

NEW COMMERCIAL SPOOLER

External Specifications

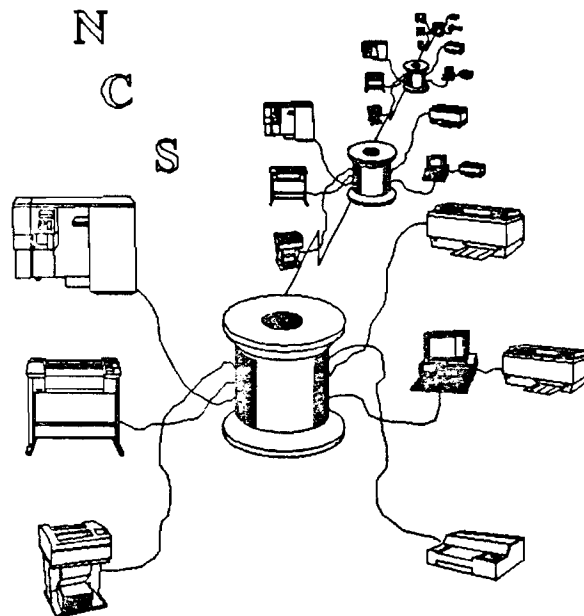


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Commercial Systems Division



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PRODUCT IDENTIFICATION

SECTION

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1.1 PROJECT NAME AND MNEMONIC

PROJECT NAME: NEW COMMERCIAL SPOOLER

PROJECT MNEMONIC: NCS

1.2 PRODUCT ABSTRACT

The NEW COMMERCIAL SPOOLER (NCS), bundled with the MPE XL Operating System and scheduled for availability on MPE XL Release 2.1, will replace the existing spooling subsystem (CM SPOOLER). This consists primarily of modules 79 and 80, and the SPOOK utility. NCS, running on HP3000 Series 9xx, will provide a structured system, both supportable and maintainable, to meet the needs of large commercial systems through the 1990s.

Product Identification

The base features (Fundamental Operating Software) for NCS are:

- Normal disc files
- Improved recoverability
- Saving files after printing
- Increased performance
- Backwards compatibility
- New spooling commands
- Hot printer support
- NRJE support

2.1 PRODUCT OVERVIEW

The New Commercial Spooler (NCS) is a complete native mode replacement of the current compatibility mode spooler on MPE XL, plus a new set of spooling commands and some enhancements on existing commands. Future releases will contain enhanced special forms handling, customized banner support, and the :BANNERS and :SPOOLQ commands to support customized banners and enhanced forms handling.

The NCS has a high degree of backward compatibility so that system operators and managers will need very little training. All the current spooling command syntaxes and most of the behaviors remain unchanged. New or altered behaviors of existing commands are described in Section 5.2 (Compatibility Specifications) of this document. In addition, a new command set provides a friendly, powerful, and consistent interface to system users, device operators, and system administrators. Programmatic access and control of spoolfiles and spooled devices will also be available (on a future release) via the Architected Interface Facility (AIF).

2.2 GLOSSARY OF TERMS

The following are terms that may not be familiar to the reader. The definition of commands and their parameters are in the User Interface section of this document.

Terms

<i>BANNERS</i>	The generic term for either the header or trailer of a printout. It contains the identification information for the listing.
<i>BATCH JOB</i>	A batch job is the non-interactive execution of a series of MPE commands and/or user programs. The commands/programs are preceded by a valid :JOB record and followed by an :EOJ record. Batch jobs are submitted to the system via a spooled input device or the :STREAM command. Batch jobs are normally submitted to the DS and ES dispatch queues for execution so that they do not interfere with interactive sessions which normally run in the CS dispatch queue.
<i>CHECKPOINT</i>	A snapshot of the state of a printer at a point in the output known to both the device and the spooler. By using checkpoints in appropriate device commands, the spooler can quickly re-establish the state of a device as of the time that the checkpoint was taken. A CIPER protocol printer generates a checkpoint at the top of each page.

CHECKPOINT FILE

A small file created and managed by the spooling subsystem in which the spooler keeps checkpoints returned from the device, as well as other data which it needs to recover from printing interruptions properly. There is one checkpoint file per spoolfile per device on which the spoolfile is printed. All checkpoint files for a given spoolfile are deleted when the spoolfile is deleted.

CIPER

An acronym for Control of Intelligent PERipherals, CIPER is a spooler-printer co-operative protocol designed to foster rapid recovery from a device interruption such as a power failure. A device using this protocol generates checkpoints, described elsewhere in this glossary, and returns them to the spooler, which saves them in a checkpoint file. Printer output may be interrupted, either by device power failure or user command. When output is resumed, an appropriate checkpoint is retrieved from the checkpoint file and downloaded to the printer, restoring the state of the printer as of that checkpoint. In this way it is possible to start transmitting spoolfile data at points other than the beginning of the file. For large output spoolfiles, the time saved is quite noticeable. Currently the only peripherals which support the CIPER protocol are the HP-IB-connected 256x family of line printers.

CM SPOOLER

The term CM SPOOLER refers to the Compatibility Mode Spooler that was released with all versions of MPE V/E and all versions of MPE XL before release of the New Commercial Spooler.

*CONDITIONAL
TOP-OF-PAGE*

The motion of the logical pen or physical paper such that the next output begins at the top of the next logical page, side of the physical sheet or new physical sheet (depending on use). The "conditional" means that this motion does not occur if the pen is already at the top of the page due to

- An explicit (HP)FOPEN or FCLOSE of a spooled devicefile by a user,
- A record with a carriage control character of "1" (octal 61).

DATA FILE

A spoolfile that has been input from a device or STREAMed using the :DATA command. The data in it will be used later by an interactive session or a batch job.

FLABX

File LABEL eXtension. Each MPE file has a label in which are stored attributes common to all files (such as its Unique File Identifier, or UFID). The FLABX is an optional additional area associated with the file label in which information may be stored that is not a part of the data in the file but which is unique to a particular category of files. For spoolfiles, the NCS stores attributes such as file state (READY, PRINT), output priority, number of copies, and so on, in the FLABX.

LINKED SPOOLFILE

A spoolfile that has an entry in the SPFDIR. The linked spoolfile is always in the reserved account HPSPPOOL. Input spoolfiles are in IN.HPSPPOOL. Output spoolfiles are in OUT.HPSPPOOL. Only linked spoolfiles can be scheduled for printing by a spooler (output) or execution by a CI (input). If

a user copies a spoolfile from OUT.HPSPOOL to her/his local group and account, that copy has no SPFDIR entry and is therefore not a linked spoolfile.

MOM

MOM is a child process of PROGEN, the master system process. MOM creates all other spooling processes. .

OPERATOR

The person who monitors the System Console and manages the computer on a daily basis. This includes establishing job and session limits, setting the output fence, responding to users' resource requests, cold loading the system after a shutdown or failure, and informing users of the system's status. Also called Console Operator, or System Operator.

PRIVATE SPOOLFILE

A spoolfile which is created with the Private option specified. The private option is intended for applications which produce sensitive output. Private spoolfiles have more stringent access and attribute restrictions than non-private spoolfiles.

A more detailed description of private spoolfiles is found in Section 3 and in Section 5.

SELECTION EQUATION

A method of selecting, or filtering, one or more spoolfiles from a larger group of spoolfiles according to user-specified criteria. For example, it is possible to select all spoolfiles created by a specific user or which are in a particular state (or both). The selection equation is not an independent command or intrinsic but is a feature of the :LISTSPF and :SPOOLF commands. Further details may be found in Appendix A and in the description of the :LISTSPF and :SPOOLF commands in Section 6.

SILENT-RUN

A method of recovery to a particular page following an interruption of the printing process. (The interruption can be expected, as in a :SPOOLER...; SUSPEND or :SPOOLER...; RESUME, or unexpected, as in a device power failure). Silent-run requires hardware support in the device or software support in the device's Storage Manager. When in silent-run mode the device or storage manager interprets, but does not print, all data sent to it. When it reaches the page at which it should start printing, it does so automatically and without additional spooler control. Some devices, such as the HP2680, must silent-run from the beginning of the spoolfile to the restart point. Others, such as all CIPER devices, are capable of silent-running from a location closer to the desired restart point. Serial printing devices do not support any form of silent-run, so any silent-running must be simulated by the device's Storage Manager or the device must restart at the beginning of the file. See the Printer Storage Manager ES for further details.

SPFDIR

SPoolFile DIRectory. This is an internal table used by the New Commercial Spooler to keep information about spoolfiles that are linked (known to the spooling subsystem). Attributes such as target device, output

priority, number of copies, etc. are kept in an SPFDIR entry.

The SPFDIR is the working copy of this information, built from the master copy [kept in each spoolfile's File Label Extension (FLABX)] when the system is booted and whenever new linked spoolfiles are created.

SPIT

Spooling Process Information Table. This is an internal table used by the New Commercial Spooler to keep information about spooling processes. Attributes such as process state (ACTIVE, IDLE, SUSPEND) and current spoolid (if any) are kept in a SPIT entry.

SPOOL

Simultaneous Peripheral Operation On-Line. A facility that permits the concurrent usage of devices which would otherwise be non-sharable, such as tape drives and printers. This is accomplished by copying the input from or output to these devices to disc, where it waits to be processed until the required process (input) or device is available. The operation is called spooling, and the program which accomplishes it is called a spooler. This facility includes commands for monitoring and controlling the spooled devices and the spooled files on disc.

SPOOLER

A process that manages input from or output to non-sharable devices so that they appear to be shared among several users. The input spooler collects data from an input device (usually a tape drive) and places it in a disc file for later use by a CI or user process. The output spooler builds an output spoolfile on disc, and oversees the orderly selection and printing of spoolfiles.

SPOOLFILE

The term spoolfile refers to a file originating from or directed to a spooled non-disc device. When a non-sharable device is spooled, any user program attempting to access the device is actually accessing an OPENed input spoolfile or a CREATED output spoolfile instead of the device itself. Associated with each spoolfile (except :DATA files) is a job or session number, a file designator, a username, an account name, a device name, a state of the file and a spoolid. (A :DATA file may, but need not, have a file designator. It has no job or session number until it is opened by a user, then it acquires the job or session number of that user. It has all of the other attributes listed above). Spoolfiles may be in one of the following states: OPEN, ACTIVE (input spoolfiles only), READY, DELPND (input or output spoolfiles), or CREATE, PRINT, DEFER, PROBLM, or SPSAVE (output spoolfiles only). These states describe different steps in the life of a spoolfile.

SPOOLID

The NCS equivalent of the CM Spooler Device File ID (DFID). The primary difference is that it can range from 1 to 9999999. The SPOOLID is the number which follows the #O's or the #I's in the :LISTSPF display and the spoolfile portion of the :SHOWOUT or :SHOWIN display. It is assigned by the NCS file management routines when the spoolfile is first created and is associated with the file for its entire lifetime. It determines the filename of the spoolfile (e.g., O<spoolid>.OUT.HPSPOOL).

STORAGE MANAGER

The lowest level of the three MPE XL file system abstractions. The storage manager is responsible for resolving all device-specific requirements into a common interface for higher levels. For example, all printers support the concept of a device job. All data is printed between the start and end of a device job, but different printers have different ways of being told to start and end a job, and different responses to those commands. The storage managers accept a generic "start device job" command and issue whatever unique device commands are required to implement the generic command.

STREAM

A concept similar to input spooling by which users submit batch jobs to MPE. An input spooler is a system process controlling a device which reads batch job record images into an input spoolfile for later execution. The *:STREAM* command runs in a user process and accesses a file of batch job record images, reading these images into an input spoolfile for later execution.

SYSTEM MANAGER

The person who manages the computer installation, responsible for creating accounts and defining resource-use limits and capabilities for each user.

TYPE MANAGER

The middle level of the three MPE XL file system abstractions. The type manager is a filter for file access methods. For example, a tape type manager would allow the *FREADBACKWARD* intrinsic, where a disc type manager would return an error. Another example: A disc type manager for RIO files would allow the *FDELETE* intrinsic, while a disc type manager for non-RIO files would not.

2.3 USER DEFINITIONS

There are two main categories of users for the New Commercial Spooler. They are the normal system user and the system manager. Each type of user has different tasks to perform and thus a different set of expectations that the spooler should fulfill.

2.3.1 Normal System User

This is the user that accesses spooled devices to generate hardcopy output or submit batch jobs or data. Their expectations are to have their spooled data (both input and output) processed reliably. They also expect to have a method to track spooled data on the system.

2.3.2 System Manager

The system manager is in charge of configuring devices, setting up operation UDC's and other tools to allow the other types of spooler users to access the devices in a specific manner.

2.4 PRODUCT ENVIRONMENT

2.4.1 Hardware Requirements and Restrictions

The NCS will run on HP Precision Architecture Processor models 3000/930, 3000/950, or later. It will not run on the Classic HP3000 family systems. However, spoolfiles generated on a Classic HP3000 and SPOOKed to tape may be imported to NCS using the Spoolfile Transfer Utility (SPFXFER) described in Appendix C.

All spoolable peripherals which are supported by the CM Spooler on HPPA 3000 systems will continue to be supported under NCS. Note that not all of the peripherals supported on Classic HP3000 systems will be supported on HPPA HP3000 systems.

2.4.2 Software Requirements and Restrictions

The NCS is supported as a part of the Fundamental Operating System (FOS) on MPE XL release 2.1 or later.

2.5 USER DOCUMENTATION REQUIREMENTS

2.5.1 New Manuals

One new manual describes the features and uses of the NCS, including the new command set, permanent disc files (including checkpoint files), and the spoolfile block format and its limitations.

2.5.2 Manual Updates

All manuals that mention spooling and management of spoolable devices must be updated. The following is a list of current manuals that need to be updated.

- MPE XL Commands Reference Manual:
 - Add a set of new spooling commands: SPOOLER, SPOOLF, LISTSPF.
 - Document some enhancements on existing commands: OPENQ, SHUTQ, OUTFENCE, BUILD, COPY, FILE, JOB, LISTEQ, LISTF, PURGE, RENAME.
 - Document changes to old MPE commands: STARTSPOOL, STOPSPPOOL, SUSPENDSPOOL, RESUMESPOOL.
- System Configuration (add description of device names)
- File System Reference Manual (add new features on intrinsics, document device files and label extension for spoolfiles)
- Managing Peripherals (add new features)
- Storing and Restoring Files (reference how spoolfiles are handled)

- System Backup and Recovery (reference spoolfile backup and recovery)
- System Utilities (document SPFXFER, the Spoolfile Transfer Utility, and delete SPOOK)
- Accessing Files (discuss creation of spoolfiles with HPFOPEN)
- Getting System Information (system configuration information)
- Guide for the New System Manager
- Guide for the New System Operator

2.5.3 New Training Classes

There are no new training classes for the New Commercial Spooler.

2.5.4 Training Class Update

There are two levels of training that need to be considered. One is customer training on how to use the New Commercial Spooler. The second level of training is for the field support personnel which would cover support and internal information about the New Commercial Spooler.

2.5.4.1 CUSTOMER TRAINING CLASSES. The current System Manager and System Operator courses must be updated to include new features available with the New Commercial Spooler.

2.5.4.2 FIELD SUPPORT CLASSES. There are no technical courses currently available that teach about the internals of the CM Spooler on MPE XL. If any advanced technical internals course is developed for MPE XL, a section should be included that covers the New Commercial Spooler.

2.5.5 Manual Translation

The documentation group is in charge of any needed translation of all manuals available for MPE XL.

This section presents a summary of the major features of the New Commercial Spooler (NCS) project. Detailed reports of the features outlined below can be found in the sections following this one.

3.1 PERMANENT DISC FILES

3.1.1 Spoolfiles

The spoolfiles generated by the file system for the NCS are ordinary disc files. This prevents input and output spoolfiles from being lost during system boots as they are today. A new file type identifies the files as spoolfiles and allows them to be managed as such. Three new file codes have also been assigned, 1515 for input spoolfiles, 1516 for output spoolfiles, and 1517 for checkpoint files.

Input spoolfiles are created in the IN group of the reserved account HPSPPOOL and remain there until they are either consumed by a CI (:JOB file) or user process (:DATA file), or explicitly deleted by an :ABORTJOB or :SPOOLF... :DELETE command, respectively.

Output spoolfiles are created in the OUT group of the HPSPPOOL account and, unless they are explicitly deleted, remain there until they are printed. If the new ;SPSAVE option has not been specified, they are deleted after the last copy has been printed. The ;SPSAVE option leaves a spoolfile in OUT.HPSPPOOL after all copies have been printed. The user can then copy it into her/his own group.account so that the generating application does not have to be run again.

3.1.2 Private files

A user or application may choose to mark an output spoolfile as Private (the default is non-Private). All input spoolfiles are forced Private. Private output spoolfiles are a security mechanism, and differ from normal output spoolfiles as follows:

- They are File System Level 2 (privileged) files, and can therefore be accessed only by processes which call HPFOPEN while running at Level 2. This corresponds roughly to an MPE CM program which has been PREPped with PM capability and is running in a group which has PM capability. In the bullets which follow, we assume that users are not using such a process to access these files.
- A user may not ;SPSAVE a Private file after printing. Supposedly the spoolfile data is sensitive enough that a permanent disc copy of it should not exist (except while printing the file).
- No user (not even one with SM capability) can :STORE a Private file.
- No one can copy, browse, or otherwise open the spoolfile as a disc file. This also applies to input spoolfiles.
- No one can alter the number-of-copies attribute. This prevents an unauthorized user from generating an extra copy of sensitive data for himself or herself.
- No one except a user with System Manager (SM) capability can alter the device attribute. This restricts rerouting the output away from a possibly secured output device. Refer to Section 5.3, Security Specifications, for further details.
- The only other control over such a file is to raise or lower its priority (including DEFERRing/UNDEFERRing it), or to delete it completely.

3.1.3 Checkpoint files

A checkpoint file is a companion to an output spoolfile. It is a relatively small file designed to help the spooler recover from device problems such as power failure and paper jams. It is also useful when RESUMEing output on a suspended spooler. There is one checkpoint file per spoolfile per device on which the spoolfile is output. It is created by an output spooler process the first time that process outputs the spoolfile, and can be used for subsequent copies of the file on the same device. All checkpoint files for a given spoolfile are deleted when the spoolfile is deleted from the HPSPool account.

Checkpoint files also reside in the HPSPool account, in groups whose name is based on the device name of the spooled device currently outputting the file. (See Appendix B.3 for details of the group name). Each spooler process will create its checkpoint file group if necessary, but there is no automatic deletion of these groups. An HPSPool account manager user must delete any group which is no longer useful (say, because of a configuration change which deletes a formerly spooled device).

3.1.4 Save After Print Option

The file system has been enhanced so that an SPSAVE option can be specified at spoolfile creation time. New NCS commands also allow you to SPSAVE a file anytime until it is deleted after printing. With the SPSAVE option, the spoolfile remains 'linked' and its state changes to SPSAVE after printing. The user can then copy the SPSAVED spoolfile(s) into his/her local group account and delete the 'linked' spoolfile(s). This feature, together with the ;PRINT option of the :SPOOLF command, allows a user to reprint a previously formatted spoolfile without re-running the application program which generated it.

3.2 MPE SPOOLER DATA FORMAT

The NCS uses the CM Spooler record format as its only format. There are three major reasons for this:

- This format provides the spooler a device independent interface. The Printer Storage Manager does any required data conversion such as providing spoolfile block format for the 2680 and 2688 printers.
- It is a convenient method of placing carriage control and other device-independent control information in the spoolfile. There is no data-only spoolfile format which allows this type of control in a device-independent manner. Users and applications need and expect to control their devices as they have in the past, so this format is as good as any.
- It provides compatibility with all existing spoolfiles.

3.3 COPY NUMBER

Each copy of an output file has a copy number associated with it. This copy number and the total number of copies is displayed on whichever banner is enabled (or both).

The copy number information is part of the standard banner, four sets of three lines. The following is an example of the standard banner line:

```
#J345; #03594; *   OUTPUT, USER.ACCOUNT; ..... [1 OF 4]
```

NOTE

The same copy number may appear on more than one copy if the copy is interrupted for any reason during output. For example, if a spooler process is suspended, then resumed later at any other point in the file, the same copy number will appear on headers for both the suspended and resumed copy.

The total copy number may also appear differently on the header and the trailer of the same copy if the number of copies is changed while the spoolfile is printing.

3.3.1 Total Copies

The maximum total copies of a spoolfile has been increased to 65,535. For compatibility reasons, you may only specify up to 127 copies in any :FILE equation, (HP)FOPEN or :ALTSPoolFILE. To change to a total number of copies greater than 127, use the :SPOOLF...; ALTER command.

3.4 SUPPORTED DEVICES

The NCS supports the following devices:

3.4.1 Output Devices

- HP2680 and HP2688 laser page printers.
- The HP256x CIPER protocol printers. The HP2608S is not supported as part of an HPPA system configuration.
- Serially connected printers (such as the LaserJet series and the HP293x printer series), with less functionality than either the page or CIPER printers in the following areas:
 - Powerfail and paper jam recovery.
 - Resumption of printing after a scheduled interruption (such as a :SPOOLER...;SUSPEND).
- Serially connected plotters.

3.4.2 Input Devices

A tape drive is the only supported input spooling device.

3.5 USER INTERFACE

The NCS provides a friendly, powerful, flexible, and consistent interface to system users, device operators and system administrators. It provides control for centralized as well as decentralized installations.

3.6 RELIABILITY AND RECOVERY

3.6.1 Recovery

As systems expand, recovery becomes more important. Recovery is supported at the device level and the spoolfile level.

3.6.1.1 Device Recovery

The NCS uses all available device features to aid in device recovery, either automatically (following a device power failure) or manually by an operator (for example, when using the :SPOOLER...;RESUME command).

- If page checkpoints are supported, as with CIPER devices, the spooler will use them to recover quickly to a specific page.
- The 2680 and 2688, which use a more primitive recovery method, are forced to silent-run from the beginning of the file to the point of recovery, however the device's knowledge of pages will assure that output resumes correctly.
- A serial printer, on the other hand, has no feedback mechanism to notify the spooler of its page location; indeed many such printers don't know or remember anything about page boundaries. For these printers, the spooler must make assumptions about pages based on data in the spoolfile. Output on such devices may not resume at the correct page boundary, or the page boundary may be shifted from its original position in the data, or both.

A full discussion of paging is given in the description of the :SPOOLER...;RESUME command.

