Print Services Facility for OS/390

Diagnosis

Version 3, Release 1.0

G544-5623-00

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Note

Before using this information and the product it supports, be sure to read the general information in “Notices” on page vii.

First Edition (January 1999)

This edition applies to Print Services Facility Version 3 Release 1 Modification 0 for OS/390, Program Number 5655-B17, and to all subsequent releases and modifications until otherwise indicated in new editions or Technical Newsletters. Be sure to use the correct edition for the level of the product.

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This publication is intended to help you, the customer, diagnose problems in Print Services Facility for OS/390 (PSF for OS/390) and report them to IBM.

This publication contains information on diagnostic tools that you can use to isolate PSF software problems. This publication documents *product implementation information* provided by PSF.

Product implementation information is detailed design and implementation information that IBM provides to assist you in tasks such as tailoring, monitoring, modifying, tuning, and diagnosing. By their nature, these tasks require the use of information that depends on the detailed design and implementation of PSF. This publication documents no programming interfaces for you to use when writing programs that request or receive the services of PSF.

Attention: This publication documents information that is NOT intended to be used as Programming Interfaces.

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- OGL/370
- OS/390®
- Print Services Facility
- PSF
- RACF
- System/370
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About This Publication

This publication helps you communicate with the IBM Support Center representatives as they work to isolate the source of a problem in Print Services Facility for OS/390 (PSF for OS/390), hereafter called PSF. This publication does not give enough information to change or correct program logic.

The information in this publication is provided by IBM for diagnostic purposes and is subject to change as a result of maintenance and other activity.

Who Should Use This Publication

Use this publication if you are a system programmer, a system analyst, or an application programmer responsible for diagnosing problems in PSF.

What This Publication Describes

- About This Publication introduces you to the content of this publication.
- Chapter 1, Who Can Answer Questions About PSF? describes the roles of the people involved and the steps they should take when diagnosing a problem with PSF.
- Chapter 2, Building a Keyword String describes how to build a keyword string to help you communicate with the IBM Support Center.
- Chapter 3, Using the PSF Diagnostic Tools describes the diagnostic tools for use with PSF.
- Appendix A, Message-to-Module Cross-Reference associates the messages issued by PSF with the module or modules that detected the need for the messages.
- Appendix B, Cross Reference of Printer Commands and Structured Fields lists the printer commands built by PSF, as well as the source of the data.
- Appendix C, PSF Reason Codes presents the reason codes and return codes that PSF uses.
- Bibliography presents the titles and order numbers of the publications for IBM AFP printers, PSF, and related products.

Related Information

Publications that are referred to in this book or that contain additional information about Advanced Function Presentation (AFP), the MVS operating system, PSF, and related products are listed in the “Bibliography” on page 105.

For additional information about OS/390 and PSF for OS/390, refer to these Web pages:

`http://www.ibm.com/s390/os390`
`http://www.printers.ibm.com/pbin-id/go?/pdocs/psf390/home.html`

To obtain the latest documentation updates for OS/390 base elements and optional features that result from DOC APARs and PTFs, refer to the DOC APARs and ++HOLD DOC Web page:

`http://www.s390.ibm.com/os390/bkserv/new_tech_info.html`

To obtain the latest documentation updates for PSF for OS/390, refer to these members in SYS1.SAMPLIB:

Member	Publication
APSGCUSU	*PSF for OS/390: Customization*, S544-5622
APSGDGNU	*PSF for OS/390: Diagnosis*, G544-5623
APSGDLGU	*PSF for OS/390: Download for OS/390*, G544-5624
APSGMACU	*PSF for OS/390: Messages and Codes*, G544-5627
APSGSECU	*PSF: Security Guide*, S544-3291
APSGUSRU	*PSF for OS/390: User's Guide*, S544-5630

Summary of Changes

Summary of Changes for PSF for OS/390 Diagnosis, G544–5623–00

This publication contains additions and changes to information previously presented in *PSF/MVS: Diagnosis*, G544-5462-03, which supports PSF/MVS Version 2 Release 2.0. The technical additions and changes to that publication are marked with a revision bar to the left of the changes.

The following information describes the changes made in preparing this publication.

- The component identification number for PSF for OS/390, which is used in building keyword strings, was changed to 5655B1701. See “Component Identification Number” on page 6.
- The default for the TRACE parameter on the PRINTDEV statement has changed to YES. See “TRACE Parameter on the PRINTDEV Statement” on page 28.
- The syntax in the PARM statement was amended and the parameter *tcpip_name* was added under “PARM Parameters on the EXEC Statement” on page 28.
- Changes to the description of trace entries were made under “Using the PSF Trace Facility with the Download for OS/390 Feature” on page 36.
- In Appendix A, the following messages and modules were added, and messages APS361I, APS559I, and APS865I were deleted.

Message	Modules
APS030I	APSPPDVP
APS123I	APRBPGEX
APS128I	APRBPGEX
APS169I	APRCFIEX APRIPSEX APRIOBEX APSDLOAD
APS223I	APRMSGEX
APS225I	APSPPDVP
APS2431I	APRBPGEX
APS383I	APREAGAZ
APS384I	APRFDPAZ
APS385I	APRFDPAZ
APS386I	APROSTAZ
APS387I	APROSTAZ APREIOBEX
APS388I	APROSTAZ APRIMGAZ
APS389I	APRMSGEX
APS390I	APRMSGEX

Message	Modules
APS391I	APRMSGEX
APS392I	APRMSGEX
APS393I	APRMSGEX
APS395I	APRIBPAZ
APS615I	APSJCL
APS616I	APSJCL
APS617I	APSJCL
APS631I	APSEATCD
APS632I	APSEATCD
APS633I	APSEATCD
APS634I	APSEATCD
APS641I	APSEATCD
APS642I	APSEATCD
APS643I	APSEATCD
APS644I	APSEATCD
APS704I	APSESNTB
APS706I	APSEMSG
APS730I	APSESNTB
APS735I	APSEATCD
APS736I	APSEATCD
APS770I	APSESNTB
APS775I	APSEMSG
APS776I	APSEATCD
APS806I	APSESNTB
APS814I	APSESNTB
APS820I	APSEMSG
APS829I	APSEATCD
APS838I	APSESNTB
APS839I	APSEMSG
APS860I	APSEMSG
APS863I	APSEMSG
APS864I	APSEATCD
APS875I	APSEMSG
APS885I	APSEMSG
APS886I	APSEMSG
APS926I	APSCNORS
APS940I	APSCNORS
APS941I	APSCNORS
APS942I	APSCAPCI

Message	Modules
APS971I	APSCCLR
APS948I	APSNINIT
APS949I	APSNINIT APSPPFSP

- In appendix C, the following reason codes were added:

PSF CODES	DEFINITION	SET BY
X'04160000'	General information reason code. Provides environmental messages for objects on stack and position of current record.	APRBPGEX
X'04160100'	Group level finishing requested but printer does not support group level finishing.	APRBPGEX
X'04160200'	Medium level finishing requested but the printer does not support medium level finishing.	APRBPGEX
X'08140143'	X'4B' triplet missing from IOB structured field.	APRMSGEX
X'08140144'	Parameter in IOB structured field contains unacceptable data.	APRMSGEX
X'08140145'	Structured field not allowed in page segment included with an IOB.	APRMSGEX
X'08140146'	Invalid X'84' triplet in MCF2 structured field.	APRMSGEX
X'08140264'	Conflicting Setup IDs in MMCs under single MCC.	APRMSGEX
X'08140265'	Unpaired X'B4'/X'B5' keywords in an MMC.	APRMSGEX
X'08140266'	System Setup ID specified in the MMC is not available in the device.	APRMSGEX
X'08140267'	Invalid X'78' triplet in the PFC structured field.	APRMSGEX
X'08140268'	Scope of Medium Finishing Control structured field is invalid.	APRMSGEX
X'08140269'	Input bin substituted for a disabled inserter bin.	APRMSGEX
X'08140270'	No back side for a media eject control—no duplex.	APRMSGEX
X'08140429'	The FNM index in the FNI structured field is unacceptable.	APRMSGEX
X'08140430'	Metric technology and resolution values in the font do not match the specified values.	APRMSGEX
X'08160100'	Not enough storage for the RRB control block.	APRIOBEX
X'08160104'	The IOB specifies an invalid or unsupported object type.	APRIOBEX
X'0970EF08'	Cached Resource was not found on a load request.	APSLRIDS

- In Appendix C, reason codes X'0730202400', X'07302800', X'07302C00', X'07310200', and X'07310400' were deleted.
- The list of related publications was updated.

Chapter 1. Who Can Answer Questions About PSF?

This section describes the roles and tasks of the people involved in diagnosing and correcting problems. This section also describes how they can help you solve problems you encounter while using PSF.

Diagnostician

The diagnostician identifies the IBM program causing a problem and builds a keyword string describing it. The diagnostician then uses the string to search either an online data base called Information/Systems or a microfiche copy of the data base called the early warning system (EWS). The purpose of this search is to determine whether the problem has been described previously and, if so, whether a correction already exists for it.

The diagnostician can contact an IBM Support Center representative for help in the search. For more information, refer to *Introducing the Information/Family* and *IBM Programming Support General Information*.

IBM Support Center Representative

The IBM Support Center representative has three responsibilities in the diagnosis and correction process:

- Help the diagnostician search Information/Systems or EWS.
- Provide a correction if one exists.
- Refer the problem to an IBM specialist if the problem is new.

