BASIC MONITOR CONTROL AND PROGRAM EXECUTION

Objective: Familiarize the student with the content and function of the various control cards utilized by Basic Monitor along with the steps required to prepare for, call and execute a job utilizing a program of IBSYS.

R. M. - Pg. 33

A. DECK LAYOUT

1. Basic Monitor Control Card Group
 - a. Prepare for job execution
 - b. Call desired program and transfer control to it.

2. Control cards and program deck (if required) associated with desired program
 - a. Control cards supply parameters to specialize program for this run.
 - b. Program deck is required by certain programs of IBSYS (Ex. 9IOCS and IBSFAP)
 - c. \$IBSYS causes return to Basic Monitor for preparation for and execution of next desired job.

Note: If following job is to utilize the same program, return need not be made to Basic Monitor. A second pass of the program would normally be sufficient.

B. CONTROL CARDS

R. M. Pg. 6 thru 10

1. Control Card Format
 - a. Column 1 - \$
 - b. Columns 2 - 15 - Control card name
 - c. Columns 16 - 72 - Variable field information

2. Control Card Categories
 - a. Operational
 - (1) \$EXECUTE
 - (a) Call desired program and relinquish control to it.
 - (2) \$IBSYS
 - (a) Returns control to Basic Monitor on completion of desired program execution
 - (b) Interpreted by program executed

- (3) \$PAUSE
 - (a) Causes machine halt
 - (b) Prints message on-line:
OPERATOR ACTION PAUSE
PRESS START TO CONTINUE
- (4) \$CARDS
 - (a) Following Basic Monitor control cards will be read from reader
- (5) \$TAPE
 - (a) Following Basic Monitor control cards will be read from tape (SYSINI)
- (6) \$RESTORE
 - (a) Brings in IBSUP and performs all operations of a "COLD" start except the reset of tape positions (unit control blocks word 3) and system date (SYSDAT)
- (7) \$STOP
 - (a) Causes machine halt
 - (b) Prints message on-line:
END OF JOBS
CANNOT PROCEED
- b. Unit Assignment
 - (1) \$ATTACH
 - (a) Physical unit specified on card is marked attached and placed in availability chain for corresponding channel
 - (2) \$DETACH
 - (a) Physical unit specified on card is marked detached and removed from the appropriate availability chain or system unit function
 - (3) \$AS
 - (a) Unit designated on previous \$ATTACH card is assigned to system unit function specified in variable field of the \$AS card.
 - (b) Unit density is also assigned as specified in variable field
 - (4) \$RELEASE
 - (a) The unit assigned to the function specified in the variable field is released from that assignment and entered into the appropriate availability chain

- (5) \$SWITCH
 - (a) The units assigned to the functions specified in the variable field are transposed
- c. Tape Manipulation
 - (1) \$ENDFILE
 - (a) An end of file is written on the unit assigned to the function specified in the variable field.
 - (2) \$REWIND
 - (a) The unit assigned to the function specified in the variable field is rewound.
 - (3) \$REMOVE
 - (a) The unit assigned to the function specified in the variable field is rewound and unloaded.
- d. Miscellaneous
 - (1) \$DATE
 - (a) The date specified in the variable field is stored into the system date cell in IBNUC (SYSDAT)
 - (2) \$*
 - (a) True comment card
 - (3) \$UNITS
 - (a) All functions and their associated assignments and unit densities as well as available units and reserve units are printed on-line
 - (4) \$UNLIST
 - (a) Suppresses printing of all Basic Monitor control cards except \$PAUSE and \$STOP
 - (5) \$LIST
 - (a) Resumes printing of all Basic Monitor control cards
 - (6) \$IBEDT
 - (a) The system editor is called from the library.
 - (7) \$ID
 - (a) Used in association with installation accounting routines.

C. RUNNING UNDER BASIC MONITOR CONTROL

1. Initial Start Procedure
 - a. Mount system library (SYSLB1)
 - b. Set sense switch 1
 - (1) Up - Basic Monitor control cards to be read from tape
 - (2) Down - Basic Monitor control cards to be read from card reader
 - c. Press Load Tape Key
Note: If SYSLB1 is other than physical unit A1, a call card procedure must be used.
2. Transition from job to job will now be automatic as governed by control cards.
3. Discuss on-line operator message printout of sample job.

R. M. - Pg. 31

S. G. -

V. IOEX

Objectives: Introduce the student to the functions, use and internal workings of the I/O operation scheduler and trap supervisor incorporated within Basic Monitor.

A. FUNCTIONS OF IOEX

R. M. - Pg. 2

1. I/O operation scheduler
2. Channel Trap Supervisor

B. ADVANTAGES OFFERED TO ITS USER

1. Centralized input/output activity is achieved despite buffering techniques used.
2. Diagnosing I/O failures is facilitated when all unit usage is made through one routine.
3. Minimized I/O programming since debugged routines are available.
4. Current I/O media positions are always readily available via internal accounting facilities.
5. Standard and automatic redundancy recovery is performed when necessary.
6. The availability of miscellaneous routines for number conversions, printing or punching on-line, etc.

