IBM

Application Program

GH20-0368-3

System/360 Continuous System

Modeling Program

Operator's Manual

Program Number 360A-CX-16X

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.

This manual contains information and procedures that will
enable the user to incorporate the System/360 Continuous
System Modeling Program into an Operating System/360
library; to include a procedure in the Operating System/360
procedure library (OS/360 SYS1.PROCLIB); and subsequently
to execute S/360 CSMP under the control of, and using the
services of, OS/360.

CONTENTS

COMPILING AND LINK EDITING

The process of incorporating the System/360 Continuous System Modeling Program into a private library of the OS/360 module library SYS1.LINKLIB is relatively straightforward. It is expected that the individual who is responsible for the installation and maintenance of S/360 CSMP will be reasonably familiar with OS/360 and its associated procedures.

The S/360 CSMP tapes, as distributed by IBM, are 9-track or 7-track distribution tape reels (blocked ten cards per record). Both basic and optional material is distributed as unloaded partitioned data sets (PDS).

1. Basic material -- the object modules, link-edit control cards, sample problem, OS/360 control cards, and assembly source for DEJCSMP2.

File	DS Name	Members	Description
1	CSMP.OBJMOD (blocked 21 cards per record when loaded on a DASD)	All S/360 CSMP subroutines by subroutine name	Object card images
2	CSMP.SYMBM (unblocked when loaded on a DASD)	TRANMOD (110K region) TRANMIN (98K region)	Primary link-edit input for creating S/360 CSMP translation phase load modules
		EXECMOD	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	Cable reel problem input deck
		JCLCARDS	OS/360 control cards for Figures 3 - 8
		DEJCSMP2	Assembly source cards for DEJCSMP2

2. Optional material -- FORTRAN and assembly source modules

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

1

Basic Distribution

To link-edit the object modules as distributed:

1. Mount the basic distribution tape containing S/360 CSMP on a nine-track tape drive.

2. Run the OS/360 control cards and data, prepared as shown in Figure 1, as a normal OS/360 batch job. This run will load the entire contents of the distributed tape onto a direct access device (DASD).

3. Run the OS/360 control cards and associated data, prepared as shown in Figure 2, as a normal OS/360 batch job. This will punch the sample problem, control cards, and data corresponding to Figures 3 - 8, and also the source deck for DEJCSMP2. Interpret the decks produced: note that each deck is identified in cc 73-80. Replace all "INSERT A DELIMITER CARD HERE" cards with delimiter cards to correspond with the figures.

4. Select the deck identified as FIG6. Modify the control cards of this deck to reference the desired data set name and volume serial number (this is illustrated in Figure 6). If the generated system is to operate in a restricted region or on a 128K machine FIG60180 card must be changed to use member TRANMIN. Run the modified control cards as a normal OS/360 batch job. This will create load modules for the translation and execution phases of S/360 CSMP.

5. After creation of the load modules, the object module data set may be scratched to save space on the DASD. This may be done by running control cards FIG60010 thru FIG60040 (see Figure 6) followed by data card

SCRATCH VOL=2314=CSMPDK, DSNAME=CSMP.OBJMOD

S/360 CSMP models may now be executed by following the procedure given under "S/360 CSMP Cataloged Procedure".

```
//SCRTCH   EXEC   PGM=IEHPROGM,REGION=60K                                    FIG10010
//DD1      DD     VOL=SER=CSMPDK,DISP=OLD,UNIT=2314                          FIG10020
//SYSPRINT DD     SYSOUT=A                                                   FIG10030
//SYSIN    DD     *                                                          FIG10040
     SCRATCH   VOL=2314=CSMPDK,DSNAME=CSMP.OBJMOD                            FIG10050
     SCRATCH   VOL=2314=CSMPDK,DSNAME=CSMP.SYMBM                             FIG10060
     SCRATCH   VOL=2314=CSMPDK,DSNAME=CSMP.DECKS                             FIG10070
/*                                                                          FIG10080
//LOADPDS  EXEC   PGM=IEHMOVE,REGION=64K                                     FIG10090
//SYSPRINT DD     SYSOUT=A                                                   FIG10100
//DISK     DD     UNIT=(2314,,DEFER),VOL=SER=CSMPDK,DISP=OLD                 FIG10110
//TAPE1    DD     UNIT=(2400,,DEFER),VOL=SER=CSMP,LABEL=(,NL),DISP=(OLD,     FIG10120
//                PASS),DCB=(DEN=2,RECFM=FB,LRECL=80,BLKSIZE=800)           FIG10130
//SYSUT1   DD     UNIT=(2314,,DEFER),VOL=SER=CSMPDK,DISP=OLD                 FIG10140
//SYSIN    DD     *                                                          FIG10150
   COPY   TO=2314=CSMPDK,FROMDD=TAPE1,FROM=2400=(CSMP,1),PDS=CSMP.OBJMOD     FIG10160
   COPY   TO=2314=CSMPDK,FROMDD=TAPE1,FROM=2400=(CSMP,2),PDS=CSMP.SYMBM      FIG10170
   COPY   TO=2314=CSMPDK,FROMDD=TAPE1,FROM=2400=(CSMP,3),PDS=CSMP.DECKS      FIG10180
/*                                                                          FIG10190
```

