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INTRODUCTION

At present the Statistical Software Section supports the following programs on the IBM System 370.

- o SAS, SAS/STAT, SAS/GRAPH, SAS/ETS, SAS/OR, SAS/FSP, SAS/AF, SAS/IML, SAS/DB2, SAS/ASSIST, SAS/CONNECT, SAS/CBT001
- o BMDP
- o SPSS, SPSS/TABLES
- o IMSL
- o GLIM
- o LISREL

In addition, the SSS supports SAS, SPSS, BMDP, and IMSL on the IBM PC and IMSL on the Convex C240. Additional information about these packages can be obtained from the SSS. Additional documentation for many of these packages is available from the DCRT Technical Information Office.

Telephone numbers that may be useful are:

Statistical Software Section/LSM: (301) 496-6037

The SSS provides support for the statistical software packages listed above. The LSM is located in Building 12A, Room 3045.

Programmer Assistance and Liason (PAL) Unit: (301) 496-5525

The PAL Unit provides technical assistance, information, and consultation to Computer Center users. All questions regarding WYLBUR should be directed to the PAL Unit. It is located in Building 12A, Room 1017.

DCRT Technical Information Office (TIO): (301) 496-5431

The Technical Information Office provides users with publications and documentation related to the services and facilities of the NIH Computer Utility. Users can use WYLBUR's ENTER PUBWARE to order publications. The TIO is located in Building 12A, Room 1017.

Training Unit: (301) 496-2339

The Training Unit provides courses for Computer Center users. Users can use WYLBUR's ENTER TRAINING to see information on Computer Center courses and scheduling. The Training Unit is located in Building 12A, Room 1025.

User Area: (301) 496-6888

The User Area contains computer terminals that are available for all Computer Center users. The User Area is located in Building 12A, Room 1018.

Information Media Library: (301) 496-6021

The Information Media Library maintains a large supply of magnetic tapes for use with the IBM System 370 computer. You may request up to two tapes per day by contacting them by phone. The Information Media Library is located in Building 12, Room 1100.

JOB CONTROL LANGUAGE INTRODUCTION

Jobs run in batch mode at NIH must begin with Job Control Language (JCL) to tell the IBM System 370 who the user is, what kind of program he wants to run, and what data sets he wants to use. JCL must be typed in upper case, begin in column 1, and extend no farther than column 71.

The first line of JCL is the job statement. It has the following format:

```
//iii JOB (aaaa,box,class),lastname
```

where the words shown in lower case are to be replaced with the user's information:

iii	registered initials
aaaa	account number
box	box number
class	class of the job
lastname	user's last name

The job class is determined by the resources needed for the job. Small jobs not requiring tapes (but possibly using the Managed Storage System (MSS)) get fast turnaround time from class A or class E. Class B or C is needed to mount a tape. Other parameters, such as maximum CPU time or maximum lines, may appear after the job class. For more information, see the Computer Center User's Guide (CCUG), available from the Technical Information Office.

The following abbreviations are used throughout this handout:

dsname	operating system data set name
serial	serial number of a tape
seqnum	sequence number of a data set on tape (defaults to 1)
lab	type of label on tape (SL, NL, AL--defaults to SL)
len	maximum line length (integer)
b	blocksize (calculation discussed below)
s1	primary space allocation (calculation discussed below)
s2	secondary space allocation (calculation discussed below)
uu	logical unit number

In accordance with the Computer Center's move toward an 'All-Cataloged Environment,' all JCL discussed will assume that all input and output files are cataloged. For a discussion of how to catalog files, see the WYLBUR Fundamentals Manual and the CCUG, both available from the Technical Information Office. For information about how to move existing files to the all-cataloged environment, see INTERFACE, Number 166, also available from the Technical Information Office. Utilities that may be useful in converting to the all-cataloged environment are CATDS, UNCATDS, and DSSCR.

One consequence of the all-cataloged environment is that during program development, it is possible to accidentally create multiple copies of permanent files of which only the first copy is cataloged. To avoid this, include an EXEC DSSCR statement in the JCL to delete previous copies of the permanent file. To see a list of files on different disks with the same name, use WYLBUR's SHOW DSNS DUPLICATE command.