NOTE

Device recovery is actually carried out by the Printer Storage Manager level of the MPE XL file system, on command from the NCS.

3.6.1.2 Spoolfile Recovery

Now that spoolfiles are permanent disc files, spoolfile recovery is no more complicated than that of other disc files.

- Output spoolfiles are preserved for all system startups except Install. The spoolfile directory is rebuilt for all such startups from information kept with each spoolfile.
- Input spoolfiles have a one-to-one association with Job Master Table (JMAT) entries. The JMAT is still a CM table, so it is still rebuilt for updates and START NORECOVERY. Whenever this

happens, input spoolfiles are purged. If, in the future, the JMAT becomes an NM table and is preserved across configuration changes, it will then be possible to preserve input spoolfiles also.

Another aspect of spoolfile recovery is that the NCS retains output spoolfiles until the device positively notifies the spooler that physical output is complete (paper is in the output station) and error free.

In this section we describe the organizational structure of the New Commercial Spooler (NCS). The objective here is to give the reader a general idea of the internal organization of the NCS, with the caveat that this is only informational. The design is not static and may be changed at any time without notice. Users of this product should not depend on any of the information in this section.

4.1 PROCESS STRUCTURE

The base NCS product exists as two process levels consisting of one monitor process and two types of spooler processes. A process map is shown in Figure 1 below.

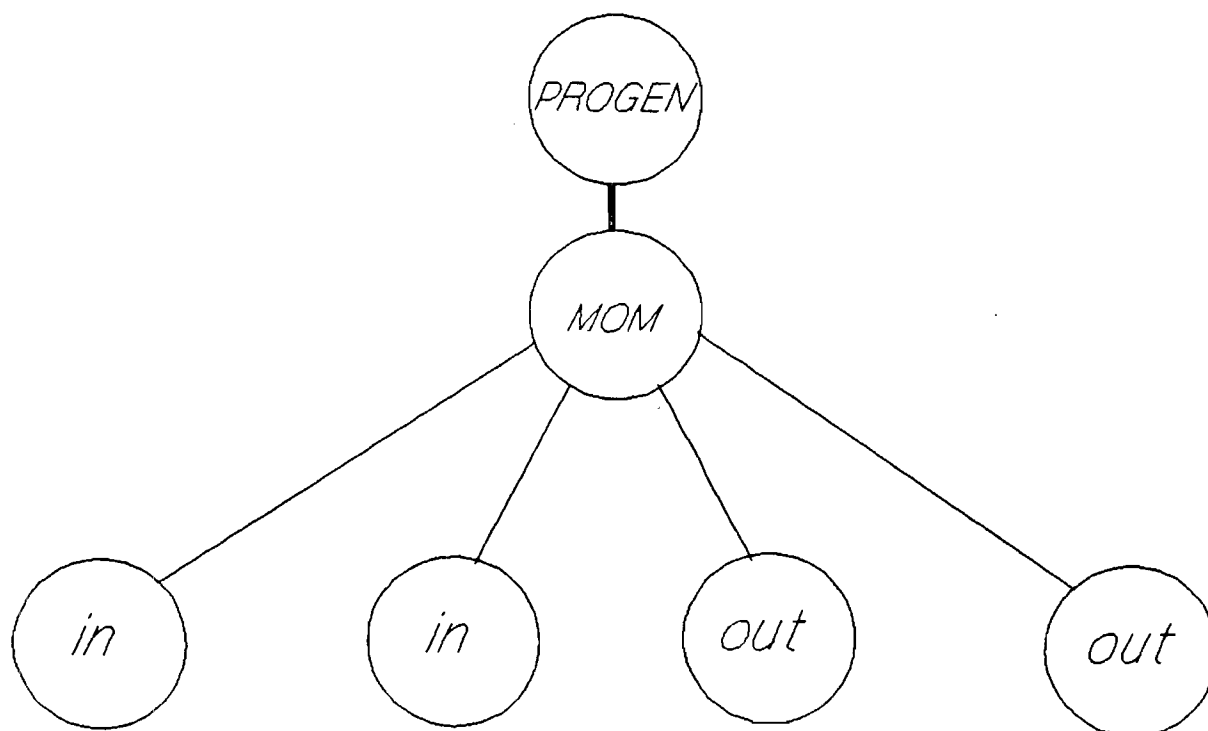


Figure 1

4.1.1 Monitor processes

4.1.1.1 MOM

MOM is a system process, created as a child of PROGEN, the master system process, when the system is booted. MOM creates all spooling processes (input and output) in response to user commands. Unlike the CM Spooler, in which spooling processes are created under a user CI and adopted to PROGEN, MOM creates each spooler process in response to an MPE XL System Port message from either the :STARTSPOOL or :SPOOLER... ;START command executor. The spooler process then continues to run in her process tree.

4.1.2 Spooler processes

4.1.2.1 Output Spooler

MOM creates an output spooler process:

- In response to a :STARTSPOOL or :SPOOLER...;START command which references a spoolable output device.
- At system boot time, if the device is configured as initially spooled.

As with the CM Spooler, there is one output spooler process for each spooled output device. Figure 2 is an expansion of Figure 1, showing the output spooler process environment. The other elements of the environment (ports, Native Mode File System, etc.) are discussed later in this section.

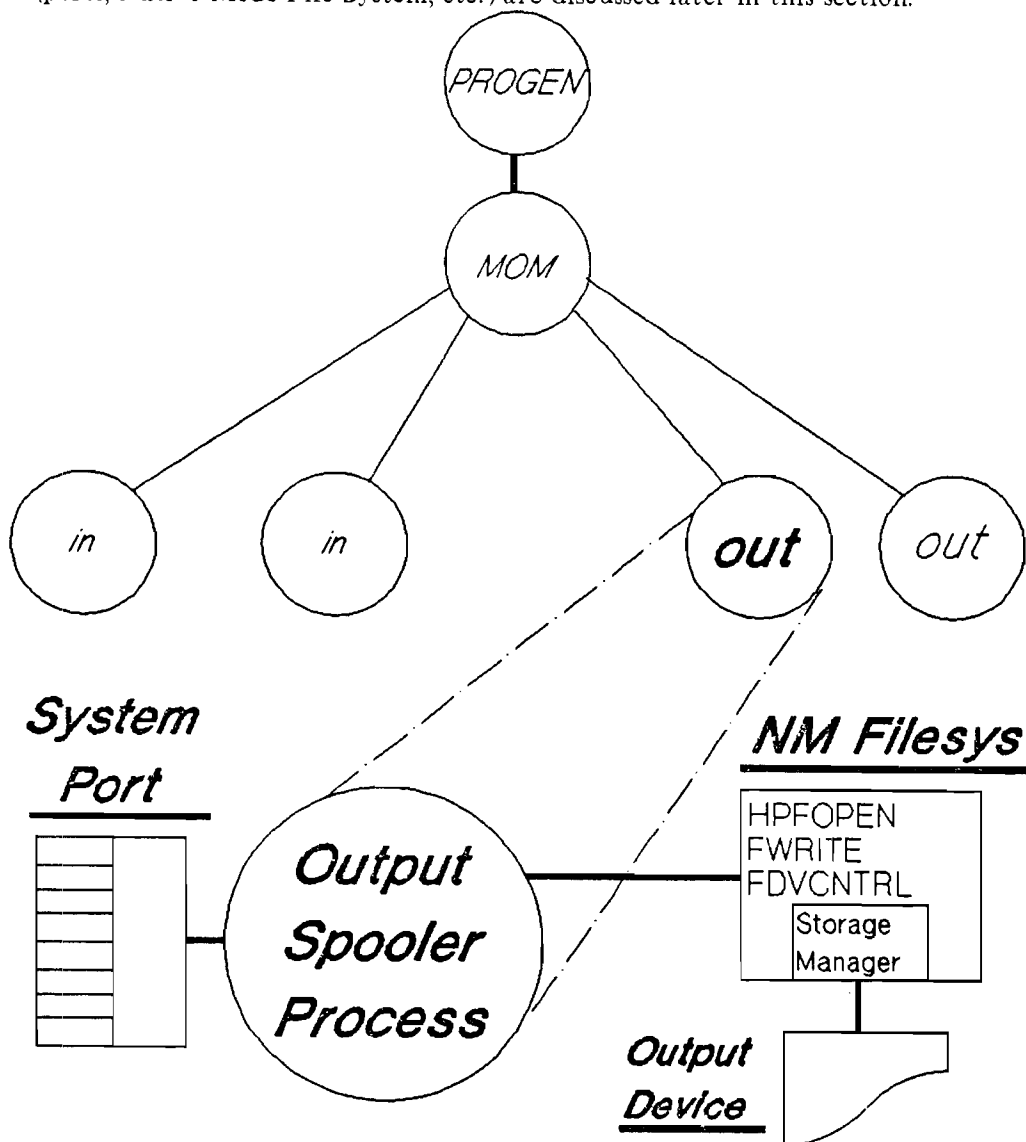


Figure 2

4.1.2.2 Input Spooler

MOM creates an input spooler process:

- In response to a :STARTSPOOL or :SPOOLER...;START command which references a spoolable input device.
- At system boot time, if the device is configured as initially spooled.

As with the CM Spooler, there is one input spooler process for each spooled input device. Its environment is similar to that shown in Figure 2, except that it manages an input device and interfaces to it with FREADs rather than FWRITES.

NOTE

A tape drive is the only supported input spooling device.

4.2 PROCESS ENVIRONMENT

4.2.1 File System Interface

Although NCS processes are system processes, we have tried to design them to operate at as high a level as possible. Thus, the ATTACHIO interface of the CM Spooler has been replaced with a file system intrinsic interface for the input and output spoolers.

4.2.2 IPC via MPE XL System Ports

The various CI and NCS processes use MPE XL System Ports to communicate with each other. Each spooler process has its own port through which it receives controlling commands (such as STOP, SUSPEND, RESUME, etc.), and notification that a file is available for them to output. Using supplied System Ports access routines, it is possible to define prioritized subqueues and inquire for port messages using either a wait or nowait request.

Each spooler process uses its port as its primary idle wait mechanism. When it has nothing to do, it waits on its port for a command or one of the notifications described earlier. The CM Spooler had several states in which it would not respond to stimuli. For example, it could not respond to commands if it was waiting for a forms message or if it was waiting for I/O completion. The NCS tried to eliminate this problem for input and output spoolers by always having a way to get back to a port wait. For various reasons this effort was largely unsuccessful at initial release, but the project team is continuing to address this important customer satisfaction issue.

4.3 RELEVANT DATA STRUCTURES

In this section we outline briefly the major data structures used by the NCS and their function. This is not a detailed description, nor do we show the specific make-up of the structures. Rather, it is to give you an idea of where some of the information required to operate a spooling subsystem is kept.

4.3.1 Spooler Process Information Table (SPIT)

There is one entry in the SPIT per spooled input or output device. Each entry contains all information relating to the spooler process for that device. The entry is created and deleted at the same time as the associated spooler process. The SPIT entry contains items such as the state of the spooler (active, idle, suspended...), the ID of the spoolfile currently being processed, etc.

4.3.2 SPoolFile DIRectory (SPFDIR)

The NCS utilizes 2 spoolfile directories, the input spoolfile directory and the output spoolfile directory, generically referred to as the SPFDIR. Each SPFDIR entry contains all information relating to a particular spoolfile: its spoolid, total number of copies, copies in progress, target device or class, etc. Entries exist in the SPFDIR only while a spoolfile is linked to the spooling subsystem. After all copies of a spoolfile have been output (or the job has logged off, for input spoolfiles), the spoolfile is deleted and its SPFDIR entry returned to the available list [unless the SPSAVE option has been specified (output spoolfiles only)]. Spoolfiles which have been so "saved" by a user are actually the original spoolfiles. The user can use the :COPY or :FCOPY command to copy a saved spoolfile from OUT.HPSPOOL to his/her local file space. The copied spoolfile, which resides in user local space, is not linked to the spooling subsystem.

NOTE

Spoolfiles which have been SPSAVED will remain in the OUT group of the HPSPOOL account until they are explicitly deleted with a :PURGE or SPOOLF... ;DELETE command.



CAUTION

Now that there are explicit spoolfile directories, spoolfile information is no longer kept in the IDD and ODD. Third-party applications and unsupported utilities which access either of these CM system tables directly to perform spooling-related functions will no longer work properly and may cause system interrupts or aborts.

4.3.3 File Label Extension

An SPFDIR entry is actually the working copy of information kept in the MPE XL spoolfile file label extension (FLABX). The FLABX is the master copy of this information, and is used to rebuild the SPFDIR when the system is booted. It is this structure which allows the recovery of spoolfiles across all boots.

4.3.4 Checkpoint File

A checkpoint file is a small file associated with each output spoolfile. The output spooler saves page checkpoints and other data in it for use during recovery following a device power failure or other interruption, or when RESUMEing following a SUSPEND. There is one checkpoint file per spoolfile per

device which outputs the spoolfile. Thus if a spoolfile is directed to a class with three devices and each device prints a copy, there will be three checkpoint files. A checkpoint file is created when a spoolfile is first output on a device and can be used for rapid forward access if additional copies of the spoolfile are printed on the same device. All checkpoint file(s) are deleted when the spoolfile is deleted.

Checkpoint files exist only for spoolfiles linked to the spooling subsystem. They are not "saved" along with user copies of a spoolfile, nor are they automatically stored when an associated spoolfile is stored.

NOTE

Checkpoint files are useful only for devices which support checkpointing (such as the CIPER protocol printers), but they are created for all currently supported devices.

4.3.5 Device File

Native mode device files are the replacement of CM device tables with a native mode data structure. Device files reside in the group "DEVICES" in the account "3000devs". There is also a device file for each class. These class device files reside in the group "CLASSES" of account "3000devs". Only privileged (level-2) users can access device files.

Each device file keeps its device (or class) description in the file label and file label extensions. Security will be implemented, as it is for disc files, in a file label extension.

For details regarding native mode device files, please refer to the Native Mode Device Files External Specifications.

5.1 USER INTERFACE

For details regarding the new user interface which is part of the New Commercial Spooler (NCS), please refer to Section 6, NCS USER INTERFACE.

5.2 COMPATIBILITY SPECIFICATIONS

The compatibility specifications given here for the NCS on XL are given relative to the MPE CM Spooler. New commands and functionality extensions are separate subjects from the compatibility of previously existing commands and data. The subject of functionality extensions is described in Section 3, "PRODUCT FEATURES", and Section 6, "NCS USER INTERFACE".

5.2.1 New Error and Warning Messages

In addition to new error and warning messages to support the new functionality, there are changes in the old spooler error messages. The emphasis is to make the error and warning messages as descriptive as possible. Message accuracy takes precedence over keeping old error messages worded the same. All error and warning messages are either in SYSCAT.PUB.SYS, the NM system error message catalog, or in CATALOG.PUB.SYS, the CM system error message catalog. This allows the error and warning messages to be localized for other native languages.

5.2.2 SPOOK Utility

With the release of the New Commercial Spooler, SPOOK as a separate utility ceases to exist. Its features have been replaced as described in the following paragraphs.

5.2.2.1 Command Functionality Replacement

SPOOK commands are replaced with Command Interpreter (CI) commands. The following is a list of the old SPOOK commands and their replacements.

SHOW	:LISTSPF
PURGE	:PURGE or :SPOOLF ;DELETE
ALTER	:SPOOLF ;ALTER
INPUT	:RESTORE or use SPFXFER (utility program)
OUTPUT	:STORE or use SPFXFER (utility program)
TEXT	your favorite editor
LIST	your favorite editor or :PRINTSPF (utility program)
FIND	your favorite editor
MODE	:PRINTSPF (utility program)
COPY	:FCOPY or :COPY
APPEND	:FCOPY

Note: the SPOOK > OUTPUT and > INPUT commands are replaced by :STORE/:RESTORE when transporting NCS spoolfiles between XL systems which both support NCS. For transporting NCS spoolfiles to the MPE XL CM Spooling or MPE V/E Spooling environments, or importing V/E or CM spoolfiles to an NCS environment, the Spoolfile Transfer Utility, SPFXFER.PUB.SYS, must be used.

For further information on the new spooler command set available with NCS, see the section titled "NCS USER INTERFACE".

5.2.2.2 New Utility Name

:STORE and :RESTORE will work with NCS spoolfiles in addition to other disc files. However, a tape created with STORE/RESTORE cannot be used to input spoolfiles to an MPE V/E or CM Spooler system. Also spoolfiles output to tape with either the SPOOK or SPOOK5 utility cannot be input with the STORE/RESTORE utility.

In order to migrate spoolfiles between NCS systems and V/E and CM Spooler systems, a new utility called SPFXFER (SPoolFile tape TRANSFER) is provided. This utility transfers spoolfiles to tape with a format that is capable of being input by SPOOK on CM Spooler MITs and SPOOK5 on MPE V/E Spooler releases G.02.B0 and later. SPFXFER is able to read SPOOK tapes from any release of MPE (CM Spooler) XL, MPE V/E (including pre-G.02.B0 versions), or its own SPOOK-compatible tapes.

5.2.2.3 File Label Change

In order to support the new functions of NCS, the information stored in file labels has changed. The SPFXFER.PUB.SYS utility performs the needed file label changes transparently for the user when NCS spoolfiles are transferred to or from the SPOOK tape format.

5.2.3 STARTSPOOL Functionality

The :STARTSPOOL command works differently for device class names than it used to. Previously, if the :STARTSPOOL <device class> form of the command was used, it merely opened spooling queues for that device class. This means that any FOPEN using that device class name would generate a spoolfile. Spooling processes were not started for the actual devices in the device class. This treatment of device classes and actual devices has introduced many misunderstandings and hidden features since it does not fit the normal definition of device classes and devices.

With the NCS, device classes are treated as a group of related devices. Therefore, when a device class name is used with the :STARTSPOOL command, the command is applied to all devices that belong to that device class (as though a :STARTSPOOL command were issued for each individual device). This can have novel consequences not seen on earlier MPE releases. For example, if there are three devices in class LP and a user enters :STARTSPOOL LP, but two of the devices are already spooled, that user gets two error messages, one for each already spooled device. Meanwhile, a spooling process is created for the third device.

The :STARTSPOOL command is executed partially in CM and partially in NM. This modifies the above description because the ; SHUTQ keyword is parsed by the CM portion of the command executor before the NM portion is invoked. Thus :STARTSPOOL <device class>; SHUTQ still returns an error (and no spooling processes are started) because this syntax used to be an error under the old treatment of device classes.

Because the new Native Mode Device File (NMDF) devicenames look like a device class (they start with a letter), the CM executor returns the same error if ; SHUTQ is specified on a :STARTSPOOL <device name>.

5.2.4 STOPSPPOOL Functionality

The :STARTSPPOOL comments above also apply to the :STOPSPPOOL <device class> command (with appropriate substitutions). Basically, :STOPSPPOOL <device class> is now applied to all devices in the class rather than just a device class queue as in the past, but the ; OPENQ keyword will still fail if used with either the device class or device name form of the command.

NOTE

The spooler checks for a command after each record of the spoolfile and stops sending data to the device as soon as it detects one (unless it includes a ; FINISH keyword). However there can be a lot of data in file system and device buffers at the time, and this data will continue to print on the device until it is exhausted. Depending on the device and the composition of the data, this can be one-half page to 10 pages or more.

5.2.5 SUSPENDSPPOOL Functionality

When the CM Spooler suspended, it closed its current file and returned it to the ready list. If you later entered :RESUMESPOOL and the file was still READY (had not been selected by another spooler process), it was possible to apply the BACK or FORWARD nnn PAGES option to the file. Otherwise it was an error. Under NCS, the :SUSPENDSPPOOL command without the ; FINISH option causes the spooler process to retain ownership of its current file. Furthermore, the spooler does not cap the current file with a page eject and an (optional) trailer, but pauses output at the point of the command. [In terms of the new NCS :SPOOLER command, it is as if you had specified (or allowed by default) the ; KEEP option and did not specify a page offset].

NOTE

The spooler checks for a command after each record of the spoolfile and stops sending data to the device as soon as it detects one (unless it includes a ; FINISH keyword). However there can be a lot of data in file system and device buffers at the time, and this data will continue to print on the device until it is exhausted. Depending on the device and the composition of the data, this can be one-half page to 10 pages or more.

5.2.6 RESUMESPOOL Functionality

- The biggest change to :RESUMESPOOL functionality is the treatment of :RESUMESPOOL <ldev> with no FORWARD or BACK parameter. The CM Spooler would resume printing at the beginning of the file. The NCS resumes printing where it left off, provided that:
 - You suspended the spooler with either the :SUSPENDSPPOOL command (without the ;FINISH option) or the :SPOOLER <ldev>; SUSPEND command without the ;FINISH option and with no offset specified.

- You did not enter a `:SPOOLER <ldev>; RELEASE` command while the spooler was suspended. To illustrate, suppose logical device 6 is owned by a spooler process and you enter `:SUSPENDSPOOL 6`. (Remember that `:SUSPENDSPOOL` functionality is also modified under NCS). Also suppose that the spooler had just transmitted the 30th line of page 12. As long the above conditions hold, if you now enter `:RESUMESPOOL 6` (or `:SPOOLER 6; RESUME`), the spooler will continue by transmitting the 31st line of page 12 -- as if the suspension had never happened.

If you suspend the spooler with an offset (using the new NCS `:SPOOLER` command) or release the spoolfile after suspending (also using the new NCS command), the spooler caps the current print job [that is, ends the job after page 12, line 30, ejects page 12, and prints a trailer with "(INCOMPLETE)" on it (if trailers are enabled)]. If you later `:RESUMESPOOL 6`, the spooler prints a header with "(RESUMED)" on it (assuming headers are enabled) and resumes printing the file at the beginning of page 12 or the page specified by the offset.

- Users should experience greater accuracy when specifying a target page to resume at (as in `BACK/FORWARD n PAGES`), if the spooled device is an HP2680/HP2688 or CIPER protocol printer. However, the page count **includes the current page** in its calculation. For example, if the spooler was suspended while printing page 15, and the command `:RESUMESPOOL <ldev>; BACK 6 PAGES` is entered, printing resumes on page 9, not page 8.
- Although the NCS supports resuming at any target page, the `:RESUMESPOOL` command is still limited to a relative offset of +/- 256 pages (or resuming at the BEGINNING of the file). To resume at other locations, use the new NCS `:SPOOLER <ldev>; RESUME; OFFSET= [+/-] nnn` command.
- The FILES parameter of the BACK and FORWARD options is no longer allowed. Previously, the FILES parameter was not allowed on the HP2680/HP2688 page printer or any CIPER-protocol printer. Now it is not allowed for any printer. If you use it, a CIERR 4810 results.