Figure 1. Control cards and data for loading CSMP partitioned data sets onto a DASD. NOTE: Figures 1 through 12 all presume the use of 2314 direct access units and 2400 tape drives; for other configurations the control and data cards referred to in this manual must be modified accordingly.

```
//PRTPUN    EXEC    PGM=IEBPTPCH                                              FIG20010
//SYSPRINT DD    SYSOUT=A                                                     FIG20020
//SYSUT1 DD    UNIT=(2314,,DEFER),VOL=SER=CSMPDK,DISP=SHR,DSN=CSMP.DECKS     FIG20030
//SYSUT2 DD    SYSOUT=B                                                       FIG20040
//SYSIN   DD    *                                                            FIG20050
   PUNCH TYPORG=PU,MAXNAME=3                                                  FIG20060
        MEMBER NAME=SAMPLE                                                    FIG20070
        MEMBER NAME=JCLCARDS                                                  FIG20080
        MEMBER NAME=DEJCSMP2                                                  FIG20090
/*                                                                           FIG20100
```

Figure 2. Control cards for punching or printing from partitioned data sets. NOTE: Data shown is for punching
        sample problem, JCL cards, and source for DEJCSMP2. This procedure may be modified to print or
        punch any members of the CSMP system data sets (that is CSMP.SYMBM, CSMP.OBJMOD, or
        CSMP.SOURCE).

Optional Distribution

To update the source and object modules:

1. Mount the DASD containing the S/360 CSMP system. If the object mod-
   ule data set has been scratched to conserve space on the DASD, first
   run steps 1 and 2 given under "Basic Distribution" using control and
   data cards FIG10010 thru FIG10160.

2. Mount the optional distribution tape on a nine-track tape drive. To
   control cards FIG10010 thru FIG10150, add the following data card:

COPY TO=2314=CSMPDK,FROM=2400=(CSMP,1),FROMDD=TAPE1,PDS=CSMP.SOURCE

Run the deck as a normal OS/360 batch job; this will load the source
decks onto the DASD.

3. Select the deck identified as FIG3. Add appropriate data to change or
   delete source statements as required (this is illustrated in Figure 3).
   Run the modified control cards as a normal OS/360 batch job. This
   will update the source programs. (NOTE: Individual source decks
   may be punched using cards prepared as shown in Figure 2, if desired.
   See note to Figure 2. After modification, source decks may be re-
   entered using the REPL statement with Figure 3.)

4. Compile or assemble the desired source module by submitting the deck
   identified as FIG4A or FIG4B (see Figures 4a and 4b). This will result
   in updated object module.

```
//UPDATE   EXEC    PGM=IEBUPDTE,REGION=44K                                    FIG30010
//SYSPRINT DD    SYSOUT=A,DCB=(RECFM=FBA,LRECL=121,BLKSIZE=3509)             FIG30020
//SYSUT1   DD    DSN=CSMP.SOURCE,UNIT=2314,VOL=SER=CSMPDK,DISP=SHR          FIG30030
//SYSUT2   DD    DSN=CSMP.SOURCE,UNIT=2314,VOL=SER=CSMPDK,DISP=(OLD,PASS)    FIG30040
//SYSIN    DD    *                                                           FIG30050
./    CHANGE    LIST=ALL,SEQFLD=774,NAME=BCDIST                              FIG30060
*******    INSERT CHANGE DECK FOR BCDIST HERE      *******                   FIG30070
/*                                                                           FIG30080
```

Figure 3. Updating CSMP partitioned data set members. NOTE: The example shown will change a card in the
        BCDIST subroutine and list the revised member (see IBM System/360 Operating System Utilities,
        GC28-6586, for complete updating capability). NOTE ALSO: Modifications to these cards to refer to
        CSMP.OBJMOD or CSMP.SYMBM will allow changes or replacement of object decks or link edit
        primary input members.

```
//COMP    EXEC   PGM=IEKAAOO,PARM='MAP,OPT=1',REGION=216K                          FIG4A010
//SYSPRINT DD    SYSOUT=A                                                          FIG4A020
//SYSLIN   DD    UNIT=2314,VOL=SER=CSMPDK,DISP=(OLD,PASS),                         FIG4A030
//               DSN=CSMP.OBJMOD(BCDIST)                                           FIG4A040
//SYSIN    DD    UNIT=2314,VOL=SER=CSMPDK,DISP=SHR,                                FIG4A050
//               DSN=CSMP.SOURCE(BCDIST)                                           FIG4A060
```