IBM Specialist

The IBM specialist contacts the diagnostician, and, together, they do two things to solve the problem:

- Verify that the diagnostician used the correct keywords in building the string.
- Gather additional information about the problem. For the information that might be needed, see “Preparing APARs” on page 14.

After confirming that no previous report of the problem exists, the IBM specialist develops a bypass, if the customer requires one to continue using the product. Also, the specialist gives the customer an authorized program analysis report (APAR) number to use when sending requested information to the IBM change team.

IBM Change Team Member

The IBM change team member does the following:

- Develops corrections for valid program problems reported in APARs.
- Makes the correction available to the customer reporting the problem.

- Modifies the keyword string, if necessary, to describe the problem more accurately.
- Adds the keyword string and the program correction to the data base.

Chapter 2. Building a Keyword String

Often a problem you encounter with PSF is one that other users have reported and that has been fixed. Records of such problems and their fixes are stored in an online data base called Information/Systems and in a microfiche data base called the early warning system (EWS). To search one of these data bases, you can construct a keyword string, consisting of a concise series of terms, each of which describes one aspect of the problem. By constructing an accurate keyword string, you can help make the search quick, easy, and reliable.

Preparing to Build the Keyword String

Before you build a keyword string, do the following:

1. Ensure that the problem is in PSF. If you find that the problem results from a user error, refer to *PSF for OS/390: User's Guide* or *PSF for OS/390: Customization* for the correct procedure.
2. If PSF has been changed since you last used it, examine the changes. If you suspect that the problem is due to incompatibilities between your program and the changed PSF program, note the area in which the incompatibility seems to be.
3. Correct all the problems reported in messages describing incorrect user data or resources. Refer to *PSF for OS/390: Messages and Codes*.
4. Use the applicable diagnostic aids, such as traces and dumps, that may help you isolate the component that contains the problem. For a description of the aids available, see Chapter 3, Using the PSF Diagnostic Tools.
5. Note the sequence of events that led to the problem. This information may be useful in developing a keyword string and is needed if an authorized program analysis report (APAR) is required.
6. If you suspect a problem in the PSF program, see Figure 1 on page 5 for an explanation of the procedure for selecting keywords.

The Keywords

Each keyword in a keyword string is a word or abbreviation describing one aspect of a PSF program problem. The first keyword gives the name of the PSF component in which the problem is thought to have occurred. By searching Information/Systems or EWS with this keyword, you can find all the APARs written for that component of PSF. By adding other keywords to the keyword string, you reduce the number of matches and increase the chances of finding a solution to your specific problem.

A complete string of keywords contains one keyword of each of the following types:

- Component identification number
- Type of problem, with qualifiers
- Module or modifier
- Environment
- Release and maintenance level

If one of these types does not seem to apply to your problem, you can go on to the next type. In general, however, do not start your search until you have a complete string of keywords.

Your search will be most successful if you:

- Use only the keywords presented and described in this publication.
- Spell the keywords exactly as they are spelled here.
- Follow the keyword procedures in the order shown.

Throughout these procedures, each keyword string is highlighted in **bold** type. Each section provides a partial keyword string describing what is known so far about the problem. For some keywords, you may need to add a specific piece of information, for example, by replacing the *x* of the MSG*x* keyword with the identifier of the message received. Continue to develop the keyword string until you are instructed to use it as a search argument.

The position of the keywords is not important; however, you do need to separate them with spaces.

The procedure for building and using a keyword string is diagrammed in Figure 1 on page 5. After reviewing this figure, see “Component Identification Number” on page 6 to begin building a keyword string.

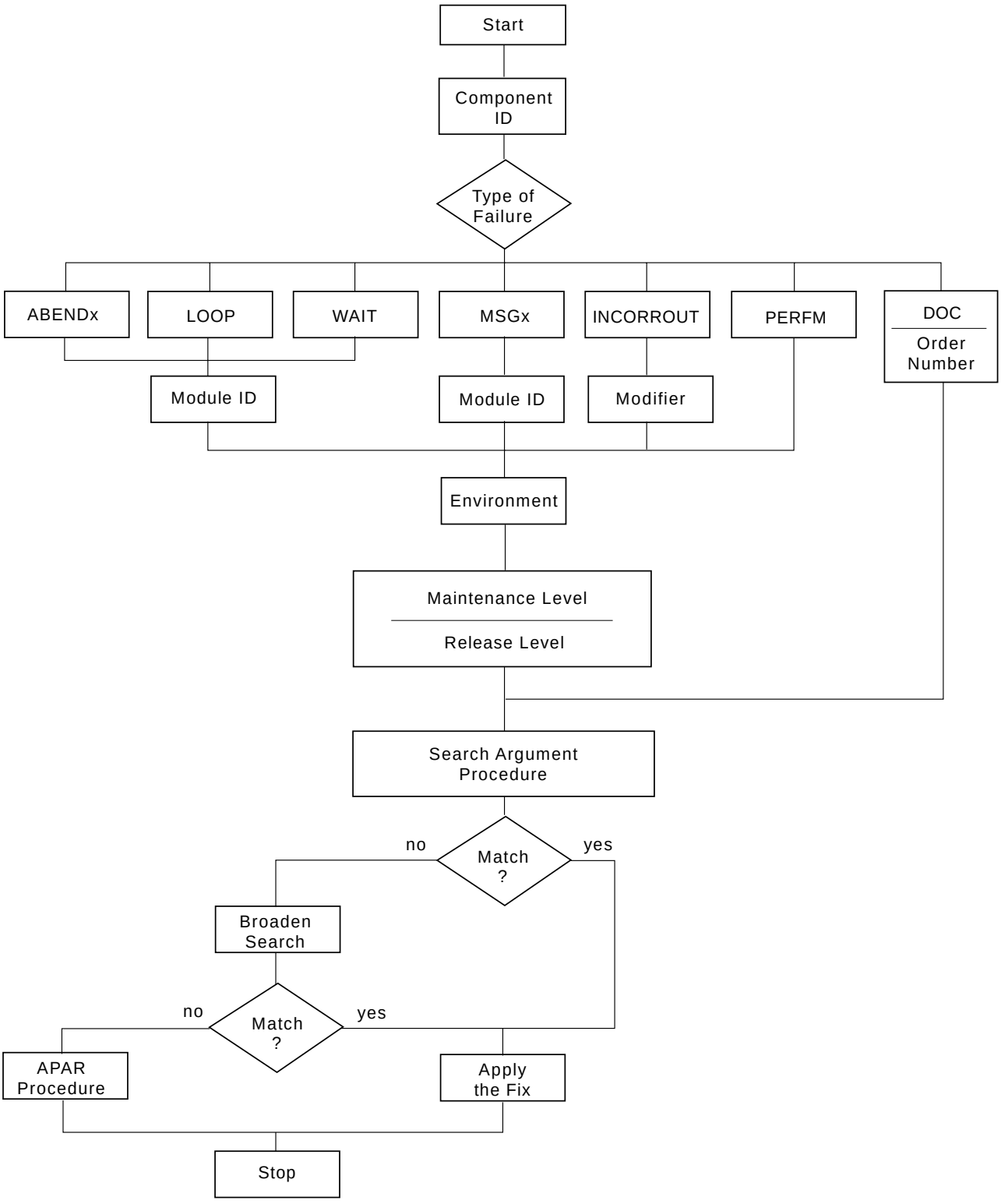

Figure 1. Building and Using a Keyword String

Component Identification Number

The component identification number is the first keyword in a keyword string. Whenever you suspect that the problem is in PSF, use 5655B1701 as the first keyword.

Procedure

1. The component identification number for PSF is:

   5655B1701

2. To indicate the type of problem that occurred, see Type-of-Failure Keyword.

Type-of-Failure Keyword

The type-of-failure keyword identifies the type of program problem. The seven possibilities are:

ABENDx	Abnormal end of PSF. See “ABENDx” on page 6.
LOOP	Uncontrolled program looping. See “LOOP” on page 7.
WAIT	Unexpected program suspension. See “WAIT” on page 8.
MSGx	An error signaled by or associated with messages. See “MSGx” on page 8.
INCORROUT	Incorrect or missing output unrelated to a message. See “INCORROUT” on page 9.
PERFM	Performance degradation. Use this keyword only when no other keyword seems applicable. See “PERFM” on page 9.
DOC	Documentation problem. See “DOC” on page 10.

Select the keyword that best describes the problem. If you are not certain which of two keywords to use, use the one listed first in the list. The following pages explain the situations that govern which type-of-failure keyword to use.

ABENDx

Use the ABENDx keyword when the host system, PSF, or any program that services PSF ends abnormally. If the abnormal end was forced by the host system or by the operator because of a prolonged wait state or an endless loop, do not use this keyword. In these situations, see the descriptions of the LOOP and WAIT keywords.

Procedure

1. Add the ABEND code (in a dump, the last 3 hexadecimal numerals in the system completion code) to the keyword. For example, if the system completion code is 0C4, use ABEND0C4. If the code is 024, 027, or 0A6 (0A6 applies to the Page Printer Communication Component, [PPCC]), indicating that PSF ended abnormally, add RC and the reason code: in a dump, the last 3 hexadecimal numerals in register 15 at the time of the error. Thus, if the system completion code is 024, and register 15 reads 000194, use ABEND024 RC0194.
2. The format of the keyword string might now be as follows:

```
5655B1701 ABEND024 RC0194
```

where the first keyword is the component ID number, the second is the type of error, and the third is the reason code.

