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September 1969

MEMORANDUM TO: Recipients of Continuous System Modeling  
Program 360A-CX-16X

SUBJECT: Version 1, Modification Level 2

The subject program is being forwarded to you with this memorandum.

Basic program material consists of:

Application Directory (attached)  
User's Manual (H20-0367-3) (C120-2329)  
Operator's Manual (H20-0368-2)  
Object Modules and Sample Problem are available on one 9-track  
Distribution Tape Reel (DTR) @ 800 or 1600 bpi. For further  
description refer to Tape Key in the Application Directory.

Optional program material consists of:

Source Modules are available on one 9-track Distribution Tape  
Reel (DTR) @ 800 or 1600 bpi. For further description refer  
to Tape Key in the Application Directory.

Any discrepancy between the material received and the material  
ordered, or any errors in reproduction, should be reported to the  
Manager of the Program Library furnishing your programming systems.

Enclosures

## SYSTEM/360 CONTINUOUS SYSTEM MODELING PROGRAM

(360A-CX-16X)

### APPLICATION DIRECTORY

This is an IBM System/360 program for the simulation of continuous systems. It provides an application-oriented input language that accepts problems expressed in the form of either an analog block diagram or a system of ordinary differential equations. Data input and output are facilitated by means of application-oriented control statements.

This directory contains information concerning all available material associated with the subject application. Its objective is to enable the recipient to understand what he has received, where to locate specific items, and what to do with them.

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## DOCUMENTATION DIRECTORY

### APPLICATION DESCRIPTION (H20-0240)

This manual contains sufficient information to enable the reader to determine whether the application would be useful to him. The contents of this manual include:

- Introduction
- General Description of the Application
  - Extent of Coverage
  - Advantages
  - Application-Oriented Concepts
  - Integration Methods
  - Special Techniques
  - Precision
- Machine Configuration
- Source Language
- General Systems Chart
- Sample Problem
- Glossary
- Bibliography

USER'S MANUAL (H20-0367-2), TNL's N20-1938, N20-2039

This manual contains sufficient information to permit the reader to understand the component parts of the application and to use them. The contents of this manual include:

- Introduction
- General Description of the Program
- Elements of the S/360 CSMP Language
  - Numeric Constants
  - Symbolic Names
  - Operators
  - Functions
  - Labels
- Structure of the Model
  - INITIAL, DYNAMIC, and TERMINAL Segments
  - Sections - Parallel or Procedural
  - Structure Statements
- Data Statements
- Control Statements
  - Translation Control Statements
  - Execution Control Statements
  - Output Control Statements
- User-Defined Functions
  - MACRO Functions
  - PROCEDURE Functions
  - Subprograms
- Modeling Techniques
  - Sorting
  - NOSORT Option
  - Initialization
  - Termination
  - Integration
  - Arbitrary Functions
  - Implicit Functions
  - Tabular Data
- Run Control
  - Sequential Runs
  - Main Program Control
- Data Output
- Sample Problem
- Problem Checkout Facilities
- Diagnostic Messages

## USER'S MANUAL (cont.)

### Methods

- Integration Techniques
- Dynamic Storage Allocation
- Program Restrictions
- Reserved Words
- Statement Ordering
- System Macros

Appendix: Index of System/360  
CSMP Functions and Statements

Glossary

Bibliography

## OPERATOR'S MANUAL (H20-0368-2)

This manual contains information regarding actual console operations, including setup procedures which must be performed to execute the program. The contents of this manual include:

- Compiling and Link Editing
- Basic Distribution
- Optional Distribution
- Modifying DEJCSMP2
- S/360 CSMP Cataloged Procedure
- Console Operating Instructions
- Halts and Message List
- Storage Map
- Restart Procedures
- Execution Phase Load Module Storage

## SYSTEM MANUAL (Y20-0111)

This manual presents a detailed description of the logical operation of the computer programs associated with the subject application. The contents of this manual include:

- Introduction
- Translation Phase
- Execution Phase
- Functions
- Program Modifications

## REFERENCE MATERIAL

Following is a list of publications which contain information relating to the use of this system:

### IBM System/360 Operating System FORTRAN Language (C28-6515)

This publication describes and illustrates the use of the FORTRAN IV language for the IBM Operating System/360. The reader is presumed to have some knowledge of an existing FORTRAN language.

The FORTRAN IV language is a symbolic programming language. It parallels the symbolism and format of mathematical notations. In addition, many programming features and facilities are available for expressing the method of solution of a mathematical problem as a meaningful FORTRAN program.