Most of the examples discussed in this handbook assume that if a tape is being used, it is an NIH standard tape. An NIH standard tape is a standard-labeled 3480 cartridge tape which has 18 tracks and stores information at 38,000 BPI. If you are interested in using another type of tape, refer to the CCUG. To have a tape assigned, call the Information Media Library at (301) 496-6021.

At NIH, WYLBUR data sets are stored in one of two formats on disk and the MSS: EDIT format or LRECL format.

EDIT FORMAT

EDIT format data sets are compressed to save space, while LRECL format data sets are not. EDIT format is the default storage format. If a data set is saved using the WYLBUR SAVE command, it is stored in EDIT format.

```
? SAVE AS dsname
```

EXAMPLE:

```
? COLLECT CLEAR
  1. ? 4 5
  2. ? 0 1
  3. ? 2 6
? ***
? SAVE AS RAWDATA1
'RAWDATA1' SAVED AND CATALOGED ON FILE
```

To find out if a data set on a disk is stored in EDIT format, use the WYLBUR SHOW DSNAME command.

```
? SHOW DSNAME dsname
```

EXAMPLE:

```
? SHOW DSNAME RAWDATA1  
FILE
```

```
RAWDATA1 ON FILE51
```

```
CREATED 11/26/91, LAST USED 11/26/91  
1 TRACK (1 USED), NO. OF AREAS=1, SECONDARY SPACE=1 BLOCK  
DSORG=PS, RECFM=U, LRECL=11476, BLKSIZE=11476  
KEYLEN=0, RKP=0, OPTCD=C(20)  
EXPIRATION DATE=11/26/91, NO PASSWORD, NOT RACF PROTECTED
```

If the data set is stored in EDIT format, this command will report RECFM=U, LRECL=11476, and BLKSIZE=11476.

To find out if a data set on the MSS is stored in EDIT format, use the NIH procedure ADSMAP, described in the CCUG.

EXAMPLE:

```
// (JOB statement)  
// EXEC ADSMAP  
//SYSIN DD *  
FIND DS NAMES
```

If the data set is stored in EDIT format, this command will report RECFM=U, LRECL=11476, and BLKSIZE=11476.

LRECL FORMAT

To save a disk data set in LRECL format, add the LRECL option to WYLBUR's SAVE command.

```
? SAVE AS dsname LRECL=len
```

where 'len' is greater than or equal to the length of the longest data line.

EXAMPLE:

```
? COLLECT CLEAR  
1. ? 4 5  
2. ? 0 1  
3. ? 2 6  
?  
?  
? ***  
? SAVE AS RAWDATA1 LRECL=6  
'RAWDATA1' SAVED AND CATALOGED ON FILE
```

To find out if a data set on disk is stored in LRECL format, use the WYLBUR SHOW DSNAME command.

EXAMPLE:

```
? SHOW DSNAME RAWDATA1
FILE
```

```
RAWDATA1 ON FILE51
```

```
CREATED 11/26/91, LAST USED 11/26/91
1 TRACK (1 USED), NO. OF AREAS=1, SECONDARY SPACE=1 BLOCK
DSORG=PS, RECFM=FB, LRECL=6, BLKSIZE=11472
KEYLEN=0, RKP=0, OPTCD=C(20)
EXPIRATION DATE=11/26/91, NO PASSWORD, NOT RACF PROTECTED
```

OTHER CONSIDERATIONS

BMDP cannot read raw data files saved in EDIT format. Therefore, if your raw data file is saved in EDIT format, you will need to apply one of the following:

- o Use the WYLBUR USE FROM and RESAVE commands on the data set

```
? USE FROM dsname
? RESAVE LRECL=len
```

where 'len' is greater than or equal to the length of the longest data line.

- o Include the EDSIN utility in the JCL

There are several places in JCL where space allocations and blocksizes must be determined.

The blocksize must be determined when using EXEC EDSIN to read in EDIT format files from disk or the MSS when the records extend past column 80. To determine the blocksize (BLKSIZE=b) to use for a given logical record length (LRECL=len), use the following WYLBUR command:

```
T 11476/len*len
```

where 'len' is greater than or equal to the length of the longest record.