Figure 4a. Control cards for creating an object module from a FORTRAN source module. NOTE: This example uses FORTRAN IV (Level H, opt 2) to compile subroutine BCDIST. The output object replaces the BCDIST member in the object module data set. Modify these control cards for the desired compiler options and CSMP.SOURCE member.

```
//ASSMB   EXEC   PGM=IEUASM,PARM='LOAD,NODECK',REGION=96K                          FIG4B010
//SYSGO   DD     UNIT=2314,DISP=(OLD,PASS),VOL=SER=CSMPDK,                         FIG4B020
//               DSN=CSMP.OBJMOD(DEJCSMP2)                                         FIG4B030
//SYSLIB  DD     DSN=SYS1.MACLIB,DISP=SHR                                          FIG4B040
//SYSPRINT DD    SYSOUT=A,DCB=(RECFM=FBM,LRECL=121,BLKSIZE=3509)                   FIG4B050
//SYSPUNCH DD    SYSOUT=B                                                          FIG4B060
//SYSUT1  DD     UNIT=SYSDA,SPACE=(3500,(200,50),,,ROUND),DCB=BLKSIZE=3500         FIG4B070
//SYSUT2  DD     SPACE=(3500,(200,50),,,ROUND),DCB=BLKSIZE=3500,                   FIG4B080
//               UNIT=(SYSDA,SEP=SYSUT1))                                          FIG4B090
//SYSUT3  DD     SPACE=(3500,(200,50),,,ROUND),DCB=BLKSIZE=3500,                   FIG4B100
//               UNIT=(SYSDA,SEP=(SYSLIB,SYSUT1,SYSUT2))                           FIG4B110
//SYSIN   DD     UNIT=2314,VOL=SER=CSMPDK,DISP=SHR,                                FIG4B120
//               DSN=CSMP.SOURCE(DEJCSMP2)                                         FIG4B130
```
Figure 4b. Control cards for creating an object module from an assembly source module. NOTE: This example uses the OS assembler to obtain object output for DEJCSMP2. The output object replaces the DEJCSMP2 member in the object module data set.

5. Select the deck identified as FIG6. Modify the control cards of this deck to reference the desired data set name and volume serial number (this is illustrated in Figure 6). Run the modified control cards as a normal OS/360 batch job. This will create load modules for the translation and execution phases of S/360 CSMP.

6. S/360 CSMP models may now be executed by following the procedure given under "S/360 CSMP Cataloged Procedure". However, it is good practice to first create a "restore tape" containing the updated source and object modules. Run the control cards and data identified as deck FIG5A (see Figure 5a) as an OS/360 batch job. This will create a "restore tape" and scratch or remove the source and object modules from the DASD.

7. If subsequent modification of S/360 CSMP is required, mount the "restore tape" created in step 6 and run the deck identified as FIG5B as a normal OS/360 batch job. Then proceed with steps 3 - 6 above.

```
//UNLOAD  EXEC   PGM=IEHMOVE,REGION=64K                                            FIG5A010
//SYSPRINT DD    SYSOUT=A                                                          FIG5A020
//DISK    DD     UNIT=(2314,,DEFER),VOL=SER=CSMPDK,DISP=OLD                        FIG5A030
//TAPE3   DD     UNIT=(2400,,DEFER),VOL=SER=CSMP,LABEL=(,NL),DISP=(NEW,            FIG5A040
//               PASS),DCB=(DEN=2,RECFM=FB,LRECL=80,BLKSIZE=800)                   FIG5A050
//SYSUT1  DD     UNIT=(2314,,DEFER),VOL=SER=CSMPDK,DISP=OLD                        FIG5A060
//SYSIN   DD     *                                                                 FIG5A070
 COPY  TO=2400=(CSMP,1),TODD=TAPE3,FROM=2314=CSMPDK,PDS=CSMP.OBJMOD               FIG5A080
 COPY  TO=2400=(CSMP,2),TODD=TAPE3,FROM=2314=CSMPDK,PDS=CSMP.SOURCE               FIG5A090
/*                                                                                 FIG5A100
//SCRTCH  EXEC   PGM=IEHPROGM,REGION=60K                                           FIG5A110
//DD1     DD     VOL=SER=CSMPDK,DISP=OLD,UNIT=2314                                 FIG5A120
//SYSPRINT DD    SYSOUT=A                                                          FIG5A130
//SYSIN   DD     *                                                                 FIG5A140
   SCRATCH  VOL=2314=CSMPDK,DSNAME=CSMP.OBJMOD                                     FIG5A150
   SCRATCH  VOL=2314=CSMPDK,DSNAME=CSMP.SOURCE                                     FIG5A160
/*                                                                                 FIG5A170
```
Figure 5a. Control cards for unloading the source and object data sets onto a tape and to scratch them from the DASD

```
//LDPDS   EXEC  PGM=IEHMOVE,REGION=64K                                           FIG5B010
//SYSPRINT DD   SYSOUT=A                                                         FIG5B020
//DISK    DD    UNIT=(2314,,DEFER),VOL=SER=CSMPDK,DISP=OLD                       FIG5B030
//TAPE3   DD    UNIT=(2400,,DEFER),VOL=SER=CSMP,LABEL=( ,NL),DISP=(OLD,          FIG5B040
//              PASS),DCB=(DEN=2,RECFM=FB,LRECL=80,BLKSIZE=800)                  FIG5B050
//SYSUT1  DD    UNIT=(2314,,DEFER),VOL=SER=CSMPDK,DISP=OLD                       FIG5B060
//SYSIN   DD    *                                                               FIG5B070
 COPY   TO=2314=CSMPDK,FROMDD=TAPE3,FROM=2400=(CSMP,1),PDS=CSMP.OBJMOD           FIG5B080
 COPY   TO=2314=CSMPDK,FROMDD=TAPE3,FROM=2400=(CSMP,2),PDS=CSMP.SOURCE           FIG5B090
/*                                                                              FIG5B100
```

