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readable or both) as indicated in the appropriate Catalog of Programs.
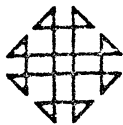
Program Contribution Form
Type III (IBM Employee)

1 PROGRAM ORDER NUMBER (TO BE FILLED IN BY PID)
360D-05.2.006

2 SYSTEM TYPE (MACHINE)
3 6 0

3 SEARCH KEY
DOS AUTOMATIC DISK TAPE
SPOOLING USING READERS
AND WRITERS

4 AUTHORS' NAME(S) (IF DIFFERENT THEN SUBMITTER'S)

5 SUBMITTER'S NAME (DIRECT TECHNICAL INQUIRIES TO)
L. A. Whitney

6 SUBMITTER'S ADDRESS
7 Penn Center Plaza
Philadelphia, Pennsylvania 19103

7 TITLE OF PROGRAM
Priority Output Writers Execution Processors, and Input Readers

8 PRIM. SUB. CODE
0 5 . 2

9 SECONDARY SUBJECT CODES
0 3 . 4   0 0 . 1

10 OPERATING OR MONITOR SYSTEM REQUIRED
DOS

11 TYPE OF SUBMITTAL PLEASE CHECK (√)
1 INITIAL PROGRAM ABSTRACT
2 INITIAL SUBMISSION OF PROGRAM [X]
3 RESUBMITTAL OF UNANNOUNCED PROG.
4 CORRECTION TO PROGRAM NUMBER

12 DATE OF SUBMITTAL
0 9 0 9 6 8

13 ABSTRACT (PLEASE LIMIT TO 150 WORDS. DESCRIBE PROGRAM AND PURPOSE. CLEARLY IDENTIFY MACHINE CONFIGURATION AND SOURCE LANGUAGE.)

This DOS system is an automatic SYSIN/SYSLST/SYSPCH spooling processor which requires no IBM or user program changes. Using a variable number of 2311 or 2314 modules for intermediate storage, this program acts as a peripheral processor and priority scheduler for normal batch processing under DOS. It can, simultaneously, operate up to 26 peripheral devices, maintain unique input/print/punch or print/punch streams for one or two DOS batch partitions.

Machine Configuration: any hardware which will support DOS; practically, however, 32K or 48K would be minimum core.

Programming SYSTEMS: Standard DOS. Source Language: ASSEMBLY LANGUAGE

Storage Requirements: varies based on sysgen options; minimum would be 12K.

120-1424-3

PLEASE ATTACH ADDITIONAL PAGES IF NECESSARY � TOTAL PAGES ATTACHED

14 _L A Whitney_ SIGNATURE OF SUBMITTER AND DATE   09-09-68

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DOS AUTOMATIC SPOOLING SYSTEM

<u>P</u>riority <u>O</u>utput <u>W</u>riters <u>E</u>xecution processors, and input <u>R</u>eaders (POWER)
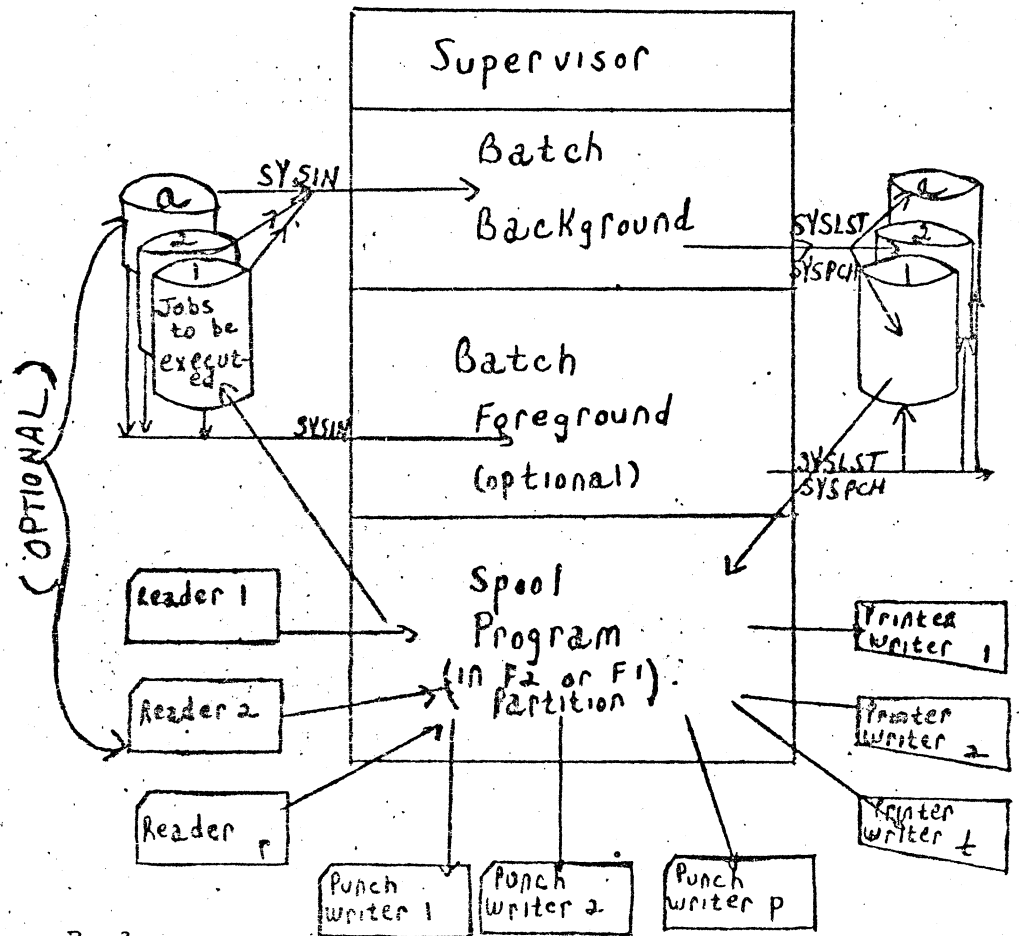
General Overview of Spool

A DOS input reader is defined as a program to read cards onto a disk for eventual use for execution of the batch partition(s). Such a program, operating in the spool partition, progresses asynchronously to the execution of the batch partition(s), and to the execution of any other reader or writer within the spool partition.

A DOS output writer is defined as a program to print or punch records which have been previously created by the batch partition(s). Such a program, operating in the spool partition, progresses asynchronously to the execution of any other writer or reader within the spool partition.

An execution processor is defined as a program, operating in the spool partition, to accomplish the following:

a. Read blocked card images from a disk which have been placed on a disk by a reader.

b. Supply the card images to the batch program whenever the batch program requests to read a card record from SYSIN.

c. Save the print/punch images whenever the batch program requests to write a line/card.

d. Write blocked print/punch disk records for later use by an output writer.

3.