The logical record length, blocksize, and space allocations must be determined when outputting raw data from BMDP. In general, the secondary space allocation ('s2') can be 1. Set LRECL equal to an integer greater than or equal to the length of the longest record. To calculate blocksize and primary space allocation, use WYLBUR's ENTER DISKCALC facility. The example

below shows how to use ENTER DISKCALC when LRECL=133 and there are 500 records to be output. The blocksize and primary space allocation can be read from the first two columns of the output.

? enter diskcalc

DISKCALC Command Procedure:

Select a function from the following menu (or strike ENTER):

(For fixed length, NON-keyed data sets)

(Function 2 is applicable to all data set types)

- 1 What is the Computer Center recommendation for BLKSIZE for a given LRECL?
- 2 Compute how many physical records (blocks) may be stored on a track or cylinder with a given BLKSIZE.
- 3 Show records and blocks per track and cylinder for a selection of possible BLKSIZES for a given LRECL.
- 4 Compute total space needed to contain a specified number of records of a given LRECL for a selection of possible BLKSIZES.
- 5 Change default disk model (currently 3380K, 2,635 cylinders per volume, 15 tracks/cylinder, 47,476 bytes per track).

END Return to WYLBUR.

Select a function (or press ENTER to see the function menu): 4

Enter the LRECL (logical record length) of the record (or press Enter):

LRECL: 133

Enter the number of logical records (or press ENTER):

Number of records: 500

Space required for 500 records with LRECL=133 on a 3380K volume which contains approximately 2,635 cylinders per volume.

BLKSIZE	Number of Tracks	Number of Cylinders
3,059	2	
3,458	2	
3,857	2	
4,256	2	
4,788	2	
5,453	2	
6,251	2	
7,448	2	
9,044	2	
11,438	2	<=NIH Recommendation
15,428	2	
23,408	2	

BMDP does not automatically define the record format, the logical record length, or the blocksize for its save files. Consequently, in the DD statement for the output BMDP save file, it is necessary to have the DCB parameter set as follows:

```
DCB=(RECFM=VBS,LRECL=6352,BLKSIZE=6356)
```

To calculate the primary space parameter to use with a BMDP save file, use the following steps:

1. Let $X = (4 * (\text{number of variables}) + 4) * \text{number of observations}$.
2. Let $Y1 = X/6356$. Let $Y2$ be $Y1$ rounded up to the next integer.
3. Let $Z = Y2/7$. The primary space allocation 's1' is Z rounded up to the next integer.

For example, suppose you have 12 variables and 5000 records. Then

```
X = ((4*12) + 4)*5000 = 260,000
Y1 = 260,000/6356 = 40.91
Y2 = 41
Z = 41/7 = 5.86
s1 = 6
```

and the space parameter in the JCL would be `SPACE=(TRK,(6,1))`.

JOB CONTROL LANGUAGE FOR BMDP

When submitting BMDP jobs using WYLBUR, be sure to use the UNNUMBERED option of the RUN command.

Two JCL procedures are provided for using BMDP:

BMDP: The primary procedure. It corresponds to the procedure BIMED in the BMDP Manual.

BMDPT: This procedure allows the user to make extensive transformations or define FORTRAN functions (programs BMDP3R, BMDPAR, BMDP7D, BMDP4F). It corresponds to BIMEDT in the BMDP Manual.

The following abbreviations are used in the BMDP JCL examples:

ppp	the last three characters of the program name (for example, ppp=P2R for BMDP2R)
uu	logical unit number, any integer greater than 08 and less than 15
yy	logical unit number, any integer except 'uu' greater than 08 and less than 15

If the input data for the BMDP program is located anywhere except the job stream, the INPUT paragraph in the program must include a 'UNIT IS uu' sentence, where the 'uu' in the JCL matches the 'uu' in the UNIT sentence. Do not use the FILE sentence in the INPUT paragraph.

If a raw data file or a BMDP save file is created on disk, tape, or the MSS, then include a 'UNIT IS uu' sentence in the SAVE paragraph, where the 'uu' in the JCL matches the 'uu' in the UNIT sentence. Do not use the FILE sentence in the SAVE paragraph.