Figure 5b. Control cards for loading source and object modules onto a DASD from a tape

```
//LOADMOD  EXEC  PGM=IEHPROGM,REGION=6CK                                         FIG60010
//DD1     DD    VOL=SER=CSMPDK,DISP=OLD,UNIT=2314                                FIG60020
//SYSPRINT DD   SYSOUT=A                                                         FIG60030
//SYSIN   DD    *                                                               FIG60040
   SCRATCH   VOL=2314=CSMPDK,DSNAME=CSMP.LOADM                                   FIG60050
/*                                                                              FIG60060
//ALLOC   EXEC  PGM=IEFBR14,REGION=16K                                           FIG60070
//DD1     DD    DSN=CSMP.LOADM,VOL=SER=CSMPDK,DISP=(NEW,KEEP),                   FIG60080
//              UNIT=2314,SPACE=(3500,(100,40,15))                              FIG60090
//TRMOD   EXEC  PGM=IEWL,PARM='MAP,OVLY,SIZE=(88K,8K)',REGION=96K                FIG60100
//OBJLIB  DD    DSN=CSMP.OBJMOD,UNIT=2314,DISP=SHR,                             FIG60110
//              VOL=SER=CSMPDK                                                   FIG60120
//SYSLIB  DD    DSN=SYS1.FORTLIB,DISP=SHR                                        FIG60130
//SYSLMOD DD    DSN=CSMP.LOADM,UNIT=2314,VOL=SER=CSMPDK,DISP=(OLD,PASS)          FIG60140
//SYSPRINT DD   SYSOUT=A                                                         FIG60150
//SYSUT1  DD    UNIT=SYSDA,SPACE=(1024,(200,20))                                 FIG60160
//SYSLIN  DD    UNIT=(2314,SEP=(SYSLMOD,SYSUT1)),DISP=SHR,VOL=SER=CSMPDK,        FIG60170
//              DSN=CSMP.SYMBM(TRANMOD)                                          FIG60180
//EXMOD   EXEC  PGM=IEWL,PARM='MAP,NCAL,SIZE=(88K,8K)',REGION=96K                FIG60190
//OBJLIB  DD    DSN=CSMP.OBJMOD,UNIT=2314,DISP=SHR,                             FIG60200
//              VOL=SER=CSMPDK                                                   FIG60210
//SYSLIB  DD    DSN=SYS1.FORTLIB,DISP=SHR                                        FIG60220
//SYSLMOD DD    DSN=CSMP.LOADM,UNIT=2314,VOL=SER=CSMPDK,DISP=(OLD,PASS)          FIG60230
//SYSPRINT DD   SYSOUT=A                                                         FIG60240
//SYSUT1  DD    UNIT=SYSDA,SPACE=(1024,(200,20))                                 FIG60250
//SYSLIN  DD    UNIT=(2314,SEP=(SYSLMOD,SYSUT1)),DISP=SHR,VOL=SER=CSMPDK,        FIG60260
//              DSN=CSMP.SYMBM(EXECMOD)                                          FIG60270
```

Figure 6. Control cards for creating load modules on DASD. NOTE: CSMP.LOADM is the name of the data set that will contain the
modules required by the sample procedure. CSMPDK is the serial number of the direct access device required by the sample
procedure. If your procedure is different from the sample procedure, these control cards must be modified accordingly.
NOTE ALSO: The IEW0201 warning message will print after link edit of module DEJCSMP2 and can be ignored. It is
assumed that IEWL invokes the linkage editor level F 44K or 88K.

Modifying DEJCSMP2

As distributed, DEJCSMP2 attaches FORTRAN IV, Level G (entry point
IEYFORT), as the second of the four program phases. If Level H is
to be used, DEJCSMP2 must be modified to attach to the appropriate com-
piler. If the optional distribution tape is available, the modification may
be performed using the technique previously described under "Optional
Distribution". If only the basic distribution tape is available, the modifi-
cation can be performed as follows:

1. Modify the source deck of DEJCSMP2 punched from step 3 under
    "Basic Distribution" to attach to the desired compiler.

2. Using the modified DEJCSMP2 program, run an OS/360 Assembler
    job with the deck option.

5

3. Link-edit the resulting object deck using control cards FIG60170
thru FIG60230 followed by the set of cards:

```
//SYSLIN  DD  *

        Object cards

    NAME        DEJCSMP2(R)

/*
```

Note that step 3 may also be used for permanently adding user-supplied
subroutines to supplement the set of S/360 CSMP functional elements.
The NAME card should be supplied with the appropriate name for the new
subroutine.

S/360 CSMP CATALOGED PROCEDURE

To minimize the number of OS/360 control cards required to run S/360
CSMP, and to standardize the units used by S/360 CSMP at a given com-
puter installation, it is suggested that a standard procedure be incorpo-
rated into the OS/360 SYS1.PROCLIB. All S/360 CSMP users at a given
installation could then use this procedure to run the program.