3. For help in determining which module failed, see “Module Keyword” on page 10.

LOOP

Use the LOOP keyword if part of PSF seems to go into an endless loop, for instance, if part of the output repeats endlessly. If you suspect a loop, ask the operator to request a dump by using the OS/390 system command DUMP, as described in the system commands publication for your operating system; then cancel the PSF-started job. Whenever possible, the dump should contain the OS/390 system trace table and the PSF internal trace table (see “TRACE Parameter on the PRINTDEV Statement” on page 28). For details on how to include the PSF internal trace table, see Chapter 3, Using the PSF Diagnostic Tools.

Note: Before requesting the dump, start the generalized trace facility (GTF) with the SYS and JOBNAME options, to keep the trace overhead to a minimum. For details on how to obtain and print a GTF trace, refer to the Service Aids publication for your operating system.

For an endlessly repeated message, first use the MSG keyword to conduct the search. If no match is found, use the LOOP keyword. If an intentional loop is used to wait for a resource, use the WAIT keyword rather than the LOOP keyword.

Procedure

If a PSF program suspends activity for no clear reason, PSF may be in either a loop or a wait state. An example of a loop is a page of output that repeats endlessly.

1. Run the job again and request a storage dump. Check the dump for an OS/390 system internal trace table, a PSF internal trace table, or both. If the trace tables are not contained in the dump, and you are unable to determine whether the problem is a wait or a loop, but you can recreate the problem, do the following:
   - Start the PSF internal trace. See “TRACE Parameter on the PRINTDEV Statement” on page 28.
   - Redefine the trace table size to be as large as feasible.

   For details, see Chapter 3, Using the PSF Diagnostic Tools.

   Run the job again and request a dump using the OS/390 system DUMP command. Ensure that the SDATA operand of the command contains RGN (region). If the job is not in a loop, see “WAIT” on page 8.
2. The format of the keyword string might now be as follows:

   ```
   5655B1701 LOOP
   ```

   where, as before, the first keyword specifies the component ID, and the second specifies the type of problem.
3. To determine which module contains the problem, see “Module Keyword” on page 10.

WAIT

Use the WAIT keyword when the host system, PSF, or a program that services PSF suspends activity, without issuing a message. If you suspect a wait condition, ask the operator to request a dump by using the OS/390 system command DUMP, as described in the OS/390 system commands publication for your operating system. Ensure that the SDATA operand of the command contains RGN. Then cancel the PSF-started task.

This dump should contain the OS/390 system trace table and the PSF internal trace table (see “TRACE Parameter on the PRINTDEV Statement” on page 28).

Inspect the dump to see whether the wait bit is on in the program status word (PSW).

Do not use this keyword if the wait occurs after an abnormal end, as the result of an unanswered message, or because of an endless loop in PSF; instead, use the ABEND or LOOP keywords.

Procedure

1. Add the WAIT keyword to the string.
2. The format of the keyword string might now be as follows:

   ```
   5655B1701 WAIT
   ```

3. To identify the module that contains the problem, see “Module Keyword” on page 10.

MSGx

Use the MSGx keyword when:

- A message was issued when it should not have been.
- A message was not issued when it should have been.
- A message contains invalid or missing data.
- The corrective action suggested in *PSF for OS/390: Messages and Codes* does not correct the problem.

A set of 7 or 8 characters in the form “**APS***nnns*” or “**APS***nnnns*” identifies each PSF message. APS identifies the component; *nnn* or *nnnn* identifies the message serial number; and *s* identifies the message type.

Note: If PSF issues a message when it should not, you can request a conditional dump for that message. See “Conditional Dump” on page 48.

Procedure

1. Replace the *x* in the MSGx keyword with the message identifier; for example, if the message identifier is APS022I, the MSG keyword is

   MSGAPS022I

2. To identify the module that detected the reason for the message, see Appendix A, Message-to-Module Cross-Reference, then add the module name to the keyword string. If more than one module can issue the message, you may be able to isolate the issuing module by comparing the message context with the module functions.

For example, message APS120I indicates an invalid input record or resource, and both the message variables and the associated messages show the type of input or resource. This message can be issued by any of the following modules: APRENVAZ, APRCS2AZ, APRCP2AZ, APRCF2AZ, and APRFDPAZ.

Note: The module that issued the message is not necessarily the module that contains the problem.

The format of the keyword string might now be as follows:

```
5655B1701 MSGAPS052I APSPPGDS
```

Or, if the need for the message can be detected by more than one module:

```
5655B1701 MSGAPS120I APRENVAZ
5655B1701 MSGAPS120I APRCS2AZ
```

3. See “Environment and Printer Keywords” on page 12, and select the correct environment keyword.

INCORROUT

Use the INCORROUT keyword when the output is not received or is not what you expected. Do not use this keyword for output that is repeated endlessly; in that case, use the LOOP keyword.

Procedure

1. Ensure that the output really is incorrect, rather than merely undesirable in appearance.
2. The format of the keyword string might now be as follows:

   ```
   5655B1701 INCORROUT
   ```

3. See “INCORROUT Modifier Keywords” on page 10, and select the correct keyword.

PERFM

Use the PERFM keyword when part of PSF performs below your expectations and the performance problem cannot be corrected by system tuning. Ensure that the application programs, the JCL, and the data set definitions have been thoroughly examined.

The speed with which a job is processed can be affected by the number and complexity of the resources used. Also, if you are running a 3800 printer under compatibility mode and then switch to all-points-addressable (APA) mode, you may note a difference in performance. This difference is not necessarily caused by a performance problem.

Procedure

1. The format of the keyword string might now be as follows:

   ```
   5655B1701 PERFM
   ```

2. See “Environment and Printer Keywords” on page 12, and select the correct environment keyword.

DOC

Use the DOC keyword when a programming problem seems to have been caused because information in a PSF publication is vague, incorrect, or missing.

Procedure

1. After the DOC keyword, skip one space and add the order number of the publication. Do not use hyphens; that is, rather than G544-5627-00, type G544562700.
2. The format of the keyword string might now be as follows:

   ```
   5655B1701 DOC G544562700
   ```

3. If you find too many matches, add keywords unique to the documentation error you suspect. For example, add MSG*x* as a keyword if you are looking for a particular message because you suspect its contents are incorrect or unclear, or because it is not documented in *PSF for OS/390: Messages and Codes*.

If the search is unsuccessful, replace the suffix numerals in the order number ("00" in the example above) with two asterisks, and search again. By including the asterisks, you are requesting a search for document errors in all the editions of a publication.

Module Keyword

The module keyword identifies the module related to the program problem.

Procedure

If you have a storage dump, use this procedure to find the name of the module associated with the program problem.

Note: This is not necessarily the module containing the problem.

1. In the storage dump, find the instruction address at which the abend occurred, the supervisor call instruction (SVC) for the WAIT was issued, or the LOOP occurred.
2. Back up from that instruction until you find a 6- to 8-character module ID (for example, APSPPDVP) followed by a module date. Include the module ID as part of the keyword string (for example, APSPPDVP).
3. The format of the keyword string might now be as follows:

   ```
   5655B1701 ABEND024 RC0194 APSPPDVP
   ```

4. See "Environment and Printer Keywords" on page 12, and select the correct environment keyword.

INCORROUT Modifier Keywords

This section describes the various keywords by which you can describe the incorrect output. You can use these keywords to describe missing or extra data, or data that you did not specify. The three levels of keywords to use are:

- The first level describes the document; for example, a document in line format.
- The second level describes what part of the document was incorrect; for example, an image.

- The third level describes how the part was incorrect; for example, the image was the wrong size.

Procedure

1. From Table 1, select one keyword to describe the document in which the incorrect output occurred.

Table 1. Modifier Keywords: Description of Pages

Keyword	Explanation
LINE	The document consisted of one or more line format pages, optionally including structured fields.
COMPOSED	The document consisted of one or more composed-text pages, for example, the output from DCF or OGL.
MIXED	The document consisted of both line-format and composed-text pages.

2. Select one or more keywords to describe the part that is incorrect. For example, if the incorrect output involves a page segment in an overlay, specify **OVERLAY SEGMENT**.

Table 2. Modifier Keywords: Incorrect Part

Keyword	Incorrect Part
BIN	You did not get the bin number you specified.
DBLFONT	You did not get the double-byte font you specified.
DOCUMENT	You did not get the document as you specified it.
DUPLEX	You did not get the simplex or duplex printing you specified.
EXIT	You did not get the user exits you requested.
SNGLFONT	You did not get the single-byte font you specified.
GROUP	You did not get the correct number of identical copies of a form.
IMAGE	You did not get the image you specified; you did not get the image with the orientation or position you specified; a scaling (double dot) error occurred; or the image was not repeated correctly.
MARGIN	The side, top, or bottom margin is not what you specified.
MOD	Data was not correctly added to or suppressed in selected copies of certain pages of the data set.
OVERLAY	You did not get the electronic overlay you specified; you did not get the orientation or position you specified; or part of the overlay (to be described by using one or more additional keywords) was wrong.
PAGE	You did not get the page as you specified it.
RULE	The position, direction, length, or weight of one or more rules is not what you specified.
SEGMENT	You did not get the page segment you specified, or you did not get the orientation or position you specified.
TEXT	The content, position, line spacing, or orientation of the text is not what you specified.

3. Select one or more of the keywords listed in Table 3 to describe what is wrong with the part just named.

Table 3. Modifier Keywords: Description of Incorrect Output

Keyword	Explanation
CONTENT	The content of the part was wrong.
DIRECTION	The rule direction was wrong.
EXTRA	An extra part was included in the output.
LENGTH	The rule length was wrong.
LINESPACE	The line spacing for a document, a page, or a text string was wrong.
MISSING	The part was missing from the output.
ORIENT	The orientation of the part was wrong.
POSITION	The position of the part was wrong.
REPEAT	The repetition of text or image cells was wrong.
SCALE	A scaling (double dot) error in an image occurred.
SIZE	The size of the part was wrong.
WEIGHT	The rule weight was wrong.