INPUT

1. Input data in the job stream

```
// (JOB statement)
// JCLLIB ORDER=ZABCRUN.PROCLIB
// EXEC BMDP,PROG=ppp
//SYSIN DD *
```

2. Input data on disk in LRECL format or in BMDP save file

```
// (JOB statement)
// JCLLIB ORDER=ZABCRUN.PROCLIB
// EXEC BMDP,PROG=ppp
//FTuuF001 DD DSN=aaaaiii.dsname,DISP=SHR
//SYSIN DD *
```

3. Input data on disk in EDIT format with data lines not extending past column 80

```
// (JOB statement)
// JCLLIB ORDER=ZABCRUN.PROCLIB
// EXEC EDSIN,NAME='aaaaiii.dsname'
// EXEC BMDP,PROG=ppp
//FTuuF001 DD DSN=&INPUT,DISP=(OLD,DELETE)
//SYSIN DD *
```

4. Input data on disk in EDIT format with data lines extending past column 80

```
// (JOB statement)
// JCLLIB ORDER=ZABCRUN.PROCLIB
// EXEC EDSIN,NAME='aaaaiii.dsname',LRECL=len,BLKSIZE=b
// EXEC BMDP,PROG=ppp
//FTuuF001 DD DSN=&INPUT,DISP=(OLD,DELETE)
//SYSIN DD *
```

5. Input data on the MSS in LRECL format or in BMDP save file

```
// (JOB statement)
/*ROUTE XEQ MSS
// JCLLIB ORDER=ZABCRUN.PROCLIB
// EXEC BMDP,PROG=ppp
//FTuuF001 DD DSN=aaaaiii.dsname,DISP=SHR
//SYSIN DD *
```

6. Input data on the MSS in EDIT format with data lines not extending past column 80

```
// (JOB statement)
/*ROUTE XEQ MSS
// JCLLIB ORDER=ZABCRUN.PROCLIB
// EXEC EDSIN,NAME='aaaaiii.dsname'
// EXEC BMDP,PROG=ppp
//FTuuF001 DD DSN=&INPUT,DISP=(OLD,DELETE)
//SYSIN DD *
```

7. Input data on the MSS in EDIT format with data lines extending past column 80

```
// (JOB statement)
/*ROUTE XEQ MSS
// JCLLIB ORDER=ZABCRUN.PROCLIB
// EXEC EDSIN,NAME='aaaaiii.dsname',LRECL=len,BLKSIZE=b
// EXEC BMDP,PROG=ppp
//FTuuF001 DD DSN=&INPUT,DISP=(OLD,DELETE)
//SYSIN DD *
```

8. Input data on NIH standard tape

```
// (JOB statement with class B or C)
/*ROUTE XEQ TAPE
/*MESSAGE serial,R
// JCLLIB ORDER=ZABCRUN.PROCLIB
// EXEC BMDP,PROG=ppp
//FTuuF001 DD DSN=aaaaiii.dsname,DISP=SHR
//SYSIN DD *
```

OUTPUT

9. Create a BMDP save file on disk

```
// (JOB statement)
// JCLLIB ORDER=ZABCRUN.PROCLIB
// EXEC DSSCR,NAME='aaaaiii.dsname'
// EXEC BMDP,PROG=ppp
//FTuuF001 DD UNIT=FILE,DISP=(NEW,CATLG),
// DCB=(RECFM=VBS,LRECL=6352,BLKSIZE=6356),
// SPACE=(TRK,(s1,s2)),DSN=aaaaiii.dsname
//SYSIN DD *
```

10. Create a raw data file on disk

```
// (JOB statement)
// JCLLIB ORDER=ZABCRUN.PROCLIB
// EXEC DSSCR,NAME='aaaaiii.dsname'
// EXEC BMDP,PROG=ppp
//FTuuF001 DD UNIT=FILE,DISP=(NEW,CATLG),
// DCB=(RECFM=FB,LRECL=len,BLKSIZE=b),
// SPACE=(TRK,(s1,s2)),DSN=aaaaiii.dsname
//SYSIN DD *
```