The OS/360 utility program IEBUPDTE, which should be used to place
procedures in the OS/360 SYS1.PROCLIB library, is described in the
manual IBM System/360 Operating System Utilities (GC28-6586).

A sample procedure for running S/360 CSMP is illustrated in Figure 7.
This procedure, or one modified to reflect the facilities of the installation,
should be cataloged in the OS/360 SYS1.PROCLIB using the series of
OS/360 control cards and input stream illustrated in Figure 8.

The procedure shown in Figure 7 is based on the following assumptions:

1. S/360 CSMP is on a private library.

2. The name of the data set containing S/360 CSMP load modules is CSMP.LOADM.

3. The name of the data set member containing the link-editor control cards is CTLCDS.

4. The direct access device serial number is CSMPDK.

5. FORTRAN reference units 1-5 are specified at system generation time.

6. The D.D. name of the FORTRAN execution diagnostic unit specified at system generation is FT06F001.

If any of these assumptions are not true, the procedure shown in Figure 7, should be changed accordingly. If item 6 is not true, the appropriate DD card must be supplied as an addition to the procedure.

To run S/360 CSMP using the procedure cataloged above, the OS/360 input stream must consist of control cards and S/360 CSMP input statements as shown in Figure 9 or Figure 10. The assumptions are the same as those for the procedure illustration (Figure 7), with the additional assumption that the name of the cataloged procedure is CSMP360. If the S/360 CSMP input statements are contained on a magnetic tape, the // CSMP1.SYSIN DD* card should be changed to // CSMP1.SYSIN DD (parameters identifying tape and unit, and describing tape makeup).

Note that figure 9 also shows the execution of several models within the same job step. This feature is available only for configurations with SYSIN assigned as a physical card reader and has other limitations which are discussed later in this section. Figure 10 shows the definition of a data set for storing the PREPARE option output and the control statements required to stack PREPARE output for more than one model. Note that this method of model stacking can be used for any system configuration.

Any of the control statements in the cataloged procedure may be temporarily modified during the run of a particular job. The method for doing this is described under "Overriding Cataloged Procedures" in the manual IBM System/360 Operating System: FORTRAN IV (G) Programmer's Guide (GC28-6639).

The operation of S/360 CSMP requires several data sets. The required data sets are defined by OS/360 DD statements at run time, as shown in the sample procedure in Figure 7. The DD statements specify the unit that the data sets will occupy, the space required by the data sets, and the disposition of the data sets upon completion of the S/360 CSMP run.

The data sets used are:

FT02F001   Output data set used to punch the symbolic deck if DECK
                option is chosen.

FT01F001   Input data set equated to SYSIN. (SYSIN is the normal
                input data set containing the models.)

FT06F001   SYSOUT data set for translation and execution phases.

FT07F001   Output data set used as input to FORTRAN compiler.

FT05F001   Output data set containing data cards used as input by
                execution phase.

FT13F001
FT14F001   Intermediate scratch data sets used in the translation and
                execution phases.

FT15F001   Output data set containing PREPARE option output when
                specified; otherwise a null data set.

SYSPRINT   SYSOUT data set for linkage editor.

COMPRINT   SYSOUT data set for FORTRAN compile phase.

SYSLIN   Object module output from FORTRAN compiler.

SYSLINK   Input data set to the linkage editor; includes output data
                set from FORTRAN and data set containing control cards.

SYSLIB   Direct access partitions input data sets containing the CSMP
                and FORTRAN IV execution load modules.

SYSLMOD   Output data set from linkage editor containing execution
                phase load module.

SYSUT1   Direct access intermediate scratch data set used by the link-
                age editor.

In the sample procedure shown in Figure 7, note that all data sets except
FT15F001 are assigned to direct access devices. This is recommended
for speed but is not necessary. All may be assigned to tapes, if avail-
able, with the exception of STEPLIB, SYSLIB, SYSUT1, and SYSLMOD,
which must be on a direct access device.

In the sample procedure (Figure 7) the PREPARE option output data set, FT15F001, is assigned a null data set. When using the PREPARE option in a CSMP model the user must override this statement with the definition of a data set on a directo access or tape volume. If a user supplied plotting job step immediately follows a CSMP execution step, FT15F001 should normally be assigned to a direct access device. If plotting is to be done at another time or additional plotting will be required, the output should be written on a tape volume. In the job submittal shown in Figure 10 the PREPARE output for model 1 is written on file 1 of the nine-track tape whose volume serial number is SCRTCH and the PREPARE output for model 2 is written on file 2 of the same tape volume.

If a physical card reader is available, the ENDJOB STACK feature could be used to run several models within a job step (Figure 9). However, it must be understood that if the PREPARE option is being used the PREPARE data set will be rewound before the execution of each new model and only the output data for the last model in the step would be available upon step completion.