### IBM System/360 Operation System FORTRAN IV (E) Programmer's Guide (C28-6603)

This publication describes how to compile, link edit, and execute a FORTRAN IV (E) program. The text also describes the output of compilation and execution, how to make optimal use of the compiler and a load module, and compiler and load module restrictions.

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This publication describes the library subprograms supplied with FORTRAN IV and provides the information necessary to use the library subprograms in either a FORTRAN IV or an assembler language program. In addition, the publication contains algorithms, accuracy statistics and timing estimates, descriptions of error and interruption procedures, storage estimates, and sample storage printouts.

### IBM System/360 Operating System Assembler Language (C28-6514)

This publication contains preliminary specifications for the IBM Operating System/360 Assembler Language. The assembler language is a symbolic programming language used to write programs for the IBM System/360. The language provides a convenient means for representing the machine instructions and related data necessary to program the IBM System/360. The IBM Operating System/360 Assembler Program processes the language and provides auxiliary functions useful in the preparation and documentation of a program and includes facilities for processing the assembler macro language.

Part I of this publication describes the assembler language. Part II of this publication describes an extension of the assembler language - the macro language - used to define macro instructions.



IBM System/360 Operating System Operator's Guide (C28-6540)

This publication provides the console operator and other machine room personnel with complete operating information for the IBM System/360 Operating System. It includes a discussion of the operator's duties and a description of the console input/output device. Descriptions of initialization procedures, input/output device allocations, job control information, operator commands, and the online messages and corresponding explanations are also included in this publication.

IBM System/360 Operating System - System Programmer's Guide (C28-6550)

This publication consists of self-contained chapters, each of which provides information on how to modify, extend, or implement capabilities of the IBM System/360 Operating System control program. It is designed primarily for system programmers responsible for maintaining, updating, and extending the operating system features.

Topics:

- Catalog and VTOC Maintenance
- Adding SVC Routines
- Adding Accounting Routines
- IECDSECT, IEFJFCBN, and IEFUCBOB Macro Instructions
- The Must Complete Function of ENQ/DEQ
- The EXCP Macro-Instruction
- The XDAP Macro-Instruction
- The Tracing Routine
- Implementing Data Set Protection
- PRESRES Volume Characteristic List
- Residency Options and Link Pack Area
- MVT Job Queue Formatting
- System Macro-Instructions
- Adding System Output Writer Routines
- Output Separators
- System Reader, Initiator, and Writer Cataloged Procedures
- Writing Rollout/Rollin Installation Appendages
- Adding a Universal Character Set Image to the System Library
- The Shared Direct Access Device Option
- The Time Slicing Facility
- Graphic Job Processor Procedures

IBM System/360 Operating System Job Control Language (C28-6539)

This publication contains preliminary specifications for the preparation of the IBM Operating System/360 control statements. Included are detailed descriptions of the job, execute, data definition, command, null, and delimiter statements, which form the Job Control Language. Parameters, options, and restrictions are described and illustrated for each statement. The use of the control statements, both individually and together, is illustrated.

IBM Operating System/360 Control Program Services (C28-6541)

This publication describes the use of system macro instructions that request the supervisor, data management, and test translator services of the Operating System/360 control program. It also presents the linkage conventions that have been established for use in Operating System/360.

IBM System/360 Operating System Messages, Completion Codes, and Storage Dumps (C28-6631)

This publication lists and explains the messages and completion codes produced by all IBM-supplied components of the IBM System/360 Operating System. The introduction shows the formats of the messages and completion codes, and gives certain information not given in the individual message descriptions. The messages and completion codes are presented in alphabetic order.

The formats of the storage dumps associated with abnormal terminations are also described.

IBM System/360 Operating System Linkage Editor (C28-6538)

This publication provides programmers and system analysts with the information necessary to make effective use of the linkage editor of Operation System/360. Included are descriptions of the functions performed automatically by the linkage editor as well as those performed in response to control statements prepared by the programmer.

The linkage editor combines and edits modules to produce a single module that can be loaded by the control program. The linkage editor operates as a processing program rather than as a part of the control program.

## IBM System/360 Operating System Utilities (C28-6586)

This publication discusses the capabilities of the IBM System/360 Operating System utility programs and the control statements used with each program. These programs are used by programmers responsible for organizing and maintaining operating system data.