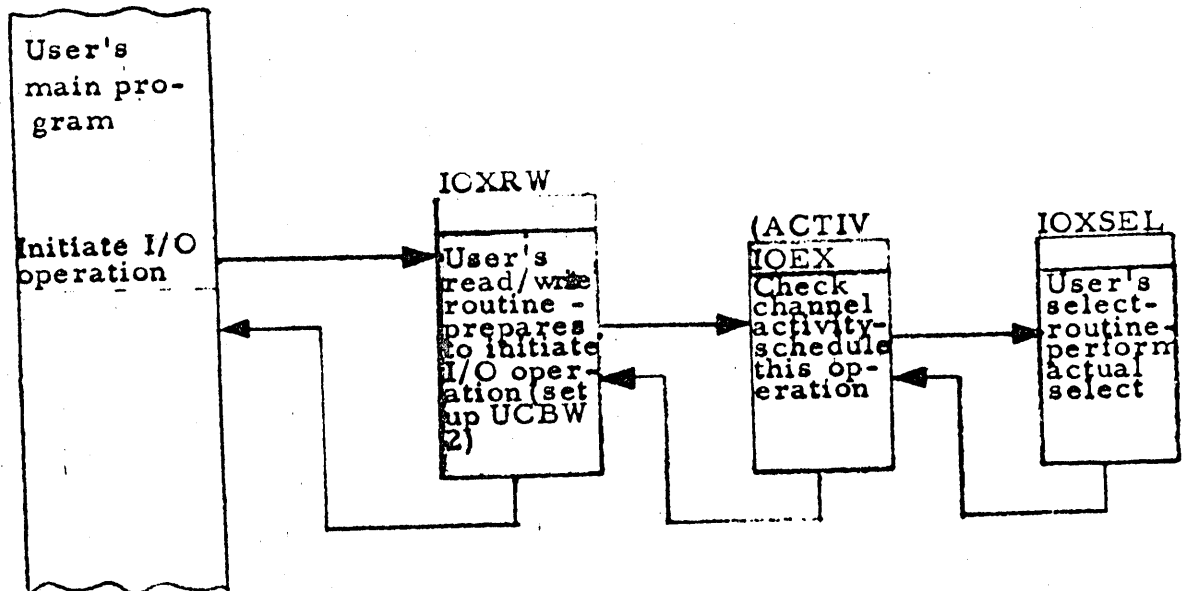
C. USE OF IOEX BY A PROGRAM

1. Initiation of an I/O operation
 - a. Request Que
 - (1) Significance of Unit Control Block Word 2.
 - (a) Zero-No que for this device
Non-zero - This device is to be activated
 - (1) Prefix - type of operation
(Read/Write)

- (II) Decrement-Location of user written select routine
- (III) Address-for user's use (optional).

b. Programming Required

- (1) A procedure must be followed as diagrammed below:

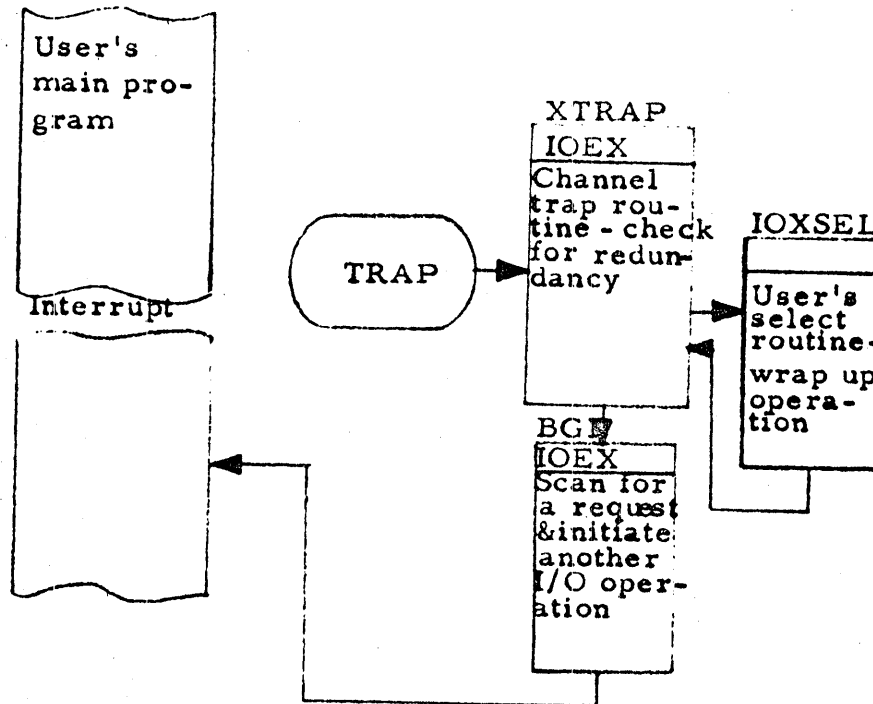


- (a) Main Program - I/O operation is desired in main program - a TSX is executed to general Read/Write routine
- (b) IOXRW - General Read/Write routine - preparation is performed for entry to IOEX routine (Activate) - Here unit control block word 2 is set up as a request que.
- (c) (ACTIV - IOEX routine - checks the activity of desired channel - if free, the I/O operation is immediately initiated; if busy, the I/O operation is scheduled.
- (d) IOXSEL(+) - Assuming channel is free, on to user's actual select routine where RDS is performed, initiating the I/O operation

- (e) Return to and continue on in main program - channel trap must always indicate completion of the operation
- (2) Examine examples of actual usage in 9IOCS and 90SORT

9IOCS - 1.00.01
 3.00.01
 90SORT-1.00.00

- 2. Completion of an I/O operation (Wrap-up)
 - a. Programming required
 - (1) Procedure



- (a) The main program is interrupted by the command word trap at the completion of the I/O operation.
- (b) XTRAP - Subroutine within IOEX that is entered at trap time. Redundancy recovery operations are initiated if necessary. Tape positions are updated. Various conditions such as "End of tape" are checked for.
- (c) IOXSEL(-) - Is a user written routine which allows him to perform specialized wrap-up operations. (Ex.: Set I/O operation completion switch, set UCBW2 to zero, etc.)
- (d) BG1 - searches for another I/O request que for this channel. If one is present its associated operation is initiated.

- (e) Return to Main Program and continue from point of interrupt
- (2) Examine example of actual usage.