DOS reader/writer capability is designed for, and justified through, the following facilities and features:

a. Significantly increase batch processing throughput

b. Reduction of scheduling bottlenecks

c. More flexibility in job scheduling

d. Can be implemented without any IBM program or user program modification

e. Recovery capability (warm start)

f. Can optionally support one or two DOS batch partitions

g. Can selectively use tape for intermediate storage of print/punch information

h. Can support multiple 2311/2314 (no mix)

i. Can support simultaneous unit record spool functions (26 maximum readers and writers)

j. Optional writer only capability (reduces core requirements)

k. Potential future support for Type 50 magnetic inscriber and remote job entry

l. User may include his own job accounting routines

Following is a discussion on the implementation considerations which must be reviewed in order to evaluate the spool system:

a. The spool program must exclusively occupy a foreground partition. In a non-teleprocessing environment, as many as two batch partitions could be supported by the foreground spool program. In a BTAM TP environment, one batch partition could be supported. With some programming effort, a BTAM TP program could operate as a spool task within the spool partition.

b. Batch program I/O references to SYSRDR, SYSIPT, SYSLST, and SYSPCH are dynamically trapped and spooled only when the system symbolic units are assigned to unit record type devices, i.e., if SYSRDR is assigned to a card reader while SYSIPT is assigned to tape, then reader spool functions are only supported for the SYSRDR symbolic unit. Any batch program requests for SYSIPT are normally serviced by the DOS supervisor.

c. Automatic channel 12 line counting is supported for an "all channel" printer carriage control tape. If no programs in the installation require special printer carriage control tapes, then the automatic line counting facility within spool will adequately handle all programs. However, line counting within the spool system or within the users programs must be added to handle the following three situations:

5.

1) A program requires a special printer carriage control tape and the program tests for the channel 9 or channel 12 condition.

2) A program specifically tests for the channel 9 condition.

3) A program skips to channel 9 or 12.

d. Disk storage capacity is utilized in the following files:

1. QFILE - This file is used to store the status of a job during its life within the spool system. One disk block (i.e. 260 bytes) is used for each job. Hence, for a 2311 system which has allocated 1 cylinder for this file, 110 jobs may be active within the system (260 byte blocks = 11 blocks = 10x11 = 110 blocks per cylinder)

2. DATAFIL - This file is used to store card images for the reader and is used to store print images and/or card images for the output writers. One disk block (i.e. 829 bytes) can hold 9 card images for the readers. The same size block can hold a variable number of print images or punch card images according to the following rule:

    6 bytes overhead/block

    2 bytes overhead/logical record

    n bytes per logical record where all blanks to the right of the last significant

6.

Incidentally, the above rule also applies to the tape block layout, if tape intermediate storage is used by the output writers. Since the space on the DATAFIL is dynamically reserved and released, estimating how many cylinders should be dedicated to the file is job stream dependent. Any job stream, operating with a small DATAFIL, which generates a tremendous amount of printing and/or punching may have to selectively use tape for intermediate spool data storage. Since spool's accessing of the DATAFIL can be numerous, the sharing of a single disk volume with multiple user files and the DATAFIL should be kept to an absolute minimum; otherwise, performance may drastically suffer.

e. Spool core storage is allocated in the following manner:

i. Core resident spool code - This portion of the spool system occupies approximately 8192 byte plus and as many as 1000 bytes depending upon the spool sysgen parameters.

ii. Buffer pool - This area serves three functions:

1) disk I/O area.

2) tape I/O area.

3) when active, reader or writer program storage area.

The size of each buffer is determined at spool sysgen time by declaring the size of the disk blocks (DBLK)

7.

for the DATAFIL. The following three sample spool systems should assist you in understanding how many buffers should be allocated to the buffer pool:

1) One batch with continuously active reader, print writer and punch writer - each reader/writer was started with the two buffer option. Hence, each reader/writer uses 3 buffers, 2 for I/O and 1 for itself. The batch execution has 2 disk I/O buffers each for reading, printing, and punch pseudo functions for a total of 6. Thus, 15 829 byte buffers would be used for this system. Total core:

8K	core resident
12K	15 @ ≈800 buffers
20K	

2) One batch with a continuously active printer writer, a continuously active reader or a punch writer - each printer writer started with 2 buffers; reader or punch writer started with 1 buffer; total = 6 buffers. Batch execution has 1 disk buffer for reading function and 3 disk buffers shared between printing and punching functions - total core:

8K	resident
8K	10 @ ≈800
16K	8.

3) One batch with no reader, and with a continuously active

printer writer or punch writer – Each printer writer or punch writer

started with 2 disk buffers. Batch execution has 1 disk buffer

for print and 1 disk buffer for punch functions. Total core:

8K	resident
4K	5 @ ≈800
12K	

f. The DOS supervisor must be generated with the MPS and the TP option.

Obviously, the resultant core size of the DOS supervisor should be in-

vestigated.

g. Batch program I/O references to problem program symbolic units are $_{\wedge}^{(1e,SYS004)}$

handled in the same manner as those I/O references to the systems

symbolic units. See part b. of this section for further discussion.

9.

Spool Systems Generation Procedures

1. Review the DOS supervisor generation parameters which were used to create

the current operational control program. If the SUPVR macro was coded with

either the MPS=NO or the TP=NO, then you must reassemble the supervisor

with both of these parameters included. MPS=YES and TP=BTAM would

generate the least amount of additional core within the control program.

However, you may use any entry value for the two macro parameters. In

addition the CCHAIN=YES must be declared in the FOPT macro.

2. Deblock the PID tape-

Original blocking: 81 byte records – blocked 40

Resultant blocking: 81 byte records – unblocked

The standard DOS tape to tape utility can be used to accomplish the deblocking

with the following control cards:

```
// JOB DEBLOCK SPOOL TAPE
// ASSGN SYS004,x'cuu'              PID TAPE
// ASSGN SYS005,x'cuu'             UNLABLED DEBLOCKED TAPE
// UPSI 10101000
// EXEC TPTP
// UTT  TR,FF,A=(81,3240),B=(81,81),IR,R1,OR
// END
/&
```

3. Execute the following job stream assigning the deblocked tape to SYSIPT:

```
// JOB CATALOG MACROS
// ASSGN SYSIPT,x'cuu'         DEBLOCKED TAPE
```
10.

// E⬤ MAINT

/*

/&

This job stream is cataloging the following spool macros into the DOS

source library:

MACRO NAME	NO. OF BLOCKS	NO. OF 2311TRACKS
a. DSKIO	12	1
b. POWER	1299	81
c. BTRAN	5	1
	1316	83

A review of disk space required for storage of these macros may suggest

the usage of a private source library. If this is the case, an

appropriate assgn card for SYSSLB should be included in the job stream.