4. The format of the keyword string might now be as follows:

   5655B1701 INCORROUT LINE GROUP EXTRA

   This example describes the case of extra, identical copies of one or more sheets of data.

   You can narrow the search by defining the incorrect output more precisely. The following are a few examples of INCORROUT strings:

   - In a composed-text page, the text in an included page segment was not in the expected orientation:

     5655B1701 INCORROUT COMPOSED SEGMENT TEXT ORIENT

   - On a line data page, an image specified as double-dot was printed in the normal size:

     5655B1701 INCORROUT LINE IMAGE SCALE

   - On a line data page, an overlay that was specified was not printed:

     5655B1701 INCORROUT LINE OVERLAY MISSING

5. See “Environment and Printer Keywords” on page 12, and select an environment keyword.

Environment and Printer Keywords

The following keywords describe both the environment under which PSF was running when the problem occurred and the type of printer that was specified.

Procedure

1. Select one keyword according to the JCL used:

   DEFERRED You specified deferred-printing mode in the JCL (SYSOUT=).

   DIRECT You specified direct-printing mode in the JCL (UNIT=).

2. Specify the type of printer [1]:

   D/Txxxxmmm

   where **xxxx** specifies the printer number, and **mmm** specifies the model number.

   For example, **D/T3820** specifies a 3820, and **D/T3835** specifies a 3835.

3. The format of the keyword string might now be as follows:

```
5655B1701 WAIT APSDLOAD DIRECT
                        D/T3835
```

   Note: SNA-attached printers run only in deferred-printing mode under the job entry subsystem (JES). All other printers run either in deferred-printing mode under JES or in direct-printing mode.

4. See "Version, Release, and Maintenance Level Keywords" on page 13, and select the correct keywords.

Version, Release, and Maintenance Level Keywords

The keywords of this type give exact details about the version, release, and maintenance level of PSF your installation is using. The System Modification Program/Extended (SMP/E) consolidated software inventory data set (CSI) contains the ID of the latest program temporary fix (PTF) that has been applied to your program. This ID, two letters and five numerals, gives the maintenance level of your program. For help in finding the PTF ID, refer to the *SMP/E User's Guide* for your operating system.

Procedure

1. From the cover of the *PSF for OS/390: Program Directory*, specify the PSF version, release, and modification level as a 3-digit code. For example, 310 represents Version 3 Release 1 Modification Level 0.

2. From the CSI listing, specify the ID, preceded by the prefix UY, UW, or UZ, of the latest PTF applied to your PSF program. Use the PTF number as a keyword *only* if you suspect that the PTF has caused the problem.

3. The format of the keyword string might now be as follows:

```
5655B1701 WAIT APSDLOAD DIRECT 310
                        D/T3835
```

[1] You can also use D/T3800 as a keyword for all models of the 3800.

Search Argument Procedure

You now have the information needed for an effective search of the problem listings in Information/Systems or EWS. If you do not have access to Information/Systems or EWS, consult your IBM Support Center. If you do have access to Information/Systems or EWS, perform the following steps:

Each keyword describes one aspect of a program problem. The more precisely the keyword string describes the problem, the more selective the search.

The following procedure explains how to use the keyword string as a search argument in Information/Systems or EWS:

1. Search Information/Systems or EWS, using the full keyword string you have developed.
2. From the list of matches, eliminate any APAR fixes or PTFs that have already been applied to your system.
3. Compare each remaining APAR or PTF closing description with the problem symptoms you have observed.
4. If you find a match and a fix, apply the fix described in the APAR record, and test the fix.
5. If you find a match but no fix, ask your IBM representative to notify you when a fix becomes available.
6. If you find no match, broaden the search by dropping keywords one at a time from the right side of the search argument, and repeat the search.
7. If you still cannot find a match, consult your IBM Support Center.

Preparing APARs

If the diagnostic procedures described here have been followed, but the keyword search has been unsuccessful, then and only then is an authorized program analysis report (APAR) prepared.

Procedure

1. Initiating an APAR

   If, after you have consulted your IBM Support Center for assistance, no fix for your problem is found, an IBM specialist will contact you to diagnose the problem in more detail. If the problem is a new one, the specialist will initiate an APAR. Be prepared to supply the following information:

   - Customer number
   - Release level
   - Current service level (the PTF list and list of APAR fixes applied)
   - Keyword string or strings used to search Information/Systems or EWS
   - Processing unit number: serial number, type, and model
   - Printer type and model

2. Gathering information for an APAR

You may be asked to supply any or all of the following information to describe the environment of the PSF problem:

- A description of the problem
- The SMP/E PTF or SMP/E CSI listing
- As small a segment of the input statements and data as is sufficient to reproduce the problem
- As small a segment of the output as is sufficient to illustrate the problem
- Any traces or storage dumps that you have used to diagnose the problem
- Terminal operator log (or the control statement listing from the library)
- A full listing of the JCL used
- Any printed output of data related to the job or data set in error, such as data set error messages
- A copy of the link-edit map for load module APSPPIEP
- A copy of the host system log
- For a WAIT problem (if possible):
  - A description of the resource being waited for
  - The program module that is waiting
- For a LOOP problem, the location of the loop or at least a partial trace of the loop
- For a DOC problem, the location of the error in the publication and a description of the problem it caused
- For a PERFM problem, a description of the actual performance and the expected performance, and the source of the performance specification

3. Submitting the information

   When submitting information for an APAR to IBM, carefully pack and clearly identify any storage media that contain source programs, job stream data, data sets, or libraries.

   Any storage media submitted must have the following information attached and visible:

   - The APAR number assigned by IBM
   - A list of the data sets on the storage media: application source program, JCL, data, and so on
   - A description of how the storage media were made, including the following:
     - The JCL needed to get the information from the tape
     - The exact JCL listing or the list of commands used
     - Labeling information used for the volume and its data sets
     - The recording mode and density
     - The attributes used for each data set

   Each source submitted must have the following information attached and visible:

   - The APAR number assigned by IBM

- The contents of the storage media: source program, job control statements, data, and so on

Each dump, and any other printed information, must show the APAR number.

Chapter 3. Using the PSF Diagnostic Tools

This chapter describes the diagnostic tools you can use to collect information about PSF software problems. These tools may help you identify the PSF module causing a problem. After you have identified the module causing the problem, you can include the module name in the keyword string you have created for searching the data base of known PSF problems, as explained in Chapter 2. If you cannot find a match for your problem in the data base, the tools described in this chapter can provide information that will be useful to your IBM specialist when further investigation of the problem is required.

This chapter describes both the PSF diagnostic tools and some standard OS/390 diagnostic tools. For the PSF diagnostic tools, the chapter describes methods of invoking them and presents sample JCL statements to illustrate using them. For the standard OS/390 diagnostic tools that can be useful in diagnosing PSF problems, the chapter provides brief descriptions with references to other publications that contain details on using the tools and interpreting their output.

This chapter also presents a procedure for terminating a printer FSA that does not respond to JES commands.

Diagnostic Procedures

Listed below are problem situations corresponding to the first five keywords listed in “Type-of-Failure Keyword” on page 6. Each situation is followed by the names of diagnostic tools you can use to gather information about the problem, as well as what to look for in the output of those tools.

Abend

If you have correctly coded the JCL to request a dump, a storage dump is written to the applicable data set. For a description of the ways to request the various dumps, see “Dumps” on page 48.

LOOP or WAIT

If a loop or a wait is indicated, cancel the PSF-started task with a dump:

- If the dump indicates a loop, start the PSF internal wrap trace, start a GTF trace with the SYS and JOBNAME options, and request a dump by using the OS/390 system DUMP command; ensure that the SDATA operand of the DUMP command includes TRT.
- If the dump indicates a wait, you might want to start an FSA full external trace to get a complete history of the PSF activity. The full trace might help you determine the cause of the wait.

INCORROUT

A conditional dump or a PSF internal or external trace can help find the source of the program problem.

Messages

The action to take in response to a message depends on the type of message. To correct an error condition, you may have to use an OS/390 SLIP trap or a conditional dump.

Invalid Error Message

The three types of invalid error messages occur when:

- A message is issued when it should not have been.

  If you receive a PSF error message and follow the recovery actions described in *PSF for OS/390: Messages and Codes* without finding the source of the problem, use the DUMP keyword in the PRINTDEV statement to request that the system perform a conditional dump when the message occurs.

- PSF does not issue a message when it should.

  If you do not receive a PSF message when you think you should have, run the job again and capture a PSF full FSA trace.

- A message contains invalid data or does not contain data that it should contain for the error encountered.

  Run the job again and capture a PSF full FSA trace.

Valid Error Message

Do not confuse this case with one in which the message itself is in error. PSF messages point to the data stream object associated with the error. For an explanation of the error and for suggested actions to take, refer to *PSF for OS/390: Messages and Codes*.

Traces

The following list presents PSF-supplied traces and system traces that can be helpful in diagnosing PSF software problems. The service representative in the IBM Support Center may ask you to run a trace to aid in diagnosing a problem. You do not have to interpret the trace; just send it to your service representative, who will tell you how and where to send it. For additional information, see “PSF Traces” on page 22.