9IOCS-1.00.01
 3.00.12
 90SORT-1.00.00

3. Students are to flow chart the sample routine given. Review several completed charts as a group

R. M. - Pg. 35

a. Note the following in the course of the review:

- (1) Select routine (IOXSEL) must not destroy the contents of IR1.
- (2) On entry to select, pulse (IOXSEL)
 - (a) C(IR1) = the 2's complement of channel index (0=A, 1=B, etc.)
 - (b) S(AC) = plus indicating that select plus is to be executed.
 - (c) A(AC) = the location of the U. C. B.
- (3) Return from select plus is to 1, 4
- (4) On entry to select minus (IOXSEL)
 - (a) C(IR1) = The 2's complement of channel index (0=A, 1=B, etc.)
 - (b) S(AC) = minus indicating that select minus is to be executed.
 - (c) A(AC) = the location of the U. C. B.
 - (d) Sense Indicators
 - (I) No Bit in Sign - Noise record flag
 - (II) Bit in 1 - End of File (read)/ End of Tape (Write)
 - (III) Bit in 2 - Permanent Redundancy (read only)
- (5) Two types of returns from select minus
 - (a) Normal
 - (I) 1, 4
 - (b) Error
 - (I) Noise Record 2, 4 (Read or Write)
 - (II) Redundancy 3, 4 (Read only)

D. DETAILED INVESTIGATION OF IOEX ROUTINES FOR DATA INPUT/OUTPUT OPERATIONS

Reference
R. M. - Pg. 24

1. Activate - ((ACTIV, (ACTVX)
 - a. I/O operation scheduler
 - b. Examine calling sequence
 - (1) Location of UCB is given indirectly in address.
 - (2) Prefix can be either:
 - (a) PZE
 - (I) Channel active-request que is entered only
 - (II) Channel dormant-I/O operation is initiated immediately
 - (b) MZE
 - (I) Channel active - remains in holding loop until I/O operation can be initiated
 - (II) Channel dormant-I/O operation is initiated immediately
 - Note: Entry to Activate at trap time is not considered here.
 - c. Go through the logic diagrams associated with Activate
2. Save - Xtrap
 - a. Trap supervisor
 - b. Go through the logic diagrams associated with these routines.
3. Red
 - a. Redundancy recovery routines for read and write
 - b. Procedure
 - (1) Read
 - (a) Detected by RTT instruction
 - (b) Tape cleaner action followed by 9 backspace record actions. This procedure is performed ten times.
 - (c) If permanent, an operator message is printed and the redundancy flag is set in the Sense Indicators.

PSAG - Charts CA and CB

PSAG-charts CC, CD, CE

(2) Write

- (a) Detected by Tape Check Trap
- (b) The tape is backspaced one record and an erase area is written. The record is then rewritten.
- (c) The procedure in (b) above is repeated until a successful write is executed or the end of tape is reached. After each group of 25 erase areas, an operator message is printed.

- c. Go through the logic diagrams associated with these routines

PSAG-Charts CH, CJ, CK

4, BG1

- a. When an I/O operation is completed this routine checks for another request que on that channel in a priority sequence. If one is found it initiates another I/O operation
- b. Go through the logic diagrams associated with this routine.

PSAG-Charts CF and CG

E. BASIC MONITOR STORAGE ALLOCATION

- 1. Examine and discuss storage map

PSAG - Chart YA

ASSIGNMENT #1

INTRODUCTION

Objective: To review the basic objectives of the course and reinforce the use of the flow chart symbols presented during the lecture.

A. Review the material presented by reading Part I of Lecture Summaries of the Study Guide.

B. Study Questions

1. List the three program packages that are to be covered in the course.

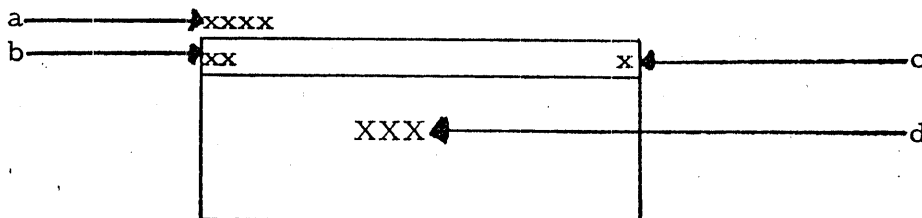
- a. _____
- b. _____
- c. _____

2. List three objectives of the course.

- a. _____
- b. _____
- c. _____

3. Why was the subroutine symbol adopted?

4. In the following illustration determine the purpose of each of the indicated areas.



5. Flow chart the following program: $q = \frac{ax + b}{cx + d}$

Print the result using subroutine "PRINT" located on page 15 of the flow chart package. Entrance to the subroutine is at point D. Halt on return to the main program. Assume a, b, c, d and x are contained on separate input devices.