4. Review the macro parameters for assembling the spool macro POWER.

5. Assemble the POWER and BTRAN spool macros. An example of the macro

parameters and the job stream is:

```
        // JOB ASSEMBLE SPOOL PROGRAM

        // OPTION DECK, LIST

        // EXEC ASSEMBLY

            POWER  TAPE=YES, RDRCLOS=EXIT

            END    INIT

/*

// EXEC ASSEMBLY

            BTRAN

            END

/*

/&
```

11.

Note that the first assembler END card requires an opera⬤ INIT.

BTRAN requires no parameters for assembling the program.

6. Remove and discard the first card of the first object deck.

7. Two decisions must be made at this time:

a. Which foreground partition will be used for execution of the spool

   system? If two batches will be controlled by the spool system,

   then F1 must be used for the spool program. Otherwise, either

   F1 or F2 may be used.

b. How much core is required for the foreground spool partition?

   The MNOTE CORE SIZE EVALUATION LABELS which appears

   with the assembly of the spool program makes references to two

   labels: (1) PROGEND; (2) HOWBIG. Core of the spool partition

   is allocated in the following manner:

```
           ┌──────────────────────────────┐
           │ register save area =x'78'     │
           ├──────────────────────────────┤
           │                              │
           │                              │
           │   ROOT (always in core)       │
           │                              │
PROGEND→   ├──────────────────────────────┤
           │            1                 │
           │            2                 │──┐ minimum of 4 DBLK buffers
           │            3                 │  │
           │            4                 │──┘
HOWBIG→    ├──────────────────────────────┤
           │                              │
           └──────────────────────────────┘
```

12.
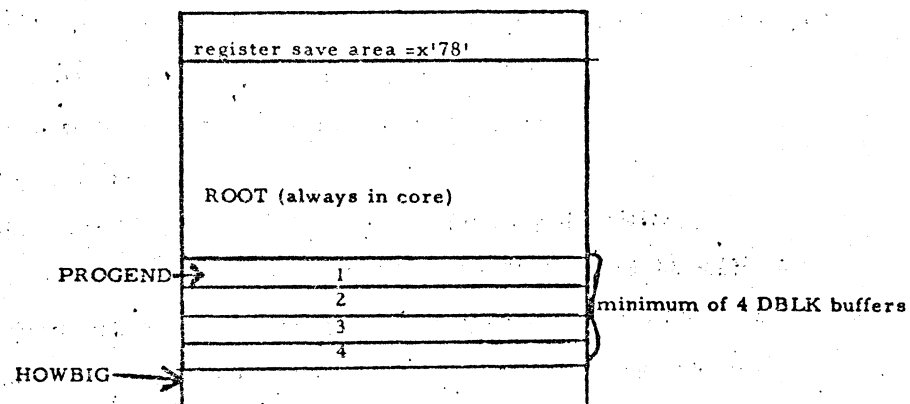
Hence, the size of the foreground partition is one of two values:

i)   HOWBIG

ii) HOWBIG plus the additional number of buffers over 4 which will
     be used by the spool system. Note that the spool macro parameter
     MAXBUFS should normally indicate how many buffers in total will
     be used by the spool system.

8. Catalog the object deck into the DOS core image library with the following
    job stream:

            ALLOC F1=nk, F2=mk   (see above no. 7 for m and n)

    //   JOB CATALOG SPOOL SYSTEM

    //   OPTION CATAL

         ACTION   (F1 or F2)   (see above no. 7 for F1 or F2)

         INCLUDE
       { object decks

    /*

    //   EXEC LNKEDT

    /&

If VII of DOS is used, then the PHASE card for the phase FGPSPOOL
must be changed to reflect the starting address for the spool program.
This phase card is approximately one third of the way into the object deck.

13.

9. If the decision has been made to permanently allocate one or more disk
    packs for spool usage; then you may want to initiate the spool system
    at this time to format the disk packs (see spool initiation section).
    Otherwise the spool systems generation is complete.

14.

1. $F2 = \left\{ {NO \atop YES} \right\}$ Specify if a second batch will be run under control of spooling.

2. $TAPE = \left\{ {NO \atop YES} \right\}$ Specify if tape writers may be used.

3. $READER = \left\{ {TYPE\ 1 \atop TYPE\ 2} \atop {BOTH \atop NO} \right\}$ Specify what reader device type will be used for spooling; when TYPE1 is specified, only 2540's and 2501's may be used for spool readers; when TYPE2 is specified, only 1442's and/or 2520's may be used for spool readers; when BOTH is specified, any card reader may be used for spool readers; when NO is specified reader capability is not available.

4. $MAXRW = \left\{ {3 \atop N} \right\}$ Specify the maximum number of all active readers and writers ($1 \leqslant N \leqslant 26$)

5. $SIZE = \left\{ {NO \atop YES} \right\}$ Specify if the spool program is expected to run in a partition which is greater than 12K.

6. $NUMDDKS = \left\{ {1 \atop n} \right\}$ Specify the number of physical disk modules available for spool's data storage. (not including the QFILE)

7. $DISK = \left\{ {2311 \atop 2314} \right\}$ Specify the type of disk device used for spool.

8. $QBLK = \left\{ {260 \atop n} \right\}$ Specify the size of the disk records used for storage of the job status information; $n \geqslant 120 + ab$ where,

   $a = 2$ if no readers, $a = 3$ if readers

b = size of the cylinder bit ● (see appendix A)

9. $QNRPERT = \left\{ {11 \atop n} \right\}$ Specify the number of QBLKs per disk track.

10. $DBLK = \left\{ {829 \atop n} \right\}$ Specify the size of the disk records used for storage of card and print images; ($n \geqslant 829$)

11. $DNRPERT = \left\{ {4 \atop n} \right\}$ Specify the number of DBLKs per disk track.

12. $TRACKGP = \left\{ {10 \atop n} \right\}$ Specify the number of tracks to be used for allocation of a track group (see appendix B).

13. $MAXJOBS = \left\{ {195 \atop n} \right\}$ Specify the maximum number of allowable jobs within spool; $n \leqslant QBLK-1-32*a$ where,

   $a = 1$ if F2 = NO
   $a = 2$ F2 = YES
   $n \leqslant 256$

14. $SVCCODE = \left\{ {200 \atop n} \right\}$ Specify a svc code which must be used for the spool partition; n must not be used by DOS or by any other special program such as cs 30, cs 40. VIII of DOS uses svc 0 $\rightarrow$ svc 34.

15. $STDLINE = \left\{ {10000 \atop n} \right\}$ Specify the standard number of generated lines which a batch partition may create before a warning message occurs.

16. $STDCARD = \left\{ {720 \atop n} \right\}$ Specify the standard number of generated cards which a batch partition may create before a warning message occurs.

17. ADDITR = $\left\{\begin{array}{c} 10000 \\ n \end{array}\right\}$ Specify the number of additional print/punch records which will be permitted by the batch to generate before another warning message occurs.