- **PSF internal wrap traces**

  The internal traces contain hexadecimal entries for most module entries and exits. Data for these traces is maintained in internal storage and wraps when the trace storage area is full.

- **PSF external traces**

  These trace records contain unformatted entries for PSF and PPCC activity. You must use the formatter utility to format these entries. PSF provides external traces of several different types, which are described in “PSF External Traces” on page 22.

  Note: To diagnose problems occurring at the attachment or SNA level, run a VTAM buffer trace. For more information about VTAM buffer traces, refer to the applicable ACF/VTAM diagnosis guide.

- **Generalized trace facility traces**

The trace produced by the OS/390 generalized trace facility (GTF) contains OS/390 system-level information as well as information pertinent to PSF. Data that might be useful in PSF diagnosis includes:

- I/O interrupts
- Start I/O operations
- SVC interrupts
- FSI interface
- Program interrupts
- External interrupts
- System recovery routine operations, including STAE/ESTAE operations

GTF traces run independently of PSF. If a GTF trace is started, you can also direct PSF trace output to the GTF trace data set (see “Specifying Trace Parameters with the PSF Operator Interface” on page 31). For more information on GTF, refer to the Service Aids publication that applies to the operating system you are running. To reduce the effect of external tracing on PSF processing, PSF writes unformatted external trace records to the output DD. To format these external trace records, two utilities are supplied: the PSF Trace Formatter and the GTF Formatting Appendage. Both utilities format external trace records after PSF processing is complete.

Note: You do not have to format traces to submit them to IBM. However, if your IBM Service Representative is going to view the trace at your installation, you will need to run the formatting routine.

- **OS/390 (or system) traces**

  This trace produces a smaller set of information than the GTF trace. The OS/390 trace provides the following information that might be useful in PSF diagnosis:

  - I/O interrupts
  - Start I/O operations
  - SVC interrupts
  - Program interrupts
  - External interrupts
  - Recovery events

  For more information on the OS/390 trace, refer to the diagnostic techniques publication (using dumps and traces) for your operating system.

- **ACF/VTAM traces**

  Several traces produced by ACF/VTAM can record data flow to and from an SNA-attached printer. For information about these traces, refer to the applicable ACF/VTAM diagnosis guide.

  Note: You also have another option with the 3820 printer, because it has a trace capability that can record communication activity. For more information about printer traces, refer to the reference publication for your printer.

Dumps

You can use three types of dumps to diagnose PSF software problems:

- **Conditional dump**

  This dump, generated by PSF, gives you an abend dump of PSF and PPCC activity when a specified PSF message is issued or a return reason code is generated. For a list of PSF return reason codes, see Appendix C, PSF Reason Codes.

- **Standard OS/390 abend dump**

  This dump is generated when the PSF program abends. A PSF message is issued, with a reason code.

- **SVC dump**

  This dump is for system-related errors.

For more information about requesting a dump, see “Dumps” on page 48.

When most PSF modules return control to a calling module, they set a return code and a reason code. The meanings of these codes are described in Appendix C, PSF Reason Codes. You can specify that PSF should produce a conditional dump upon the occurrence of some of these return reason codes. For more information on the use of codes, see “Dumps” on page 48.

Messages

Whenever PSF ends abnormally, it issues an error message (either APS050I or APS055I, and VTAM issues 1ST493I for A06 abends) containing PSF abend reason codes. These codes are explained in *PSF for OS/390: Messages and Codes*.

If the system ends abnormally, the OS/390 operating system issues messages containing system abend codes. These codes are explained in the messages publication for your operating system.

Restartable Abends

PSF processing can refresh and restart an FSA. This occurs when the level of JES you are using includes abend suppression support. [2] Restart is available for the following abend codes:

[2] JES indicates that the abend suppression option is available at START FSA time.

Abend Category	Restartable Abend Codes
02XX abends	X'239' X'260' X'2BA' X'2BE' X'2EB' X'2EE'
04XX and 05XX abends	X'435' X'490' X'4B0' X'4B1' X'4B2' X'4B4' X'4B5' X'4B6' X'4F0' X'4F5' X'502' X'51E' X'520' X'521' X'523' X'551' X'556' X'557'
06XX abends	X'602' X'652'
07XX abends	X'752' X'7A8'
08XX abends	X'850' X'851' X'860' X'880' X'881' X'891' X'8A0' X'8A1' X'8A2' X'8A3' X'8A4' X'8A5' X'8A6' X'8A7' X'8A8' X'8A9' X'8AA' X'8AB' X'8AC' X'8AD' X'8C0'
09XX abends	X'926' X'931' X'933' X'936' X'937'
0FXX abends	X'F00' X'F02' X'F03' X'F05' X'F06' X'F07' X'F09' X'F0A' X'F0B' X'F0C' X'F0D' X'F0E' X'F0F' X'F10' X'F11' X'F12' X'F14' X'F15' X'F16' X'F17'

The processing for abends that can restart is as follows:

- For a restartable abend, PSF passes control to ESTAE, where the abend code and a time stamp are logged in a table. The table retains a certain number of abends to determine whether an abend loop is occurring.
- An abend loop causes the FSA to terminate abnormally, and the restart processing ends.
- If an abend occurs during the restart processing, PSF proceeds with the normal abend processing for the original abend.

In the following conditions, PSF does not attempt to restart:

- B1-security environment
- Direct-printing mode
- Abends running under a level of JES that does not support the suppression of JES abends
- Abends that, if restarted, fail again or loop

To produce a dump during restart processing, specify an abend code on the PRINTDEV DUMP parameter. The format of the parameter is:

```
DUMP=(ABD0xxx)
```

where *xxx* is the abend code.

Figure 2. Specifying an Abend Code on the PRINTDEV DUMP Parameter

PSF Traces

PSF provides several traces, as shown in Table 4. Each of these traces is described on the following pages.

Table 4. Types of PSF Traces

Internal Wrap Traces	External Traces
FSS FSA PPCC	Notify Subtask (NST) FSA • Full • Component • Synchronization (SYNC) • FSI

Internal Wrap Traces

A PSF internal trace is a wrap trace that contains general flow information. Only a small set of the control block information is saved. Because this is a wrap trace, it reflects only the most recent history of PSF processing.

If an internal trace is done in conjunction with an FSA component external trace, the same PSF components are traced with both. For more information on specifying PSF component tracing, see “FSA Component Trace” on page 23.

The PSF internal wrap traces are maintained in PSF internal storage and cannot be directed to an external data set. To see the output of an internal trace, perform a memory dump of PSF internal storage. For more information on when and how dumping is done, see “Dumps” on page 48.

Separate wrap traces are maintained for:

- The functional subsystem (FSS), which is used only for deferred-printing mode. This trace has a fixed length of 1K bytes (K equals 1024).
- Each functional subsystem application (FSA). This trace has a variable length, from 4K to 3996K bytes.
- The PPCC activity for each FSA if the printer is SNA-attached. This trace has a fixed length of 16K bytes.

The FSS internal trace is always active when PSF is active. If the FSA internal trace is started for an SNA-attached printer, the PPCC trace is also started.

For procedures to run an internal trace, see “Starting Traces” on page 25.

PSF External Traces

The two major PSF external traces are the notify subtask trace (NST) and the functional subsystem application (FSA) external trace. PSF external traces are directed to a data set specified by the individual user. For more information on how to specify the data set for trace output, see “Directing External Traces” on page 26.

Notify Subtask Trace

The notify subtask trace (NST) contains information related to the releasing and checkpointing of data sets by PSF. It does not contain information related to getting data set records or to the data set records themselves.

The data gathered in an NST trace for an FSA is recorded only if an FSA internal or external trace of the page printing writer (PPWTR) component is also active for that FSA. The NST trace can be directed either to the GTF data set or to a data set owned by PSF. PSF-owned trace data sets are specified in the JCL of the PSF startup procedure.

The procedures for running an NST trace are given in “Starting Traces” on page 25.

Functional Subsystem Application External Trace

A functional subsystem application (FSA) external trace contains information related to the internal processing of PSF or to the interface between PSF and JES. It can include information generated by individual PSF subcomponents and related to the accessing, processing, and transmitting of print jobs. It can also trace input data records and output printer commands.

One FSA external trace can be active for each FSA controlled by PSF. An external trace for a particular FSA contains information only for that FSA. Multiple FSAs can be traced simultaneously. With a PSF trace, the trace data for each FSA must be directed to a separate data set. With GTF, however, multiple FSA external traces can be directed to a single GTF data set.

Procedures for running FSA traces are given in “Starting Traces” on page 25.

The information in an FSA external trace is user-controllable and may be subdivided into the following categories:

FSA Full Trace: A full trace is the largest and most complete FSA external trace. All PSF subcomponents and all input records and output printer commands are traced.

FSA Component Trace: A component trace provides a subset of the information provided by a full trace. By use of the MVS MODIFY command, the operator can specify which PSF components are to generate trace entries. If all components are specified, the trace output is the same as that of a full trace. For more information, see “Specifying Trace Parameters with the PSF Operator Interface” on page 31.

A component trace is useful if you know what pieces of trace information in your trace data set are necessary. Specifying one or more components helps reduce the volume of extraneous data in the trace. If you are not sure which components should be traced, however, use the FSA full trace.

The components selected for an component external trace are also the only components traced by an internal FSA wrap trace.

FSA Synchronization (SYNC) Trace: A SYNC trace generates information relevant only to page repositioning and contains entries only when page repositioning occurs. A SYNC trace is completed faster than a full trace but contains less information.