5.2.7 OUTFENCE Functionality

The systemwide outfence is now set to 14 for each type of system startup, not just for START RECOVERY. Now that spoolfiles are preserved for all startups except Install, if the outfence were not set to 14, initially spooled devices could start printing spoolfiles even before the operator is logged on.

5.2.8 The DFID and the SPOOLID

The CM Spooler kept track of individual spoolfiles by assigning a unique Device File Identifier (DFID) number to each file. The NCS assigns a unique SPOOLID number to each spoolfile. SPOOLIDs are similar to DFIDs, but are not the same:

5.2.8.1 Similarities

- They both appear as the number *nnn* following the "#O" of displays, as in "#Onnn"
- A SPOOLID can be used in the `:ALTSPoolFILE` and `:DELETESPOOLFILE` commands where you formerly used a DFID.

5.2.8.2 Similarities

- SPOOLIDs can range from 1 to 99999999. DFIDs range from 1 to 32767.
- The DFID is not totally supplanted by the SPOOLID. It still exists and is applied to unspooled ("hot") input and output devicefiles such as terminals, tape drives, and unspooled printers. Only spoolfiles get a SPOOLID.
- DFIDs are still assigned by the IDD and ODD (CM tables) management routines, and hot devicefile entries are still kept in those tables. SPOOLIDs are no longer kept in the xDD, but are instead kept in the SPFDIR.
- Because DFIDs and SPOOLIDs are kept in separate tables, a DFID and a SPOOLID can have the same numeric value. For example, #O1315 can be the DFID of a terminal \$STDLIST and can also be the SPOOLID of an output spoolfile.

5.2.9 SHOWOUT functionality

:SHOWOUT (with appropriate parameters) displayed both spoolfiles and non-spoiled devicefiles. This was straightforward when their entries could all be found in the ODD. Now that SPOOLIDs are in the SPFDIR while output DFIDs remain in the ODD, command compatibility requires some restructuring of command execution.

:SHOWOUT begins in the CM command executor, where it validates syntax, and determines the selected options. If the options include displaying spoolfiles ("SP" or a wildcard option such as "JOB=@"), execution switches to an NM routine which formats and displays the spoolfiles. Execution then returns to CM, where any required DFIDs are displayed followed by the SHOWOUT summary statistics.

If the :SHOWOUT #Onnnnn form of the command is used and "nnnnn" <= 32767, an ambiguity exists because this can be a spoolid, a DFID, or both. To resolve this, SHOWOUT displays either one or both if they exist. If nnnnn > 32767 it must be a spoolid, so if it does not exist SHOWOUT displays "NO SUCH FILES", as in the past.

5.2.10 Use of Normal Files

With the NCS, spoolfiles are normal disc files and have an entry in the system directory. This makes possible several new features, one of which is recoverability of (output) spoolfiles for all system start options except INSTALL. [Job input spoolfiles have corresponding Job Master Table (JMAT) entries. Since the JMAT is still a CM table and is rebuilt for all system startups except START RECOVERY, job input spoolfiles are destroyed whenever the JMAT is rebuilt.]

Another NCS normal file is the checkpoint file. Checkpoint files are kept in several groups in the HPSPOOL account. The group names for the checkpoint files are based on the device name of the spooled device currently outputting the file. (See Appendix B.3 for details of the group name). The filename of the checkpoint files is of the form C#####, where "#####" is a string of one to seven digits.

With the CM Spooler, checkpoints were stored in spoolfile user labels. This restricted spoolfiles to a single device and to a position within 256 pages of the current position. Both limitations are removed with the NCS checkpoint file.

The user may now use normal file system commands to affect either spoolfiles or checkpoint files.

5.2.10.1 LISTF

The :LISTF command directed at the HPSPool account displays spoolfiles and checkpoint files.

5.2.10.2 LISTFILE

This new MPE command allows users to see spoolfile attributes for files with an OUTSP or INSP file code. For more details, refer to the MPE Command Reference Manual.

5.2.10.3 PURGE

The :PURGE command can now purge a non-Private output spoolfile as well as deleting its associated SPFDIR entry. If any checkpoint files exist for the spoolfile, the :PURGE command will automatically delete them also.

Job input spoolfiles cannot be purged with this command because they are linked to the JMAT. Purging them would orphan the JMAT entry. Such spoolfiles must be deleted with :ABORTJOB, as before.

Checkpoint files may also be explicitly purged by a user with proper access to files in the HPSPool account. (Refer to Appendix B for the recommended structure of the HPSPool account.) This is not usually needed nor recommended since all checkpoint files associated with a spoolfile are automatically purged along with the spoolfile after the final copy is printed (unless the spoolfile has been SPSAVED). Should a spooler process need a checkpoint file which has been accidentally purged, it will simply create a new one. The process' behavior during any recovery or SUSPEND/RESUME will then be as if this were the first copy printed by that process.

5.2.11 STORE/RESTORE functionality

NCS output spoolfiles, being normal disc files, can now be STORED and RESTORED. (Input spoolfiles are Private files, so cannot be STORED. Therefore they cannot be RESTORED either. The rest of this description applies only to output spoolfiles).

NOTE

A tape created with STORE/RESTORE cannot be used to input spoolfiles to an MPE V/E or CM Spooler system. Also spoolfiles output to tape with either the SPOOK or SPOOK5 utility cannot be input with the STORE/RESTORE utility.

The use of an auxiliary directory (the SPFDIR), and the association of each spoolfile with two accounts (HPSPool and the creator's account) and one creating user not necessarily in the HPSPool account) make this operation more complex than for non-spoolfiles. Below is a summary of some of STORE/RESTORE's rules when dealing with NCS spoolfiles. Refer to the STORE/RESTORE external specifications for full details.

5.2.11.1 STORE

- Linked spoolfiles reside in the HPSPool account but are created by users in other accounts. Normally STORE would only allow a user with SM capability or an Account Manager user of the HPSPool account to store files from the HPSPool account. This would disallow creating users

from STOREing their own spoolfiles, which is one of the major enhancements of NCS over the SPOOK utility. Therefore, STORE has been enhanced (for linked spoolfiles in the HPSPPOOL account) to allow the creating user to store his/her own spoolfiles and an account manager user to store any files created by a user of her/his account, in addition to the users which would normally be able to do so (users with SM or OP capability or an account manager user of the HPSPPOOL account).

- The ; PURGE option of STORE is supported. The SPFDIR entry for the spoolfile is deleted when the file is purged. So are any checkpoint files associated with the spoolfile.

5.2.11.2 :RESTORE

Spoolfiles have a creating user in a creating account (whom we will call MAX.HEADROOM in the following examples). The files themselves live in the OUT group of the HPSPPOOL account.

- A spoolfile successfully restored to OUT.HPSPPOOL is automatically linked to the SPFDIR and its name is changed to match the new spoolid assigned by the file management routines. This avoids potential ID and name conflicts. The SHOW=LONG option displays both the old and the new fully qualified file names.
- Files may be RESTORED to OUT.HPSPPOOL in one of three ways:
 - By restoring files which were STORED to tape from the OUT.HPSPPOOL group. This is the recommended method, since only spoolfiles should ever be in that group, so only spoolfiles will ever be RESTORED there. An SM or OP user can restore files created by any user (even if that user does not exist on the system, see below). An AM user can restore files created by any user in his/her account. Any other user can only restore files s/he created.
 - By a user logged on in OUT.HPSPPOOL who specifies the ; LOCAL keyword. This is not recommended, since non-spoolfiles in the selected fileset will also be RESTORED to that group.
 - By an SM or OP user logged on anywhere who specifies the GROUP=OUT; ACCOUNT=HPSPPOOL option. Again this is not recommended because it will also restore non-spoolfiles in the selected fileset to OUT.HPSPPOOL.
- If files are RESTORED to OUT.HPSPPOOL by a user with SM or OP capability, the existence of the creating user (MAX) in the creating account (HEADROOM) is not checked unless the CREATOR option is specified explicitly. This means the file may be RESTORED even if no MAX.HEADROOM exists on the system. This provision is to allow RESTOREing spoolfiles on a print hub for creating users which exist on other systems. (If the CREATOR option is specified but MAX.HEADROOM does not exist, the file is not RESTORED).
- An AM user can only restore spoolfiles to OUT.HPSPPOOL created by users in his/her account. ; CREATE=CREATOR will create the file creator's user (MAX in our example) if necessary.
- If an AM user restores files created by other users in his/her account, those users must have ND capability at the time of the restore or the restore will fail (because they should not be able to acquire the printer needed to print their output). Note that the AM user must have ND capability or s/he would not be able to allocate the tape drive for the RESTORE!
- The ; CREATE=GROUP and/or ; CREATE=ACCOUNT options will not create the HPSPPOOL account or any groups in it if they do not exist. Any files targeted for the HPSPPOOL account will not be restored. Since spoolfiles are associated with two accounts, HPSPPOOL and the creator's account (HEADROOM in our examples), there is an ambiguity in CREATE=ACCOUNT. Since the HPSPPOOL account should never be purged, the ambiguity is resolved by not restoring the file if the HPSPPOOL account is missing.

- Assuming that OUT.HPSPOOL exists, an SM or OP user who specifies CREATE will create the file creator's account and user (MAX.HEADROOM in our example) if necessary. The file is still restored to OUT.HPSPOOL, not to the HEADROOM account.
- Specifying ; CREATOR=<newuser>; GROUP=OUT; ACCOUNT=HPSPOOL changes only the file's account, not the creator's account. Thus if the unlinked spoolfile ABC, originally created by MAX.HEADROOM and stored from the HEADROOM account, were restored using ; CREATOR=SKIPPY; GROUP=OUT; ACCOUNT=HPSPOOL, the result would be <new spoolid>.OUT.HPSPOOL and the creator would be SKIPPY.HEADROOM.
- Any spoolfile restored to OUT.HPSPOOL which is destined for a device or class not configured on the target system is put in the PROBLM state and linked to the queue of its device or class. The queue is created if necessary. Subsequent files destined for the same device or class will also be put in the PROBLM state and linked to the same queue.

5.2.12 Spoolfile Defer State

DEFER is now a state of a spoolfile, not just the condition of a spoolfile at priority 0 as in the past. The possible states of a spoolfile include the old states of ACTIVE, READY, and OPEN, and the new states of CREATE, PRINT, DEFER, PROBLM, DELPND, and SPSAVE. (OPEN and ACTIVE apply to input spoolfiles only, READY and DELPND apply to input or output spoolfiles, and CREATE, PRINT, DEFER, PROBLM, or SPSAVE apply to output spoolfiles only). In the NCS, a spoolfile retains its priority when it is deferred but it will not print, even if that priority is above the outence. This is a new feature which enables users to see the former priorities of deferred spoolfiles. The spoolfile keeps this priority if the state is changed back to READY.

With the old spooling command :SHOWOUT, a spoolfile in the DEFERred state still displays READY,D. Use the new :LISTSPF command to see the DEFER state.

The :SPOOLF...; DEFER and :SPOOLF...; UNDEFER commands may be entered against a spoolfile in the CREATE state or PRINT state. The NCS remembers the last such command, but the state displayed by the :LISTSPF command does not change until the file is closed, either by the user process (CREATE) or the spooler process (PRINT). At that time, the file enters the DEFER or READY state (depending on which command was processed last).

NOTE

A :SPOOLF...; DEFER command entered against a file in the PRINT state causes the NCS to interrupt the spooler process currently printing the file. The spooler is directed to end its print job and return the file to NCS file management. This part of the operation continues, even if a :SPOOLF...; UNDEFER command is received before it has completed.

5.2.13 Copy numbers on banners

When the operator is separating listings, copy numbers can be used to verify that a trailer really belongs to a header. The CM Spooler prints two copies of a spoolfile with identical banners. The operator can easily think that the output is just one job, and overlook a short job in between them. With a copy number,

every copy is uniquely identified. The NCS appends the following prototype string to each line of the banner: "[<current copy> OF <total copies>]" (for example, "[2 OF 5]").

5.2.14 Total Number of Copies

The maximum total copies of a spoolfile has been increased to 65,535. For compatibility reasons, you may only specify up to 127 copies in any :FILE equation, (HP)FOPEN or :ALTSPoolFILE. To change to a total number of copies greater than 127, use the :SPOOLF...; ALTER command.

5.2.15 Spoolfile Space and Limits

Another benefit of spoolfiles being standard disc files is that management of the disc space which holds them is now much more straightforward. It is no longer necessary to configure MAX NUMBER OF SPOOLFILE KILOSECTORS; instead, the system administrator adjusts the filespace limit of the HPSPool account. Also, it is no longer necessary to specify (and adjust) spoolfile extent size to obtain large spoolfiles, because the 32-extent limit has been removed. Now each spoolfile is potentially 2 Gbytes long, just like all MPE XL disc files. The only reasons a spoolfile will be incomplete in the future is because account, group or total system disc space is exhausted or the system aborted while the spoolfile was being created. Should that happen, when the file is later printed the header and trailer will each have "(INCOMPLETE)" appended to each line.

5.3 SECURITY SPECIFICATIONS

5.3.1 File Security

A modified MPE file system security is enforced on linked spoolfiles (that is, those with entries in the spoolfile directory) at all times. If the MPE Security product is installed, it is applied to spoolfiles and devicefiles. (Standard file system security, with optional MPE Security product security, is enforced on unlinked spoolfiles, as it is with all ordinary disc files.) The modification to MPE file system security comes about because a spoolfile is placed in the reserved HPSPool account, yet it should be accessed by existing MPE V/E spoolfile control commands (:ALTSPoolFILE, :DELETESPOOLFILE) and NCS commands as if it were in the account of the user who created it. This user is called the creating user for the rest of this section. Also, from here on all spoolfiles are assumed to be linked.

5.3.1.1 Non-Private Spoolfiles

The following ordered set of rules governs access to non-Private spoolfiles:

- The console user or any user with SM capability can access any spoolfile on the system. A user who has :ASSOCIATED herself or himself to a device class can access and control any spoolfile whose destination device is in that class. Such a user can read, write, delete, append to, or change the attributes of a spoolfile, using either NCS commands and intrinsics or standard MPE commands and intrinsics.
- A user with AM capability has the same rights over any spoolfile whose creating user is in the same account.
- A creating user has the same rights over any of his/her spoolfiles.

- The last check is standard MPE file security. Again, the access modes available to a given user determine what that user can do with the file.

Non-Private spoolfiles may be :STOREd and :RESTOREd by any user who has read access to them. Write access is required to use the ;PURGE option of :STORE.

5.3.1.2 Private Spoolfiles

If the Private option is specified at HPFOPEN time, the resulting spoolfile will be Private. This is implemented as an MPE Privilege Level 2 file, which means that MPE commands (such as :PURGE and :PRINT) which must open the file will fail. So will the FOPEN intrinsic, which has no level option and therefore opens all files at Level 3. The HPFOPEN intrinsic (specifying the Level 2 option) will only be able to open the file if it is called from a program which has been LINKed at Level 2 and which is running at Level 2 at the time of the intrinsic call. Thus, Level 3 programs such as FCOPY or one's favorite editor will not be able to open a Private file.

The :SPOOLF ..;ALTER command uses the same ordered set of rules as for non-Private spoolfiles to determine who may access a Private spoolfile. However, the functions available in the command are restricted (with one exception) to altering the file's priority, deleting it or deferring it. In particular, :SPOOLF ;ALTER will not allow any user to ;SPSAVE the file, or change the number of copies.

The exception of the previous paragraph is that the user with SM capability is able to change the target device. This is a bailout mechanism if the intended device is unavailable (say, because it is broken), an appropriate substitute device is available, and the output cannot wait for the original device to become available once more.

Neither private output spoolfiles nor input spoolfiles may be :STOREd or :RESTOREd by any user.

5.4 INSTALLATION INSTRUCTIONS

The New Commercial Spooler is bundled with the Fundamental Operating System (FOS).

5.4.1 Base Product Installation

The NCS is installed on the MPE XL operating system with an INSTALL or UPDATE. No other installation procedures are needed for the base product.

5.4.2 Device Configuration

Device configuration is not really part of the installation of the New Commercial Spooler product; however, there are some new extensions to device configuration that are applicable to spooling. Please refer to the System Configuration Manual for more details on the actual steps for configuring a device.

Plotting devices that are connected directly to the SPU via RS-232 interface can be configured using the Node Management Manager Configuration Utility, NMMGR.PUB.SYS. Please refer to the NS 3000/XL Network Manager Reference Manual and the Asynchronous Serial Communication System Administrator Reference Manual for more details.

5.5 RELIABILITY/RECOVERABILITY SPECIFICATIONS

5.5.1 STORE/RESTORE

The input and output of spoolfiles is now more reliable. With the CM Spooler, if the device or class specified in the spoolfile could not be located on the target system, the spoolfile was not imported. This restriction is removed for the NCS. If the device or class of a spoolfile cannot be found, the spoolfile is imported but placed in the PROBLM state. The operator can then change its device or class, or take some other appropriate action.

5.5.2 Device Recovery

The NCS uses all available device features to aid in device recovery, either automatically (following a device power failure) or manually by an operator (for example, when using the :SPOOLER...;RESUME command).

- HP256x printers connected via HP-IB obey the CIPER protocol. This is the most robust recovery protocol available on HP devices. As part of the protocol, the printer takes a "snapshot" of its operating state (called a checkpoint) every time it reaches the top of a physical page. The NCS stores these checkpoints in a checkpoint file. If a device power failure occurs or a :RESUMESPOOL or :SPOOLER...; RESUME is required, the NCS retrieves the appropriate checkpoint and transmits it to the device, thus restoring the device's state as of that checkpoint. The NCS then starts silent running just before that point (not at the beginning of the file). When the desired checkpoint is reached, the printer begins printing automatically. The difference between this type of recovery and that used for the HP2680 and HP2688 (described next) is that the time spent in silent run mode is usually very small.

If a VFC (Vertical Forms Control) image is part of the environment specification for a CIPER printer, the printer is unable to store all of that image in its checkpoint. It is therefore impossible to restore the full state of the device from any checkpoint after the VFC image was transmitted. In these situations, it is necessary to silent run from an earlier checkpoint. Since VFC images are usually transmitted at the beginning of an output file, this is tantamount to silent running from the beginning.

- The HP2680 and HP2688 page printers also support silent running to a specified recovery page, however they do not return periodic checkpoints. This forces the NCS to silent-run the device from the beginning of the file. The printer interprets all the information (including re-establishing any printing environment) but prints nothing until the NCS reaches the desired page. At that point the printer automatically begins printing with no explicit command from the NCS. Note that if the target page number is high, there may be an appreciable delay while earlier pages are being skipped.
- A serial printer has no feedback mechanism to notify the NCS of its page location; indeed many such printers don't know or remember anything about page boundaries. For these printers, NCS services (namely the serial printer storage manager) must make assumptions about pages based on data in the spoolfile. Output on such devices may not resume at the correct page boundary, or the page boundary may be shifted from its original position in the data, or both. Even this is only applicable to ; RESUMEing a file. There is no recovery from device power failure because there is no provision to return that status through the DCC (Avesta), even for devices which report it.

A full discussion of pages is given in the description of the :SPOOLER command.

5.5.3 Spoolfile Recovery

Now that spoolfiles are permanent disc files, spoolfile recovery is no more complicated than that of other disc files. This is true for both output and input spoolfiles. Output spoolfiles are preserved for all system startups except INSTALL, but input spoolfiles are only recovered on a START using the RECOVERY option. This is because input spoolfiles are associated with Job Master Table (JMAT) entries which are only recovered during a START RECOVERY. The spoolfile directories are rebuilt for all such startups from information kept with each spoolfile.

If the startup follows an unscheduled system interruption such as a system abort, any copies of spoolfiles in the PRINT state when the interruption occurred are recovered and started afresh. All spoolfiles in the DELPND state are deleted.

If the system is booted with the NORECOVERY option of the START command, an apostrophe (') is inserted between the J or S and the job number in each spoolfile's associated job/session number. For instance, J3473 becomes J'3473. This is to indicate that the job session number was not generated from the current system job/session counters, since the NORECOVERY option resets these counters to 1. Note that there are other circumstances under which an apostrophe is added to a spoolfile's job number, such as when the spoolfile has been RESTORED from tape.

Spoolfiles which are in the CREATE state when a system interruption occurs are obviously incomplete. The NCS attempts to recover them when the system is rebooted. Since transaction management is not used when creating spoolfiles, it is likely that some of the data written to such spoolfiles will not be recovered. Without transaction management, the recovery algorithm can only work with the part of the spoolfile successfully written to disc. Records of the spoolfile are written to consecutive virtual addresses, but are not flushed to disc until memory pressure forces them out of main memory, or until they can be posted to disc via background writes. Therefore, the fact that an application wrote a record to a spoolfile does not mean that the record made it to disc before the system interruption occurred.

Another aspect of recovery is that (except for serial printers) the NCS retains output spoolfiles until the device positively notifies the spooler that physical output is complete (paper is in the output station) and error free.

5.5.4 Checkpoint File Dependence

The NCS now stores printer checkpoints (CIPER protocol devices only) in regular files. Checkpoint files, which are created even for non-CIPER protocol devices, are kept in several groups in the HPSPool account. The group names for the checkpoint files are based on the device name of the spooled device currently outputting the file. (See Appendix B.3 for details of the group name). The filename of the checkpoint files is of the form C#####, where "#####" is a string of one to seven digits.

Checkpoints were previously stored in user labels for the spoolfile. This restricted spoolfiles to a single device and to a position within 256 pages of the current position. Both limitations are removed with the NCS checkpoint file.

Checkpoint files may be explicitly purged by a user with proper access to the file. (Refer to Appendix B for the recommended structure of the HPSPool account.) This is not usually needed nor recommended since the spooler process which prints the final copy of a spoolfile also deletes all the associated checkpoint files. Should a spooler process need a checkpoint file which has been accidentally purged, it will simply

create a new one. The process' behavior during any recovery or SUSPEND/RESUME will then be as if this were the first copy printed by that process.

5.5.5 Job Recovery

When the system is booted with the NORECOVERY option of the START image, or the UPDATE or INSTALL image is used, any entries in the Job Master Table (JMAT) are lost because the table is rebuilt. Since input spoolfiles have a 1:1 association with JMAT entries, input spoolfiles are also not recovered on such a boot.