18. AUTOSTR = $\left\{\begin{array}{c} 00c \\ nnn \\ NO \end{array}\right\}$ Specify the device address of a reader/printer writer which will be automatically started at spool initiation time: nnn should be a card reader device address if readers are used; otherwise nnn should be a printer device address; NO indicates that no reader/writer will be automatically started at spool initiation time.

19. MAXCCB = $\left\{\begin{array}{c} 3 \\ n \end{array}\right\}$ Specify the number of active unit record and tape devices which the spool system may be simultaneously using. (see apendix C)

20. RDREOF = $\left\{\begin{array}{c} GO \\ PAUSE \end{array}\right\}$ Specify what action a reader should take whenever end of file but not end of job is encountered: PAUSE requires an operator message to reactivate the reader; GO will cause a standard DOS I/O intervention required message to occur. *+ outstanding I/O request.*

21. ACCOUNT = $\left\{\begin{array}{c} NO \\ xxxxx \end{array}\right\}$ Specify if a user accounting routine is to be assembled with the spool program; xxxxx is the name of the user's accounting macro. *(for conventions look at listing)*

22. RDRCLOS = $\left\{\begin{array}{c} PAUSE \\ GO \\ EXIT \end{array}\right\}$ Specify what action a reader should take whenever the end of file and the end of job is encountered: PAUSE requires an operator message to reactivate the reader; GO will cause a standard DOS I/O intervention required message to occur; EXIT will cause the reader to permanently stop, releasing all allocated buffers.

23. MAXBUFS = $\left\{\begin{array}{c} 5 \\ n \end{array}\right\}$ Specify the maximum number of buffers which will be allocated for the spool use (n $\geq$ 4). *for n = 4bytes*

24. INSCRIB = $\left\{\begin{array}{c} NO \\ YES \end{array}\right\}$ Specify if spooling capability will be generated for the magnetic inscriber TYPE 50. *not active*

25. RJE1050 = RJE2780 = RJE2740 = RJECPU = $\left\{\begin{array}{c} NO \\ YES \end{array}\right\}$ Specify if remote job readers and writers will be generated for the associated devices.

A. Cylinder bit table - used for dasd space management

(b) bytes long
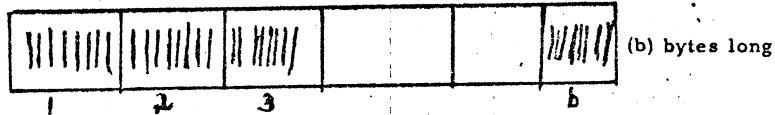
Each bit represents 1 track group (see appendix B)

2311

    i.   if TRACKGP= 5, then (200 cyls*10/5)/8 = 50 bytes = b

    ii.   10, then (200 cyls*10/10)/8 = 25 bytes = b

2314

    i.   5,   (200 cyls*20/5)/8 = 100 bytes = b

    ii.   10,   (200 cyls*20/10)/8 = 50

    iii.   20,   (200 cyls*20/20)/8 = 25

B. Track group - used for dasd space management

A track group is defined as the number of continuous tracks allocated per request to a spool task, whenever a spool task requires disk space. For 2311's, a track group can be 1, 2, 5, or 10 tracks, while for 2314's a track group can be 1, 2, 4, 5, 10, or 20 tracks.

19.

C. Spool's logical symbolic i/o assignments

SYS001	-	disk device	- QFILE reference
SYS002	-	disk device	- DATAFIL reference - first module
SYS003	-		second
SYS00m	-		last module
SYS00m+1	-	tape/unit record device #1 - dynamically assigned
SYS00m+2	-		#2
SYS00n	-		last

Hence, the supervisor which will be used with the spool system, must have n+1 problem program lubs generated for the appropriate foreground partition.

Example:

    1 data disk

    3 unit record/tape devices

SYS001   = QFILE reference

SYS002   = DATAFIL reference

SYS003   = ⎫

SYS004   = ⎬ unit record/tape device assignments

SYS005   = ⎭

                      TOTAL problem program lubs = 6.

20.

<u>SPOOL INITIATION</u>

1. Assuming SPI mode of initiation of a 1 data disk foreground spool program, then the following cards should be prepared:

```
ALLOC F1=nk, F2=mk          (see part 7 of spool sysgen)
ASSGN SYSLST, UA
ASSGN SYSIN, UA
ASSGN SYS001, X'cuu'        QFILE disk
ASSGN SYS002, X'cuu'        DATAFIL disk
// DLBL QFILE, 'any alpha characters', 99/360, DA
// EXTENT SYS001, vol serial no., 1, 0, rel track, no. of tracks
// DLBL DATAFIL, 'any alpha characters', 99/360, DA
// EXTENT SYS002, vol serial no., 1, 0, rel track, no. of tracks
EXEC FGPSPOOL
* $$JOB     ⎫
* $$PRTD    ⎬   Required for writer only system
* $$PUND    ⎭
ASSGN SYSLST, X'cuu'
```

The QFILE and DATAFIL need not be on the same physical pack. Choice of the number of tracks for the DATAFIL is based on how much of the pack has been allocated for spool usage. Choice of the number of tracks for the QFILE is based on the QNRPERT and MAXJOBS parameters. Appropriate DOS VII label control cards may also be used if necessary.

21.

2. A printer carriage control tape must be created without a channel 9 punch and without a channel 12 punch. If this tape is not placed on the printer, an uncontrolled occurrence of print line dropping may happen.

3. Place the indicated control cards in the card reader and execute the job stream. When PLEASE ASSIGN SYSRDR appears on the typewriter, enter the following DOS commands:

   a. STOP

   ------------------Hit typewriter request key

   READY FOR COMMUNICATIONS   ---- generated by DOS

   b. START (F1 or F2)

   c. READ X'cuu'

   ------------------At this time, the foreground control cards are read.

   ENTER 'COLD' OR 'WARM' OR 'CLRx' --- generated by the spool program

   d. ⎧ COLD ⎫
      ⎪ WARM ⎪
      ⎨ CLR1 ⎬   One of these should be entered.
      ⎪ CLR2 ⎪
      ⎩ CLR3 ⎭

   i. COLD - entered whenever no data on the spool files is needed. Spool packs should, however, have been formated from a previous spool initiation.

   ii. WARM - entered whenever data on the spool files is needed. This option should normally be used even if the spool

22.

files are empty of work. Spool packs should have been
formated from a previous initiation.

   iii. CLR1 - QFILE only
           2 - DATAFIL only
           3 - BOTH files
             entered whenever the spool packs have never been

used for spool operations. Normally, this option

is only used once at sysgen time, unless the spool

disk area is used for other work.