Stacking within a job step is further limited by the amount of space assigned on the SYSLMOD DD card. The space assignment in the sample procedure should be sufficient for stacking eight to ten models. If a SYSABEND with system code E37 should occur, the space assigned was not sufficient for the number of models stacked. This situation would then require separate stacks for long jobs.

```
//CSMP1   EXEC   PGM=DEJCSMP2,REGION=110K                                    FIG70010
//FT01F001 DD    DDNAME=SYSIN                                                FIG70020
//FT02F001 DD    SYSOUT=B,DCB=(RECFM=F,BLKSIZE=80)                           FIG70030
//FT05F001 DD    UNIT=SYSDA,SPACE=(3500,(10,10)),DCB=(RECFM=F,BLKSIZE=80)    FIG70040
//FT06F001 DD    SYSOUT=A,DCB=(RECFM=FBA,LRECL=133,BLKSIZE=1330)             FIG70050
//FT07F001 DD    UNIT=SYSDA,SPACE=(3500,(20,20)),DCB=(RECFM=F,BLKSIZE=80)    FIG70060
//FT13F001 DD    UNIT=SYSDA,SPACE=(3500,(40,40)),                           FIG70070
//               DCB=(RECFM=VS,LRECL=204,BLKSIZE=208)                        FIG70080
//FT14F001 DD    UNIT=SYSDA,SPACE=(3500,(40,40)),                           FIG70090
//               DCB=(RECFM=VS,LRECL=204,BLKSIZE=208)                        FIG70100
//FT15F001 DD    DSN=NULLFILE                                                FIG70110
//COMPRINT DD    SYSOUT=A                                                    FIG70120
//STEPLIB  DD    UNIT=2314,VOL=SER=CSMPDK,DSN=CSMP.LOADM,DISP=(SHR,PASS)     FIG70130
//SYSLIB   DD    UNIT=2314,DISP=SHR,VOL=SER=CSMPDK,DSN=CSMP.LOADM            FIG70140
//         DD    DSN=SYS1.FORTLIB,DISP=SHR                                   FIG70150
//SYSLIN   DD    UNIT=SYSDA,SPACE=(3500,(20,10)),DCB=BLKSIZE=800             FIG70160
//SYSLINK  DD    DISP=(OLD,PASS),VOL=REF=*.SYSLIN,DSN=*.SYSLIN               FIG70170
//         DD    UNIT=2314,DISP=SHR,VOL=SER=CSMPDK,DSN=CSMP.SYMBM(CTLCDS)    FIG70180
//SYSLMOD  DD    UNIT=SYSDA,SPACE=(3500,(050,20,1)),DSN=&NOSET(DEJEXE)       FIG70190
//SYSPRINT DD    SYSOUT=A                                                    FIG70200
//SYSUT1   DD    UNIT=(SYSDA,SEP=(SYSLMOD,SYSLINK)),SPACE=(3500,(40,10))     FIG70210
```

Figure 7. Procedure control cards for running S/360 CSMP models. NOTE: If assumptions described in previous narrative do not apply this procedure must be modified accordingly.

```
//PROCD   EXEC   PGM=IEBUPDTE,REGION=44K                                     FIG80010
//SYSPRINT DD    SYSOUT=A                                                    FIG80020
//SYSUT1   DD    DSN=SYS1.PROCLIB,DISP=SHR                                   FIG80030
//SYSUT2   DD    DSN=SYS1.PROCLIB,DISP=(OLD,PASS)                            FIG80040
//SYSIN    DD    DATA                                                        FIG80050
./  ADD    LIST=ALL,NAME=CSMP360                                            FIG80060
*******        INSERT FIGURE 7 CARDS HERE              *******              FIG80070
/*                                                                          FIG80080
```

Figure 8. Control cards for adding CSMP procedure to the procedure library. NOTE: Use the REPL feature if this procedure is to replace an existing procedure.

```
//CSMP     JOB     ACCOUNT,USER,MSGLEVEL
//STEP1   EXEC   CSMP360
//CSMP1.SYSIN DC  *
*******        INSERT CSMP STATEMENTS FOR MODEL 1 HERE       *******
ENDJOB  STACK
              ( BLANK CARD )
*******        INSERT CSMP STATEMENTS FOR MODEL 2 HERE       *******
ENDJOB  STACK
              ( BLANK CARD )
*******        INSERT CSMP STATEMENTS FOR MODEL 3 HERE       *******
                                   •••
                                   •••
                                   •••
*******        INSERT CSMP STATEMENTS FOR MODEL N HERE       *******
ENDJOB
/*
```

Figure 9. User-supplied cards at run time

```
//CSMP       JOB     ACCOUNT,USER,HSGLEVEL
//STEP1  EXEC  CSMP360
//CSMP1.FT15F001   DD   UNIT=(2400,,DEFER),DSN=&PREPARE,DISP=(NEW,PASS),
//                 LABEL=(1,NL),VOL=SER=SCRTCH
//CSMP1.SYSIN   DD   *
*******        INSERT CSMP STATEMENTS FOR MODEL 1 HERE        *******
ENDJOB
/*
//STEP2  EXEC  CSMP360
//CSMP1.FT15F001   DD   UNIT=(2400,,DEFER),DSN=&PREPARE,DISP=(OLD,PASS),
//                 LABEL=(2,NL),VOL=SER=SCRTCH
//CSMP1.SYSIN   DD   *
*******        INSERT CSMP STATEMENTS FOR MODEL 2 HERE        *******
ENDJOB
/*
```

Figure 10. User-supplied cards at run time. Note method for stacking jobs. This method must be used if more than one job uses PREPARE or for those configurations in which SYSIN is not the card reader.