If START RECOVERY is specified, any job which was completely STREAMed or input spooled, but which had not logged on prior to the system interruption, is recovered. So are any jobs which had logged on but whose :JOB statement contained the RESTART option. The \$STDIN spoolfiles for these jobs are therefore also recovered. All previously ACTIVE input spoolfiles (:JOB and :DATA) are deleted, since they were being created and hence are not complete. All non-ACTIVE :DATA files are recovered.

5.6 LOCALIZABILITY SPECIFICATIONS

5.6.1 Native Language Data

The New Commercial Spooler acts as a buffering system. It takes data that is output to or input from a spooled device and holds it until the system can process it. The NCS does not act upon or change the data in any way. Therefore, there are no NCS issues regarding native language data.

Any native language data issues lie in the area of storage managers or I/O drivers which control native language peripherals. These modules must be written to support the native language peripherals that will be available on the HPPA line of commercial systems. Such issues are beyond the scope of this ES.

5.6.2 Localizable User Interface

All the new spooling commands use the MPE XL scanner/parser and the message catalog. Using the scanner/parser allows a Country Software Center to localize the command set and all error, warning and informational messages.

In addition, all spooler process error and warning messages are placed in the native mode system catalog SYSCAT.PUB.SYS, again to allow customization by the various Country Software Centers.

This section describes the new command set provided by the New Commercial Spooler (NCS). Also included are existing user commands which are being enhanced to support the new functionality.

6.1 DESCRIPTION OF FEATURES

Today's CM Spooler was first developed in the early 1970's. It was designed for the HP3000 of that period - a small mini-computer, supporting a limited number of users with limited data processing and printing needs. Over the years, the original spooler has undergone a number of revisions and enhancements: new device support was added, the user interface grew and changed, and it was ported to MPE XL.

The HP3000 series 900 of the late 1980's is, however, a very different machine. The need of our current users is for a more powerful spooler. The size of the HP3000 series 900 demands that the spooler be able to handle more data - faster and more efficiently. The spooler has to be more easily extensible to handle new devices easily as the rate of technological development increases throughout HP.

This section discusses how the New Commercial Spooler will provide a simpler, more integrated user interface.

6.1.1 LDEV/Device Name/Device Class

In earlier versions of MPE, devices were known to users as Logical DEVICES, or LDEV's. Each device was configured with a unique LDEV number and then the LDEV number could be specified by a user to designate a particular device. Along with the New Commercial Spooler, the native mode device file has also been provided by the NM file system group. On MPE XL 2.1, some devices can be configured with an optional device name. A device name is an alphanumeric string of up to 8 characters. Using the device name is equivalent to using the LDEV number of the device.

A device class is a related set of similar devices. The concept of a device class allows a user to perform an operation on a set of devices with a single command. If we want to invoke the same spooling controls on three different printer devices, we could create a device class that contains the LDEV numbers or device names of these three printers. Then, we could issue the spooling command using the device class name. This is equivalent to issuing the spooling command three times, once for each printer.

6.1.2 New Command Set

The user interface commands that affect spooling have two major functions:

- Control Spoolfiles.
- Control Spooler Processes (spooled devices).

Users can perform eight functions to control files: Create, list, print, alter, browse, copy, rename, purge. Users generally would like to perform the same eight functions on spoolfiles. The New Commercial

Spooler has made spoolfiles into regular, visible files - just like any other file the user might create or access.

The above 8 functions are now available to the spoolfile user with the same commands s/he would use to manipulate any other file. The `:BUILD`, `:FILE`, `:COPY`, `:LISTF`, `:RENAME` and `:PURGE` commands are enhanced to support spoolfiles.

Spoolfiles, even as files, still have one major difference from regular files: At any given time, there are generally multiple files vying for the attention of a single process, associated with a single device. A computer system has, at any particular time, a pool of spoolfiles available. The pool may have anywhere from zero to hundreds of spoolfiles, but it is fundamentally just a group of files which need to be processed for either input or output spooling.

For backward compatibility, the default order in which spoolfiles are sent to a particular spooled device is the same as that on versions of MPE before the New Commercial Spooler's release. The order is based on output priority of the spoolfile and then the time the spoolfile became `READY`.

Spooler processes are always associated with (manage) a specific device. Thus when the user enters `:STARTSPOOL 6`, what s/he has really specified is: Create and activate an output or input spooler process to own and manage logical device 6. This command actually controls a process - not a device.

Commands usually reference the device instead of the process because the device is more readily known to the user. For example, if a user wants to print a file on device 6, s/he knows the nature of device 6. S/he most likely does not know how to identify the spooler process that is controlling device 6, but there is no need for her/him to. Instead s/he executes a command to find the spooler process associated with device 6. Once the spooler process is found, the command communicates what is to be done to device 6 and the spooler process does as requested. The system operator can control spooler processes with the `:SPOOLER` command.

Spooler commands can also reference a device class. For example, the user can print to device class `LP` which has several devices configured in it. To control a group of spooled devices, the `:SPOOLER` command can be used with a device class name.

6.1.3 Compatibility

The new commands provide all the functionality of the old command set and are used to expose new features. The new commands have no impact on the old command set.

The existing command set is still available. Any command which can be executed today will continue to be executable with the syntax and function it has today, except where an existing command has been expanded and taken into the New Commercial Spooler command set.

The Spook utility as it exists today is no longer supported. The tape transport facility of Spook is now provided by a SPoolFile TransFER utility, `SPFXFER`. `SPFXFER` reads Spook-created tapes into the NCS environment and writes NCS spoolfiles to tape in Spook format for transport to CM Spooler and MPE V/E systems.

NOTE

Spoolfile transport is not supported to and from pre-MPE V/E systems.

Another program, Printspf, displays the contents of (non-Private) spoolfiles in a manner similar to Spook with the Mode Control=On option enabled. Printspf is described in Appendix D.

6.1.4 Error Handling

All spooler error messages have been placed in the native mode catalog and are accessible by the MPE XL error management intrinsics.

All spooler statuses that may be returned to an external user have error messages in the catalog numbered according to the returned info part of the error status. Users can call the MPE XL error management intrinsics to either print the error, or to retrieve it in a buffer for further manipulation.

6.1.5 Native Mode Device Management

System default information for spoolfiles is handled by Native Mode Device Management. An interface is provided to set and retrieve characteristics such as the default output priority, the default output device/class, the default banners, the default queuing mechanism, etc. For more information, see the Native Mode Device Management External Specifications document.

6.1.6 Tape Management

Store/Restore is used to provide a spoolfile backup and transport mechanism for the New Commercial Spooler.

6.2 COMMERCIAL SPOOLER COMMANDS

6.2.1 :BUILD Command

SYNTAX

```

BUILD  filereference1
      [;REC=[recsize][,[blockfactor][,[ F | U | V ]
      [ ,BINARY | ASCII ]]]]
      [;CCTL | ;NOCCTL]
      [;TEMP]
      [;DEV=[dsdevice]#[device]]
      [;CODE=filecode]
      [;DISC=[numrec[, [numextents[, [initalloc]]]]]
      [;RIO | ;NORIO]
      [;MSG | ;CIR | ;STD | ;KSAMXL | ;SPOOL]
      [;ULABEL=numlabels]
      [;KEY=filereference2|keyinfo]
      [;FIRSTREC=recnum]
      [;REUSE | ;NOREUSE]
      [;LANG = langid | langname]

```

DESCRIPTION

The :BUILD command has been rewritten in native mode, but will remain compatible; any command variant which can be entered today will continue to function. This description is limited to listing the new keywords and parameters, and the detailed parameter description which follows shows only those parameters which have been added or changed to support the New Commercial Spooler. For a complete description of the command, see the MPE XL Commands Reference Manual.

The functionality of the :BUILD command has been extended. Eight new parameters have been added: ;SPOOL, ;KSAMXL, ;KEY, ;LANG, ;LABELS, ;FIRSTREC, ;REUSE, ;NOREUSE. The ;SPOOL option is the only new parameter that directly affects the spooler. Spoolfiles cannot be TEMP files. (The TEMP option will be ignored if it is specified). The SPOOL option is required to generate a spoolfile. However, the spoolfile will not be linked into the spooler queues, and therefore will not be printed unless the :SPOOLF command's PRINT option is invoked upon it.

The remaining seven new parameters have been added to support KSAM/XL. All KSAM/XL specific information will be stored in a file label extension. The ;LABELS option is supported for any type of file.

Parameter Definitions

filecode

A code indicating a particular kind of file. This code is recorded in the file label and is available to processes accessing the file through the **FFILEINFO** or **FGETINFO** intrinsic. Although any user can specify a positive integer ranging from 0 to 32767 or mnemonic name for this parameter, certain reserved integers and mnemonics have particular system defined meanings. The list which follows shows only the new NCS filecodes.

Integer	Mnemonic	Meaning
1515	INSP	Input Spoolfile
1516	OUTSP	Output Spoolfile
1517	CHKSP	Output Spoolfile Checkpoint file

Default is the unreserved file code of 0.

STD,MSG,CIR, KSAMXL,SPOOL

Defines the type of file. The default, **STD**, is a standard MPE disc file.

SPOOL specifies an output spoolfile which is not linked to the spoolfile directory (**SPFDIR**) and, therefore, will not be printed. No spooling attributes are initialized. This means that if this file is ever linked to the **SPFDIR** with the **:SPOOLF ;PRINT** command, all attributes will be set at that time according to the rules of that command.

Example:

```
:BUILD MYSPPOOL;DISC=3000,1,1;CODE=OUTSP
:PRINT DOCFILE.MYGROUP.MYACCT, MYSPPOOL
```

At some later point in time, to send this file to a printer, simply use the following command:

```
:SPOOLF IDNAME=DOCFILE.MYGROUP.MYACCT; PRINT; DEV=LP
```

This links **DOCFILE** to the **SPFDIR** using the default **PRI** (8) and number of copies (1). Note that the **DEV=** parameter is required in this context to link the spoolfile to a target device. Failure to specify **DEV=** (or specifying an inappropriate **DEV** such as a disc) results in an error message.

6.2.2 :COPY Command

SYNTAX

```
COPY    [FROM=]sourcefile  
        [[;TO=]targetfile]  
        [;ASK | ;YES | ;NO]
```

DESCRIPTION

This description is limited to the changes to the :COPY command which support the New Commercial Spooler. For a complete description of the command, see the MPE XL Commands Reference Manual.

The :COPY command remains syntactically the same as it currently is on MPE XL. The functionality is extended to allow the copying of non-private, output spoolfiles. The newly created file is not linked to the spooler.

6.2.3 :FILE Command

SYNTAX

```
FILE formaldesignator =
    [ $NULL | $NEWPASS | $OLDPASS |
      $STDIN | $STDINX | $STDLIST |
      filereference[,filedomain]]
    [;DEV=[[envname]#][device][,outpri][,numcopies]]
    [;VTERM]
    [;ENV=[envfile[:nodespec]]]
    [;option]
    [;access]
    [;disposition]
```

DESCRIPTION

The :FILE command declares the file attributes to be used when a file is opened. This declaration, informally known as a file equation, may be used to override programmatic or system default file specifications.

This command allows the user to change specifications for files at run time, including the devices on which they reside, overriding specifications supplied via the FOPEN or HPFOPEN intrinsic. The :FILE command remains in effect for the entire job or session unless revoked by the :RESET command or superseded by another :FILE command.

This description is limited to listing the new keywords and parameters, and the detailed parameter description which follows shows only those parameters which have been added or changed to support the New Commercial Spooler. For a complete description of the command, see the MPE XL Commands Reference Manual.

New keywords have been added to the :FILE command to support both the KSAM/XL project and the New Commercial Spooler.

Four new features were added to support the New Commercial Spooler: ;SPOOL, ;PRIVATE, ;FORMID and ;SPSAVE. To support KSAM/XL, seven new keywords were added: ;KSAMXL, ;KEY, ;LANG, ;LABELS, ;FIRSTREC, ;REUSE, ;NOREUSE.

Parameter Definitions

option

Any valid option for the :FILE command.

SYNTAX FOR OPTION

```
[;REC=[recsize][,[blockfactor][,[ F | U | V ][,BINARY | ASCII ]]]]
[;DEN=[density]]
[;DISC=[numrec[,[numextents[,[initalloc]]]]]
[;CODE=filecode]
[;RIO | ;NORIO]
[;MSG | ;CIR | ;STD | ;KSAMXL | ;SPOOL]
[;ULABEL=numlabels]
[;KEY=^filereference2|keyinfo]
[;FIRSTREC=recnum]
[;REUSE | ;NOREUSE]
[;LANG=langid | langname]
```

Parameter Definitions

filecode

A code indicating a particular kind of file. This code is recorded in the file label and is available to processes accessing the file through the FFILEINFO or FGETINFO intrinsic. Although any user can specify a positive integer ranging from 0 to 32767 or mnemonic name for this parameter, certain reserved integers and mnemonics have particular system defined meanings. The list which follows shows only the new NCS filecodes.

Integer	Mnemonic	Meaning
1515	INSP	Input Spoolfile
1516	OUTSP	Output Spoolfile
1517	CHKSP	Output Spoolfile Checkpoint file

Default is the unreserved file code of 0.

*STD,MSG,CIR,
KSAMXL,SPOOL*

Defines the type of file. The default, STD, is a standard MPE disc file.

SPOOL specifies an output spoolfile which is not linked to the spoolfile directory (SPFDIR) and, therefore, will not be printed. No spooling attributes are initialized. This means that if this file is ever linked to the output SPFDIR with the :SPOOLF ;PRINT command, all attributes will be set at that time according to the rules of that command. Use of this option forces the ;SAVE disposition, overriding any user-specified disposition.

Example:

```
:BUILD MYSPool;DISC=3000,1,1;CODE=OUTSP
:PRINT DOCFIL.MYGROUP.MYACCT, MYSPool
```

At some later point in time, to send this file to a printer, simply use the following command:

```
:SPOOLF IDNAME=DOCFILE.MYGROUP.MYACCT; PRINT; DEV=LP
```

This links DOCFILE to the SPFDIR using the default PRI (8) and number of copies (1). Note that the DEV= parameter is required in this context to link the spoolfile to a target device. Failure to specify DEV= (or specifying an inappropriate DEV such as a disc) results in an error message.



SYNTAX FOR ACCESS

```
[;CCTL | NOCCTL ]
[;ACC= [ IN | OUT | UPDATE | OUTKEEP | APPEND | INOUT ]
[;BUF=[numbuffers] | ;NOBUF ]
[;EXC | ;SHR | ;EAR | ;SEMI ]
[;NOLABEL | ;LABEL=[valid][,[IBM|ANS][,[expdate][,seq]]]]
[;NOMULTI | MULTI | GMULTI ]
[;NOMR | ;MR ]
[;WAIT | ;NOWAIT ]
[;LOCK | ;NOLOCK ]
[;COPY | ;NOCOPY ]
[;FORMS=formsmsg ]
[;FORMID=<formid>]
[;PRIVATE]
[;SPSAVE]
```

Parameter Definitions

formid

Applies only to output spoolfiles. A string of up to 8 alphanumeric characters, beginning with a letter, which uniquely identifies a special form which is to be mounted. A message displaying this *formid* is printed on the System Console or \$STDLIST of the ASSOCIATED user of the spooled device. The spooler process then awaits verification that the special forms have been mounted before printing the file for which the *formid* was specified. The default is that no *formid* or message is displayed.

This parameter has been added to support the New Commercial Spooler.

PRIVATE

The **PRIVATE** option generates a spoolfile which may be accessed in privileged mode only. This means that the file is not accessible to normal users on the system. Private spoolfiles may not be saved or copied. They may only be purged, printed, or (within limits) altered by using the :SPOOLF command instead of using :PURGE, or :COPY commands. (See Section 5.3.1.2.)

SPSAVE

If this parameter is used, the resulting spoolfile is created with **SPSAVE** disposition. This means the spoolfile is not to be purged after the last copy of it has been printed, but is instead retained in the OUT.HPSPOOL account.

PRIVATE spoolfiles cannot be SPSAVED.

6.2.4 :JOB Command

SYNTAX

```
JOB [jobname,]username[/userpass].acctname
    [/acctpass][,groupname[/grouppass]]
    [;TIME=cpusecs]
    [;PRI= BS | CS | DS | ES]
    [;INPRI=inputpriority | ;HIPRI]
    [;RESTART]
    [;OUTCLASS=[device][,outputpriority[,numcopies]]]
    [;TERM=termtype]
    [;PRIVATE]
    [;SPSAVE]
```

DESCRIPTION

The Job command initiates a batch job, establishing contact with MPE XL. When MPE begins the job, it displays the following information on the list device:

- Job Number, as assigned by MPE, to identify the job.
- Date and time.
- "HP 3000", and the modified and base MPE *version.update.fix* numbers.

The :EOJ command is used to terminate or end the job. The only alternative exits from a job are an error flush or an ABORT. An error flush stops the completion of the job at the point the error occurred.

Two new parameters, ;PRIVATE and ;SPSAVE have been added to the :JOB command to support the New Commercial Spooler. The detailed parameter description which follows shows only those parameters. For a complete description of the command, see the MPE XL Commands Reference Manual.

Parameter Definitions

PRIVATE

The *PRIVATE* option forces the job output \$STDLIST to be a private file. The file is only accessible to privileged users on the system. Private spoolfiles may not be saved or copied. They may only be purged, printed, or (within limits) altered. See Section 5.3.1.2.

SPSAVE

If this option is used, the resulting job output \$STDLIST spoolfile is created with SPSAVE disposition. This means the spoolfile is not to be purged after the last copy of it has been printed, but is instead retained in the OUT.HPSPOOL account.

NOTE

The parameters, **PRIVATE** and **SPSAVE**, are mutually exclusive.

6.2.5 :LISTEQ Command

SYNTAX

```
LISTEQ [listfile]
```

DESCRIPTION

The :LISTEQ command displays all active :FILE equations for a job or session. The command remains syntactically and functionally the same as it currently is on MPE XL. The output is extended to display the new parameters to the :FILE command.

6.2.6 :LISTFILE Command

Please refer to MPE XL Command Reference Manual for detail description on this new command.

6.2.7 :LISTSPF Command

SYNTAX

```
LISTSPF  [[IDNAME=] spoolid | (spoolid [,spoolid] ....) ]
          [[;SELEQ=] [ select-eq ] | ^indirect_file]
          [;DETAIL | ;STATUS]
```

DESCRIPTION

The :LISTSPF command produces a listing of spooled files, both input and output. The command is provided to enable users to obtain a list of spoolfile information without having to look for it within a list which includes other files. The current :SHOWIN and :SHOWOUT displays do not provide as much information as one might like but cannot be changed for compatibility reasons.

The display for :LISTSPF is different from the SHOWIN/SHOWOUT display. :LISTSPF displays both output and input spoolfiles. The display shows output spoolfiles then input spoolfiles and finally a summary status display.

The parameters are divided into three groups: selection, detail and status.

The selection group allows a user to limit the display of spoolfiles to a subset of the overall group of spoolfiles on the system.

The detail parameter displays more than the default information on the files which have been selected.

The status parameter, when used without other parameters, displays summary status only.

Except for the STATUS parameter, which is ignored if entered with any other parameter, these parameters can be combined as desired.

Parameter Definitions

spoolid

One or more spoolfile IDs, (*#Innnn* for input spoolfiles or *#Onnnn* for output spoolfiles). These IDs are assigned by the spooling subsystem at spoolfile creation time. The "#" is optional. So is the "O" if you are displaying output spoolfiles, that is, if neither [#]O nor [#]I is specified, then [#]O is assumed.

The symbol "@" may be used to specify all spoolfiles.

The symbol "O@" may be used to specify all output spoolfiles.

The symbol "I@" may be used to specify all input spoolfiles.

If @, O@, or I@ is specified, it must be the only value supplied. @, O@, and I@ are mutually exclusive.

The default is all the spoolfiles created by the current <user>.<account>.
The default spoolid for the console user is all the spoolfiles on the system.

NOTE

If duplicate spoolids are specified, a warning message is displayed.

select-eq

The selection equation is used as a filter on the set of spoolfiles selected. Only spoolfiles whose attributes satisfy all filter requirements will be listed.

Selection equations have the following format, displayed in a pseudo-BNF (Backus-Naur Form) grammar :

NOTE

A selection equation must begin with "[" and end with "]". These have been underlined on the :LISTSPF command syntax diagram to show that they are required.

```

<select-eq> ::= [ <equation> ]

<equation>  ::= <condition>          |
                ( <equation> )      |
                NOT <equation>      |
                <equation> <lop> <equation>

<lop>       ::= AND |
                OR
    
```

NOTE

AND takes precedence over OR.

```

<condition> ::= <parm> <rop> <value>

<parm>      ::= The parameter (PARM) may be one of
                  the following attributes of the
                  spoolfile to be altered/deleted:
    
```

DEV Ldev number, device name, or device class name. Wildcarding is supported for device name and device class name. For further details refer to NATIVE MODE DEVICE FILES ES.

FILEDES Formal file designator for the spoolfile. For example, if you enter the file equation below and print to it, "EPOCLONG" will be the spoolfile's FILEDES.

```
:FILE EPOCLONG;DEV=EPOC;ENV=LPLONG.ENV.SYS
```

```
:PRINT MYFILE,*EPOCLONG
```

Wildcarding is supported.

SPOOLID Spoolfile identifier number in the format #Onnnn or #Innnn. The '#' is optional. 'O' is also optional for output spoolfiles, i.e. 123 = #0123. The valid range of spoolids is from 1 to 9999999.

Limited wildcarding is supported:

The symbol "@" may be used to specify all spoolfiles.

The symbol "O@" may be used to specify all output spoolfiles.

The symbol "I@" may be used to specify all input spoolfiles.

PAGES Number of pages in spoolfile (if known). A positive integer number is expected.

NOTE

This attribute does not apply to input spoolfiles, therefore any logical <condition> involving the attribute always returns FALSE when tested against an input spoolfile. For more details regarding the handling and comparison of attributes which do not apply to one or the other type of spoolfile (input or output), see Handling of Non-Applicable Attributes in Appendix A, Selection Equations.

FORMID Form name. Wildcarding is supported. (The formid is an ASCII string up to 8 characters. The first character must be a letter). See the NOTE accompanying the PAGES description.

STATE READY, ACTIVE, OPEN, CREATE, PRINT, PROBLM, DELPND, SPSAVE, DEFER.