If AUTOSTR has been generated into the system,then the following will appear on the

typewriter:

$$BG \begin{Bmatrix} ROOC \\ TOOE \end{Bmatrix} BUFFERS =$$

Refer to the operator commands for this message. If AUTOSTR has not

been generated into the system, then appropriate readers and/or writers should

be started at this time. When all spool readers and/or writers have been

initiated regardless of the AUTOSTR option, continue to enter the following

DOS commands:

          ---------------------hit the typewriter request key

    READY FOR COMMUNICATIONS --- generated by DOS

e. START

f. ASSGN SYSIN, X'cuu'
    e
g. o
    b

DOS is now completely under control of the spool system.

All spool typewriter messages are preceeded by some task indentifying characters

(prefix) The following three different types of spool tasks can issue messages or

accept input data:

1. <u>Operator command task</u> ($OP prefix)

This task is activated by depressing the console interrupt key. The

characters $OP will be typed and the typewriter will be waiting for

operator input of a command. Note that the use of the console interrupt

key for spool usage does not conflict with the background's usage of the

key. Depressing the console interrupt key a second time while the type-

writer is waiting for input, will allow the background to use its console

interrupt routine. If all activity on the cpu is dormant, then the operator

must depress the console interrupt key a second time in order to activate

the operator command task. This action will cause the message NO

ROUTINE LINKAGE to be typed prior to the appearance of the $OP message.

2. Reader/Writer task - (prefix-see text)

This task is activated by entering the S (START) command. Refer to each

message to find out whether the reader or writer task deactivates itself

after typing the message. The typewriter prefix for the task is:

        XXYZZZ   where,

        XX - BG or F2

         Y - T(printer writer) , P(punch writer), or R (reader)

        ZZZ - unit record device address used by the reader or writer

3. Batch partition task - ($BG or $F2 prefix)

    This task is active whenever DOS activates its BG (back round)

    or F2 (foreground) partitions.

The brackets [ ] which appear with the description of the following commands and

messages indicate that the parameters within the brackets are optional.   The

brackets { } indicate a choice of required parameters.   Small letters indicate

data to be entered by the operator while capital letters indicate data which is typed

by one of the three types of spool tasks.

OPERATOR COMMANDS

Entered when the console interrupt key is depressed and the prefix

$OP appears on the typewriter.

A. Start a reader or writer

    s xxyyy, zzz [, aaa]

    $$xx = \left\{ \begin{array}{c} bg \\ f2 \end{array} \right\} \qquad yyy = \left\{ \begin{array}{c} prt \\ pun \\ rdr \end{array} \right\}$$

    zzz= unit record device address

    aaa= tape drive device address-to be used to start a tape writer

example:

a.   s bgprt, 00e

b.   s f2pun, 00d, 180

This command is used to activate reader programs which will read

cards and create job queues to be processed by batch partitions; this

command is also used to activate writer programs, print or punch, which

will process print or punch queues that have been created by the batch partitions.

25.

B. Stop a reader or writer

    p xxyyy, zzz

    $$xx = \left\{ \begin{array}{c} bg \\ f2 \end{array} \right\} \qquad yyy = \left\{ \begin{array}{c} prt \\ pun \\ rdr \end{array} \right\} \qquad zzz = \text{unit record device address}$$

example:

a.   p bgprt, 00e

b.   p f2rdr, 00c

This command is used to deactivate a reader or a writer program. All core

buffer space used for all associated disk/tape I/O buffers and core buffer

space used for the reader or writer program itself is released for other use.

If a reader program is currently preparing a job to be run by the batch partition,
the
then stop command will cause the reader to terminate the card reading. The

job must be re-entered through another activated reader. If a tape/disk

writer is currently printing or punching a job, then the stop command will

cause the writer to terminate the printing or punching. The job is not deleted and

it can be re-processed whenever another writer is activated. Note that in

the case of a tape writer, the tape is repositioned to the beginning of the

current job.

C. Cancel a reader or writer

    c xxyyy, zzz

    $$xx = \left\{ \begin{array}{c} bg \\ f2 \end{array} \right\} \qquad yyy = \left\{ \begin{array}{c} prt \\ pun \\ rdr \end{array} \right\} \qquad zzz = \text{unit record device address}$$

example:

a: c bgpun, 00d

b.   c f2prt, 00f

This command is identical to the stop 'p' command for a reader program.

26.

In the ca●● the tape or disk writer, however, the cancel command deletes
the curr●●b being processed by the writer prior to de-activating the writer.

D. Restart a printer writer

    t xxprt, zzz
            $\begin{Bmatrix} bg \\ f2 \end{Bmatrix}$ zzz= unit record device address
    xx=

    example:

    a.   t   bgprt, ooe

    b.   t   f2prt, oof

    This command directs the associated printer writer to discontinue printing

    at its current disk/tape block; the printer writer immediately resumes

    printing at the beginning of the jobs printed output.

E. Display command

        d xxyy, aaaaaaaa [, bbbbb]   JOB OPTION

        d xxyyy, all   ALL OPTION

        d xxyyy, hold   HOLD OPTION

        d xxyyy, pn   PRIORITY OPTION
    xx= $\begin{Bmatrix} bg \\ f2 \end{Bmatrix}$ yyy= $\begin{Bmatrix} prt \\ pun \\ rdr \end{Bmatrix}$ aaaaaaaa= job name

                                          bbbb= job number

    example:

    a.   d bgrdr, jobabcde, ooo21

    b.   d f2prt, all

    c.   d bgpun, hold

    d.   d f2rdr, p1

    This command is used to display the status of one or more jobs in the

    specified queue (yyy). The format of the status which appears on SYSLOG

    IS: 27.

    AAAAAAAA BBBBB P H CCCCCCC

    where,

            AAAAAAAA= job name

             BBBB= job number

                P= priority no. (if any)

                H= the character H if the job is in the hold status

            CCCCCCC= number of logical records in this job's file.

    If there are no jobs in the queue(yyy), then the message Q IS EMPTY

    will be typed. If the JOB OPTION is requested and no job aaaaaaaa

    [, bbbbb] can be found, then the 'D' command terminates without any

    output. All jobs for the appropriate OPTION will be displayed before the

    command is complete. Note that any spool tasks which need the job queue

    file will wait until the 'D' command has terminated.

F. Hold Command

        h xxyyy, aaaaaaaa [, bbbbb]   JOB OPTION

        h xxyyy, all   ALL OPTION
    xx= $\begin{Bmatrix} bg \\ f2 \end{Bmatrix}$ yyy= $\begin{Bmatrix} prt \\ pun \\ rdr \end{Bmatrix}$ aaaaaaaa= job name

                                          bbbbb= job number

    example:

    a.   h bgrdr, jobabcde, ooo11

    b.   h f2prt, all

    This command is used to prevent the processing of one or more jobs in the

    specified queue (yyy). Such jobs will be held waiting until the operator

    frees them with the 'R' command. In the case of the reader queue, all 'H'

    jobs will not be processed by the batch partitions. In the case of the

    writer queues, all 'H' jobs will not be printed or punched. If there are no
                                          28.

jobs in the queue (yyy), then the message Q IS EMPTY is typed. Review the 'R' command to see how to implement operator oriented job priorities.