STUDY QUESTION ANSWERS

ASSIGNMENT #1

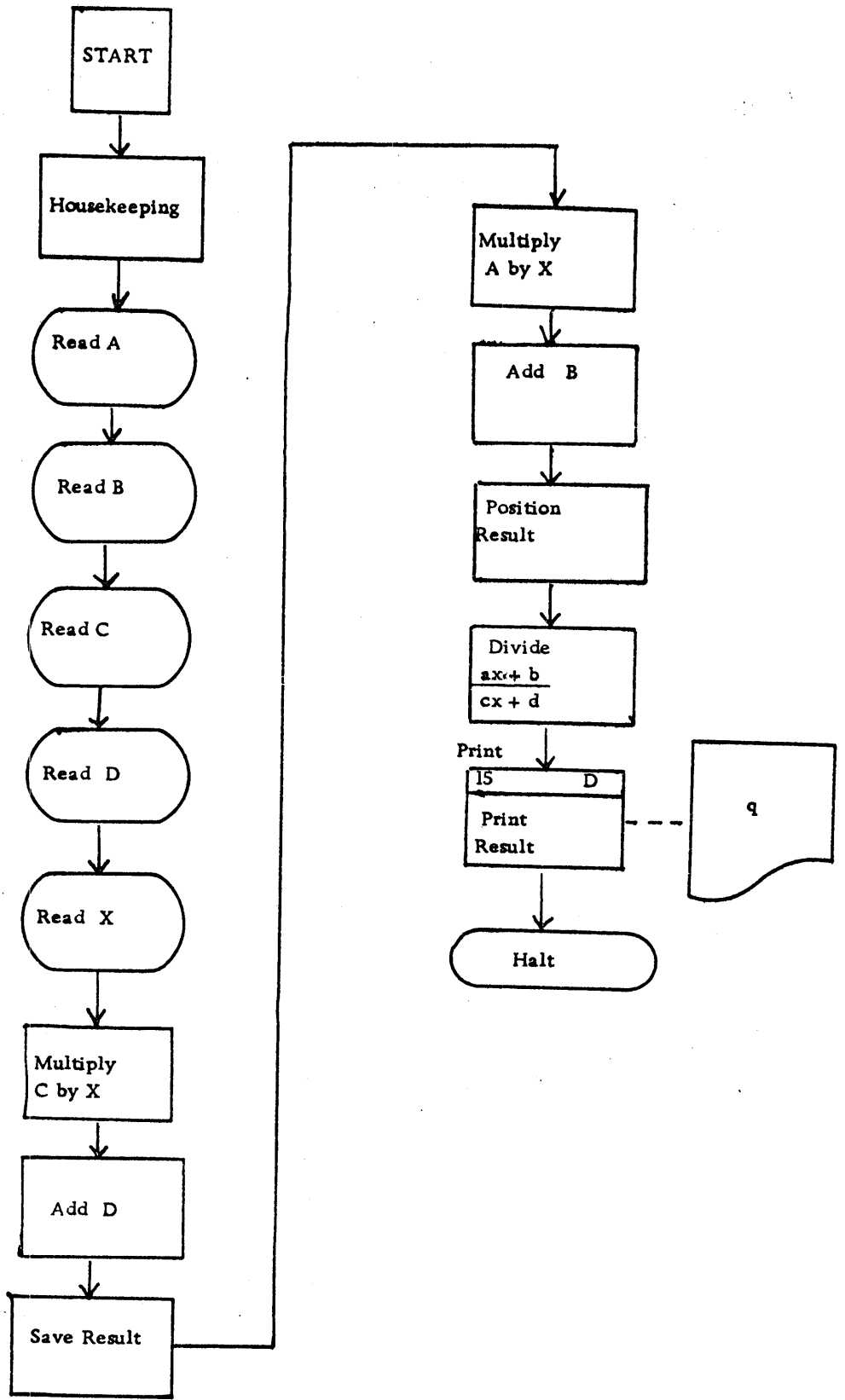
B.

1.
 - a. Basic Monitor
 - b. 9IOCS
 - c. 90SORT

2.
 - a. A knowledge of the use and internal workings of the above listed programs along with an understanding of their associated terminology.
 - b. Exposure to techniques useful in the analysis of a program.
 - c. An extended opportunity to read program listings.
 - d. Form a foundation for the study of future programming systems.

3. To provide a means of referring to a closed subroutine without the necessity of flow-charting it each time its use is encountered in a main program. Using this method it is only necessary to flow chart the subroutine once.

4.
 - a. Symbolic name of subroutine
 - b. Page number
 - c. Entry point
 - d. Function



ASSIGNMENT #2

BASIC MONITOR SYSTEM (IBSYS)

Objective: To review the basic concepts of a monitor system of this type.

- A. Review the material presented by reading Part II of Lecture Summaries of the Study Guide.
- B. Read page 5 of the Basic Monitor (IBSYS) Reference Manual.
- C. Study Questions

1. What is the overall objective of the Basic Monitor System (IBSYS)?

2. What is the overall function of the Basic "Monitor" within IBSYS?

3. List three specific objectives of the Basic Monitor. Be specific!

- a. _____
- b. _____
- c. _____

4. The Basic Monitor is divided into four sections. List them.

- a. _____
- b. _____
- c. _____
- d. _____

5. What is the function of the section called "IOEX"?

STUDY QUESTIONS ANSWERS

ASSIGNMENT #2

C.

1. To save valuable operating time by allowing the computer to pass from one job to another automatically. This reduces operator intervention to a minimum.
2. To act as the main element of control of job execution using the Basic Monitor System (IBSYS).
3.
 - a. Call participating programs to execute jobs in sequence desired.
 - b. Make tape unit assignments.
 - c. Keep account of the physical characteristics of each I/O device.
 - d. Make available debugged I/O routines to the user.
 - e. Provide an effective method of modifying and updating the library tape/s.
4.
 - a. Nucleus - IBNUC
 - b. Trap Supervisor - IOEX
 - c. Supervisor - IBSUP
 - d. Editor - IBEDT
5. Offer routines to participating systems for the primary purpose of I/O control.

ASSIGNMENT #3

I/O DEVICE HANDLING

Objective: To review the methods used to keep account of the condition and function of each I/O device, in addition to those used for the generation of tape assignments.

- A. Review the material presented by reading Part III of Lecture Summaries of the Study Guide.
- B. Read the pages of the Basic Monitor (IBSYS) Reference Manual listed below in the sequence given:
 - 1. Pages 11 and 12
 - 2. Pages 43 and 44
 - 3. Pages 45 and 46

C. Study Questions

- 1. What is a "unit control block"? Describe its function.

- 2. What are "Available" tape units?

- 3. What are "Detached" units?

- 4. What are "Function" Units?

- 5. What are "Reserve" tape units?

6. List the two types of areas within the "Communication Region and One-word Entry Table" of IOEX.
- a. _____
 - b. _____

STUDY QUESTION ANSWERS

ASSIGNMENT #3

C.

1. A unit control block is a control area four cells in length which is used to keep account of pertinent conditions associated with a particular I/O device.
2. Available units are tape devices which are currently free for miscellaneous usage by a participating program.
3. Detached units are devices that cannot currently be used for any purpose.
4. Function units are I/O devices which are currently assigned to a specific "usage" such as System Library.
5. Reserve units are tape devices which are currently being used for intersystem purposes.
6.
 - a. Cells which locate various tables within the Nucleus.
 - b. Cells which contain constants and parameters of value to all participating programs.

ASSIGNMENT #4

BASIC MONITOR CONTROL AND PROGRAM EXECUTION

Objective: Review the content and function of the various control cards utilized by Basic Monitor along with the steps required to prepare for, call and execute a job utilizing a program of IBSYS.