CONSOLE OPERATING INSTRUCTIONS

S/360 CSMP source statements with the appropriate OS/360 job control language and DD control cards, as outlined and described in this manual, are submitted as a normal job for batch processing under OS/360.

No special or additional console operating instructions are required when running S/360 CSMP jobs, other than the normal procedures associated with OS/360.

HALTS AND MESSAGE LIST

There are no halts in S/360 CSMP. The Operating System/360 may cause a halt during the running of S/360 CSMP. If this should happen, action should be taken in accordance with the Operating System/360 instructions. Any action required of the operator will be requested by Operating System/360, not by S/360 CSMP.

Diagnostic messages may occur during the running of a S/360 CSMP model. The User's Manual contains a complete list and description of these messages. The run may be terminated prematurely; however, control will be returned to the OS/360 so that the next job may be processed.

STORAGE MAP

The region size required for execution of the CSMP system in an MVT environment is determined by the maximum of the requirements for each of the four phases: translator, compiler, linkage editor, and execution. If the FORTRAN G compiler (96K region) and the 88K Linkage Editor F (96K region) are invoked, the translator will normally be the maximum requirement. The sample procedure (Figure 7) and the TRANMOD overlay structure will operate in a region size of approximately 110K. The TRANMIN overlay structure, which requires a region size of approximately 98K, may be used in place of TRANMOD with a slight increase in translator running time. When operating in a 98K region the permissible size of the model may be restricted by the capacity of the FORTRAN compiler. The execution phase requirement, which is dependent on the size of the model (the number of variable names required for the symbol table plus the core required for UPDATE and user-supplied subroutines), is usually less than the translator requirement except for very large models. Increasing the data set block sizes will require a corresponding increase in region size.

The approximate sizes of the individual S/360 CSMP routines presented in this section are in hexadecimal bytes. Where the source language was FORTRAN, the level H compiler with optimization was used to create the distributed object modules. The load modules described in this section are those created by step 4 of the Basic Distribution procedures.

Control program for all phases: Load module DEJCSMP2
                   DEJCSMP2   2D4

The TRANMOD overlay contains the following System/360
CSMP object module placement.

Translation phase routines always present in core during translation:

SHIFT	42
BOOLE	70
INTRP	1A6
CSMPST	4C4
BUILD	390
MOVE	1BE
CONTIN	224
CSTORE	3C2
CKSTOR	224
STORE	188
SSTORE	188
NTOBCD	1C4
NAME	1A4
SPLIT1	350
SPLIT	24E
TRANSA	180
COMMON	AB20
TRMAIN	A8

Translation phase first overlay:

BCDIST	F98

Translation phase second overlay:

RMACST	1462
DATAST	B5C
STRUST	ECC
MMACST	F10
INTGST	E46
IMPLST	654
STORST	462
SCAN	D38

Translation phase third overlay

SEQUST	1672
GEN1ST	E1C

Translation phase fourth overlay:

GEN2ST	2950

The translator load module, which also includes FORTRAN Library
routines, has the following approximate size:

DEJCSMPT	18400 (TRANMOD overlay)
	15548 (TRANMIN overlay)

Each of the following overlay segments was link-edited separately and stored in the CSMP load module data set.

Execution phase routines always present in core during execution:
DEJROOT load module

MAINEX	1CE
MAIN	AC
CSTORE	3C2
SHIFT	42
BOOLE	70
COMMON	9924 (minimum)

Execution phase first overlay: DEJALPH1

INITLZ	66A

Execution phase second overlay: DEJALPH2

STATUS	B2A
SIMOUT	165E

First sub-overlay: DEJBETA1

RKS	A74
ADAMS	344

Second sub-overlay: DEJBETA2

MILNE	D64
F	1DC

Third sub-overlay: DEJBETA3

RECT	180
TRAPZ	274
SIMP	324
NOCENT	12E

Fourth sub-overlay: DEJBETA4

CENTRL	114

Execution phase third overlay: DEJALPH3

PLOTR	AO8
RANG1	26E

Execution phase fourth overlay: DEJALPH4

INTRAN	19EO
CKSTOR	224
NUMER	808
BUILDR	1FO
SPLITR	27E

First sub-overlay: DEJGAMM1

ALPHA	630

Second sub-overlay: DEJGAMM2

RANG2	372

Note: The overlay load modules are link-edited together with UPDATE, CSMP functions as called, and user-supplied routines during the linkage editor phase of a CSMP run. The size of the executable load module, member name DEJEXE, is model-dependent.

14

The following execution phase function routines were link-edited and stored as individual load modules with member names the same as the function names:

DEBUG	9BO
DELAY	532
DERIV	2E6
IMPL	3BC
IMPULS	28E
ZHOLD	164
RST	1AE
PULSE	1F4
RNDGEN	152
AFGEN	51A
SINE	150
RAMP	FO
NLFGEN	63C
GAUSS	1D2
QNTZR	15C
DEADSP	11C
INSW	EA
COMPAR	E8
OUTSW	126
FCNSW	10E
LIMIT	104
STEP	E4
HSTRSS	1DA
AND	FO
IOR	FO
EOR	102
NOR	FO
NAND	FO
NOT	D6
EQUIV	102
RERUN	14C

RESTART PROCEDURES

If S/360 CSMP detects a source statement error during any phase of processing, an indication of the error will be given with accumulated output (if any) up to the point when the error was detected. The run will be terminated automatically and control returned to OS/360. To successfully execute the S/360 CSMP model, the user must eliminate the error and resubmit the job.