Functional Subsystem Interface (FSI) Trace

The FSI trace contains information relevant to the interface between PSF and JES. The data itself is not traced, only the JES interface control information. If you want only the FSI traced, direct the output to the GTF data set.

Understanding the Impacts of Tracing

Consider the following when using traces.

Processor Use

A FSA full external trace affects processor performance. You should not run a full external trace during a time of peak processor use. All other traces affect processor performance, too, but less significantly.

Printer Throughput

When tracing is active, printer throughput is directly affected by the volume of trace data being run. You should not run an FSA full external trace while other print jobs are running. All other external traces affect throughput, too, but less significantly.

DASD Requirements

An external trace is usually directed to a DASD data set. An FSA full external trace can become so large, however, that DASD space is affected. Consider directing a full external trace to some other device, such as a tape drive.

An error may occur after multiple data sets are processed. If you know which data set caused the error, you can start the trace dynamically, to reduce the volume of trace data. However, you should start the trace before the print job that is causing the error. For more information on starting traces dynamically, see “Specifying Trace Parameters with the PSF Operator Interface” on page 31.

If a full trace is directed to DASD, allocate 6 cylinders for the first page processed while tracing is active, plus 1 cylinder for each additional page of data processed (IBM 3390 disk storage or equivalent).

Formatting a trace requires additional storage. Allocate 9 cylinders for the first page, and 2 cylinders for each succeeding page.

Timing

Activating a trace causes changes in the timing relationships between the processor and printer, with the result that problems may seem to disappear while tracing is active. The more data traced, the more skewed the timings.

When problems disappear while tracing is active, try traces that affect timing less but still evoke trace data relevant to the problem. The different types of traces are as follows, in order of increasing effect on timing:

- Internal wrap trace.
- FSA SYNC trace.
- NST trace.
- FSI trace.
- FSA component trace. A trace of only one component may be more useful than an FSI, NST, or FSA SYNC trace, depending on what component is traced.

- FSA component trace (multiple components)
- FSA full trace

Starting Traces

In deferred-printing mode, you can activate a trace and specify the trace control options you want in either of two places:

- The PSF startup procedure
  - TRACE parameter on the PRINTDEV statement
  - PARM parameters on the EXEC statement
  - DD statements for trace data sets
- The MVS MODIFY command, which serves as a PSF operator interface

In direct-printing mode, you can specify the parameters that activate and control a trace only in the print job JCL in either of two places:

- The TRACE parameter on the PRINTDEV statement
- The DD statements for trace data sets

The parameters that activate tracing in the PSF startup procedure take effect when PSF is initialized. By using the PSF operator interface, you can control traces dynamically while PSF is running.

The methods of starting the various traces are summarized in Table 5. For procedural information on each of these methods, see “Specifying Trace Parameters in the PSF Startup Procedure” on page 27, “Specifying Trace Parameters with the PSF Operator Interface” on page 31, and “Specifying Trace Parameters in Direct-Printing Mode JCL” on page 37. For samples of trace invocation, see “Examples of Starting Various Traces” on page 37.

Table 5. Methods to Start PSF Traces

	Deferred Printing	**Deferred Printing**	**Direct Printing**
Trace Type	Startup Procedure	PSF Operator Interface	Print Job JCL
NST	x	x	
FSA full	x	x	x
FSA SYNC	x	x	
FSA component		x	
FSI		x	
Internal	x	x	x

Determining the Kind of Traces You Want

The method of starting a trace depends on what trace you want, which, in turn, depends on the error being diagnosed or the information to be collected.

Use the following guidelines to determine which type of trace to request:

- If the problem is related to page repositioning during the printing of a data set, request an FSA full trace.

- If the problem is related to incorrect handling of the JES spool, request an NST trace and an FSA full trace.
- If the problem is related to the interface between PSF and JES, request an FSI trace.
- If the problem is related to a PSF abend, request an internal trace and, if possible, an FSA full trace.
- If the problem is related to printer errors or to incorrect processing of a data set, request an FSA full trace.
- If the problem cannot be recreated with an FSA full trace, try directing the trace to the GTF data set. If the error still cannot be recreated, request an internal trace. For information about specifying the size of the FSA internal trace table, see “PARM Parameters on the EXEC Statement” on page 28.

Directing External Traces

You can direct the output of FSA external traces and NST traces either to the GTF data set (only in deferred-printing mode) or to a PSF-owned data set. If you start an external trace as a part of PSF initialization, the trace output is always directed to a PSF-owned data set. Traces started by the PSF operator interface can be directed either to the GTF data set or to a PSF-owned data set.

When PSF is running, you can redirect the external trace output to the GTF data set or start a trace and direct its output either to the GTF data set or to a PSF-owned data set.

Only the PSF operator interface can be used to redirect trace output. A single PSF operator interface command can start a trace and direct its output. For more information about directing trace output with the PSF operator interface, see “Specifying Trace Parameters with the PSF Operator Interface” on page 31.

When you direct the output of FSA external traces and NST traces to PSF-owned data sets, use separate data sets. If you direct two traces to the same PSF-owned data set, you may get unpredictable results or even lose trace data. PSF simultaneously directs the output of all FSA external traces and NST traces to a single GTF data set.

For information about defining PSF-owned data sets for trace output, see “DD Statements for PSF External Trace Output” on page 30.

Before you direct external trace output to the GTF data set, you must start GTF. The number of FSAs that can be traced with GTF is limited to 16. For information on running GTF, refer to the Service Aids publication for OS/VS2 MVS.

Note: When you start a GTF trace, use the USR trace option for GTF; otherwise, GTF rejects all PSF entries, which are not included in the trace data set. Also, use the JOBNAMEP option for GTF, to restrict the extraneous data in the GTF trace.

Notational Conventions

The following notational conventions are used to represent the various JCL parameters and PSF operator interface commands:

- Type uppercase letters, uppercase words, and the following symbols and literals exactly as they appear in the command syntax:

comma	**,**
equal sign	**=**
parentheses	**( )**
period	**.**

- For the variables shown here with lowercase letters and words in *italics,* type information specific to your application.
- Parentheses show that the data they enclose is a list of subparameters. Enclose your own subparameter list in parentheses unless you select a single keyword subparameter or the default.
- Do not type any of the following symbols as part of a command or a JCL statement:

Brackets	[ ]
Vertical bar	|
Braces	{ }
Underscore	__

  These symbols define the command format and have the following meanings:

  – Brackets around a single item mean that that item is optional. Brackets around more than one item mean that you can select one or none of the items.

  – A vertical bar between options means that you must select one option.

  – Braces around items mean that you must select one of the items.

  – An underscored value is the default value. Unless you specify another value, PSF uses the underscored value.

Specifying Trace Parameters in the PSF Startup Procedure

Two statements in the PSF startup procedure contain parameters to start tracing or to specify trace options. DD statements in the PSF startup procedure define the data sets to which the output of an external trace is to be sent. The syntax of each statement is described here. For examples of how to use these parameters to start the various traces, see “Examples of Starting Various Traces” on page 37.

Note: If you can recreate the problem, start an FSA full external trace at PSF initialization, which is described under “Starting an FSA Full External Trace at PSF Initialization” on page 39. If the problem is intermittent, and you cannot recreate it, use the GTF trace data set, which is described under “Using the GTF Trace Data Set” on page 40.

To change the PSF startup procedure after a PSF FSA has started, perform the following steps:

1. Stop each of the FSAs in the FSS.
2. Cancel the PSF address space.
3. Change the statements in the startup procedure.
4. Restart the printers.

TRACE Parameter on the PRINTDEV Statement

The PRINTDEV statement contains parameters that specify PSF processing defaults. Among these parameters is the TRACE parameter, as shown in the following example:

```
//printer-name PRINTDEV
⋮
TRACE={YES | NO}
```

Figure 3. Example of the TRACE parameter in the PRINTDEV Statement

printer-name
Specifies the name of the printer FSA to which this PRINTDEV statement applies.

YES
Specifies that any requested PSF tracing for this FSA is to begin during FSA initialization. If you specify no other trace parameters in the PSF startup procedure, only PSF internal tracing is activated for this FSA. YES is the default.

NO
Specifies that no PSF tracing is to be started during PSF initialization. You can use the PSF operator interface to start traces dynamically after PSF is initialized.

Specifying TRACE=YES on the PRINTDEV statement is the only specification required to start the FSA and PPCC internal traces.

For more information about the PRINTDEV statement, refer to *PSF for OS/390: Customization*.

PARM Parameters on the EXEC Statement

To specify trace options, you can include the PARM parameter in the EXEC statement of the PSF startup procedure, as follows:

```
//  EXEC PGM=APSPPIEP,PARM=(NSTddname, type, prompt, pagecount,
tcpip_name)
```

Figure 4. The PARM Parameter in the EXEC Statement of the Startup Procedure

You must specify the options with the PARM parameter in the correct position. If you do not want to specify a value for a given parameter, type a comma in its place. For example, if you want to specify PSF prompting, type:

```
//  EXEC PGM=APSPPIEP,PARM=(,,PROMPT)
```

Figure 5. Example of Specifying PSF Prompting in the EXEC Statement

The following list describes the PARM parameters:

NSTddname

Specifies the name of a DD statement defining the output data set in which to record the NST trace output. For information about specifying the DD statement, see “DD Statements for PSF External Trace Output” on page 30. This name must conform to the standard JCL DD naming conventions.

This parameter specifies that the NST trace is to start during PSF initialization if you have specified TRACE=YES on the PRINTDEV statement and have defined the NST trace data set in a DD statement. If you want the NST trace to be started dynamically, do not specify the *NSTddname* parameter.

type Specifies the FSA trace to start.