- A. Review the material presented by reading Part IV of Lecture Summaries of the Study Guide.
- B. Read the pages of the Basic Monitor (IBSYS) Reference Manual listed below in the sequence given:
 - 1. Pages 6 through 10
 - 2. Pages 31 and 32

ASSIGNMENT #5

Objective: To review the functions, use and internal workings of the I/O operation scheduler and trap supervisor incorporated within Basic Monitor.

- A. Review the material presented by reading Part V of Lecture Summaries of the Study Guide.
- B. Read the pages of the Basic Monitor (IBSYS) Reference Manual listed below in the sequence given:
 - 1. Pages 20 through 30
 - 2. Pages 13 through 19
- C. Study Questions:
 - 1. List the two major functions of IOEX
 - a. _____
 - b. _____
 - 2. List three advantages offered to the user of IOEX.
 - a. _____
 - b. _____
 - c. _____
 - 3. How is a request que for the initiation of an I/O operation established?

 - 4. Using general terms, list the routines in the sequence they are utilized to initiate an I/O operation. Indicate which ones are to be written by the user.
 - a. _____
 - b. _____
 - c. _____
 - d. _____
 - e. _____

5. Using general terms, list the routines in the sequence they are utilized to wrap-up an I/O operation when a channel trap occurs. Indicate which ones are to be written by the user.

- a. _____
- b. _____
- c. _____
- d. _____

STUDY QUESTION ANSWERS

ASSIGNMENT #5

C.

1.
 - a. I/O operation scheduling
 - b. Channel trap supervision

2.
 - a. Minimized I/O programming
 - b. Current I/O media positions are always available.
 - c. Automatic redundancy recovery operations.
 - d. Centralized input/output activity.
 - e. Miscellaneous utility routines are available.
 - f. Diagnosing I/O failures is facilitated.

3. Word 2 of the unit control block associated with the I/O device to be activated is set non-zero by the user. The prefix is set to the type of operation desired and the decrement to the location of a user written select routine.

4.
 - A. General select routine (user written)
 - b. "Activate" routine (IOEX)
 - c. Select "plus" routine (user written)
 - d. Return to "Activate" routine (IOEX)
 - e. Return to general select routine (user written)

Note: Entry to and exit from the general select routine are from and to the main program (user written)

5. Channel trap occurs - main program interrupted.
 - a. Channel trap routine (IOEX)
 - b. Select "minus" routine (user written)
 - c. Return to Channel trap routine (IOEX)
 - d. I/O operation scan routine (IOEX)Return to main program - execution resumed.

LABORATORY PROJECT #1

Running under IBSYS Control

Objective: To furnish the student with an operator's view of the setup and execution of a Basic Monitor run.

A. PROCEDURE

1. Form lab groups of not more than 5 persons.
2. Each group is to do the initial setup of the system and then run the Demonstration Deck. Observe System Tape motion and on-line message printout.

\$ATTACH RDA
 \$AS SYSIN1
 \$IBEDT

IBSYS-EDITOR 729/1301 1.IBSYS SAMPLE MAP DATE 07/23/62

NEW IBSYS EDIT WILL BE DONE ON A3 , HIGH DENSITY.

FILE 1
 RECORD 1 5UG002 7 WORDS
 RECORD 2 IBSYS 4819 WORDS
 RECORD 3 SYSDMP 1074 WORDS

.....FILE MARK.....
 FILE 2

RECORD 1 FORTRA 2319 WORDS
 RECORD 2 9FJ100 37 WORDS
 RECORD 3 9F0200 1470 WORDS
 RECORD 4 9F0300 1425 WORDS
 RECORD 5 9F0400 7045 WORDS
 RECORD 6 9F0500 2660 WORDS
 RECORD 7 9F0600 904 WORDS
 RECORD 8 9F0700 2666 WORDS
 RECORD 9 9F0800 888 WORDS
 RECORD 10 9F0900 243 WORDS
 RECORD 11 9F1000 699 WORDS
 RECORD 12 9F1100 342 WORDS
 RECORD 13 9F1200 12 WORDS

.....FILE MARK.....
 FILE 3

RECORD 1 9F1300 1652 WORDS
 RECORD 2 9F1400 5471 WORDS
 RECORD 3 9F1500 1173 WORDS
 RECORD 4 9F1600 952 WORDS
 RECORD 5 9F1700 464 WORDS
 RECORD 6 9F1800 985 WORDS
 RECORD 7 9F1900 1992 WORDS
 RECORD 8 9F2000 727 WORDS
 RECORD 9 9F2100 3009 WORDS
 RECORD 10 9F2200 2784 WORDS
 RECORD 11 9F2300 561 WORDS
 RECORD 12 9F2400 628 WORDS
 RECORD 13 9F2500 474 WORDS
 RECORD 14 9F2600 2403 WORDS
 RECORD 15 9F2700 176 WORDS
 RECORD 16 9F2800 164 WORDS
 RECORD 17 9F2900 1392 WORDS
 RECORD 18 9F3000 1581 WORDS
 RECORD 19 9F3100 3376 WORDS
 RECORD 20 9F3200 2666 WORDS
 RECORD 21 9F3300 888 WORDS
 RECORD 22 9F3400 243 WORDS

.....FILE MARK.....
 FILE 4

RECORD 1 9FL000 3 WORDS
 RECORD 2 9FL001 282 WORDS
 RECORD 3 9FL002 282 WORDS
 RECORD 4 9FL003 282 WORDS
 RECORD 5 9FL004 282 WORDS
 RECORD 6 9FL005 282 WORDS
 RECORD 7 9FL006 282 WORDS
 RECORD 8 9FL007 282 WORDS
 RECORD 9 9FL008 282 WORDS
 RECORD 10 9FL009 282 WORDS