The Execution Phase load module for a particular model may be stored
under a unique data set name. This feature is useful when a simulation
model is to be run frequently without change of the structure statements,
but with many different parameter values or control options. The DECK
label followed by the name SYMBOLS creates a data set (FT02F001)
containing the symbol table required by the execution phase. The control
cards in Figure 11, used with the sample procedure, will store the
symbol table and executable load module for the particular model and
then execute that load module as in the cataloged procedure for the data
and control cards supplied with the run.

```
//CSMP        JOB     ACCOUNT,USER,MSGLEVEL                          FIG11010
//STEP1    EXEC    CSMP360                                           FIG11020
//CSMP1.FT02F001  DD  UNIT=2314,SPACE=(TRK,(0,1)),DISP=(NEW,KEEP),   FIG11030
//            DSN=CSMP.SYMB.CABLE,VOL=SER=CSMPDK,                    FIG11040
//            DCB=(RECFM=F,BLKSIZE=80)                               FIG11050
//CSMP1.SYSLMOD  DD  UNIT=2314,SPACE=(TRK,(20,20,1)),DISP=(NEW,KEEP),  FIG11060
//            DSN=CSMP.CABLE(DEJEXE),VOL=SER=CSMPDK                  FIG11070
//CSMP1.SYSIN    DD   *                                             FIG11080
DECK  SYMBOLS                                                       FIG11090
******       INSERT CSMP MODEL STATEMENTS HERE        *******       FIG11100
*******      MODEL WILL BE STORED IN DATA SET CSMP.CABLE            FIG11110
*******      SYMBOL TABLE WILL BE STORED IN DATA SET CSMP.SYMB.CABLE  FIG11120
/*                                                                  FIG11130
```

Figure 11. Execution Phase Load Module Data Set Storage. NOTE: The data set names are chosen by the user to identify his particu
model. The member name DEJEXE, however, is required by the CSMP system.

The Execution Phase of S/360 CSMP may then be executed without again
performing translation, compilation, or link editing. The control cards
in Figure 12 combine the model symbol table and a set of data and execu-
tion control cards into one input data set and then execute the stored load
module for a particular model.[9]

```
//CSMPEXEC  JOB     ACCOUNT,USER,MSGLEVEL                           FIG12010
//CONCAT1    EXEC  PGM=IEBGENER                                     FIG12020
//SYSPRINT DD  SYSOUT=A                                             FIG12030
//SYSUT2    DD   UNIT=SYSDA,SPACE=(TRK,(10,2)),DISP=(NEW,PASS),     FIG12040
//            DCB=(RECFM=F,LRECL=80,BLKSIZE=80)                     FIG12050
//SYSIN     DD   DUMMY                                              FIG12060
//SYSUT1    DD   UNIT=2314,DISP=SHR,DSN=CSMP.SYMB.CABLE,VOL=SER=CSMPDK  FIG12070
//CONCAT2    EXEC   PGM=IEBGENER                                    FIG12080
//SYSPRINT DD  SYSOUT=A                                             FIG12090
//SYSUT2    DD   DSN=*.CONCAT1.SYSUT2,DISP=(MOD,PASS)               FIG12100
//SYSIN     DD   DUMMY                                              FIG12110
//SYSUT1    DD   *                                                  FIG12120
*******     INSERT DATA AND EXECUTION CONTROL CARDS HERE      ******* FIG12130
STOP                                                                FIG12140
/*                                                                  FIG12150
//GO          EXEC    PGM=DEJEXE,REGION=110K                        FIG12160
//FT05F001  DD   DSN=*.CONCAT1.SYSUT2,DISP=(OLD,DELETE)             FIG12170
//FT06F001  DD   SYSOUT=A,DCB=(RECFM=FBA,LRECL=133,BLKSIZE=1330)    FIG12180
//FT13F001  DD   UNIT=SYSDA,SPACE=(3500,(40,40)),                   FIG12190
//            DCB=(RECFM=VS,LRECL=204,BLKSIZE=208)                  FIG12200
//FT14F001  DD   UNIT=SYSDA,SPACE=(3500,(40,40)),                   FIG12210
//            DCB=(RECFM=VS,LRECL=204,BLKSIZE=208)                  FIG12220
//FT15F001  DD   UNIT=(2400,,DEFER),DSN=PREPARE,DISP=(NEW,PASS),    FIG12230
//            LABEL=(,NL),VOL=SER=SCRTCH                            FIG12240
//STEPLIB   DD   DSN=CSMP.CABLE,DISP=SHR,UNIT=2314,VOL=SER=CSMPDK   FIG12250
```

Figure 12. Execution of the CSMP Execution Phase for a particular model

When the particular model requires a structure change, the stored data
sets must be scratched and then recreated by running Figure 11 control
cards with the modified model.

16

GH20-0368-3

IBM®