JOBNAME	Job or session name. This is the job name under which the spoolfile was created. The job name can be up to 8 alphanumeric characters, the first of which must be a letter. For job input spoolfiles the JOBNAME and JOBNUM shown are those allocated to that job, NOT those of the job or session which STREAMEd it. Wildcarding is supported.
DISP	Disposition, SPSAVE or PURGE. See the NOTE accompanying the PAGES description.
COPIES	Number of copies (max=65535, min=1). See the NOTE accompanying the PAGES description.
PRI	Output priority (max=14, min=0) or input priority (max=14, min=1). See the NOTE accompanying the PAGES description.
JOBNUM	Job/Session number under which the spoolfile was created, for example, #S257 or #J329 ("#" optional). The limits are 1 and 16,383. Limited wildcarding is supported. J@ accepts all jobs, S@ all sessions.
RECS	Number of records in the spoolfile. A positive integer is expected.
OWNER	The user under which the spoolfile was created. The format of the OWNER is <user>.<account>. If the account is not specified, the user's current account is assumed. Wildcarding is supported.
JOBABORT	Select based on whether this is the \$STDLIST of a job which aborted when an error was encountered but no "CONTINUE" was in effect. Valid values are "TRUE" and "FALSE". Only "=" and "<>" are allowed as relational operators. See the NOTE accompanying the PAGES description.
DATE	Creation date in the format mm/dd/yy or mm/dd/year. Note that the year can be in the form of 'yy' or 'year', i.e. 10/10/88 or 10/10/1988 are both legal syntax for the DATE parameter.
<rop>	::= > >= < <= <> =

NOTE

For string types other than DATE (e.g., user name), only the relational operators '=' and '<>' are applicable. Using any others will result in an error.

<value> ::= Appropriate values per data type.

indirect_file

Specifies the name of a file containing the selection equation. It must be preceded by a caret ("^"). The selection equation contained in the file may not exceed 277 characters in length, including the brackets in which it must reside. There is no restriction on the indirect file code. If the record size exceeds 277, only 277 characters per record are read and a warning is issued. Backreferencing to a formal file designator is also allowed for an indirect_file name. i.e. ^*filename is also allowed. Any file will be accepted as an indirect_file, unless the file system returns an error from FOPEN, or FREAD.

NOTE

There is no limit to the number of records in the indirect_file, only the total character count. Records are processed as follows: Leading and trailing blanks are stripped. If the last non-blank character is an ampersand ("&"), it too is stripped, otherwise one blank is added back to the end of the record as a delimiter. If the character count of this record plus those processed previously exceeds 277, an error is returned. If not, the current record is appended to previous records and the process repeats until either 277 characters have been counted or the end-of-file is detected. Records terminating with or without ampersands may be mixed as desired in the indirect file.

If the resulting string is <= 277 characters it is parsed. If the parser detects a syntax error or if any non-blank character follows the closing "]" of the seleq, an error is returned and the seleq is not processed.

DETAIL

Produces a two line description of the specified spoolfile(s). The default is a one line display (not DETAILED).

STATUS :LISTSPF, by default, displays a listing of selected spoolfiles, followed by a statistical summary of those spoolfiles, known as the STATUS display.

Specification of the STATUS option with no other parameters causes only the STATUS summary to be displayed. The STATUS option is ignored (and status is displayed after the spoolfile listing) if it is used in combination with any other parameters.

USE

This command may be issued from a Session, Job, in BREAK, or from a Program. It is Breakable. Only files to which the user has access are displayed.

OPERATION

This command displays status information for one or more spoolfiles. The information reflects the status at the time the command is entered and always appears on the standard list device. The selected spoolfiles are sorted for display by the following keys (listed in descending order of importance): priority, date and time, and device class. Output spoolfiles are displayed first, followed by input spoolfiles and the status display.

The first line of the display for :LISTSPF has the following format :

SPOOLID	JOBNUM	FILEDES	DEV	PRI	COPIES	STATE	RSPFN	OWNER
#O1234567	J12345	ABCDEFGH	12345678	14	1	CREATE	RSPFN	THISUSER.ACCOUNT1
#I	S		ABCDEFGH	1	127	READY		
				0		ACTIVE		
						OPEN		
						PRINT		
						DEFER		
						SPSAVE		
						PROBLM		
						DELPND		

Field and Description:

SPOOLID	The unique spoolfile identifier.
JOBNUM	The job or session identifier of the job or session which created the spoolfile. The exception to this is that the JOBNUM for a :JOB input spoolfile is the job number assigned the process whose \$STDIN <u>is</u> (or <u>will be</u>) this input spoolfile, as opposed to the JOBNUM of the process which STREAMed the job.
FILEDES	The formal file designator for the spoolfile. Printing to a file equation such as :FILE EPOCLONG;DEV=EPOC;ENV=LP88LONG.HPENVSYS creates spoolfiles whose formal designator is "EPOCLONG".
DEV	The LDEV, device name or device class name that is the destination of the spoolfile.
PRI	The input or output priority of the spoolfile.
COPIES	The total number of copies of the spoolfile to be printed.
STATE	The current state of the spoolfile. READY and DELPND apply to input spoolfiles as well as output spoolfiles.
CREATE	An output spoolfile is being created, that is, an output spooled device has been opened and is being written to, thereby generating an output spoolfile. When the device is closed, the spoolfile enters the READY state.

READY	An output spoolfile is ready to be printed or an input spoolfile is ready to be accessed.
ACTIVE	An input spoolfile is active when it is being read from a STREAM file or a spooled device to disc.
OPEN	A :JOB input spoolfile (the \$STDIN for a batch job) is being accessed by the job's CI process.
PRINT	An output spoolfile is being printed.

NOTE

If this command is entered while a trailer is being printed, you may observe two spoolfiles in the PRINT state at the same time for the same device. This is because the spooler must open its next file to print before printing the trailer of its current one. (This in turn is required to manage headers and trailers properly). Also note that you will see only one file in the PRINT state during a trailer if the next file is another copy of the current file.

DEFER	An output spoolfile is in the defer state.
SPSAVE	The SPSAVE option was specified when the spoolfile was created or at any time before it would have been deleted after its final copy was printed. That final copy has been printed, so the spoolfile is now in this state instead of being deleted.
PROBLM	The target device of the spoolfile does not match any device name or device class on the system. This usually occurs because the spoolfile has been RESTORED to a system which has a different configuration than the system from which the spoolfile was STORED.
DELPND	Either the spooler has printed the last copy of the output spoolfile and is waiting for one or more users to close the spoolfile before purging it, or someone has requested that the spoolfile be deleted (using the :DELETESPOOLFILE or the :SPOOLF,DELETE command) and the file management routines are waiting for the last FCLOSE of the spoolfile before purging it.
RSPFN	The column under each letter R, S, P, F, and N, contains the respective letter as a flag indicating something about the spoolfile described in that row.

- R indicates a restartable spooled job file.
- S indicates that SPSAVE disposition has been specified for this

spoolfile. The spoolfile will be SPSAVED in the OUT.HPSPOOL account after the last copy is printed.

- P indicates that the spoolfile is Private.
- F indicates that the spoolfile has a forms message associated with it, a FORMID, or both, and therefore, requires special forms on which to print. If a FORMID is present, its identity can be seen, using the DETAIL option, on the second line of the display for the given spoolfile.
- N indicates that the spoolfile is not complete because insufficient account, group or system disc space was available when the spoolfile was created or the system aborted while the spoolfile was being created.

OWNER

This is the fully qualified name of the creator of the spoolfile.

The optional second line of the display has the following appearance.

FORMID	JOBNAME	SECTS	RECS	PAGES	DATE	TIME
	TESTJOB	250	500	125	12/20/88	8:39

Field and Description:

FORMID	An 8 character display, the first of which is a letter. If an "F" appears in the RSPFN column but this field is blank, it means that the file has a forms message which is not part of a FORMID specification.
JOBNAME	The job or session name of the user who created the spoolfile.
SECTS	The number of sectors required by the spoolfile.
RECS	The number of records in the spoolfile.
PAGES	The number of physical pages in the spoolfile. This quantity is accurate only for CIPER protocol and 2680/88 page printers, and then only if the device has printed at least one complete copy. The device keeps track of pages as they are printed and returns the correct count at the end of the copy. Until the actual count is known, an approximate count [denoted by a leading tilde ("~") and calculated as <number of records>/60] is displayed.

NOTE

For serial printers, even the count without the tilde is approximate because it is calculated as a best guess from the spoolfile data. It is not returned by the device because serial printers have no provisions for reporting this information.

DATE	The date that the file first entered the 'ready' state (mm/dd/yy).
TIME	The time that the file first entered the 'ready' state, in 24-hour form (hh:mm).

The status display has the following format:

```

INPUT SPOOL FILES          OUTPUT SPOOL FILES
ACTIVE   = 1;              CREATE   = 2;          READY    = 3;
OPEN     = 2;              DEFER    = 1;          SELECTED = 4;
READY    = 3;              DELPND   = 0;          SPSAVE   = 1;
                                PRINT   = 1;
                                PROBLM   = 0;

TOTAL IN FILES   = 6;      TOTAL OUT FILES   = 8;
      IN SECTORS = 144;      OUT SECTORS = 13090;

OUTFENCE = 6
OUTFENCE = 10 FOR LDEV  6

```

The display consists of three parts. The values in the first two parts represent only those spoolfiles selected for display:

- The itemized count of spoolfiles in each of the various states. They are shown in two groups, input spoolfiles to the left of the display and output spoolfiles to the right. Of these, only **SELECTED** is not a state. Instead, **SELECTED** shows the total count of spoolfiles whose output priority is higher than the global outfence, that is, **SELECTED** displays the sum of **PRINTing** files plus those **READY** files whose output priority is above the global outfence.
- The total number of input and output spoolfiles and the total sector count for all the spoolfiles displayed.
- The global outfence and any device-specific outfences.

On the next two pages are some examples of the displays produced by `:LISTSPF`.

Single Line Display (; DETAIL not specified)

:LISTSPF

SPOOLID	JOBNUM	FILEDES	DEV	PRI	COPIES	STATE	RSPFN	OWNER
#0123	J12	SP	PP	13	2	PRINT	F	DEV.HPE
#0124	S14	LIST	12	9	1	READY	F	DEV.HPE
#0128	J144	\$STDLIST	EPOC	8	1	READY		DEV.HPE
#01233	S1234	OUTLIST	FASTLP	0	1	DEFER		DEV.HPE
#I564	J164	\$STDIN	10			READY		DEV.HPE

INPUT SPOOL FILES

ACTIVE = 0;
 OPEN = 0;
 READY = 1;

OUTPUT SPOOL FILES

CREATE = 0;
 DEFER = 1;
 DELPND = 0;
 PRINT = 1;
 PROBLM = 0;

READY = 2;
 SELECTED = 3;
 SPSAVE = 0;

TOTAL IN FILES = 1;
 IN SECTORS = 64;

TOTAL OUT FILES = 4;
 OUT SECTORS = 5964;

OUTFENCE = 6

Two Line Display

:LISTSPF ;DETAIL

SPOOLID	JOBNUM	FILEDES FORMID	DEV JOBNAME	PRI	COPIES SECTS	STATE RECS	RSPFN PAGES	OWNER DATE	TIME
#0123	J12	SP	PP TESTJOB	13	2 250	PRINT 500	F 125	DEV.HPE 07/09/88	8:39
#0124	S14	LIST PAYCHECK	12 TESTJOB	9	1 250	READY 500	F 125	DEV.HPE 12/20/88	8:39
#0128	J144	\$STDLIST	EPOC LPJOB	8	1 250	READY 127	DEV.HPE ~14	12/20/88	22:19
#01233	S1234	OUTLIST	FASTLP TESTJOB	0	1 250	DEFER 500	DEV.HPE 125	12/20/88	8:39
#I564	J164	\$STDIN	10 BATCHJOB			READY 17 12	DEV.HPE 12/20/88	22:23	

INPUT SPOOL FILES

ACTIVE = 0;
OPEN = 0;
READY = 1;

OUTPUT SPOOL FILES

CREATE = 0;
DEFER = 1;
DELPND = 0;
PRINT = 1;
PROBLM = 0;
READY = 2;
SELECTED = 3;
SPSAVE = 0;

TOTAL IN FILES = 1;
IN SECTORS = 64;

TOTAL OUT FILES = 4;
OUT SECTORS = 5964;

OUTFENCE = 6

Status display

:LISTSPF ;STATUS

INPUT SPOOL FILES

ACTIVE = 0;
OPEN = 0;
READY = 1;

OUTPUT SPOOL FILES

CREATE = 0;
DEFER = 1;
DELPND = 0;
PRINT = 1;
PROBLM = 0;
READY = 2;
SELECTED = 3;
SPSAVE = 0;

TOTAL IN FILES = 1;
IN SECTORS = 64;

TOTAL OUT FILES = 4;
OUT SECTORS = 5964;

OUTFENCE = 6

6.2.8 :OPENQ Command

SYNTAX

```
OPENQ [DEV=] ldev | devclass | devname [;SHOW]
```

DESCRIPTION

:OPENQ enables spooling for a specified logical device, device name, or all devices belonging to a device class. It allows users to generate spoolfile(s) destined for the specified device(s) or class(es). It does not enable those files to print - that functionality is controlled by the :SPOOLER command.

Use of the :OPENQ command does not affect the operation of any spooler process.

Since spoolfiles can be created faster than they are processed, you may want to issue one or more :SHUTQ commands to allow spooler processes to clear the backlog of spoolfiles that are waiting to be processed. When the number of spoolfiles have been reduced to an acceptable level, you can then re-open queues with the :OPENQ command.

:OPENQ is an MPE command whose functionality has been extended. Support of the [DEV=], devname, and SHOW parameters is new with the first release of the New Commercial Spooler.

NOTE

This command is only valid for output spooled devices. It returns an error if issued for an input spoolable or non-spoolable device.

Parameter Definitions

<i>ldev</i>	The logical device number of the spooled device.
<i>devclass</i>	The device class name of the spooled device. <i>devclass</i> must begin with a letter and consist of eight or fewer alphanumeric characters.
<i>devname</i>	The device name of the spooled device. <i>devname</i> must begin with a letter and consist of eight or fewer alphanumeric characters. Users should note that it is not possible to have a device class name and a device name which are the same. If you enter an alphanumeric character string, the command will search the device class list first, and then the device name list.

SHOW The **SHOW** parameter displays the current queue state (enabled or disabled) of the devices specified with the **OPENQ** command.

USE

This command may be issued from a Session, Job, in **BREAK**, or from a Program. It is not Breakable. It may be executed from the Console or by a user to which the command has been :ALLOWed or ASSOCIATED.

EXAMPLES

To open the spool queue for logical device 6, enter:

```
:OPENQ 6
```

To open the spool queue for device name LDEV6, enter:

```
:OPENQ LDEV6
```

To open spool queues for all the devices in device class EPOC, enter:

```
:OPENQ EPOC
```

To show the state of queues and other information about the specified device(s), enter:

```
:OPENQ 6;SHOW
```

LDEV	DEV	SPSTATE	QSTATE	OWNERSHIP	SPOOLID
6	LDEV6	ACTIVE	OPENED	SPOOLED OUT	#0679

6.2.9 :OUTFENCE Command

SYNTAX

```
OUTFENCE outputpriority
      [;LDEV=ldev] |
      [;DEV=ldev | devclass | devname]
```

DESCRIPTION

The :OUTFENCE command defines the value (*outputpriority*) that the priority of an output spoolfile must exceed in order to be processed. This command remains syntactically compatible with the :OUTFENCE command on MPE V/E and MPE X/L 1.0 based versions of the operating system. The ;DEV= parameter has been added to allow users to specify device names (*devname*) in accordance with device management's new naming conventions, and to allow users to set the outfence for all devices in a device class in one command using the *devclass* parameter.

At any point in time, the outfence for a given device is the last outfence assigned to it as the result of its membership in the set of devices selected by the :OUTFENCE command parameters. For instance, if LDEV 6 is a member of 2 classes, EPOC and PP80, and commands are issued in the following order:

```
OUTFENCE 8;DEV=6
```

```
OUTFENCE 4;DEV=EPOC
```

```
OUTFENCE 5;DEV=PP80
```

then the outfence for LDEV 6 will be 5. The first command sets it to 8 since the command selected LDEV 6 specifically. The second command sets the outfence to 4 since LDEV 6 is a member of the set of devices in the device class EPOC, and so on.

If neither DEV nor LDEV is specified, the :OUTFENCE command sets the outfence for every device on the system.

Parameter Definitions

<i>outputpriority</i>	A number between 1 and 14 inclusive. Larger numbers are more limiting.
<i>ldev</i>	The logical device number of an output device.
<i>devclass</i>	The name of a class of spooled device(s) that are to have their outfence value changed. <i>Devclass</i> must begin with a letter and consist of eight or

fewer alphanumeric characters.

devname

The name of the spooled device. *Devname* must begin with a letter and consist of eight or fewer alphanumeric characters. Users should note that it is not possible to have a device class name and a device name which are the same. If you enter an alphanumeric character string, the command will search the device class list first, and then the device name list.

USE

This command may be issued from a Session, Job, in BREAK, or from a Program. It is not Breakable. It may be executed from the Console or by a user to which the command has been :ALLOWed or :ASSOCIATED.

6.2.10 :PURGE Command

SYNTAX

```
PURGE filereference [,TEMP]
```

DESCRIPTION

The :PURGE command remains both syntactically and functionally the same as it currently is on MPE XL. The command deletes a disc file from the system. This description is limited to those features which have been added or changed to support the New Commercial Spooler. For a complete description of the command, see the MPE XL Commands Reference Manual.

Since spoolfiles are now normal disc files, it is possible to purge a non-Private spoolfile by entering :PURGE *filename* (assuming all NCS and file system access provisions are satisfied). The :PURGE command deletes the specified spoolfile, its SPFDIR entry, and any checkpoint files which may exist for the spoolfile. The spoolfile will not print after it has been purged.

NOTE

The :PURGE command cannot be used on a Private spoolfile. Nor can it be used on any file to which it does not have exclusive access. This means it cannot be used on a file in the PRINT state because such a file has been opened by an output spooler process. Use the :SPOOLF...; DELETE command instead.

USE

This command may be issued from a Session, Job, Program, or in BREAK. It is not Breakable.

6.2.11 :RENAME Command

SYNTAX

```
RENAME oldfilereference,newfilereference[,TEMP]
```

DESCRIPTION

The :RENAME command remains both syntactically and functionally the same as it currently is on MPE XL. The command changes the system file identification for a permanent or temporary disc file. It can be used to change the name of a file, to move a file from one group to another (by specifying a different groupname in the *newfilereference* parameter), or to change the lockword. You cannot rename files that exist in other accounts. (To transfer a file from one account to another, use :COPY.)

This description is limited to those features which are affected by the presence of the New Commercial Spooler. For a complete description of the command, see the MPE XL Commands Reference Manual.

Since spoolfiles are now normal disc files, the :RENAME command will rename spoolfiles if the user has access to them. However, this will only be allowed on spoolfiles which are not linked to a spoolfile directory (SPFDIR).

USE

This command may be issued from a Session, Job, Program, or in BREAK. It is Breakable (aborts execution).



6.2.12 :SHUTQ Command

SYNTAX

```
SHUTQ [DEV=] ldev | devclass | devname [;SHOW]
```

DESCRIPTION

:SHUTQ disables spooling for a specified logical device, device name, or all devices belonging to a device class. It prevents users from generating spoolfile(s) destined for the specified device(s) or class(es). It does not prevent previously generated spoolfiles from printing - that functionality is controlled by the :SPOOLER command.

Use of the :SHUTQ command does not affect the operation of any spooler process.

Since spoolfiles can be created faster than they are processed, you may want to issue one or more :SHUTQ commands to allow spooler processes to clear the backlog of spoolfiles that are waiting to be processed. When the number of spoolfiles have been reduced to an acceptable level, you can then re-open queues with the :OPENQ command.

:SHUTQ is an MPE command whose functionality has been extended. Support of the [DEV=], devname, and SHOW parameters is new with the first release of the New Commercial Spooler.

NOTE

This command is only valid for output spooled devices. It returns an error if issued for an input spoolable or non-spoolable device.

Parameter Definitions

<i>ldev</i>	The logical device number of the spooled device.
<i>devclass</i>	The device class name of the spooled device. <i>devclass</i> must begin with a letter and consist of eight or fewer alphanumeric characters.
<i>devname</i>	The device name of the spooled device. <i>devname</i> must begin with a letter and consist of eight or fewer alphanumeric characters. Users should note that it is not possible to have a device class name and a device name which are the same. If you enter an alphanumeric character string, the command

will search the device class list first, and then the device name list.

SHOW The **SHOW** parameter displays the current queue state (enabled or disabled) of the devices specified with the **OPENQ** command.

USE

This command may be issued from a Session, Job, in **BREAK**, or from a Program. It is not Breakable. It may be executed from the Console or by a user to which the command has been :ALLOWed or ASSOCIATED.

EXAMPLES

To shut the spool queue for logical device 6, enter:

```
:SHUTQ 6
```

To shut the spool queue for device LDEV6, enter:

```
:SHUTQ LDEV6
```

To shut spool queues for all the devices in device class EPOC, enter:

```
:SHUTQ EPOC
```

To show the state of queues and other information about the specified device(s), enter:

```
:SHUTQ 6;SHOW
```

LDEV	DEV	SPSTATE	QSTATE	OWNERSHIP	SPOOLID
6	LDEV6	ACTIVE	CLOSED	SPOOLED OUT	#0679

6.2.13 :SPOOLER Command

SYNTAX

```
SPOOLER [DEV=] ldev | devclass | devname
[;START |
;STOP [ ;FINISH | ;NOW ] |
;SUSPEND [[ ;FINISH | ;NOW ]
[ ;KEEP | ;NOKEEP ]
[ ;OFFSET= [+/-]<page> ] ] |
;RESUME [ ;OFFSET= [+/-]<page> ] |
;RELEASE [ ;OFFSET= [+/-]<page> ]
[;SHOW]
[;OPENQ | SHUTQ ]
```

DESCRIPTION

NOTE

At least one of the options must be specified for SPOOLER command.

:SPOOLER DEV=PP is not a valid command.

But :SPOOLER DEV=PP;SHOW or :SPOOLER DEV=PP;OPENQ;SHOW are valid commands.

The :SPOOLER command controls spooler processes. It allows the user to start, stop, suspend, and resume spooler processes, and release files from the spooler process(es). Spooler processes come in two varieties: input spoolers and output spoolers.