I.
 IBSYS LIBRARY SAMPLE MAP

RECORD	11	9FL010	282 WORDS
RECORD	12	9FL011	282 WORDS
RECORD	13	9FL012	282 WORDS
RECORD	14	9FL013	282 WORDS
RECORD	15	9FL014	282 WORDS
RECORD	16	9FL015	282 WORDS
RECORD	17	9FL016	282 WORDS
RECORD	18	9FL017	282 WORDS
RECORD	19	9FL018	282 WORDS
RECORD	20	9FL019	282 WORDS
RECORD	21	9FL020	282 WORDS
RECORD	22	9FL021	282 WORDS
RECORD	23	9FL022	282 WORDS
RECORD	24	9FL023	282 WORDS
RECORD	25	9FL024	282 WORDS
RECORD	26	9FL025	282 WORDS
RECORD	27	9FL026	282 WORDS
RECORD	28	9FL027	282 WORDS
RECORD	29	9FL028	282 WORDS
RECORD	30	9FL029	282 WORDS
RECORD	31	9FL030	282 WORDS
RECORD	32	9FL031	282 WORDS
RECORD	33	9FL032	282 WORDS
RECORD	34	9FL033	282 WORDS
RECORD	35	9FL034	282 WORDS
RECORD	36	9FL035	282 WORDS
RECORD	37	9FL036	282 WORDS
.....FILE MARK.....			
FILE	5		
RECORD	1	9D0000	4485 WORDS
.....FILE MARK.....			
FILE	6		
RECORD	1	9LEDIT	325 WORDS
.....FILE MARK.....			
FILE	7		
RECORD	1	IBSFAP	7674 WORDS
RECORD	2	IBSFP2	2660 WORDS
.....FILE MARK.....			
FILE	8		
RECORD	1	IOCS	285 WORDS
.....FILE MARK.....			
FILE	9		
RECORD	1	POST	38 WORDS
RECORD	2	PREP	6829 WORDS
RECORD	3	IOBB	30 WORDS
RECORD	4	IOBM	67 WORDS
RECORD	5	NOBS	47 WORDS
.....FILE MARK.....			
FILE	10		
RECORD	1	SORT	1309 WORDS
.....FILE MARK.....			
FILE	11		
RECORD	1	ASSIGN	198 WORDS
RECORD	2	BT0	126 WORDS
RECORD	3	IOBS	1422 WORDS
RECORD	4	CKPT	126 WORDS
RECORD	5	CKSUM	78 WORDS
RECORD	6	DB	78 WORDS
RECORD	7	DEBLK	294 WORDS
RECORD	8	DELETE	126 WORDS
RECORD	9	DEPAD	78 WORDS
RECORD	10	FPM01	54 WORDS

RECORD	11	EPM02	54 WORDS
RECORD	12	EPM03	54 WORDS
RECORD	13	EPM04	54 WORDS
RECORD	14	EPM05	54 WORDS
RECORD	15	EQUALS	78 WORDS
RECORD	16	EP001	7134 WORDS
RECORD	17	LEQ	294 WORDS
RECORD	18	XTR	270 WORDS
RECORD	19	FMM01	54 WORDS
RECORD	20	FMM02	54 WORDS
RECORD	21	FMM03	54 WORDS
RECORD	22	FMM04	54 WORDS
RECORD	23	FMM05	54 WORDS
RECORD	24	FMM06	54 WORDS
RECORD	25	FMM07	54 WORDS
RECORD	26	FMM08	54 WORDS
RECORD	27	FMM09	54 WORDS
RECORD	28	FMM10	54 WORDS
RECORD	29	FXMOV	78 WORDS
RECORD	30	LABEL	678 WORDS
RECORD	31	LOCATE	102 WORDS
RECORD	32	MPM01	54 WORDS
RECORD	33	MPM02	54 WORDS
RECORD	34	MPM03	54 WORDS
RECORD	35	MPM04	54 WORDS
RECORD	36	MPM05	54 WORDS
RECORD	37	MRL	126 WORDS
RECORD	38	MOVE	222 WORDS
RECORD	39	SOP	1230 WORDS
RECORD	40	POST	318 WORDS
RECORD	41	RBO1	246 WORDS
RECORD	42	RELEAS	102 WORDS
RECORD	43	RESTAR	270 WORDS
RECORD	44	SK001	486 WORDS
RECORD	45	IOSS	1350 WORDS
RECORD	46	WTFIX	102 WORDS
RECORD	47	WRSEL	270 WORDS
RECORD	48	XSM01	54 WORDS
RECORD	49	XSM02	54 WORDS
RECORD	50	XSM03	54 WORDS
RECORD	51	XSM04	54 WORDS
RECORD	52	XSM05	54 WORDS
RECORD	53	XSM06	54 WORDS
RECORD	54	XSM07	54 WORDS
RECORD	55	XSM08	54 WORDS
RECORD	56	XSM09	54 WORDS
RECORD	57	XSM10	54 WORDS
RECORD	58	XS	1830 WORDS
RECORD	59	FM	1878 WORDS
RECORD	60	MR	1878 WORDS
.....FILE MARK.....			
FILE	12		
RECORD	1	CT	1064 WORDS
.....FILE MARK.....			
FILE	13		
RECORD	1	BASIC	3676 WORDS
.....FILE MARK.....			
FILE	14		
RECORD	1	CTB	3384 WORDS
RECORD	2	CTC	8650 WORDS
RECORD	3	CTI	1379 WORDS
RECORD	4	CTD	12801 WORDS