Three types of utility programs are discussed: system utilities and data set utilities, which are used directly with the System/360 Operating System; and independent utilities, which operate outside the operating system. System utilities deal with operating system control data. Data set utilities manipulate data sets at the record level and above. Independent utilities initialize, dump, and restore direct access volumes.

### TAPE KEY

The S/360 CSMP tapes, as received by the user, are 9-track Distribution Tape Reels (blocked ten cards per record). Both basic and optional material are distributed as unloaded partitioned data sets.

1. Basic material -- object modules, link-edit control cards, sample problem, OS/360 control cards, and assembly source for DEJCSMP2. Number of records equals 352.

<u>File</u>	<u>DS Name</u>	<u>Members</u>	<u>Description</u>
1	CSMP.OBJMOD (blocked 21 cards per record when loaded on a DASD)	All S/360 CSMP sub- routines by subroutine name	Object card images
2	CSMP.SYMBM (unblocked when loaded on a DASD)	TRANMOD (108K region ) TRANMIN (96K region)  EXECMOD	Primary link edit input for creating S/360 CSMP trans- lation phase load modules  Primary link edit input for creating S/360 CSMP execution phase load modules
		CTLCDs	Primary link edit input used by sample procedure
3	CSMP.DECKs (unblocked when loaded on a DASD)	SAMPLE  JCLCARDS	Cable reel problem input deck  OS/360 control cards for Figs. 3-8

<u>File</u>	<u>DS Name</u>	<u>Members</u>	<u>Description</u>
		DEJCSMP2	Assembly source cards for DEJCSMP2

2. Optional material -- FORTRAN and assembly source modules. Number of records equals 757.

<u>File</u>	<u>DS Name</u>	<u>Members</u>	<u>Description</u>
1	CSMP.SOURCE (blocked 21 cards per record when loaded on a DASD)	All S/360 CSMP subroutines by subroutine name	Source card images

#### PREPARATORY SYSTEM PROCEDURES

There are no special preparatory system procedures other than those given in the Operator's Manual.

#### REQUIRED SYSTEMS

The procedures for installing and operating the distributed program require the IBM System/360 Operating System with its associated utilities and library programs. Linkage Editor F (88K or 128K) is required for link editing the object modules as distributed (blocked 21 cards per record when loaded on a DASD). Other linkage editor programs (E level and 44K F level) may be used if an unblocking operation is performed first. When installed, the program operates under System/360 Operating System and requires FORTRAN IV (G) and the linkage editor designated as IEWL. These entry points may be changed to use FORTRAN IV (E) or FORTRAN IV (H) and any linkage editor available by following the Operator's Manual section, "Modifying DEJCSMP2".

The FORTRAN IV source modules distributed as Optional Material may be compiled under any FORTRAN IV level. The distributed object modules were created by compiling the source modules using FORTRAN IV Level H with optimization.

#### MACHINE CONFIGURATION

The program requires a minimum of 96K bytes of storage, excluding that required by OS/360, the Standard Instruction set, and the Floating-Point Option.

In addition to the I/O units needed by the Operating System for FORTRAN IV compiling, the program will require three logical utility units, one of which must be a direct access storage device (DASD). The other two may be portions of the required DASD, or may be portions of other DASD's or magnetic tape drives.

#### STATEMENT OF MAINTENANCE PROCEDURES

This program will be maintained through the use of serially numbered modification letters. Any unmodified system is considered to be modification level 0. Each subsequent modification raises the modification level by 1. The initial availability of this program is version 1, modification level 0. Should the nature or quantity of changes make a recompilation necessary, a new version will be distributed. Each recompilation raises the version number by 1; modification letters to a new version begin at 1.

Modification letters will be mailed to all previous recipients of the program. All modification letters will be supplied with the program.

An Authorized Programming Analysis Report (APAR) should be submitted through your local IBM Systems Engineer to report any difficulties encountered in the use of this system. The APAR should be addressed to APAR Processing, IBM Corporation, 1501 California Ave., Palo Alto, California 94304.