An input spooler reads data from its device and uses that to create an input spoolfile. The data may consist of one or more batch jobs, data files, or any combination of the two. (See the glossary in Section 2 for definitions of these terms.) Input spoolfiles are Private files, meaning they are only accessible to a user running in privileged mode. They are not printed, but are used strictly as input for other processes.

An output spooler processes output spoolfiles - files that were created by a user accessing a spooled output device such as a printer or plotter. A spooled output device processes spoolfiles first in order of priority and then the time the spoolfile entered the READY state. Only files that have an output priority greater than the outfence are considered for output.

NOTE

Because this command may now affect more than one process (if applied to all devices in a class), it is possible to get errors for some of those devices and not for others. For example, if class LP consists of ldevs 6, 11 and 19, and ldev 11 is already owned by a spooler process, the command :SPOOLER LP; START creates and activates spooler processes for ldevs 6 and 19, but also generates the message "DEVICE 11 IS ALREADY SPOOLED."

Parameter Definitions

<i>ldev</i>	The logical device number of the spooled device.
<i>devclass</i>	The device class name of the spooled device. <i>devclass</i> must begin with a letter and consist of eight or fewer alphanumeric characters.
<i>devname</i>	The device name of the spooled device. <i>devname</i> must begin with a letter and consist of eight or fewer alphanumeric characters. Users should note that it is not possible to have a device class name and a device name which are the same. If you enter an alphanumeric character string, the command will search the device class list first, and then the device name list.

START

OUTPUT SPOOLER(S)

The START parameter creates and activates a new spooler process to own and manage the device and print spoolfiles destined for it. If a class is specified, then a spooling process is created and activated for each device in the class.

If neither the OPENQ nor the SHUTQ option is specified, OPENQ is taken as the default.

INPUT SPOOLER(S)

The START parameter creates and activates a new spooler process to own and manage the device, to read data from it and create job or data input spoolfiles for later processing by a CI (job) or user process (data). If a class is specified, then a spooling process is created and activated for each device in the class.

STOP

OUTPUT SPOOLER(S)

The STOP parameter terminates the spooling process associated with the specified device. If a class is specified, then spooling process(es) for all devices in the specified class are terminated. A spooler in the ACTIVE state first moves to the Stop Pending state (shown as *STOP with the

;SHOW option) while it finishes its work on its current file (including any required trailer). When this is complete, or if the spooler was previously in the IDLE state, the spooler displays "Output spooler, LDEV #<ldev>: Stopped." on the Console (or the \$STDLIST of an ASSOCIATED user) and terminates. You may determine the spooler state at any time by entering :SPOOLER <ldev>;SHOW.

The STOP option is valid only if a spooler is in the ACTIVE, SUSPEND or IDLE state, or (if accelerating a previous STOP ;FINISH to STOP ;NOW) the Stop Pending (*STOP) state.

If neither the NOW nor the FINISH option is specified, NOW is taken as the default.

If neither the OPENQ nor the SHUTQ option is specified, SHUTQ is taken as the default.

NOTE

Because of the large amount of data buffered in the file system and the device, an output device may continue to print, making it appear as if the STOP parameter has not had any effect. In reality, the spooler stops sending data to the device when the command is received but must wait until all buffered data has been printed before STOPping. Depending on both the content of the data and the amount of buffering, this may require a significant part of a page or even several pages.

INPUT SPOOLER(S)

The STOP parameter terminates the spooling process associated with the specified device. If a class is specified, then spooling process(es) for all devices in the specified class are terminated. The spooler first moves to the Stop Pending state (shown as *STOP with the ;SHOW option) while it finishes its work on its current file (closing and deleting it, rewinding the tape and placing it offline, etc.). When this is complete, the spooler displays "Input spooler, LDEV #<ldev>: Stopped." on the Console (or the \$STDLIST of an ASSOCIATED user) and terminates. You may determine the spooler state at any time by entering :SPOOLER <ldev>;SHOW.

The STOP option is valid only if a spooler is in the ACTIVE state. Except for a short period during startup when it is in the START state, an input spooler is always in the START state.

The NOW, FINISH, OPENQ and SHUTQ options are not applicable to an input spooler process and will result in an error message if any is

used.

SUSPEND

The SUSPEND option is valid only for output spooler processes. It suspends output to one or more spooled devices. The associated spooler process(es) remain alive, but inactive. A spooler in the ACTIVE state first moves to the Suspend Pending state (shown as *SUSPEND with the ;SHOW option) while it finishes its work on its current file (including any required trailer). When this is complete, or if the spooler was previously in the IDLE state, the spooler displays "Output spooler, LDEV #<ldev>: Suspended." on the Console (or the \$STDLIST of an ASSOCIATED user) and enters the SUSPEND state. You may determine the spooler state at any time by entering :SPOOLER <ldev>;SHOW.

The SUSPEND option is valid only if a spooler is in the ACTIVE or IDLE state, or (if accelerating a previous SUSPEND ;FINISH to SUSPEND ;NOW) the Suspend Pending (*SUSPEND) state.

If neither the NOW nor the FINISH option is specified, NOW is taken as the default.

If neither the KEEP nor the NOKEEP option is specified, KEEP is taken as the default.

If the OFFSET option is not specified, the spooler retains the present location in the output spoolfile. Default.

NOTE

The combination of the NOW, KEEP and no OFFSET parameters (all defaults) is a special case. When the spooler receives this form of the SUSPEND option, it suspends after processing the current record. A subsequent :SPOOLER...; RESUME with no OFFSET parameter and without an intervening :SPOOLER...; RELEASE causes the spooler to resume at the next record, as if it had never been interrupted.

NOTE

Because of the large amount of data buffered in the file system and the device, the device may continue to print, making it appear as if the SUSPEND parameter has not had any effect. In reality, the spooler stops sending data to the device when the command is received but must wait until all buffered data has been printed before SUSPENDING.

Depending on both the content of the data and the amount of buffering, this may require a significant part of a page or even several pages.

RESUME

The RESUME option resumes a suspended spooler process and is therefore valid only for output spoolers. The spooler must be in the SUSPEND state. If the spooler retained a spoolfile when it was SUSPENDED (meaning the KEEP option was specified or taken by default), and the spoolfile was not subsequently RELEASED, the OFFSET option is valid. If no offset is specified with either the earlier SUSPEND or the present RESUME, then output will resume where it left off. If an OFFSET was specified at either time (or both), the spooler will resume at the final location indicated by the OFFSET(s). If OFFSET is specified and the spooler does not have a retained file, a warning is generated and the spooler prints the next available spoolfile from the beginning.

RELEASE

The RELEASE parameter directs a suspended spooler to close (release) a spoolfile that it is currently retaining due to an earlier SUSPEND ;KEEP option. It is invalid and generates a warning if used in any other context. The OFFSET option may be used to change the resumption point of the file the next time it is selected for printing.

FINISH

Directs the spooler to complete the currently active spoolfile and then suspend or stop. This option may be used only in conjunction with the SUSPEND or STOP options. If it is used in any other context, a warning is issued and the FINISH option is ignored. The FINISH parameter may not be used with either the KEEP/NOKEEP or OFFSET parameters.

NOTE

The FINISH option is not valid for spooled input devices.

Either a STOP or SUSPEND which includes the ; FINISH option may be accelerated to a "higher priority" command without waiting for the present spoolfile to finish printing. For example, :SPOOLER...; SUSPEND;FINISH may be followed by :SPOOLER...; SUSPEND; NOW, :SPOOLER...; STOP; FINISH, or :SPOOLER...; STOP; NOW. Similarly, a :SPOOLER...; STOP; FINISH may be accelerated to :SPOOLER...; STOP; NOW. Going in the opposite direction is an error.

NOW

Directs the spooler to immediately stop the current output. This option may be used only in conjunction with the SUSPEND or STOP options. If it is used in any other context a warning is issued. Default.

If NOW is used on the SUSPEND option with either the NOKEEP or OFFSET parameters it also causes the spooler to print a trailer if required, otherwise output is paused and may be resumed later at the point of suspension.

NOTE

The NOW option is not valid for spooled input devices.

Either a STOP or SUSPEND which includes the ; FINISH option may be accelerated to a "higher priority" command without waiting for the present spoolfile to finish printing. For example, :SPOOLER...; SUSPEND;FINISH may be followed by :SPOOLER...; SUSPEND; NOW, :SPOOLER...; STOP; FINISH, or :SPOOLER...; STOP; NOW. Similarly, a :SPOOLER...; STOP; FINISH may be accelerated to :SPOOLER...; STOP; NOW. Going in the opposite direction is an error.

KEEP

Valid only if all three of the following conditions are satisfied:

- Used as a parameter to the SUSPEND option,
- The spooler is ACTIVELY processing a file or is *SUSPENDIng,
- The NOW parameter is also specified or taken by default.

Directs the device to retain ownership of the spoolfile it is currently processing. Default.

If the OFFSET parameter is not specified (or this condition is taken by default), the spooler suspends after processing the current record.

NOKEEP

Valid only if all three of the following conditions are satisfied:

- Used as a parameter to the SUSPEND option,
- The spooler is ACTIVELY processing a file or is *SUSPENDIng,
- The NOW parameter is also specified or taken by default.

Directs the spooler to close the spoolfile it is currently processing. The spooler stops sending data after the current record, ejects a page, processes any specified OFFSET, saves the result of that processing (or the last completely printed page if no OFFSET was specified) in the FLABX, prints a trailer with "(INCOMPLETE)" on it if trailers are enabled, and returns the file to the READY state. The next spooler which prints the file will start the first copy with the page following that saved in the FLABX, and the file's header and trailer (if any) will include "(RESUMED)" if printing starts anywhere but at the first page.

[+/-]<page>

The <page> parameter may be used only in conjunction with the ;SUSPEND, ;RESUME, or ;RELEASE option. <page> must be an integer representing a physical page offset, either absolute or relative, within the file. Offsets are applied in the order they are entered, whether absolute or relative. If '+' is specified, then the offset is adjusted forward relative to

the current location by the number of pages specified. If '-' is specified, the adjustment is backward. If neither a '+' or a '-' is specified, but a <page> is specified, then printing resumes at that page, absolute from the beginning for the file. No matter which combination of offsets are specified, the final location is limited by the bounds of the file.

Here are some examples of the use of the ;OFFSET option:

1. A spooler is printing physical page 30 of its output and the following sequence is entered:

```
:SPOOLER <dev>; SUSPEND; KEEP; OFFSET = -3  
:SPOOLER <dev>; RESUME; OFFSET = -6
```

Output resumes at page 21 (30 -3 -6).

2. A spooler is again on page 30 when the following sequence is entered:

```
:SPOOLER <dev>; SUSPEND; KEEP; OFFSET = -15  
:SPOOLER <dev>; RESUME; OFFSET = 20
```

Output resumes at (absolute) page 20.

3. Under the same original conditions as the previous two examples:

```
:SPOOLER <dev>; SUSPEND; KEEP; OFFSET = 20  
:SPOOLER <dev>; RELEASE; OFFSET = -5
```

The next time this copy is selected by a spooler, its output will start at page 15 (absolute page 20 -5).

4. To ensure that a file resumes at the beginning, enter:

```
:SPOOLER <dev>; SUSPEND; NOKEEP; OFFSET = 1
```

A page is defined as follows:

1. For CIPER protocol devices, a physical sheet.
2. For the HP2680 or HP2688, a physical sheet (which may contain one or more logical pages).
3. For all other devices the ;OFFSET option (except for OFFSET = 1 or OFFSET = 0, the beginning of the file) is not supported. No error or warning message is generated if it is used on such devices, however results are unpredictable. This is because page numbers are accurate only for CIPER protocol devices and HP2680 and HP2688 page printers.

The spooler's serial printer storage manager will make an approximate guess as to the correct page. However, it is only a guess based on an extremely limited interpretation of the spoolfile by the storage manager, because a serial printer does not return page data to its storage manager.

The storage manager does not attempt to interpret the spoolfile data, looking for escape sequences which may advance paper, eject a page, or change the page length or line density. This would degrade performance to an unacceptable level. Instead it checks the carriage control character supplied as part of the user's FWRITE intrinsic call.

If that character is an ASCII "I" or an octal 300 (indicating skip to VFC channel 1, which by industry standards is a page eject), it notes that this type of page control is in use and assembles its own checkpoint based on the location of this record in the spoolfile. If a RESUME with OFFSET is later required, it will count these checkpoints to try to find the proper restarting point. The storage manager ignores any other carriage control character.

The page eject carriage control is not required in user data, and many applications do not use it. In this case, the storage manager is forced to assume a static number of records (60) per page. Historically, this is the number of lines which fit on a standard 11 inch page at 6 lines per inch, allowing three lines of margin at the top and the bottom of the page. This is often a flawed assumption, as the following examples show:

- For many applications (for example, A4 paper, 8 lines per inch, etc.) 60 lines per page is the wrong value.
- Other applications are designed for specific forms and manage their own paper advancement. These applications may attach a carriage control value to a record which causes paper to advance (say) five lines after printing a line of data. The storage manager counts this as one record.
- Control records (those which affect some aspect of printer operation but do not print anything) are included in the 60 record count.

The last two examples come about because the storage manager does not interpret the data in the spoolfile, as mentioned earlier, and so cannot detect these situations.

In summary then, if the storage manager cannot interact with the device to determine page boundaries, it uses a carriage control "I" or %300, or 60 records per page to simulate checkpoints for :SPOOLER <ldev>; RESUME. Therefore, for the most consistent results with serial printers you should always include an OFFSET=1 parameter with the SUSPEND option. You can also include the parameter with a subsequent RESUME option, but this does not prevent another spooler process from printing the file from the "wrong" place in the meantime.

SHOW

The SHOW parameter displays the status of the spooling process associated with the device(s) or class(es) specified. All other parameters on this command will be processed first, so the SHOW option reflects the updated state of the process(es) at the completion of the command executor. Please refer to the note following the example below.

A sample of the output might be :

```
:SPOOLER PP;SHOW
```

```
LDEV    DEV    SPSTATE    QSTATE    OWNERSHIP    SPOOLID
```

14	LDEV14	*SUSPEND	OPENED	SPOOLED OUT	
15	LDEV15	ACTIVE	OPEPED	SPOOLED OUT	#0264

NOTE

If the SHOW option is used, the display shows the current state of the selected spooler(s) at the time the command executor has completed processing the command. This means that the selected spooler(s) may not actually be in the requested state, but in a pending state on the way to achieving the requested state because it has not finished acting on the command and updating the process state before the SHOW option is performed. If this is so, an asterisk (*) will precede the process state on the SHOW display to denote that the state is pending. Please refer to LDEV 14 in the example display of the SHOW option above.

OPENQ

The OPENQ parameter enables spooling for a specified logical device, device name, or all devices of a device class. This allows users to generate spoolfiles on that device(s). See the :OPENQ command for more information.

OPENQ is only valid with the START or STOP option, and is the default value for the START option.

SHUTQ

The SHUTQ parameter disables spooling for a specified logical device, device name, or all devices of a device class. This prevents users from generating spoolfiles on that device(s). See the :SHUTQ command for more information.

SHUTQ is only valid with the START or STOP option, and is the default value for the STOP option.

USE

This command may be issued from a Session, Job, in BREAK, or from a Program. It is not Breakable. It may be executed from the Console or by a user to which the command has been :ALLOWed or ASSOCIATED.

6.2.14 :SPOOLF Command

SYNTAX

```

SPOOLF { [[IDNAME=] spoolid | (spoolid [,spoolid ] ...) ]
        [;ALTER] [[;SELEQ=] [ select-eq ] | ^indirect_file ]
                [[;DEV=] ldev | devclass | devname ]
                [[;PRI=] outpri ]
                [[;COPIES=] numcopies ]
                [;SPSAVE ]
                [;DEFER | ;UNDEFER ]
        } |
        { [IDNAME=] fileset | ( fileset [,fileset ] ... )
          ;PRINT [[;DEV=] ldev | devclass | devname ]
                [[;PRI=] outpri ]
                [[;COPIES=] numcopies ]
                [;SPSAVE ]
                [;DEFER | ;UNDEFER ]
        } |
        { [[IDNAME=] spoolid | (spoolid [,spoolid ] ...) ]
          ;DELETE [[;SELEQ=] [ select-eq ] | ^indirect_file ]
        }
        [;SHOW]

```

DESCRIPTION

The :SPOOLF command allows a qualified user to alter output spoolfile characteristics. Input spoolfile attributes cannot be altered, but input spooled :DATA files can be deleted. Private spoolfiles may be altered in a limited fashion; only the keywords PRI, DEFER, UNDEFER, and DELETE are allowed. If the user has System Manager capability, DEV= is also allowed.

The :SPOOLF ..;ALTER command can be used on PROBLM state spoolfiles to alter the DEVice attribute so that the spoolfile becomes READY again. Most of the time, the spoolfile is in PROBLM state because the target device of the spoolfile is invalid.

Parameter Definitions

spoolid

One or more spoolfile IDs, (#Innnn for input spoolfiles or #Onnnn for output spoolfiles). These IDs are assigned by the spooling subsystem at spoolfile creation time. The "#" is optional. So is the "O" if you are displaying output spoolfiles, that is, if neither [#]O nor [#]I is specified, then [#]O is assumed.

The symbol "@" may be used to specify all spoolfiles.
 The symbol "O@" may be used to specify all output spoolfiles.
 The symbol "I@" may be used to specify all input spoolfiles.
 If @, O@, or I@ is specified, it must be the only value supplied. @, O@, and I@ are mutually exclusive.

The default is all the spoolfiles created by the current <user>.<account>.
 The default spoolid for the console user is all the spoolfiles on the system.

NOTE

If duplicate spoolids are specified, a warning message is displayed.

fileset

Specifies the set of files to be modified. This positional parameter has the form:

`filename[/lockword[.groupname[.accountname]]]`

Wildcarding is supported, however, all files in the fileset must be output spoolfiles. If a file is not an output spoolfile, the print option on that file fails and the command continues on the rest of the files if any.

If the file name or set is not fully qualified, the default is the user's current logon group and account. If any file in the set has a lockword, it must be supplied with the command in batch mode; therefore the file cannot be part of a wildcarded set. This restriction does not apply in interactive mode because the system prompts the user for each required lockword. In any case, if the lockword is not correctly provided the print option on that file fails with a warning message, and the command continues on the rest of the files if any. No default.

select-eq

The selection equation is used as a filter on the set of spoolfiles selected. Only spoolfiles whose attributes satisfy all filter requirements will be listed.

Selection equations have the following format, displayed in a pseudo-BNF (Backus-Naur Form) grammar :

NOTE

A selection equation must begin with "[" and end with "]". These have been underlined on the :SPOOLF command syntax diagram to show that they are required.

`<select-eq> ::= [ <equation> ]`

`<equation> ::= <condition> |`

```

( <equation> )      |
NOT <equation>      |
<equation> <lop> <equation>

<lop>      ::= AND |
              OR

```

NOTE

AND takes precedence over OR.

```
<condition> ::= <parm> <rop> <value>
```

```
<parm>      ::= The parameter (PARM) may be one of
                  the following attributes of the
                  spoolfile to be altered/deleted:
```

DEV Ldev number, device name, or device class name. Wildcarding is supported for device name and device class name. For further details refer to NATIVE MODE DEVICE FILES ES.

FILEDES Formal file designator for the spoolfile. For example, if you enter the file equation below and print to it, "EPOCLONG" will be the spoolfile's FILEDES.

```
:FILE EPOCLONG;DEV=EPOC;ENV=LPLONG.ENV.SYS
```

```
:PRINT MYFILE,*EPOCLONG
```

Wildcarding is supported.

SPOOLID Spoolfile identifier number in the format #0nnnn or #Innnn. The '#' is optional. 'O' is also optional for output spoolfiles, i.e. 123 = #0123. The valid range of spoolids is from 1 to 9999999.

Limited wildcarding is supported:

The symbol "@" may be used to specify all spoolfiles.

The symbol "O@" may be used to specify all output spoolfiles.

The symbol "I@" may be used to specify all input spoolfiles.

PAGES Number of pages in spoolfile (if known). A positive integer number is expected.

NOTE

This attribute does not apply to input spoolfiles, therefore any logical <condition> involving the attribute always returns FALSE when tested against an input spoolfile. For more details regarding the handling and comparison of attributes which do not apply to one or the other type of spoolfile (input or output), see Handling of Non-Applicable Attributes in Appendix A, Selection Equations.

FORMID	Form name. Wildcarding is supported. (The formid is an ASCII string up to 8 characters. The first character must be a letter). See the NOTE accompanying the PAGES description.
STATE	READY, ACTIVE, OPEN, CREATE, PRINT, PROBLM, DELPND, SPSAVE, DEFER.
JOBNAME	Job or session name. This is the job name under which the spoolfile was created. The job name can be up to 8 alphanumeric characters, the first of which must be a letter. For job input spoolfiles the JOBNAME and JOBNUM shown are those allocated to that job, NOT those of the job or session which STREAMed it. Wildcarding is supported.
DISP	Disposition, SPSAVE or PURGE. See the NOTE accompanying the PAGES description.
COPIES	Number of copies (max=65535, min=1). See the NOTE accompanying the PAGES description.
PRI	Output priority (max=14, min=0) or input priority (max=14, min=1). See the NOTE accompanying the PAGES description.
JOBNUM	Job/Session number under which the spoolfile was created, for example, #S257 or #J329 ("#" optional). The limits are 1 and 16,383. Limited wildcarding is supported. J@ accepts a" jobs, S@ all sessions.
RECS	Number of records in the spoolfile. A positive integer is expected.
OWNER	The user under which the spoolfile was created. The format

of the OWNER is <user>.<account>. If the account is not specified, the user's current account is assumed. Wildcarding is supported.

JOBABORT Select based on whether this is the \$STDLIST of a job which aborted when an error was encountered but no "CONTINUE" was in effect.

Valid values are "TRUE" and "FALSE". Only "=" and "<>" are allowed as relational operators. See the NOTE accompanying the PAGES description.

DATE Creation date in the format mm/dd/yy or mm/dd/year. Note that the year can be in the form of 'yy' or 'year', i.e. 10/10/88 or 10/10/1988 are both legal syntax for the DATE parameter.

<rop> ::= > | >= | < | <= | <> | =

NOTE

For string types other than DATE (e.g., user name), only the relational operators '=' and '<>' are applicable. Using any others will result in an error.