RECORD	5	CTE	7114 WORDS
.....FILE MARK.....			
FILE	15		
RECORD	1	IOCT	3647 WORDS
.....FILE MARK.....			
FILE	16		
RECORD	1	LOAD	8888 WORDS
.....FILE MARK.....			
FILE	17		
RECORD	1	SRDLOC	16 WORDS
RECORD	2	SRDICT	255 WORDS
RECORD	3	SRDICT	255 WORDS
RECORD	4	SRDICT	16 WORDS
.....FILE MARK.....			
FILE	18		
RECORD	1	IOEXMP	48 WORDS
RECORD	2	IBMAP	25 WORDS
RECORD	3	CTMCOM	25 WORDS
RECORD	4	IOBSMP	71 WORDS
RECORD	5	UNITAS	163 WORDS
RECORD	6	INREAD	71 WORDS
RECORD	7	PRGINT	163 WORDS
RECORD	8	ZCELLS	25 WORDS
RECORD	9	SYSADJ	25 WORDS
RECORD	10	SYSSXY	48 WORDS
RECORD	11	SYSSDX	48 WORDS
RECORD	12	SYSDIV	48 WORDS
RECORD	13	SYSMPX	94 WORDS
RECORD	14	SYSCOL	94 WORDS
RECORD	15	SYSCOM	140 WORDS
RECORD	16	MOVFLT	255 WORDS
RECORD	17	MOVFLT	255 WORDS
RECORD	18	MOVFLT	255 WORDS
RECORD	19	MOVFLT	255 WORDS
RECORD	20	MOVFLT	255 WORDS
RECORD	21	MOVFLT	48 WORDS
RECORD	22	OPEN1	48 WORDS
RECORD	23	OPEN2	48 WORDS
RECORD	24	CLOSE1	48 WORDS
RECORD	25	CLOSE2	140 WORDS
RECORD	26	STPPRT	48 WORDS
RECORD	27	KAPUT	71 WORDS
RECORD	28	UNXEOF	48 WORDS
RECORD	29	EOBERR	186 WORDS
RECORD	30	BCDBIN	48 WORDS
RECORD	31	HOLBCD	163 WORDS
RECORD	32	BCDHOL	117 WORDS
RECORD	33	NJJJNJ	209 WORDS
RECORD	34	BCDERR	71 WORDS
RECORD	35	GETVLM	94 WORDS
RECORD	36	BLERR	48 WORDS
RECORD	37	WRTEOB	71 WORDS
RECORD	38	PATTRN	48 WORDS
RECORD	39	MOVPAK	255 WORDS
RECORD	40	MOVPAK	255 WORDS
RECORD	41	MOVPAK	255 WORDS
RECORD	42	MOVPAK	255 WORDS
RECORD	43	MOVPAK	255 WORDS
RECORD	44	MOVPAK	255 WORDS
RECORD	45	MOVPAK	186 WORDS
RECORD	46	FPTRP	48 WORDS
RECORD	47	EXPSNG	117 WORDS

RECORD	48	EXPDBL	255 WORDS
RECORD	49	EXPERR	71 WORDS
RECORD	50	SRMOVE	71 WORDS
.....FILE MARK.....			
FILE	19		
RECORD	1	IOBB	30 WORDS
RECORD	2	IOBM	67 WORDS
RECORD	3	NOBS	51 WORDS
.....FILE MARK.....			
FILE	20		
RECORD	1	SUBUP	2733 WORDS
.....FILE MARK.....			
FILE	21		
RECORD	1	MAIN	1243 WORDS
.....FILE MARK.....			
FILE	22		
RECORD	1	DK90UT	785 WORDS
RECORD	2	DK90FA	1279 WORDS
RECORD	3	DK90D	706 WORDS
RECORD	4	DK90C	542 WORDS
RECORD	5	DK90R	590 WORDS
RECORD	6	DK90L	990 WORDS
.....FILE MARK.....			
FILE	23		
RECORD	1	9PAC	5700 WORDS
RECORD	2	9PAC12	1962 WORDS
RECORD	3	9PAC13	1627 WORDS
RECORD	4	9PAC14	4721 WORDS
RECORD	5	9PAC15	731 WORDS
.....FILE MARK.....			
FILE	24		
RECORD	1	9PAC21	7355 WORDS
RECORD	2	9PAC22	7565 WORDS
RECORD	3	9PAC23	517 WORDS
.....FILE MARK.....			
FILE	25		
RECORD	1	9PAC31	6864 WORDS
RECORD	2	9PAC32	6984 WORDS
RECORD	3	9PAC33	916 WORDS
RECORD	4	9PAC34	1890 WORDS
.....FILE MARK.....			
FILE	26		
RECORD	1	9PAC41	162 WORDS
RECORD	2	9PAC42	838 WORDS
RECORD	3	9PAC43	578 WORDS
RECORD	4	9PAC44	503 WORDS
RECORD	5	9PAC45	791 WORDS
RECORD	6	9PAC46	1350 WORDS
RECORD	7	9PAC47	531 WORDS
RECORD	8	9PAC48	908 WORDS
RECORD	9	9PAC49	610 WORDS
RECORD	10	9PAC4A	531 WORDS
RECORD	11	9PAC4B	791 WORDS
.....FILE MARK.....			
FILE	27		
RECORD	1	IBEDT	5 WORDS
RECORD	2	EDITOR	6741 WORDS
RECORD	3	*EOT	3 WORDS
.....FILE MARK.....			

IBSYS SYSTEMS EDIT COMPLETED.

SUNITS	FUNCTION	UNIT	
	SYSLB1	A1	HI DEN
	SYSLB2	NONE	
	SYSLB3	NONE	
	SYSLB4	NONE	
	SYSCRD	RDA	
	SYSPRT	PRA	
	SYSPCH	PUA	
	SYSOU1	B1	
	SYSOU2	B1	
	SYSIN1	A2	
	SYSIN2	A2	
	SYSPP1	B2	
	SYSPP2	B2	
	SYSCK1	NONE	
	SYSCK2	NONE	
	SYSUT1	A3	HI DEN
	SYSUT2	B3	HI DEN
	SYSUT3	A4	HI DEN
	SYSUT4	B4	HI DEN

ATTACHED UNITS NOT ASSIGNED OR RESERVED.

A5
A6
B5
B6
C1
C2
D1
D2
ED00/0
ED01/0

INTER SYSTEM RESERVE UNITS.
NONE

\$ATTACH	B1
\$AS	SYSCK2
\$ATTACH	RDA
\$AS	SYSIN1
\$RELEASE	SYSUT3
\$RELEASE	SYSUT4

SYSUT4 IS NOT ASSIGNED. NO DUMP CAN BE TAKEN.