FULL Specifies an FSA full external trace.

SYNC Specifies an FSA SYNC external trace.

INTR Specifies an FSA internal trace and, if the printer is SNA-attached, a PPCC internal trace. INTR is the default value.

prompt Specifies that PSF is to tell the operator when to type PSF operator interface commands.

PROMPT Specifies that each time the FSS is initialized, the operator is to receive a message, APS620A, prompting the operator to issue a response notifying PSF to initialize the PSF operator interface. The response can be any PSF operator interface command; it is directed to all FSAs or to the notify subtask.

Thus the operator can type commands, such as those to start FSI or FSA component traces, before PSF starts processing data sets. Prompting occurs even if the startup procedure does not include tracing specifications.

NOPROMPT Specifies that the PSF operator interface is to be initialized automatically. No operator response is required. NOPROMPT is the default value.

pagecount

Specifies the number of 4K pages of storage to allocate for each internal FSA trace table. Valid values are from 1 to 999. The default is 32 (128K bytes). This allocation occurs only if PSF internal tracing is active.

Note: When the number of pages specified is more than 32, and the specified region is greater than 32M, increase the PSF REGION size. To determine how large an increase is needed, use the following equation:

```
REGION increase = (number of FSAs active) x 4K x (pagecount – 32)
```

Figure 6. Determining the Region Size

where *number of FSAs active* is the maximum number of FSAs active while the FSS is running.

tcpip_name
Specifies the name of the TCP/IP address space. If this parameter is not coded, PSF will use the default name of 'TCPIP'.

DD Statements for PSF External Trace Output

As is explained in “Directing External Traces” on page 26, you can direct the output of a PSF external trace either to the GTF trace data set (in deferred-printing mode) or to a PSF-owned data set. To define the PSF-owned data sets, use the DD statements described below; if you direct trace output to the GTF trace data set, PSF ignores these statements. When you use PSF-owned data sets, you must direct the output of each PSF external trace to a different data set.

The name of the DD statement depends on the type of trace output being directed to the data set:

- For an NST trace data set, the DD name must match the DD name specified in the first parameter of the PARM keyword on the EXEC statement.
- For an FSA trace data set, the DD name must match the *printer-name* specified in the PRINTDEV statement for the FSA to be traced.

The following example shows how to specify an NST trace together with a full trace:

```
//EXEC   PGM=APSPPIEP, PARM=(NSTTRACE,FULL)
⋮
//NSTTRACE  DD   DSNAME=XXXX,DISP=XXX
//*
//PRTZ       DD   DSNAME=XXXX,DISP=XXX
⋮

//PRTZ   CNTL
//       PRINTDEV
//       TRACE=YES
```

Figure 7. Specifying an NST Trace With a Full Trace

If no valid data set name is specified, no PSF external trace data is recorded unless the operator directs the data to the GTF data set. For information on directing trace output to the GTF data set, see “Specifying Trace Parameters with the PSF Operator Interface” on page 31.

The parameters on the DD statement must be as follows:

- The record length must be 80, which is the default.
- The block size must be a multiple of 80. If the block size is not specified, or if it is not a multiple of 80, it defaults to 1040.
- The record format must be F, U, or FB. The default is FB, which is recommended for best performance.
- The organization must be sequential (PS).

DASD data sets can be either preallocated or allocated by PSF, as in the examples below. Preallocated data sets can be reused with no user action, but data sets allocated by PSF must be deleted or renamed before each PSF startup.

The required size of the data set depends on the type of trace being generated and how long tracing is to last. For FSA full traces (the largest kind), a general rule is a data set of 6 cylinders for the first page, plus 1 cylinder for each additional page of data printed (IBM 3390 disk storage or equivalent). For complex pages containing many fonts, overlays, and page segments, more storage may be required.

The following examples show how to code a DD statement to direct the output of a PSF external trace to a DASD data set.

The first example assumes that the data set has been preallocated and cataloged. The data set will be reused on each successive PSF startup.

```
//ddname    DD   DSNAME=SYS1.PSF.TRACE,DISP=OLD
```

Figure 8. Writing Trace Results to a DASD Data Set

Note: Both **DISP=MOD** and **DISP=SHARE** are acceptable.

The following example shows how to send the result of a trace to an unallocated data set:

```
//ddname    DD DSNAME=SYS1.PSF.TRACE,UNIT=3390,VOL=SER=SYS000,
//             DISP=(NEW,KEEP,CATLG),SPACE=(CYL,(5,10),RLSE)
```

Figure 9. Writing Trace Results to an Unallocated Data Set

This DD statement causes a data set to be allocated with a record format of FB, a record length of 80, a block size of 1040, a primary space allocation of 5 cylinders, and a secondary space allocation of 10 cylinders.

The following example specifies writing the trace results to a tape device:

```
//ddname    DD DSNAME=TRACEOUT,UNIT=TAPE,VOL=SER=TAPE01,
//             DISP=(NEW,KEEP),SPACE=(CYL,(5,10),RLSE),
//             DCB=(BLKSIZE=1120,RECFM=U)
```

Figure 10. Writing the Trace Results to a Tape Device

Specifying Trace Parameters with the PSF Operator Interface

You can use the MVS MODIFY command as a PSF operator interface only in deferred-printing mode. This interface can start and stop traces dynamically. You can start the FSI and FSA component traces through the PSF operator interface.

When to Issue PSF Operator Interface Commands

A PSF operator interface command can affect one of five trace environments:

- An NST trace
- An FSA external traces for an active FSA
- FSA external traces for all FSAs that are not yet active
- An FSI trace
- An internal trace

To affect the NST trace environment, specify MODE=NOTIFY on the PSF operator interface command. (Do not specify a printer name when specifying MODE=NOTIFY.) To affect the FSA external traces for a single FSA, specify the name of the printer FSA on the PSF operator interface command. To affect the FSA external traces for all FSAs, do *not* include a printer name in the PSF operator interface command. For more information on these command parameters, see "Syntax of the PSF Operator Interface Command" on page 33.

Operator interface commands can be entered at any time while PSF is running. If a command is directed to a specific FSA, however, that FSA must be up and running at the time when the command is issued, or the command will be rejected.

You can type multiple operator interface commands during PSF processing. Remember that each successive command overrides all the options of preceding commands affecting the same trace. Even if you want to change only one characteristic of a trace (for example, the data set to which it is directed), you still have to specify values for any of the other options for which you do not want the default value to be used.

When Operator Interface Commands Are Processed

The time at which a PSF operator interface command is processed depends on the trace environment. The concept underlying the processing of operator interface commands is *FSA initialization*. FSA initialization is complete when PSF has processed the PRINTDEV statement in the PSF startup procedure.

The exact time of FSA initialization is hard to determine. The following guidelines may help:

- When message APS620A is issued (as a result of the PROMPT parameter of the PARM keyword in the PSF startup procedure), no FSA has been initialized.
- When PSF issues the setup message for a channel-attached printer, this means that the FSA for that printer has been initialized.
- For any printer, when the START command for that FSA is entered, FSA initialization occurs immediately after any of the following types of command:
  - **Commands affecting the NST trace**

    Operator interface commands affecting the NST trace are usually queued internally by PSF. The commands are processed, and the options are changed as indicated, only on data set boundaries (any FSA) or on FSA initialization (any FSA), whichever occurs first.
  - **Commands affecting the tracing of a specific FSA**

    Commands affecting the tracing of a specific FSA cannot be entered unless the FSA has been initialized. Commands are processed only when the FSA is idle or on data set boundaries. If the FSA is not idle, the command is queued and is processed on the next data set boundary.
  - **Commands affecting the tracing of all FSAs**

    A command affecting the tracing of all FSAs is processed during the initialization of each FSA. The command affects only FSAs that have not yet been initialized—usually, only those that are not currently started. Therefore, the command does not affect an FSA that is already active, unless the FSA has to be reinitialized.

Syntax of the PSF Operator Interface Command

For examples of using the PSF operator interface to start traces, see “Examples of Starting Various Traces” on page 37.

```
{MODIFY | F} FSSname,TRACEON
    [,
    [ printer-name]
    [,MODE={NOTIFY | FULL | SYNC | INTR}]
    [,FORMAT={PSF | IGTF}]
    [,COMP={ALL | (CCM |  DEVM |
DOCP | ERRM | EXIT |  JCLM | LASI | LMC | MSGM |
PPCC |  PPQM | PPWTR | SRM | TCP) }]
    [,EID={FSI | PSF | ALL }]
    ]
```

Figure 11. PSF Operator Interface Command Format for Starting Traces

Note: The comma is always required if you specify keywords after TRACEON.

To start a trace, the PSF operator types the MODIFY (or F) command with the TRACEON parameter. The parameters used with the MODIFY command to start a trace are as follows:

FSSname
: Specifies the name of the FSS for which tracing should be started. This parameter is required. The *FSSname* parameter must match the FSSNAME parameter of the JES FSSDEF statement for the FSS.

TRACEON
: Specifies that tracing should be started for one or more FSAs or for the notify subtask. This parameter is required.

printer-name
: Specifies the name of the printer FSA for which tracing should be started. This parameter is optional and cannot be specified for NST traces (MODE=NOTIFY). For information about starting an NST trace for a specific FSA, see “Starting an NST Trace Dynamically” on page 38. If *printer-name* is not specified, the command affects all the FSAs that are managed by the FSS and that are started after the command is entered. Notice that *printer-name* is a positional parameter, which means that you must place it exactly as shown in Figure 11.