G. Release Command

r xxyyy, aaaaaaaa[, bbbbb]   JOB OPTION

r xxyyy, all   ALL OPTION

$xx = \begin{Bmatrix} bg \\ f2 \end{Bmatrix}$ $yyy = \begin{Bmatrix} prt \\ pun \\ rdr \end{Bmatrix}$ aaaaaaaa = job name

bbbbb = job number

example:

a.   r bgrdr, jobabcde, 00011

b.   r f2prt, all

This command is used to free, for processing, one or more jobs in the specified queue (yyy). In the case of the reader queue, all 'R' jobs will become immediately available for processing by the batch partitions. In the case of the writer queues, all 'R' jobs will become immediately available for printing or punching by all active writers. If there are no jobs in the queue (yyy), then the message Q IS EMPTY is typed. Any specific job aaaaaaaa[, bbbbb] can effectively be placed at the beginning of its queue (yyy) by holding 'H' all jobs of that queue and selectively releasing the important job aaaaaaaa[, bbbbb]. Hence, the next job to be processed in queue (yyy) will be the job aaaaaaaa[, bbbbb]. This method of implementing operator job priorities does not stop or cancel the current job of the queue (yyy). The DOS operator command "CANCEL" or the spool commands 'P', 'C', 'F' should be reviewed to be able to manipulate the current job.

H.   Flush Command

f xxyyy, zzz   CURRENT JOB OPTION

f xxyyy, zzz, all   ALL JOBS OPTION

$xx = \begin{Bmatrix} bg \\ f2 \end{Bmatrix}$ $yyy = \begin{Bmatrix} prt \\ pun \end{Bmatrix}$ zzz = unit record device address

example:

a.   f bgprt, ooe

b.   f f2pun, ood, all

This output writer command deletes the current or ALL jobs from the queue (yyy) with which the writer zzz is associated. The writer remains active and it will continue to process any free jobs in the queue (yyy). If more than one writer is active with the queue (yyy), then all active jobs associated with those writers will not be affected by the 'F' command.

I.   Go Command

g xx   BATCH OPTION

g xxyyy, zzz   READER/WRITER OPTION

$xx = \begin{Bmatrix} bg \\ f2 \end{Bmatrix}$ $yyy = \begin{Bmatrix} prt \\ pun \\ rdr \end{Bmatrix}$ zzz = unit record device address

example:

a.   g bg

b.   g f2prt, ooe

This command is used to re-activate a spool task which is waiting for an operator response. The BATCH OPTION is normally used in response to error or warning messages while the READER/WRITER OPTION is normally used in response to informative messages.

J.   Delete Command

λ xxyyy, aaaaaaaa [, bbbbb]   JOB OPTION

λ xxyyy, all   ALL OPTION

xx= $\begin{Bmatrix} bg \\ f2 \end{Bmatrix}$ yyy= $\begin{Bmatrix} prt \\ pun \\ rdr \end{Bmatrix}$ aaaaaaaa= job name

bbbbb= job number

example:

a. λ bgrdr, jobabcde, 00011

b. λ f2prt, all

This queue processor command deletes one or ALL jobs from the queue (yyy).

All jobs that are currently being processed by readers or writers for the

queue (yyy) are not affected by this command. In addition, jobs that have

been held will not be affected by this command. If there are no jobs in

the queue (yyy) then the message Q IS EMPTY is typed.

K.   End Spool Command

          e

This command is used to normally terminate the spool partition and to

restore the system to normal DOS operation.

L.   Kill Spool Command

          k

This command terminates the spool partition with a dump.

M.   Nop Command

          n

This command is used to free the typewriter which is waiting for an

operator response to a $OP message. No action is taken in response to the

'N' command.

31.

In a writer-only spool environment, spool control cards are mandatory

for every spool job. However, spool cards can be optionally defaulted to the DOS

// JOB and the /& cards whenever readers are generated into the spool system. In

this case, jobs defined through spool control cards can be interpersed with

defaulted spool jobs. Following are the four fixed format spool control cards:
     (note that there is a blank column between the * and the first $)

a.   * $$JOB [nnnnnnnn] [, p] [, h]

                    nnnnnnnn - alphanumeric job name

                    p - priority number

                    H - enter directly into the hold queue

b.   * $$PRT $\begin{Bmatrix} d \\ t \\ n \end{Bmatrix}$ [, xxxx] $\begin{bmatrix} , yy \\ , yyy \end{bmatrix}$, mmmmmm] [, rrrrrr] [, uuuuuuuu]

                    D - spool out ot disk

                    T - spool out to tape

                    N - do not intercept print requests

                    xxxx - forms number

                    yy - number of copies

                    yyy - device address of tape drive

                    mmmmmm - maximum number of lines before
                         warning

                    rrrrrr - checkpoint counter during listing

                    uuuuuuuu - UCS buffer load phase name

32.

c. * $$PUN $\left\{\begin{array}{c}d\\t\\n\end{array}\right\}\left[\begin{array}{c}xxxx\end{array}\right]\left[\begin{array}{c}yy\\yyy\end{array}\right]\left[\begin{array}{c}mmmmmm\end{array}\right]\left[\begin{array}{c}rrrrrr\end{array}\right]$

      D - spool out to disk

      T - spool out to tape

      N - do not intercept punch requests

      xxxx - card number

      yy - number of copies

      yyy - device address of tape drive

      mmmmmm - maximum number of records

              before warning

      rrrrrr - checkpoint counter during punching

d. * $$EOJ

    end of spool card

The placement of the spool control cards and the DOS control cards is as follows:

a. *$$JOB   - must be first

b. *$$PRT $\left.\begin{array}{c}\\\\\end{array}\right\}$ - must be second and third if present

   *$$PUN

c. // JOB etc $\left.\begin{array}{c}\\\\\\\\\\\\\end{array}\right\}$ - normal DOS job(s) or a portion of a DOS job

   etc

   / &

   // JOB etc

   etc

   / &

d. *$$EOJ   - must be last

If defaulted DOS control cards are used in place of spool control cards, then the following defaulted spool parameters are used:

a. JOB

   i. nnnnnnnn - job name - taken from // JOB nnnnnnn

   ii. no priority

   iii. no hold

b. PRT

   i. D - disk

   ii. blank - blank forms number

   iii. 01 - 1 copy

   iv. STDLINE - maximum number of lines = system generation parameter

                 STDLINE

   v. STDLINE - checkpoint counter - same as STDLINE

   vi. blank - blank UCS phase name

c. PUN

   i. D - disk

   ii. blank - blank card number

   iii. 01 - 1 copy

   iv. STDCARD - maximum number of cards = system generation parameter

                 STDCARD

   v. STDCARD - checkpoint counter = STDCARD

d. EOJ

   occurs whenever a /& card or another // JOB card is encountered.