JUNE 1971

MEMORANDUM TO: Users of S/360 Continuous System  
Modeling Program (360A-CX-16X)

SUBJECT: APAR # PA-366 Program #360A-CX-16X (CORRECTION)  
Program Name: S/360 Continuous System  
Modeling Program  
Version 1 Modification Level 2

Abstract of Problem:

An abnormal exit will occur if a "PROCEDURAL" label is used in a MACRO definition with more than 25 input and output names. For example:

```
MACRO Y = BLK (X1, X2, ..., X25)
PROCEDURAL (blank)
```

Comment on Problem:

Table 22 of the translation module has a capacity of 180 input characters. The system code performing the automatic generation of a PROCEDURE statement using the MACRO label statement fails to test for table overflow and an abnormal exit will result. Subroutine RMACST may be modified to perform this test. Use the Optional Distribution procedures described in the Operator's Manual to compile RMACST and relink-edit the translator. The following modifications are required as input:

```
./ CHANGE SEQFLD=774,NAME=RMACST
1926 IF(LETTERS(KEND).NE.64)GO TO 1928          RMAC2422
      KEND=KEND-1                               RMAC2424
      GO TO 1926                                RMAC2426
1928 KEND=KEND+1                                RMAC2430
1936 IF(LETTERS(KEND).NE.64)GO TO 1938          RMAC2502
      KEND=KEND-1                               RMAC2504
      GO TO 1936                                RMAC2506
1938 KEND=KEND+1                                RMAC2510
      IF(KEND.GT.180)GO TO 2211                 RMAC2542
./ ENDUP
```



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September 1969

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Distribution Tape Reel (DTR) @ 800 or 1600 bpi. For further  
description refer to Tape Key in the Application Directory.

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SYSTEM/360 CONTINUOUS SYSTEM MODELING PROGRAM

(360A-CX-16X)

APPLICATION DIRECTORY

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Tape Key . . . . .	8
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Required Systems . . . . .	9
Machine Configuration . . . . .	9
Statement of Maintenance Procedures . . . . .	10



## DOCUMENTATION DIRECTORY

### APPLICATION DESCRIPTION (H20-0240)

This manual contains sufficient information to enable the reader to determine whether the application would be useful to him. The contents of this manual include:

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  - Extent of Coverage
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  - Integration Methods
  - Special Techniques
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- Machine Configuration
- Source Language
- General Systems Chart
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  - Execution Control Statements
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- User-Defined Functions
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  - PROCEDURE Functions
  - Subprograms
- Modeling Techniques
  - Sorting
  - NOSORT Option
  - Initialization
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- Run Control
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- Sample Problem
- Problem Checkout Facilities
- Diagnostic Messages

USER'S MANUAL (cont.)

Methods  
  Integration Techniques  
  Dynamic Storage Allocation  
  Program Restrictions  
  Reserved Words  
  Statement Ordering  
  System Macros  
Appendix: Index of System/360  
  CSMP Functions and Statements  
Glossary  
Bibliography

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This manual contains information regarding actual console operations, including setup procedures which must be performed to execute the program. The contents of this manual include:

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    Basic Distribution  
    Optional Distribution  
    Modifying DEJCSMP2  
  S/360 CSMP Cataloged Procedure  
  Console Operating Instructions  
  Halts and Message List  
  Storage Map  
  Restart Procedures  
  Execution Phase Load Module Storage

SYSTEM MANUAL (Y20-0111)

This manual presents a detailed description of the logical operation of the computer programs associated with the subject application. The contents of this manual include:

  Introduction  
  Translation Phase  
  Execution Phase  
  Functions  
  Program Modifications

## REFERENCE MATERIAL

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This publication consists of self-contained chapters, each of which provides information on how to modify, extend, or implement capabilities of the IBM System/360 Operating System control program. It is designed primarily for system programmers responsible for maintaining, updating, and extending the operating system features.

#### Topics:

- Catalog and VTOC Maintenance
- Adding SVC Routines
- Adding Accounting Routines
- IECDSECT, IEFJFCBN, and IEFUCBOB Macro Instructions
- The Must Complete Function of ENQ/DEQ
- The EXCP Macro-Instruction
- The XDAP Macro-Instruction
- The Tracing Routine
- Implementing Data Set Protection
- PRESRES Volume Characteristic List
- Residency Options and Link Pack Area
- MVT Job Queue Formatting
- System Macro-Instructions
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- Output Separators
- System Reader, Initiator, and Writer Cataloged Procedures
- Writing Rollout/Rollin Installation Appendages
- Adding a Universal Character Set Image to the System Library
- The Shared Direct Access Device Option
- The Time Slicing Facility
- Graphic Job Processor Procedures

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The formats of the storage dumps associated with abnormal terminations are also described.