SUNITS	FUNCTION	UNIT	
	SYSLB1	A1	HI DEN
	SYSLB2	NONE	
	SYSLB3	NONE	
	SYSLB4	NONE	
	SYSCRD	RDA	
	SYSPRT	PRA	
	SYSPCH	PUA	
	SYSOU1	B1	
	SYSOU2	B1	
	SYSIN1	RDA	
	SYSIN2	A2	
	SYSPP1	B2	
	SYSPP2	B2	
	SYSCK1	NONE	
	SYSCK2	B1	
	SYSUT1	A3	HI DEN
	SYSUT2	B3	HI DEN
	SYSUT3	NONE	
	SYSUT4	NONE	

II. Sample IBSYS Run On-Line Message Printout

ATTACHED UNITS NOT ASSIGNED OR RESERVED.

A4
A5
A6
B4
B5
B6
C1
C2
D1
D2

ED00/0

ED01/0

INTER SYSTEM RESERVE UNITS.

NONE

\$EXECUTE IOCS

BASIC MONITOR HAS ENTERED INPUT/OUTPUT CONTROL SYSTEM.

FILE DESCRIPTIONS (MOUNT FILES MARKED WITH *)--

NO.	FILE NAME	UNIT	MOUNT TAPES--	
* 1	OLD MASTER	A5	REEL 0001	
* 2	NEW MASTER	B4	REEL 0001	BLANK-UNLABELLED
* 3	TRANSACTION	A4	REEL 0001	
* 4	ORDER	B5	REEL 0001	BLANK-UNLABELLED

MOUNT INDICATED TAPES
OPERATOR ACTION PAUSE...

ACTION COMPLETED

UNIT. A5 OLD MASTER REEL 0001 - 00256 RECORDS
REDUNDANCY HISTORY 00000 RECOVERED 00002 PERM.

END OF JOB
IOCS RETURNING TO BASIC MONITOR.

PERIPHERAL TAPE POSITIONS AT RETURN TO IBSYS
 UNIT - SYSOU1 IS B1 FILE. 00000, REC. 00000
 UNIT - SYSPP1 IS B2 FILE. 00000, REC. 00000
 UNIT - SYSIN1 IS RDA FILE. 00000, REC. 00018
 \$EXECUTE SORT

OPTION, RELCOM/6000,NOCKPT

FILE, INPUT/1, BLOCKSIZE/1000,REELS/1,DENSITY/H,MODE/D

FILE, OUTPUT, BLOCKSIZE/ 500, DENSITY/H , MODE/B

RECORD, TYPE/F,LENGTH/10, FIELD/(6,6,6)

SORT, FILE/1, FIELD/(1), ORDER/3, SEQ/S

CHANNEL, INPUT/B, MERGE/(A,B)

END

PREPARE UNITS AS FOLLOWS--

UNIT B4 INPUT TAPE
 UNIT A4 MERGE TAPE NOT IN READY STATUS.
 UNIT A5 MERGE TAPE
 UNIT A6 MERGE TAPE NOT IN READY STATUS.
 UNIT B5 MERGE TAPE
 UNIT B6 MERGE TAPE NOT IN READY STATUS.
 UNIT B4 MERGE TAPE
 UNIT B1 CHECKPOINT AND UNREADABLE RECORD TAPE

PRESS START WHEN ALL UNITS ARE PROPERLY PREPARED AND IN READY STATUS.

OPERATOR ACTION PAUSE...

ACTION COMPLETED

UNIT B4 TO BE USED FOR MERGING.
 LOAD THIS UNIT WITH A SCRATCH TAPE.

UNIT A4 CLOSING OUTPUT REEL NO. 00001

	PHASE 1	PHASE 2	PHASE 3
COUNT OF INPUT RECORDS TO SORT			
AND/OR MERGE	51200	N/A	N/A
COUNT OF RECORDS SORTED OR MERGED	51200	51200	51200
COUNT OF RECORDS DUMPED	0	0	0
COUNT OF RECORDS DELETED	0	N/A	0
COUNT OF HIGH PADDING RECORDS IN OUTPUT	N/A	N/A	0
COUNT OF LOW PADDING RECORDS IN OUTPUT	N/A	N/A	0

\$IBSYS

PERIPHERAL TAPE POSITIONS AT RETURN TO IBSYS
 UNIT - SYSOU1 IS B1 FILE. 00000, REC. 00000
 UNIT - SYSPP1 IS B2 FILE. 00000, REC. 00000
 UNIT - SYSIN1 IS RDA FILE. 00000, REC. 00027
 \$UNITS

FUNCTION	UNIT	
SYSLB1	A1	HI DEN
SYSLB2	NONE	
SYSLB3	NONE	

SYSLB4	NONE	
SYSCRD	RDA	
SYSPRT	PRA	
SYSPCH	PUA	
SYSOU1	B1	
SYSOU2	B1	
SYSIN1	RDA	
SYSIN2	A2	
SYSPP1	B2	
SYSPP2	B2	
SYSCK1	NONE	
SYSCK2	B1	
SYSUT1	A3	HI DEN
SYSUT2	B3	HI DEN
SYSUT3	NONE	
SYSUT4	NONE	

ATTACHED UNITS NOT ASSIGNED OR RESERVED.

A4
A5
A6
B4
B5
B6
C1
C2
D1
D2
ED00/0
ED01/0

INTER SYSTEM RESERVE UNITS.

NONE

\$RESTORE

\$UNITS

FUNCTION	UNIT	
SYSLB1	A1	HI DEN
SYSLB2	NONE	
SYSL 3	NONE	
SYSLB4	NONE	
SYSCRD	RDA	
SYSPRT	PRA	
SYSPCH	PUA	
SYSOU1	B1	
SYSOU2	B1	
SYSIN1	A2	
SYSIN2	A2	
SYSPP1	B2	
SYSPP2	B2	
SYSCK1	NONE	
SYSCK2	NONE	
SYSUT1	A3	HI DEN
SYSUT2	B3	HI DEN
SYSUT3	A4	HI DEN
SYSUT4	B4	HI DEN

ATTACHED UNITS NOT ASSIGNED OR RESERVED.

A5
A6
B5
B6
C1
C2
D1
D2