Some discussion relative to disaster restart, machine check, or operator job destruction is appropriate with the review of spool control cards. Three critical points in a job's flow through the system must be evaluated to understand 'WARM' restart:

a. R[ea]D[E]R END OF JOB TIME - (applies to reader spool system) occurs whenever the reader encountered a *$$EOJ, /&, or // JOB card. If an unrecoverable error occurs prior to this time, the job currently being read by the reader must be entirely re-entered. Following this time, the job just read will remain in the spool system until the job has completed execution.

b. EXECUTION END OF JOB TIME - occurs whenever the batch partition has processed the spool end of job record. If an unrecoverable error occurs prior to this time, the job currently in execution must be entirely re-run. However, the job does not have to be re-read by the reader portion of the spool. When execution end of job time is reached, all information regarding printing and/or punching is saved for restart purposes. Hence, following this time, the job just executed does not have to be re-run.

c. WRITER END OF JOB TIME - occurs whenever the writer outputs the last line of print/card. If an unrecoverable error occurs prior to this time, the job currently being printed or punched must be entirely reprinted or repunched. Implementation of the checkpoint parameter in the *$$PRT or *$$PUN would reduce the reprinting or repunching time.

A. $OP INCORRECT OP COMMAND

Incorrect format of the operator command was entered.

ACTION: Try again.

B. $OP NO ROOM FOR PROG XXY

$$XX = \begin{Bmatrix} BG \\ F2 \end{Bmatrix} \qquad Y = \begin{Bmatrix} T \\ P \\ R \end{Bmatrix} \begin{matrix} \text{print} \\ \text{punch} \\ \text{reader} \end{matrix}$$

No buffers are available for storage of the reader or writer pr[og]... [whi]ch the operator is trying to 'S' (START).

ACTION: Cancel or stop another reader or writer; or wait until [the] partition becomes inactive.

C. $OP ALL SPOL LOCS ACTIVE

The operator is attempting to activate more reader or writer program[s] than were declared at spool sysgen time.

ACTION: Cancel or stop another reader or writer; or spool sysgen again declaring a larger number for the MAWRW parameter.

D. $OP YYY ALREADY IN USE

YYY= unit record device address

The unit record device address YYY is currently being used by another reader or writer program.

ACTION: Check that YYY is the correct device to be used; cancel or stop the reader or writer using the device if you want to use the device YYY.

E. $\begin{Bmatrix} \$XX \\ XXYZZZ \end{Bmatrix}$ DDD HAS NO PUB/BAD D

DDD is not a valid device address for this DOS supervisor; or DDD is not a valid device type for this reader or writer function; i.e. starting a punch writer to ooe where ooe is a device address for a printer.

F. $\begin{Bmatrix} \$XX \\ XXYZZ \end{Bmatrix}$ ALL CCBS IN USE

The operator is attempting to activate more reader or writer programs and

he is using more tape spool facilities than were declared at spool sysgen

time.

ACTION: Cancel or stop another reader or writer; or spool sysgen again

declaring a larger number for the MAXCCB parameter.

G. XXYZZZ NO BUFFERS

No buffers are available for use as a disk/tape I/O area. This reader or

writer is automatically stopped.

ACTION: Cancel or stop another reader or writer; or wait until a batch becomes

inactive.

H. XXYZZZ BUFFERS = $\begin{Bmatrix} a \\ ab \end{Bmatrix}$

This message occurs when the reader or writer is initially started. The

operator must respond with one character 'a' (reader or printer writer)

or with two characters 'ab' (punch writer) where,

$a = \begin{Bmatrix} 1 \\ 2 \end{Bmatrix}$ indicating 1 or 2 disk/tape I/O areas for use with the

reader or writer program. If any character other than a 2

is entered, 1 buffer will be used.

$b = \begin{Bmatrix} 0 \\ 1 \\ 2 \end{Bmatrix}$ indicating a pause code for disposition of punched output.

Pause occurs at the beginning of the job.

0 or any char= do not type card id unless a change in id occurs

1= type card id for every job

2= type card id for every other job unless a change in id occurs

If this message occurs a second time, a second buffer was not available for

use with the a=2 option. A response of '1' must be entered with this message.

37.

I. $OP NO BUFFERS AVAIL

This message occurs with the 'L' command when no I/O buffers can be obtained

for disk I/O operation.

ACTION: Retry the 'L' command whenever a reader/writer or batch has ter-

miniated

J. $OP RDR/WTR ID-NO MATCH

No reader or writer with the identification characters supplied in the command

can be found to be active.

ACTION: Verify spelling. Try again.

K. XXYZZZ AAAAAAAA FFFF FORMS NEEDED

AAAAAAAA= job name

FFFF= form/card id

This message occurs when a change in forms or card number is encountered by

a disk print or punch writer; it also occurs for a punch writer which has been

started with a pause code of 1 or 2.

ACTION: Change forms or cards. Respond with the operator command g xxyyy, zzz

L. XXYZZZ JOB NNNN FFFF FORMS NEEDED

NNNN= job count id on tape, ie

first job on tape NNNN=0001, third job on tape NNNN=0003

FFFF= forms id

This tape print or punch writer message is identical to the disk print or punch

writer message except for the job identification field.

M. XXRZZZ EOF

This input reader message occurs when end of file is encountered on the

card reader prior to reading an end of job card.

ACTION: The sysgen parameter RDREOF reflects if the operator must respond

with the g xxrdr, zzz command. In either case, ready the card reader

38.

with remaining portion of the job stream.

N. **XXRZZZ CLOSED**

This input reader message occurs when the end of job and the end of file is reached on the card reader. The input reader remains in core with all buffers still allocated to it unless the RDRCLOS=EXIT option was taken at spool sysgen time.

ACTION: The sysgen parameter RDRCLOS reflects if the operator must respond with the g xxrdr, zzz command. In either case, ready the card reader with new jobs when they have been received; or, stop or cancel the reader with the 'P', 'C' command prior to issuing the g xxrdr, zzz command. This will free up the core allocated to the reader for use by other spool functions.

O. **XXYZZZ ENDED**

This tape writer message occurs when all jobs on the tape have been printed or punched. The output writer frees up all core allocated to itself.

ACTION: None, unless you want to start another writer.

P. $\begin{Bmatrix} \$XX \\ XXRZZZ \end{Bmatrix}$ **DATA DISKS(S) FILLED**

This message occurs whenever all cylinders of all data disk(s) have been reserved.

ACTION: i. Wait until an output writer frees up some space.

ii. Or, start an output writer to free up some space

iii. When some space has been freed, respond with the $g\begin{Bmatrix} xx \\ xxyzzz \end{Bmatrix}$ command to continue. You may want to cancel the batch or cancel or stop the reader if you know that it will continue to fill up the disk.