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This publication provides programmers and system analysts with the information necessary to make effective use of the linkage editor of Operation System/360. Included are descriptions of the functions performed automatically by the linkage editor as well as those performed in response to control statements prepared by the programmer.

The linkage editor combines and edits modules to produce a single module that can be loaded by the control program. The linkage editor operates as a processing program rather than as a part of the control program.

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This publication discusses the capabilities of the IBM System/360 Operating System utility programs and the control statements used with each program. These programs are used by programmers responsible for organizing and maintaining operating system data.

Three types of utility programs are discussed: system utilities and data set utilities, which are used directly with the System/360 Operating System; and independent utilities, which operate outside the operating system. System utilities deal with operating system control data. Data set utilities manipulate data sets at the record level and above. Independent utilities initialize, dump, and restore direct access volumes.

TAPE KEY

The S/360 CSMP tapes, as received by the user, are 9-track Distribution Tape Reels (blocked ten cards per record). Both basic and optional material are distributed as unloaded partitioned data sets.

1. Basic material -- object modules, link-edit control cards, sample problem, OS/360 control cards, and assembly source for DEJCSMP2. Number of records equals 352.

<u>File</u>	<u>DS Name</u>	<u>Members</u>	<u>Description</u>
1	CSMP.OBJMOD (blocked 21 cards per record when loaded on a DASD)	All S/360 CSMP sub-routines by subroutine name	Object card images
2	CSMP.SYMBM (unblocked when loaded on a DASD)	TRANMOD (108K region) TRANMIN (96K region) EXECMOD	Primary link edit input for creating S/360 CSMP translation phase load modules  Primary link edit input for creating S/360 CSMP execution phase load modules
		CTLDCS	Primary link edit input used by sample procedure
3	CSMP.DECKS (unblocked when loaded on a DASD)	SAMPLE JCLCARDS	Cable reel problem input deck OS/360 control cards for Figs. 3-8

<u>File</u>	<u>DS Name</u>	<u>Members</u>	<u>Description</u>
		DEJCSMP2	Assembly source cards for DEJCSMP2

2. Optional material -- FORTRAN and assembly source modules. Number of records equals 757.

<u>File</u>	<u>DS Name</u>	<u>Members</u>	<u>Description</u>
1	CSMP.SOURCE (blocked 21 cards per record when loaded on a DASD)	All S/360 CSMP subroutines by subroutine name	Source card images

#### PREPARATORY SYSTEM PROCEDURES

There are no special preparatory system procedures other than those given in the Operator's Manual.

#### REQUIRED SYSTEMS

The procedures for installing and operating the distributed program require the IBM System/360 Operating System with its associated utilities and library programs. Linkage Editor F (88K or 128K) is required for link editing the object modules as distributed (blocked 21 cards per record when loaded on a DASD). Other linkage editor programs (E level and 44K F level) may be used if an unblocking operation is performed first. When installed, the program operates under System/360 Operating System and requires FORTRAN IV (G) and the linkage editor designated as IEWL. These entry points may be changed to use FORTRAN IV (E) or FORTRAN IV (H) and any linkage editor available by following the Operator's Manual section, "Modifying DEJCSMP2".

The FORTRAN IV source modules distributed as Optional Material may be compiled under any FORTRAN IV level. The distributed object modules were created by compiling the source modules using FORTRAN IV Level H with optimization.

#### MACHINE CONFIGURATION

The program requires a minimum of 96K bytes of storage, excluding that required by OS/360, the Standard Instruction set, and the Floating-Point Option.

In addition to the I/O units needed by the Operating System for FORTRAN IV compiling, the program will require three logical utility units, one of which must be a direct access storage device (DASD). The other two may be portions of the required DASD, or may be portions of other DASD's or magnetic tape drives.

#### STATEMENT OF MAINTENANCE PROCEDURES

This program will be maintained through the use of serially numbered modification letters. Any unmodified system is considered to be modification level 0. Each subsequent modification raises the modification level by 1. The initial availability of this program is version 1, modification level 0. Should the nature or quantity of changes make a recompilation necessary, a new version will be distributed. Each recompilation raises the version number by 1; modification letters to a new version begin at 1.

Modification letters will be mailed to all previous recipients of the program. All modification letters will be supplied with the program.

An Authorized Programming Analysis Report (APAR) should be submitted through your local IBM Systems Engineer to report any difficulties encountered in the use of this system. The APAR should be addressed to APAR Processing, IBM Corporation, 1501 California Ave., Palo Alto, California 94304.