<value> ::= Appropriate values per data type.

indirect_file

Specifies the name of a file containing the selection equation. It must be preceded by a caret ("^"). The selection equation contained in the file may not exceed 277 characters in length, including the brackets in which it must reside. There is no restriction on the indirect file code. If the record size exceeds 277, only 277 characters per record are read and a warning is issued. Backreferencing to a formal file designator is also allowed for an indirect_file name. i.e. ^*filename is also allowed. Any file will be accepted as an indirect_file, unless the file system returns an error from FOPEN, or FREAD.

NOTE

There is no limit to the number of records in the indirect_file, only the total character count. Records are processed as follows: Leading and trailing blanks are stripped. If the last non-blank character is an ampersand ("&"), it too is stripped, otherwise one blank is

added back to the end of the record as a delimiter. If the character count of this record plus those processed previously exceeds 277, an error is returned. If not, the current record is appended to previous records and the process repeats until either 277 characters have been counted or the end-of-file is detected. Records terminating with or without ampersands may be mixed as desired in the indirect file.

If the resulting string is ≤ 277 characters it is parsed. If the parser detects a syntax error or if any non-blank character follows the closing "]" of the seleq, an error is returned and the seleq is not processed.

ALTER

The ALTER option alters the characteristics of specified output spoolfiles. Private output spoolfiles may be altered in a limited fashion; only the keywords PRI, DEFER, and UNDEFER are allowed. A System Manager (SM) user may also specify DEV=. See the Security Specifications paragraph in Section 5 for which user capabilities are required to alter which spoolfiles.

NOTE

You cannot alter the attributes of SPSAVED spoolfiles.

PRINT

The PRINT option copies the specified fileset(s) to the HPSPPOOL account and links the copies into the spool queues for printing. See the Security Specifications paragraph in Section 5 for which user capabilities are required to print which spoolfiles.

If the target device or class information exists in the file label extension, then that device or class is used as the default. The DEV= option may be used to override this default. If there is no target device in the file label extension, the DEV= parameter must be specified or an error message results. The default values of PRI (8) and COPIES (1) may also be overridden by user-specified parameters.

NOTE

The user of the :SPOOLF...; PRINT command must have ND capability.

Private files cannot be PRINTed.

DELETE

The DELETE option purges all specified Private or non-Private spoolfiles to which the user has access from the system. See the Security Specifications paragraph in Section 5 for which user capabilities are required to delete which spoolfiles.

If the spoolfiles are not in the PRINT state, they are purged immediately. If any of them are in the PRINT state, they are placed in DELPND state, their spoolers are notified and printing stops at that point. Each such file is deleted when its spooler closes it.

The DELETE option works on either :DATA input spoolfiles in the READY state, or all output spoolfiles in the READY, PRINT, DEFER, SPSAVE or PROBLM state. It does not work on job \$STDIN files; use the :ABORTJOB command for these files.

ldev

Specifies the logical device number of the spoolfile's new destination device. If the spoolfile is in the PRINT state, it is returned to the READY state. It may immediately enter the PRINT state on *ldev* if all requirements are met. Note that this occurs even if *ldev* is the same as the device currently printing the file.

devclass

Specifies the new destination device class name for the spoolfile. If the spoolfile is in the PRINT state, it is returned to the READY state. It may immediately enter the PRINT state on a device in *devclass* if all requirements are met. Note that this occurs even if the result is no change in output device.

devclass must begin with a letter and consist of eight or fewer alphanumeric characters. Users should note that the MPE XL will not allow the same name to be configured as a device class name and a device name.

devname

Specifies the device name of the spoolfile's new destination device. If the spoolfile is in the PRINT state, it is returned to the READY state. It may immediately enter the PRINT state on *devname* if all requirements are met. Note that this occurs even if *devname* is the same as the device currently printing the file.

devname must begin with a letter and consist of eight or fewer alphanumeric characters. Users should note that the MPE XL will not allow the same name to be configured as a device class name and a device

name.

outpri

Specifies the output priority of the designated spoolfile(s) (0=lowest; 14=highest). Only an OP user or the console can specify an *outpri* of 14, other users are limited to 13. The default is 8 with the ;PRINT option, and no change for the ;ALTER option.

numcopies

Specifies the number of copies of the designated spoolfile(s) to be printed. The allowable range is 1 through 127. The default is 1 for the ;PRINT option, and no change for the ;ALTER option.

SPSAVE

The SPSAVE option specifies that the selected spoolfiles are not to be deleted after their last copy has printed. Instead they are retained in the HPSPool account in the SPSAVE state until deleted manually. Among other advantages, this option allows documents to be copied to user filespace, be reprinted without being reformatted, etc. PRIVATE spoolfiles may not be SPSAVED.

NOTE

When a file enters the SPSAVE state, its priority is set to 8 and its number of copies is set to 1. This is so that it will have the proper defaults should it be :SPOOLF...; PRINTed later.

DEFER

The DEFER option changes the spoolfile's state to DEFER. If it is currently in the PRINT state, its spooler is notified and printing stops at that point. The spoolfile's priority remains unchanged. If this option is used with the PRINT option, the spoolfile will be copied to OUT. HPSPool and linked to the spooling system, but the state of the spoolfile is DEFER. The spoolfile will not be printed until a subsequent :SPOOLF...; UNDEFER is entered.

NOTE

If the DEFER option is used on any file in the CREATE state (opened for original creation), the spoolfile will only enter the DEFER state after it is completed (closed for the last time).

UNDEFER

The UNDEFER option changes a spoolfile's state from DEFER to READY

and causes a spooler to start printing it if the spoolfile is qualified for an idle printer to print. The spoolfile's priority remains unchanged.

SHOW

The SHOW option allows a user to display the results of the :SPOOLF command. All other parameters are processed before the SHOW. Here is an example:

```
:SPOOLF @;SELEQ=(LDEV=6);DEV=16;SHOW
```

SPOOLID	JOBNUM	FILEDES	DEV	PRI	COPIES	STATE	RSPFN	OWNER
#0414	J5	\$STDLIST	16	8	1	READY		ALIX.MKT
#0416	J7	HOTSTUFF	16	8	2	READY		JACK.SALES

USE

This command may be issued from a Session, Job, in BREAK, or from a Program. It is not Breakable. It may be executed by a user with OP capability or by any other user meeting the capability requirements described in the Security Specifications paragraph in Section 5.

6.3 SUPPORT PROGRAMS

The STORE/RESTORE programs are modified to meet spooler specifications. For more information, see the STORE/RESTORE External Specifications.

A new utility program, SPFXFER, is provided for transferring spoolfiles to tape with a format that is capable of being INPUT by SPOOKS on all CM Spooler releases on MPE XL and MPE V/E releases G.02.B0 and later. SPFXFER is also able to read SPOOK format tapes from all releases of both the CM Spooler and the MPE V/E Spooler. SPFXFER provides two commands which are used for spoolfile archival, INPUT and OUTPUT. See Appendix C for a complete specification of SPFXFER.

SELECTION EQUATIONS

APPENDIX

A

Selection equations provide the ability to dynamically filter spoolfiles already selected by some criteria. This filtering is based upon the values of specified attributes of the spoolfiles. For example, selection equations can be used to filter candidate spoolfiles to be altered or deleted, or spoolfiles to be displayed using the LISTSPF command.

Selection equations support parentheses, NOT, AND, and OR as logical operators. The relational operators which are supported are: <, <=, =, <>, >=, and >. These operators will allow greater flexibility for filtering groups of spoolfiles to be acted upon from the superset of files actually selected by the command the selection equation is a part of.

NOTE

Selection equations do not really select at all. Rather, they perform a filter function on those spoolfiles selected by other command parameters. Frequently, if default selection is used or all spoolfiles accessible by the user are selected, the selection equation appears to do the selection. However, once again, the selection equation merely filters the defaulted or selected universe of spoolfiles.

Selection equations have the following format, displayed in a pseudo-BNF (Backus-Naur Form) grammar :

NOTE

A selection equation must begin with "[" and end with "]".

```
<select-eq> ::= [ <equation> ]

<equation>  ::= <condition> |
                ( <equation> ) |
                NOT <equation> |
                <equation> <lop> <equation>

<lop>      ::= AND |
                OR
```

NOTE

AND takes precedence over OR.

`<condition> ::= <parm> <rop> <value>`

`<parm>` ::= The parameter (PARM) may be one of the following attributes of the spoolfile to be altered/deleted:

DEV Ldev number, device name, or device class name. Wildcarding is supported for device name and device class name. Numeric ldev numbers can only be specified in decimal. For further details refer to NATIVE MODE DEVICE FILES ES.

FILEDES Formal file designator for the spoolfile. For example, if you enter the file equation below and print to it, "EPOCLONG" will be the spoolfile's FILEDES.

`:FILE EPOCLONG;DEV=EPOC;ENV=LPLONG.ENV.SYS`

`:PRINT MYFILE,*EPOCLONG`

Wildcarding is supported.

SPOOLID Spoolfile identifier number in the format #Onnnn or #Innnn. The '#' is optional. 'O' is also optional for output spoolfiles, i.e. 123 = #0123. The valid range of spoolids is from 1 to 9999999.

Wildcarding is not supported.

PAGES Number of pages in the spoolfile. A positive integer is expected. For spoolfiles which have not been printed yet, the page count used in the comparison is an estimate.

NOTE

This attribute does not apply to input spoolfiles, therefore any logical `<condition>` involving the attribute always returns FALSE when tested against an input spoolfile. For more details regarding the handling and comparison of attributes which do not apply to one or the other type of spoolfile (input or output), see Handling of Non-Applicable Attributes below.

FORMID Form name. Wildcarding is supported. (The formid is an ASCII string up to 8 characters. The first character must be a letter). See the NOTE accompanying the PAGES description.

STATE	READY, ACTIVE, OPEN, CREATE, PRINT, PROBLM, DELPND, SPSAVE, DEFER.
JOBNAME	Job or session name. This is the job name under which the spoolfile was created. The job name can consist of up to 8 alphanumeric characters, the first of which must be a letter. For job input spoolfiles the JOBNAME and JOBNUM shown are those allocated to that job, NOT those of the job or session which STREAMed it. Wildcarding is supported.
DISP	Disposition, PURGE or SPSAVE. This option selects files based on whether they will or will not be deleted after the last copy has been printed. Note that files which are in the SPSAVE state are also considered as having an SPSAVE disposition. See the NOTE accompanying the PAGES description.
COPIES	Number of copies (max=65535, min=1). See the NOTE accompanying the PAGES description.
PRI	Output priority (max=14, min=0). See the NOTE accompanying the PAGES description.
JOBNUM	Job/Session number under which the spoolfile was created, for example, #S257 or #J329 ("#" optional). The limits are 1 and 16,383. Limited wildcarding is supported. J@ accepts all jobs, S@ all sessions. Note that SELEQ=[JOBNUM=J'@ or JOBNUM=S'@ or JOBNUM=S@ or JOBNUM=J@] selects all files. The intersection of the sets of files selected by each of the ORed conditions is empty, that is, the sets do not overlap.
RECS	Number of records in the spoolfile. A positive integer is expected.
OWNER	The user under which the spoolfile was created. The format of the OWNER is <user>.<account>. If the account is not specified, the user's current account is assumed. Wildcarding is supported.
JOBABORT	Select based on whether this is the \$STDLIST of a job which aborted when an error was encountered but no "CONTINUE" was in effect. Valid values are "TRUE" and "FALSE". Only "=" and "<>" are allowed as relational operators. See the NOTE accompanying the PAGES description.
DATE	Creation date in the format mm/dd/yy or mm/dd/year. Note that the year can be in the form of 'yy' or 'year', i.e. 10/10/88 or 10/10/1988 are both legal syntax for the DATE parameter.
<rop>	::= > >= < <= <> =

NOTE

For string types other than DATE (e.g., user name), only the relational operators '=' and '<>' are applicable. Using any others will result in an error.

<value> ::= Appropriate values per data type.

Handling of Non-Applicable Attributes

The following attributes do not apply to input spoolfiles: PAGES, FORMID, COPIES, PRI, DISP, and JOBABORT. Although you can specify them as filters in the selection equation, any conditions in which they are used will always return FALSE. This has the effect of ignoring any such condition which is part of an OR clause and rendering ineffective any AND clause in which it occurs. If it is the only condition in the selection equation, the entire selection equation is FALSE. To illustrate this concept, consider the following examples:

```
:LISTSPF IDNAME = I@;SELEQ = [ (COPIES < 5      ) OR      &
                                (JOBNAME = JBACKUP)      ]
```

```
:LISTSPF IDNAME = I@;SELEQ = [ (COPIES < 5      ) AND      &
                                (JOBNAME = JBACKUP)      ]
```

```
:LISTSPF IDNAME = I@;SELEQ = [ (COPIES < 5      ) ]
```

Because COPIES is not a valid input spoolfile attribute, the COPIES test returns FALSE for each file tested against the selection equation. This means that in the first example, only input spoolfiles with JOBNAME = JBACKUP satisfy the selection equation. In the second example no files satisfy the selection equation because the COPIES test always returns FALSE, therefore the entire AND clause is FALSE. A similar analysis of the third example shows that no files satisfy its selection equation either.

NOTE

At present all the selection-equation attributes apply to output spoolfiles, although this could change in the future.

Selection Equation Examples

NOTE

The spacing of the selection equation and the line continuation characters (&) are not necessary for correct interpretation of the selection equation. The spacing and continuation lines are shown here for easier readability.

Display output spoolfiles to be printed on special forms designated by the FORMID "CHECKS".

```
LISTSPF IDNAME = @;SELEQ = [  FORMID = CHECKS  ]
```

Display only the small print jobs originating from the MPEM account, where the size of the print job is defined by the number of copies requested multiplied by the number of pages per copy.

```
LISTSPF IDNAME = @; SELEQ = [  (  OWNER = @.MPEM  )  AND      &
                             (  PAGES <= 20    )  AND      &
                             (  COPIES <= 10   )  ]
```

Alter all output spoolfiles directed to device class epoc to print on device LDEV0014:

```
SPOOLF  O@;SELEQ = [  DEV = EPOC  ];    DEV = LDEV0014
```

Delete all output spoolfiles owned by the user JON.DOE:

```
SPOOLF  @;SELEQ = [  OWNER = JON.DOE  ]; DELETE
```

Show the attributes of all output spoolfiles requesting 3 part paper:

```
LISTSPF ;SELEQ = [  FORMID = FORM3PRT  ]
```

Show the attributes of only the output spoolfiles from all users of the MIS account that are in the READY state:

```
LISTSPF ;SELEQ = [  (  OWNER = @.MIS  )  AND      &
                   (  STATE = READY  )  ]
```


The New Commercial Spooler is in charge of maintaining three different kinds of permanent files: input spoolfiles, linked output spoolfiles, and checkpoint files. All of these are named files; therefore, their names must exist in the system directory.

The NCS has a reserved directory structure that consists of the following:

Reserved Account: HPSPPOOL

Reserved Groups: OUT
 IN
 All device name groups

Reserved User: MGR

All reserved groups are required to reside on the system volume set. The NCS creates them there and they should not be relocated to a private volume set.

Now that spoolfiles are normal disc files in a normal accounting structure, the configuration questions (NUMBER OF SECTORS PER SPOOFLE EXTENT and MAX NUMBER OF SPOOFLE KILOSECTORS) no longer apply. MPE XL files are not limited to 32 extents, so there is no need for the first question. The maximum file space allocated to spoolfiles is now controlled by varying the HPSPPOOL account filespace limit. If you need to limit input and output spoolfile space independently, you may do so by adjusting the IN and OUT group filespace limit. Otherwise we suggest you set unlimited file space limits on each group.

The file security matrix for the HPSPPOOL account and its groups are as follows:

HPSPPOOL account: (R,A,W,L,X:ANY)

Groups in HPSPPOOL:

 IN and OUT: (R,A,W,L,X,S:ANY)

 Device name groups: (R,A,W,L,X,S:GU)



CAUTION

The MPE accounting structure requires that a user (MGR) be created for the HPSPPOOL account. However it should never be necessary to logon as that user, nor should additional users be created in the HPSPPOOL account. In fact, both the MGR user and the HPSPPOOL account should be passworded to prevent unauthorized access. A user who manages to logon to MGR.HPSPPOOL has unlimited access to all non-Private files in the account [as well as limited (:PURGE) access to the Private files].

The account and group security provisions have been chosen for proper operation of both the new NCS commands and existing MPE commands, and should not be altered.

NEVER :PURGEACCT the HPSPPOOL account or :PURGEGROUP the OUT or IN group. You might disable the entire spooling subsystem. High level file access commands are linked to SPFDIR routines so that :PURGEing a spoolfile (for example) also deletes its SPFDIR entry. However, the :PURGEGROUP and :PURGEACCT commands access the files at a lower level which is not linked to the SPFDIRs. They will purge files but leave orphaned SPFDIR entries for them. These entries will be listed by the :LISTSPF command but cannot be deleted by :SPOOLF...; DELETE. The entries are deleted at any system startup or whenever a spooler process tries to open the associated file.

B.1 THE OUT.HPSPOOL GROUP

The OUT.HPSPOOL group holds all "linked" output spoolfiles. As mentioned in the body of the ES, output spoolfiles do not always have to be linked to the spooling subsystem. Only linked output spoolfiles reside in the OUT.HPSPOOL group.

The OUT.HPSPOOL group is created automatically by the NCS at system startup if one does not exist already. This group is configured with the default security matrix shown above.

B.2 THE IN.HPSPOOL GROUP

The IN.HPSPOOL group holds all input spoolfiles. Input spoolfiles are always linked to the spooling subsystem, thus the IN.HPSPOOL group is the only place in the system where input spoolfiles are found.

The IN.HPSPOOL group is created automatically by the NCS at system startup if one does not exist already. This group is configured with the default security matrix shown above.

B.3 THE DEVICE NAME GROUPS

The device name groups in the HPSPPOOL account hold the checkpoint files for linked output spoolfiles.

Every output spooler creates its own device name group. The group name is based on the device name of the spooled device whose spooler process creates the group. The group name is derived according to the following rules:

- If the device name begins with a letter, the group name is the same as the device name.
- If the device name consists of eight digits (indicating that a device name was not explicitly configured during SYSGEN), the first digit is replaced by a "D". That and the remaining seven digits become the group name.

The device name groups are created with the group security shown above. Each spooler creates its group

only if the group does not already exist, however there is no provision for automatically purging the group. A user with sufficient capabilities must do this if the group is no longer required, say because of a change in system configuration.

Checkpoint files within the group are created and managed by the spooler process which owns the group. There is one checkpoint file for all copies of any spoolfile output by a particular spooler process. Thus, if copies of a spoolfile are printed on three different devices, three checkpoint files are created (one in each process' checkpoint file group).

When a spoolfile does not print completely for any reason (such as device power failure, file deferred or assigned to another device, or spooler process ;SUSPEND or ;STOP), the next spooler process which prints it on the same device uses the checkpoint file for rapid recovery to the point of interruption. For devices which support such recovery, output will start at the page after the last complete page printed before the interruption. (Output may also start at another point in the file if a [+/-] PAGES option is entered with a :SPOOLER keyword which supports the option).

Each spooler uses NCS File Management services to open and close its spoolfiles. When the File Management routines close and delete the spoolfile following its final copy, all checkpoint files associated with that spoolfile are also deleted. The checkpoint files may also be :PURGED by users with sufficient capability. If this happens while the associated spoolfile is still linked in the spoolfile directory (SPFDIR), a spooler process printing the next copy of the spoolfile will create a new checkpoint file. This merely means that the spooler will not be able to use the file for rapid forward recovery, as it could have had the file not been :PURGED.

SPOOLFILE TRANSFER UTILITY (SPFXFER)

APPENDIX

C

In order to transport spoolfiles between New Commercial Spooler systems and CM Spooler systems a new utility called SPFXFER is provided with the release of the New Commercial Spooler.

This utility

- Transfers NCS spoolfiles to tape with a format that is capable of being input by SPOOK on CM Spooler MITs and SPOOK 5 on MPE V/E releases G.02.B0 and later.
- Can read SPOOK tapes from any release of MPE XL and V/E. This includes NCS and the CM Spooler.

The commands provided with SPFXFER are described on the following pages:

C.1 INPUT Command

SYNTAX

```
INPUT [username[.accountname]];*tapefile
INPUT [dfid[,dfid] ... ];*tapefile
```

DESCRIPTION

The INPUT command reads one or more spoolfiles that were previously stored on tape back onto the system disc. The spoolfile(s) are restored to the OUT.HPSPOOL account as linked spoolfile(s) and are assigned new spoolid(s).

NOTE

Any user labels are ignored. NCS spoolfiles do not have them, so they are not restored to the system.

For each spoolfile restored SPFXFER displays its old and new spoolids, new job/session number (with a " " to distinguish it from spoolfiles created directly on this system), the target device/class name, and the owner. Below is a sample display:

#FILE	==>	#FILE	#JOB	DEV/CL	OWNER
#0100	==>	#0500	#S'99	LP	MIKE.FOX
#0200	==>	#0501	#S'99	LP	MIKE.FOX

Spoolfiles INPUT to the system are assigned the same output priority that they had when they were OUTPUT to tape.

Parameter Definitions

<i>username</i>	The user name of the creator of file(s) to be INPUT, or @ to restore files of all users.
<i>accountname</i>	The account name of the creator of file(s) to be INPUT, or @ to restore files of all accounts.
<i>dfid</i>	The spoolfiles' device file id on the system from which they were OUTPUT (if known), in the form of [#O]nnnn

NOTE

If *username.accountname* and *dfid* are both omitted, all files belonging to the logon user are INPUT.

tapefile

The tape filename from which files are to be INPUT. A file equation must exist for the tape device, and *tapefile* must be backreferenced with an asterisk (*) in the form **tapefile*.

C.2 OUTPUT Command

SYNTAX

```
OUTPUT [username[.accountname]];*tapefile[;PURGE]
OUTPUT [spoolid[,spoolid] ... ];*tapefile[;PURGE]
```

DESCRIPTION

The OUTPUT command stores linked output spoolfiles from the OUT.HPSPOOL account to tape in a SPOOK-compatible format. These can be restored to an NCS system with the SPFXFER INPUT command or to a CM or MPE V/E system with the INPUT command of SPOOK. The OUTPUT command does not alter the output priority of spoolfiles on the system.

NOTE

Spoolfile user labels are not stored on tape. NCS spoolfiles do not have them, and new ones are created by any SPOOK utility which INPUTs the file(s).