39.

Q. **MAXIMUM RECORDS EXCEEDED**

This batch warning message occurs during execution whenever the maximum number of records for the outputting of print or punch records has been exceeded.

ACTION: An installation decision. To continue, respond with g xx to permit outputting a standard number of additional records before another warning message occurs. To cancel the job, enter the standard DOS operator cancel command prior to entering the g xx spool command.

R. $\begin{Bmatrix} \$XX \\ XXRZZZ \end{Bmatrix}$ **NO JOB Q SPACE**

The $XX form only occurs whenever input readers are not used for spool operations. This message occurs whenever there are more jobs in the system then permitted by the spool sysgen parameter MAXJOBS.

ACTION: i. Wait until an output writer completes a job

ii. Or, spool sysgen again redefining the MAXJOBS parameter

S. XXRZZZ   READER DISASTER
   XXTZZZ   PRINTER DISASTER
   XXPZZZ   PUNCH DISASTER
   $\begin{Bmatrix} \$XX \\ XXYZZZ \end{Bmatrix}$ DISK ERROR
   $\begin{Bmatrix} \$XX \\ XXYZZZ \end{Bmatrix}$ TAPE ERROR

These messages occur whenever an unrecoverable I/O error has been encountered by the associated task. If a reader or writer encountered the I/O error while it wasn't processing the Q DISK file, then the reader or writer frees up all allocated core and terminates itself. In the case of writers, the current job is not deleted from its appropriate

40.

queue. In all other encounters of I/O errors, the spool partition terminates with a dump, and it restores the cpu to normal DOS operations.

MODIFYING/CHANGING POWER

Following is a list, with comments, of potential areas of alteration to the spool system:

a. Accounting Routine

The job control table (JCT) currently contains statistics on number of cards read, number of lines printed, and number of cards punched. Fields for time, JCTRDRT, JCTPRTT, JCTPUNT, JCTEXECT, have been reserved for user processing. Code would have to be added to the reader, writer, begin job time processor, and end of job processor to obtain time figures. In addition the macro to be used with the ACCOUNT spool sysgen must be written to be included with the purge phase (FGPSPOL9).

b. Special Line Counting Code - (Channel 9 and Channel 12)

If the printer carriage control tape support is inadequate, then the following sections of the spool system should be altered:

1. LINECONT, ENDPAGE, FULLPAGE must be capable of being changed on a job basis.

2. *$$PRT code must have code added to it to permit one or more line counting parameters.

3. Additional code should be added at the label NOTPRINT to support channel 9 line counting status.

4. Channel 9 and channel 12 skipping capability should be included at:

    i. Channel appendage code to supply CSW status

    ii. Printer writer phase FGPSPOLO to trigger CSW posting

    iii. Printer writer phase FGPSPOL1 to reset CSW posting.

    iv. Printer writer phase FGPSPOL3 to test Channel 9 and/or channel 12 status; reexecute the print chain. It is expected that channel 9 and channel 12 skipping capabilities will partially degrade performance.

c. Job Status Typing

If it is desirable to make the output writers type end job status, then the end of job code with phases FGPSPOL1 and FGPSPOL6 should be altered to type any required information.

d. Special Readers/Writers

If the conventions of the existing readers and writers are used as a guideline for adding any special reader or writer, then the effort of adding the special capability should not be enormous. However, adequate knowledge of the internals of the system is a prerequisite to undertaking the effort.

e. Buffer Size Manipulation

Since some of the reader and writer phases require 829 bytes, the lower limit of 829 was placed on the DBLK spool sysgen parameter. However, if core utilization is a serious problem, then reducing the size of the disk/tape I/O buffers may help. If such is the case, the following sections of the spool system should be altered:

43.

1. Change the macro parameter editing code at the beginning of the POWER macro to reflect two types of buffers; (1) reader or writer program buffers; (such a buffer could be a grouping of I/O buffers) (2) disk/tape I/O buffers.

2. Alter the code located at the label S3 of the FGPTYPSO phase to request a program storage buffer or to request continuous I/O buffers.

3. If the technique of using a program storage buffer pool is used, then code must be added at the labels COREBLKS and LOOP1.

44.

POINTS TO PONDER

1. The N option in the PRT and PUN cards should not be heavily used since no check is made to determine if the printer or punch is currently printing or punching.

2. If no data disk space is permanently held (dummy job), then there is no recovery when a single job completely fills the data disk.

3. Although the formatting of the data disk is extremely fast, it is recommended that some disk packs be permanently formatted for spool usage.

4. Placing the hold status to a job currently in progress does not stop that job.

5. Any reader or writer will not honor the stop or cancel command until all outstanding I/O has been complete (ie. intervention required on the reader must be satisfied before p bgrdr, ooc is taken).

6. Whenever the batch partition executes a print or punch command, a spool job must be defined at that time. Otherwise, an error message occurs and the line or card is lost.

7. Spool seek separation is implemented with the assumption that the entire disk volume is dedicated to spool. If the QFILE is to share the same volume as one of the DATAFIL volumes, then SYSOO2 of the DATAFIL should be assigned to the same volume as SYSOOl.

8. SYSRDR and SYSIPT should not be assigned to two different unit record card readers.

45.

9. If an invalid CCW op code is executed by the problem program, the spool system forces an invalid logical unit specification.

10. When the hold is executed for a job in the spool system, then that command is carried to all queues in which that job can be found.

11. The ATTN OOC message which normally occurred at card reader end of file does not occur under spool.

46.

Temporary and/or Permanent Restrictions

1. Tape - No multivolume support

2. Column binary card reading is not supported

3. There is no card punch stacker selection for 1442 and 2520

4. Only 1 data disk is supported

5. A TRACKGP must be equal to one cylinder

6. Checkpoint for printer or punch writer is not implemented.

7. Tape punch writer is not supported

8. UCS automatic loading is not supported.

9. Priority numbers are not implemented

10. Data buffers must be used for reader or writer program storage

11. No implementation of the partial spool job to start printing or punching

12. Extent boundaries for the QFILE and the DATAFIL must be on cylinder boundaries. Magnetic inscriber and RJE aren't implemented.

Tape Key

This volume contains 1 file and 2 tape marks arranged as follows:

800 BPI; 9 TRACK

TM:
FILE: Macro Source Records
          EBCDIC
          Sequenced in cc 78-81
          SPOL in cc 74-77
          3091 81 byte records blocked 40 per block
          78 blocks of 3240 bytes each
TM:

See the section on Spool Systems Generation Procedures to deblock the tape.

Sample Program

The following sample program can be run under spool control to list the macros:

```
// JOB LIST SPOOL MACROS

// EXEC SSERV

DSPLY   A.POWER, A.BTRAN, A.DSKIO

/*

/&
```