11. Input data on disk in LRECL format; BMDP save file created on an NIH standard tape

```
// (JOB statement with class B or C)
/*ROUTE XEQ TAPE
/*MESSAGE serial,W
// JCLLIB ORDER=ZABCRUN.PROCLIB
// EXEC BMDP,PROG=ppp
//FTuuF001 DD DSN=aaaaiii.dsname1,DISP=SHR
//FTyyF001 DD UNIT=TAPE,DISP=(NEW,CATLG),
// DCB=(RECFM=VBS,LRECL=6352,BLKSIZE=6356),
// VOL=(PRIVATE,SER=serial),DSN=aaaaiii.dsname2,
// LABEL=(seqnum,lab)
//SYSIN DD *
```

12. Input data in a BMDP save file on disk; new BMDP save file to be created on disk

```
// (JOB statement)
// JCLLIB ORDER=ZABCRUN.PROCLIB
// EXEC DSSCR,NAME='aaaaiii.dsname2'
// EXEC BMDP,PROG=ppp
//FTuuF001 DD DSN=aaaaiii.dsname1,DISP=SHR
//FTyyF001 DD UNIT=FILE,DISP=(NEW,CATLG),
// DCB=(RECFM=VBS,LRECL=6352,BLKSIZE=6356),
// SPACE=(TRK,(s1,s2)),DSN=aaaaiii.dsname2
//SYSIN DD *
```

13. Input data on a standard label 6250 BPI tape; BMDP save file to be created on the MSS

```
// (JOB statement with class B or C)
/*ROUTE XEQ 9TRACKHI
/*ROUTE XEQ MSS
/*MESSAGE serial,RS
// JCLLIB ORDER=ZABCRUN.PROCLIB
// EXEC DSSCR,NAME='aaaaiii.dsname2'
// EXEC BMDP,PROG=ppp
//FTuuF001 DD DSN=dsname1,DISP=SHR,
// VOL=(PRIVATE,SER=serial),UNIT=9TRACKHI,
// LABEL=(seqnum,lab)
//FTyyF001 DD UNIT=MSS,DISP=(NEW,CATLG),
// DCB=(RECFM=VBS,LRECL=6352,BLKSIZE=6356),
// DSN=aaaaiii.dsname2,SPACE=(TRK,(s1,s2))
//SYSIN DD *
```

USING FORTRAN TRANSFORMATIONS AND SUBROUTINES

For additional information, refer to the BMDP Manual, 1990 Edition, pp. 605-610.

14. Input data in job stream, extensive transformations made, and a BMDP save file created on disk

```
// (JOB statement)
// JCLLIB ORDER=ZABCRUN.PROCLIB
// EXEC BMDPT,PROG=ppp
//FORT.TRANSF DD *
    SUBROUTINE TRANSF(X,KASE,NPROB,USE,NVAR,XMIS)
    DIMENSION X(NVAR)

    (User's FORTRAN transformation code)

    RETURN
    END
//GO.FTuuF001 DD UNIT=FILE,DISP=(NEW,CATLG),
// DCB=(RECFM=VBS,LRECL=6352,BLKSIZE=6356),
// SPACE=(TRK,(s1,s2)),DSN=aaaaiii.dsname
//GO.SYSIN DD *
(BMDP Program)
```

15. Execute BMDP3R, BMDPAR, BMDP7D, or BMDP4F with input data on disk in LRECL format, functions specified using FORTRAN statements, and a BMDP save file created on disk

```
// (JOB statement)
// JCLLIB ORDER=ZABCRUN.PROCLIB
// EXEC DSSCR,NAME='aaaaiii.dsname2'
// EXEC BMDPT,PROG=ppp
//FORT.FUN DD *
```

(User's FORTRAN code)

```
//GO.FTuuf001 DD DSN=aaaaiii.dsname1,DISP=SHR
//GO.FTyf001 DD UNIT=FILE,DISP=(NEW,CATLG),
// DCB=(RECFM=VBS,LRECL=6352,BLKSIZE=6356),
// SPACE=(TRK,(s1,s2)),DSN=aaaaiii.dsname2
//GO.SYSIN DD *
(BMDP Program)
```