On CM and MPE V/E systems the *dfid* is a 15 bit field, that is, the *dfid* have a maximum value of 32767. Therefore the SPOOK tape format provides a 15-bit field for storing the *dfid*. On NCS systems, spoolids are 31-bit fields. Hence the maximum value of a spoolid is 2,147,483,647. If the spoolid of any file being OUTPUT exceeds 32767, it is altered to a value less than 32767 using an algorithm that is described in detail in the in-code documentation.

Owing to similar constraints imposed by backward compatibility requirements for tapes created on CM and MPE V/E systems, the job/session number associated with a spoolfile is truncated to the MPE V/E maximum of 16383.

If altered as specified above, the values of the spoolfile id and job/session number are used only for the spoolfiles OUTPUT to tape. The values of the files on the system remain unchanged.

For each spoolfile stored, SPFXFER displays the current spoolfile id, the job/session number of the file's owner, its logical device/class name, the number of sectors in the file and the owner's name and account. Below is a sample display:

#FILE	#JOB	DEV/CL	SECTORS	OWNER
#0100	#S99	LP	8	MIKE.FOX
#0200	#S99	LP	12	MIKE.FOX

Parameter Definitions

username The user name of the creator of file(s) to be OUTPUT, or @ to store files of all users.

accountname The account name of the creator of file(s) to be OUTPUT, or @ to store files of all accounts.

spoolid The spoolids of the spoolfiles to be OUTPUT in the form of [#0]nnnn.

NOTE

If *username.accountname* and *dfid* are both omitted, all files belonging to the logon user are OUTPUT.

tapefile The tape filename to which files are to be OUTPUT. A file equation must exist for the tape device, and *tapefile* must be backreferenced with a '*' in the form **tapefile*.

PURGE Indicates that the files should be purged from the system after they are OUTPUT to tape.

C.3 HELP Command

SYNTAX

HELP

DESCRIPTION

Lists all SPFXFER commands and their syntax.

PARAMETERS

This command has no parameters.

C.4 EXIT Command

SYNTAX

EXIT

DESCRIPTION

EXIT terminates SPFXFER.

PARAMETERS

This command has no parameters.

C.5 Notes to INPUT and OUTPUT Commands

- Users of the INPUT or OUTPUT command must have System Manager (SM) or System Supervisor (OP) capability. Users with neither capability can execute only the HELP and EXIT commands.
- Before using the INPUT or OUTPUT command, a file equation should be set up with these parameters:

`:FILE formaldesignator [=filereference]; DEV=device`

The ;DEV= parameter must indicate the device class name or the logical device number of a magnetic tape unit. All other parameters such as ;REC= and ;ACC= are provided by the INPUT/OUTPUT command executor.

- If files are being INPUT or OUTPUT to multiple tape reels, the operator is prompted:

`CHANGE REELS ON LDEV nnn? (Y / N)`

Entering 'N' or 'n' aborts the operation. Striking any other key means a YES and the operator mounts the new tape.

For the INPUT command, if a wrong reel is mounted the operator is prompted

`INCORRECT REEL - TRY AGAIN? (Y / N)`

This prompt is displayed until

- A correct reel is mounted, or
 - The operator enters an 'N' or 'n' in which case the INPUT operation is aborted.
- If any of the files specified in the command string cannot be INPUT or OUTPUT for any reason, SPFXFER builds an error stack and displays status similar to that shown in the following example:

#FILE	SPFXFER ERRNUM	FILESYS ERRNUM
#0100	- 10781	0
#0150	- 10779	46

C.6 SPFXFER Error Messages

The following is a list of possible error messages reported by SPFXFER:

- 10750 INVALID PURGE OPTION IN COMMAND STRING
- 10751 FILE SPECIFIER TOO LONG IN COMMAND STRING
- 10752 INVALID COMMAND NAME
- 10753 INVALID TAPE FILENAME IN COMMAND STRING
- 10754 INVALID USER NAME IN COMMAND STRING
- 10755 INVALID COMMAND SYNTAX
- 10756 INVALID DELIMITER IN COMMAND STRING
- 10757 KEYWORD MISSING IN COMMAND STRING
- 10758 INVALID PARAMETERS IN COMMAND STRING
- 10759 COMMAND IS TOO LONG
- 10760 AN ERROR HAS BEEN RETURNED BY MYCOMMAND
- 10761 TERMINAL I/O ERROR
- 10762 NO FILES WERE FOUND UNDER THE SPECIFIED USER.ACCOUNT
- 10763 UNABLE TO OPEN TAPE DEVICE
- 10764 CANNOT OPEN SPOOLFILE ON DISK
- 10765 INVALID TAPE FORMAT
- 10766 ERROR WHILE READING TAPE

- 10773 EOF MARK NOT FOUND
- 10774 WRONG REEL - INCORRECT TAPE LABEL
- 10775 WRONG REEL - INCORRECT REEL NUMBER
- 10776 WRONG REEL - INCORRECT SPOOK VERSION
- 10777 UNABLE TO CLOSE TAPE DEVICE
- 10778 ERROR WHILE READING FILE
- 10779 ERROR WHILE WRITING FILE
- 10780 ERROR WHILE WRITING TO TAPE
- 10781 FILE NOT FOUND
- 10782 INVALID FILE ID

- 10785 INSUFFICIENT CAPABILITY
- 10786 UNEXPECTED END OF TAPE ENCOUNTERED
- 10787 WRONG REEL HAS BEEN MOUNTED
- 10788 MULTI REEL ABORT
- 10789 ERROR OCCURRED WHILE ACCESSING NATIVE MODE DEVICE FILES
- 10790 ERROR IN SPOOK TAPE DEVICE CLASS DIRECTORY
- 10791 INVALID SPOOLFILE BLOCK FORMAT
- 10792 ERROR WHILE DELIMITING DEVICE NAME
- 10793 CANNOT GET UFID
- 10794 CANNOT GET SPOOLFILE ID
- 10795 ERROR RETURNED BY FCONTROL
- 10796 ERROR RETURNED BY FFILEINFO
- 10797 CANNOT OPEN SPOOLFILE ON SYSTEM DISK
- 10798 CANNOT CLOSE SPOOLFILE ON SYSTEM DISK
- 10799 ERROR RETURNED BY SP_FM_SET
- 10800 INVALID TARGET DEVICE
- 10801 SPOOKTAPE DEVICE DIRECTORY OVERFLOW
- 10802 ERROR RETURNED BY FCHECK
- 10803 ERROR RETURNED BY SP_FM_INFO

Spoolfile Transfer Utility

-10804 CANNOT OPEN STDLIST

PRINT SPOOLFILE UTILITY (PRINTSPF)

APPENDIX

D

In order to provide the functionality of SPOOK's "mode c-on", a new utility program called PRINTSPF is provided with the release of the New Commercial Spooler. PRINTSPF provides a way to display spool file contents in a formatted manner so that the contents of both the data and the special overhead record can be examined.

The syntax of PRINTSPF is modeled after the MPE XL PRINT command. It can be used to print ranges of records (both absolute and EOF-relative) and it can also display the record number of each record for easy reference.

D.1 SYNTAX

```
PRINTSPF "[FILE=]<filename>  
          [;[START=]<startrec>]  
          [;[END=]<endrec>]  
          [;[WIDTH=]<linewidth>]  
          [;NUM]"
```

Parameter Definitions

filename

Actual file name of the file to be printed to STDLIST. The filename parameter may specify a permanent disc file. File equations are ignored unless an asterisk (*) precedes the filename, indicating a backreference. If the file name is of the form I##### or O##### then PRINTSPF will search the current (logon) directory for the spool file first. If the file is not found there, PRINTSPF will then search the IN.HPSPOOL (for I#####) or OUT.HPSPOOL (for O#####) directories for the file. Note that this searching procedure is done only if the file name is not qualified with a group or account name.

For example: :PRINTSPF O2353 searches for O2353 in the current directory first. If O2353 is not found then PRINTSPF will search for O2353.OUT.HPSPOOL.

startrec

Specifies the record number of the first file record to be displayed. If positive, *startrec* is relative to 1. If it is negative, it specifies a record location relative to the end-of-file, that is, -5 indicates the fifth (5th) record from the end-of-file. Zero is changed to a 1. Default is the first record of the file (1).

<i>endrec</i>	Specifies the last record of the file to be displayed. If positive, <i>endrec</i> is relative to 1. If negative, it specifies a location relative to the end-of-file, that is, -5 indicates the fifth (5th) record from the end-of-file. Zero is changed to a 1. Default is the last record of the file.
<i>linewidth</i>	Specifies the number of characters to display on each line. The default is the record size of STDLIST minus one. If the line contains more characters than <i>linewidth</i> , they are truncated.
NUM	Specifies numbering of the lines as they are displayed. The numbers appear in front of the line (record) being displayed. The number displayed is the actual record number (relative to 1) of each line displayed. By default, record numbers are not displayed.

D.2 OUTPUT FORMAT

There are five types of spool file records: open, write, close, control and device control. For each of these types PRINTSPF displays a line of formatted data. The syntax for the formatted output is described below. Note that all output enclosed in "[" and "]" is displayed only if the spool file record contains such information.

OPEN -
OP P1=\$xxxx P2=\$xxxx [BUF/#1111= aaa...a]

xxxx are the hex values for P1 and P2.

1111 is the buffer length in decimal.

aaa...a is the ASCII contents (forms message) of the buffer.

CLOSE -
CL P1=\$xxxx P2=\$xxxx

xxxx are the hex values for P1 and P2.

WRITE -
WR P1=\$xxxx P2=\$xxxx [CC=%cc] [BUF/#1111=aaa...a]

xxxx are the hex values for P1 and P2.

cc is the octal value of the carriage control.

1111 is the buffer length in decimal.

aaa...a is the ASCII contents (data) of the buffer.

CONTROL -

CO P1=\$xxxx P2=\$xxxx

xxxx are the hex values for P1 and P2.

DEVICE CONTROL -

DC P1=\$xxxx P2=\$xxxx FN=#ffff [BUF/#1111=hhh...h]

xxxx are the hex values for P1 and P2.*ffff* is the decimal value of the FDEVICECONTROL function.*1111* is the buffer length in decimal.*hhh...h* is the hex contents of the buffer.

D.3 SAMPLE OUTPUT

The following is the sample output from the following invocation of PRINTSPF:

:PRINTSPF "FILE=02.OUT.HPSPOOL; WIDTH=69"

PRINTSPF A.00.00 Copyright (C) Hewlett-Packard 1989. All rights reserved.

OP P1=\$0000 P2=\$0000

WR P1=\$0001 P2=\$0000 CC=%061

WR P1=\$0001 P2=\$0000 CC=%000 BUF/# 21= :JOB MANAGER.SYS,PUB.

WR P1=\$0001 P2=\$0000 CC=%000 BUF/# 51= PRIORITY = DS; INPRI = 8; TIME = UNLI

WR P1=\$0001 P2=\$0000 CC=%000 BUF/# 17= JOB NUMBER = #J1.

WR P1=\$0001 P2=\$0000 CC=%000 BUF/# 28= MON, MAR 27, 1989, 9:35 AM.

WR P1=\$0001 P2=\$0000 CC=%000 BUF/# 25= HP3000 / MPE XL Z.34.45.

WR P1=\$0001 P2=\$0000 CC=%040 BUF/# 75= MPE XL CI A.20.00 Copyright (C) Hewle

WR P1=\$0001 P2=\$0000 CC=%040

WR P1=\$0001 P2=\$0000 CC=%040 BUF/# 23= :setvar hpautocont true

WR P1=\$0001 P2=\$0000 CC=%040 BUF/# 1= :

WR P1=\$0001 P2=\$0000 CC=%040 BUF/# 4= :eod

WR P1=\$0001 P2=\$0000 CC=%040 BUF/# 6= :print

WR P1=\$0001 P2=\$0000 CC=%040 BUF/# 1= 1

WR P1=\$0001 P2=\$0000 CC=%040 BUF/# 1= 2

WR P1=\$0001 P2=\$0000 CC=%040 BUF/# 1= :

WR P1=\$0001 P2=\$0000 CC=%040 BUF/# 11= :echo hello

WR P1=\$0001 P2=\$0000 CC=%040 BUF/# 9= :echo bye

WR P1=\$0001 P2=\$0000 CC=%040 BUF/# 3= bye

WR P1=\$0001 P2=\$0000 CC=%040 BUF/# 13= :print \$stdin

WR P1=\$0001 P2=\$0000 CC=%040 BUF/# 1= 1

WR P1=\$0001 P2=\$0000 CC=%040 BUF/# 1= 2

WR P1=\$0001 P2=\$0000 CC=%040 BUF/# 11= :echo hello

WR P1=\$0001 P2=\$0000 CC=%040 BUF/# 5= hello

WR P1=\$0001 P2=\$0000 CC=%040 BUF/# 4= :eod

WR P1=\$0001 P2=\$0000 CC=%040 BUF/# 9= :echo bye

Print Spoolfile Utility (PRINTSPF)

```

WR P1=$0001 P2=$0000 CC=%040 BUF/# 3= bye
WR P1=$0001 P2=$0000 CC=%040 BUF/# 14= :print $stdinx
WR P1=$0001 P2=$0000 CC=%040 BUF/# 1= 1
WR P1=$0001 P2=$0000 CC=%040 BUF/# 1= 2
WR P1=$0001 P2=$0000 CC=%040 BUF/# 1= :
WR P1=$0001 P2=$0000 CC=%040 BUF/# 11= :echo hello
WR P1=$0001 P2=$0000 CC=%040 BUF/# 9= :echo bye
WR P1=$0001 P2=$0000 CC=%040 BUF/# 3= bye
WR P1=$0001 P2=$0000 CC=%040 BUF/# 22= :run ci.pub.sys;parm=3
WR P1=$0001 P2=$0000 CC=%000
WR P1=$0001 P2=$0000 CC=%320 BUF/# 1= :
WR P1=$0001 P2=$0000 CC=%040 BUF/# 10= echo bye 0
WR P1=$0001 P2=$0000 CC=%040 BUF/# 5= bye 0
WR P1=$0001 P2=$0000 CC=%000
WR P1=$0001 P2=$0000 CC=%000 BUF/# 14= END OF PROGRAM
WR P1=$0001 P2=$0000 CC=%040 BUF/# 11= :echo bye 1
WR P1=$0001 P2=$0000 CC=%040 BUF/# 5= bye 1
WR P1=$0001 P2=$0000 CC=%040 BUF/# 11= :echo bye 2
WR P1=$0001 P2=$0000 CC=%040 BUF/# 5= bye 2
WR P1=$0001 P2=$0000 CC=%040 BUF/# 22= :run ci.pub.sys;parm=3
WR P1=$0001 P2=$0000 CC=%000
WR P1=$0001 P2=$0000 CC=%320 BUF/# 1= :
WR P1=$0001 P2=$0000 CC=%040 BUF/# 7= pstdinz
OP P1=$0000 P2=$0000
WR P1=$0001 P2=$0000 CC=%000 BUF/# 3= "a"
WR P1=$0001 P2=$0000 CC=%000 BUF/# 3= "b"
WR P1=$0001 P2=$0000 CC=%000 BUF/# 11= ":echo bar"
WR P1=$0001 P2=$0000 CC=%000 BUF/# 11= ":echo foo"
CL P1=$0000 P2=$0000
WR P1=$0001 P2=$0000 CC=%000
WR P1=$0001 P2=$0000 CC=%000 BUF/# 14= END OF PROGRAM
WR P1=$0001 P2=$0000 CC=%040 BUF/# 7= echo me
WR P1=$0001 P2=$0000 CC=%000 BUF/# 47= MISSING COLON BEFORE COMMAND NAME. (
WR P1=$0001 P2=$0000 CC=%040 BUF/# 11= :echo fudge
WR P1=$0001 P2=$0000 CC=%040 BUF/# 5= fudge
WR P1=$0001 P2=$0000 CC=%040 BUF/# 22= :run ci.pub.sys;parm=3
WR P1=$0001 P2=$0000 CC=%000
WR P1=$0001 P2=$0000 CC=%320 BUF/# 1= :
WR P1=$0001 P2=$0000 CC=%040 BUF/# 11= echo me too
WR P1=$0001 P2=$0000 CC=%040 BUF/# 6= me too
WR P1=$0001 P2=$0000 CC=%000
WR P1=$0001 P2=$0000 CC=%000 BUF/# 14= END OF PROGRAM
WR P1=$0001 P2=$0000 CC=%040 BUF/# 14= :echo you too?
WR P1=$0001 P2=$0000 CC=%040 BUF/# 8= you too?
WR P1=$0001 P2=$0000 CC=%040 BUF/# 4= :eoj
WR P1=$0001 P2=$0000 CC=%000 BUF/# 62= CPU SEC. = 3. ELAPSED MIN. = 1. MON
CL P1=$0000 P2=$0000

```

D.4 NOTES

- Although the primary purpose of PRINTSPF is to display formatted spool file records it may be used with other file types as well. However, when PRINTSPF detects that it is not working with a spool file it simply displays the contents of the file just as the PRINT command would.
- Only users with the SM capability can display private spool files.
- Control-Y will stop the display.

D.5 ERROR MESSAGES

Command syntax error.
The file name is too long.
No file name was specified.

OLD COMMAND SET Comparison

APPENDIX

E

E.1 EXISTING SPOOLING COMMANDS

Old Command Set	New Command Set
ALTSPoolFILE	SPOOLF ;ALTER
DELETESPOOLFILE	SPOOLF ;DELETE
HEADON	HEADON
HEADOFF	HEADOFF
OPENQ	OPENQ
OUTFENCE	OUTFENCE
RESUMESPOOL	SPOOLER ;RESUME
SHOWDEV	SPOOLER ;SHOW or SHOWDEV
SHOWIN	LISTSPF
SHOWOUT	LISTSPF
SHUTQ	SHUTQ
SPOOK	SPOOLF, LISTSPF, COPY, FCOPY, PURGE, RENAME, STORE, RESTORE
STARTSPOOL	SPOOLER ;START
STOPSPPOOL	SPOOLER ;STOP
SUSPENDSPOOL	SPOOLER ;SUSPEND



SPOOLING LOGGING RECORD FORMAT

APPENDIX

F

The formats of the New Commercial Spooler (NCS) Spoolfile Done log record for both output and input spoolfiles are shown below. (Note: Words 0/3 are added by the LOGHPE call. Words 4/30 (decimal) are part of the record type definition). The NCS records are similar to the corresponding MPE XL CM Spoolfile Done log records. The differences are:

- Eight bytes have been reserved following each of the User, Account, Job and File Designator fields for possible future expansion.
- The 15-bit Device File ID (DFID) is now a 31-bit SPOOLID. The I/O bit is now at the end of the field instead of at the beginning.
- The 16-bit spooler LDEV number is now an eight-byte ASCII device name with an additional eight bytes reserved for possible future expansion.
- Several of the fields have been moved and/or expanded to accommodate 32-bit boundaries.
- The maximum possible number of copies has been raised to 65535. Also the (current) copy number replaces the Number of Copies Remaining. What this means is that the CM spooler stored the copy count found in the ODD (less 1). This was counted down as each copy was printed. For example, if five copies were desired, the log record of the first copy would have a Number of Copies = 4 and the final log record would have 0. If a user altered the copy count with :ALTSPoolFILE or SPOOK >ALTER, there could be several log file entries with the same Number of Copies field.

Let's use our example to see how you could get more than one log record with the same Number of Copies entry: While the third of five copies is printing, someone changes the number of copies to 10. The first two log records (before the change) have "4" and "3" in their Number of Copies field. The third one has "9" (one less, remember), and succeeding copies count down to 0. Thus there will eventually be a second log record with "4" and another with "3". Moreover, the total number of copies printed will be 12 (two before the change and ten after).

The NCS spooling log record will record the current copy number instead. This will provide several benefits:

- The copy number is unique because it is counted up. If copies are added we just count higher.
- The copy number is provided to the output spooler along with the file. There is no need to read it from a table.
- The total number of copies is more consistent than in CM. If we use our earlier example, changing the total copies from 5 to 10 while the third copy is printing will result in ten total copies, not 12. Similarly, changing the total copies to 3 or less at that time will result in no more copies after the current one finishes.
- Maintaining the CM Number of Copies (totally backward compatible) is probably impossible. At best we would have to obtain the total number of requested copies from the SPFDIR (not normally provided us) and subtract the current copy number from it. This would not work if the total requested copies change. In our earlier example, the first two copies would be recorded as "4" and "3" as before, but after the copy count was raised to 10, subsequent log records would have:

[10 (the total) - 3 (current) =] "7", "6", etc.

Spooling Logging Record Format

NCS Spoolfile Done log record (output)

Word (hex)	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Word (dec)
0	Record type (= 120)																0
	Record length (= 62 halfwords)																
1	PIN																1
2	Time stamp																2
3	Jb type	Job															3
		number															
4	User																4
5	name																5
6	Reserved																6
7	Reserved																7
8	Account																8
9	name																9
a	Reserved																10
b	Reserved																11
c	Job																12
d	name																13
e	Reserved																14
f	Reserved																15
10	File																16
11	name																17

Spooling Logging Record Format

12		18
13	Reserved	19
14	Jb type Job +-----+ number	20
15	Spoolid I/O	21
16	Device	22
17	name	23
18		24
19	Reserved	25
1a	Number of records processed (may be > records in file if internal looping or pfail)	26
1b	Number of sectors in spoolfile	27
1c	Device type Device subtype	28
	Reserved Output priority	
1d	Current copy number	29
	Logical pages/physical page Reserved File dispostn	
1e	Number of physical pages	30

Spooling Logging Record Format

NCS Spoolfile Done log record (input)

Word (hex)	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Word (dec)
0	Record type (= 120)																0
	Record length (= 62 halfwords)																
1	PIN																1
2	Time stamp																2
3	Jb type	Job number															3
4	User name																4
5																	5
6	Reserved																6
7																	7
8	Account name																8
9																	9
a	Reserved																10
b																	11
c	Job name																12
d																	13
e	Reserved																14
f																	15
10	File name																16
11																	17

Spooling Logging Record Format

12	Reserved		18
13	Reserved		19
14	Jb type	Job number	20
15	Spoolid		21
16	Device name		22
17	Device name		23
18	Reserved		24
19	Reserved		25
1a	Number of records in spoolfile		26
1b	Number of sectors in spoolfile		27
1c	Device type	Device subtype	28
	Reserved	0	
1d	0	0	29
	0	File dispositn	
1e	0		30

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Appendix A

SELECTION EQUATIONS

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