  Note: If you do not specify a *printer-name*, you must type a comma in its place if you are going to specify any additional MODIFY command parameters.

  The following example shows how to start a trace when no *printer-name* is specified:

```
MODIFY FSSname,TRACEON,,MODE=INTR
```

Figure 12. Starting a Trace Without Specifying a Printer Name

The *printer-name* specified must match one of the following:

- For JES2, the PRT*nnnn* statement
- For JES3, the JNAME parameter of the DEVICE statement

For more information about the JES2 PRT*nnnn* statement and the JES3 JNAME parameter, refer to *PSF for OS/390: Customization*.

The presence or absence of a *printer-name* affects the time at which the MODIFY command is processed. For more information, see "When Operator Interface Commands Are Processed" on page 32.

The four optional parameters of the MODIFY command are as follows:

[MODE={NOTIFY | FULL | SYNC | INTR}]

The **MODE** parameter specifies the trace type, as follows:

NOTIFY

Specifies that an NST external trace is to be started. The NST trace data for an FSA is recorded only if an FSA internal or external trace of the page printing writer (PPWTR) component is also active for that FSA.

The following example shows how to specify an NST external trace:

```
MODIFY FSSname,TRACEON,,MODE=NOTIFY,FORMAT=GTF
```

Figure 13. Specifying an NST External Trace

FULL

Specifies that an FSA full external trace is to be started. An internal FSA trace is also started, along with an internal PPCC trace for SNA-attached printers. If the FORMAT parameter is specified, the default is FULL.

The following example shows how to specify a full external trace:

```
MODIFY FSSname,TRACEON,,MODE=FULL,COMP=(CCM,EXIT)
```

Figure 14. Specifying a Full External Trace

SYNC

Specifies that an FSA SYNC external trace is to be started. An internal FSA trace is also started, along with an internal PPCC trace for SNA-attached printers.

INTR

Specifies that only internal tracing is to be done. An internal FSA trace is to be started, along with an internal PPCC trace for SNA-attached printers. If the FORMAT parameter is not specified, the default is INTR. If MODE=INTR is specified for a particular printer FSA, any active external tracing of that FSA stops when internal tracing starts. If MODE=INTR is specified on an operator command affecting all FSAs that were not initialized at the time the command was entered, any requests for external tracing of those FSAs in the PSF startup procedure are ignored.

The following example shows how to specify an internal trace:

```
MODIFY FSSname,TRACEON,PRI1,MODE=INTR
```

Figure 15. Specifying an Internal Trace

[FORMAT={PSF | GTF}]
The FORMAT parameter specifies where external trace output is to be directed, as follows:

PSF
Specifies that the trace output is to be sent to a PSF-owned data set as defined in DD statements in the PSF startup procedure. See "DD Statements for PSF External Trace Output" on page 30.

GTF
Specifies that the trace output is to be sent to the GTF trace data set. If GTF is specified, the GTF program must be up and running before you type the PSF operator interface command. GTF must be specified for FSI traces and for NST traces that are started dynamically.

For more information on GTF, refer to *OS/390 MVS System Commands* or *MVS/ESA System Commands*.

[COMP={ ALL | (CCM | DEVM | DOCP | ERRM | EXIT | JCLM | LASI | LMC | MSGM | PPCC | PPQM | PPWTR | SRM | TCP) }]
Specifies the PSF components to be traced. You should specify COMP only for an FSA full external trace or for FSA and PPCC internal traces (MODE=FULL or MODE=INTR). You can specify multiple components, but you must delimit them with commas. You can specify them in any order. This parameter is optional.

ALL
Specifies that all the individual subcomponents listed below are to be traced. ALL is the default. You cannot specify ALL with any individual subcomponents.

CCM
Common conversion machine.

DEVM
Device manager.

DOCP
Document processor.

ERRM
I/O error manager.

EXIT
PSF installation exits.

JCLM
JCL modules.

LASI
Library access system interface.

LMC
Line-mode conversion.

MSGM
Message modules.

PPCC
Page Printer Communication Component (for SNA-attached printers).

PPQM
Pending page queue manager.

PPWTR
Page printing writer. If NST trace data is to be recorded, tracing of the PPWTR component must be active.

SRM
Resource Manager.

TCP
TCP/IP Component.

[EID={FSI | PSF | ALL}]
Specifies the Event IDs (EIDs) to be written to the GTF trace data set. If you do not specify FORMAT=GTF in conjunction with EID=PSF or EID=FSI, PSF uses the default value, EID=ALL. If you specify FORMAT=PSF, the value of the EID parameter is ignored. EID is valid only when FORMAT=GTF is specified. If EID is not specified, it defaults to ALL.

You can use the EID parameter in conjunction with the COMP parameter to limit the amount of data contained in the trace output. If you use EID=FSI, you should specify COMP=PPWTR or COMP=ALL.

ALL
Specifies that all supported EIDs are to be written to the trace data set.

PSF
Specifies that all PSF EIDs are to be written to the trace data set, with the exception of EIDs for events occurring on the FSI interface to PSF.

FSI
Specifies that EIDs for events occurring on the FSI interface to PSF are to be written to the trace data set.

To select PSF trace data when formatting the GTF trace data set, specify USR=(FDn) on the AMDPRDMP EDIT control card, where *n* is 4 for FSI trace information, and *n* is 0 for PSF information. If you want both FSI and PSF trace data, specify USR=(FD0, FD4) on the EDIT control card.

Using the PSF Trace Facility with the Download for OS/390 Feature

If you have installed the Download for OS/390 feature, you can use the same dump and trace facilities as you use with PSF. You specify trace parameters in the Download for OS/390 startup procedure and on the MODIFY operator command, as you do with PSF. If you suspect the problem is in the Download for OS/390 feature, IBM recommends that you request an FSA full external trace, tracing all components. A full external trace includes an internal wrap trace and a recording of all events occurring on the functional subsystem interface (FSI).

For more information about how to use the PSF trace facility with the Download for OS/390 feature, refer to *PSF for OS/390: Download for OS/390*.

Specifying Trace Parameters in Direct-Printing Mode JCL

When PSF is in direct-printing mode, only FSA full external tracing and FSA full internal tracing are permitted. The trace output can be directed only to a PSF-owned data set. The PRINTDEV statement parameters and DD statements described in “Specifying Trace Parameters in the PSF Startup Procedure” on page 27 can be coded in the JCL for the print job to be traced. Also in direct-printing mode, the PARM parameters on the EXEC statement are ignored; the values for those parameters are assumed to be (,FULL,NOPROMPT,32). For information on the meaning of these PARM parameters, see “PARM Parameters on the EXEC Statement” on page 28. To code the JCL for the print job to be traced, use the information presented in “Specifying Trace Parameters in the PSF Startup Procedure” on page 27.

Note: You cannot use the PSF operator interface to specify trace parameters in direct-printing mode.

To change the print job JCL when PSF is using a printer in direct-printing mode, use the following procedure:

1. Finish printing the current job.
2. Cancel the application program address space.
3. Change the statements in the JCL.
4. Restart the application program.

Examples of Starting Various Traces

The examples in this section show how to start the following traces:

- PSF internal traces
- NST trace
- FSA full external trace
- NST and FSA full external traces
- FSA component external trace
- FSI trace

For traces that can be started either at PSF initialization or dynamically with the PSF operator interface, examples of both methods are shown.

Starting a PSF Internal Trace at PSF Initialization

To start the PSF internal traces at PSF initialization and specify that 1 megabyte of storage is to be used for each FSA trace table, perform the following steps:

1. Specify TRACE=YES either on the PRINTDEV statement in the PSF startup procedure, or, if you are using PSF in direct-printing mode, in the print job JCL. TRACE=YES is the default on the PRINTDEV statement, so you can omit the TRACE parameter.
2. For deferred-printing mode only, specify the size of the internal trace table, using a PARM parameter on the EXEC statement in the PSF startup procedure only:

```
PARM=(,,256)
```

Figure 16. Specifying the Size of the Internal Trace Table

Internal tracing begins when the printer FSA is initialized.

Starting a PSF Internal Trace Dynamically

To start the PSF internal traces dynamically, using the default size of the trace table, perform the following steps:

1. Specify TRACE=NO on the PRINTDEV statement in the PSF startup procedure.
2. Start the printer FSA with the START command.
3. Start GTF, using the procedures described in *OS/390 MVS System Commands* or *MVS/ESA System Commands*.
4. Type an PSF operator interface command. For a printer name of PRT1 and an FSSname of FSS5, that command would be as follows:

```
MODIFY FSS5,TRACEON,PRT1
```

Figure 17. PSF Operator Interface Command

Internal tracing begins when the FSA is idle, or at the next data set boundary.

Starting an NST Trace at PSF Initialization

To start an NST trace at PSF initialization and direct its output to a data set called PSF.NSTDS, perform the following steps:

1. In the PSF startup procedure, specify TRACE=YES on the PRINTDEV statement for the FSAs that will be traced by the notify subtask. TRACE=YES is the default on the PRINTDEV statement, so you can omit the TRACE parameter.
2. Identify the *ddname* of the DD statement defining the trace output data set, using a PARM parameter on the EXEC statement in the PSF startup procedure. For a *ddname* of NSTDD, you would have:

```
PARM=(NSTDD)
```

Figure 18. The PARM Parameter on the EXEC Statement

3. Include a DD statement defining the NST output data set in the PSF startup procedure:

```
//NSTDD    DD   DSNAME=PSF.NSTDS,DISP=OLD
```

Figure 19. The DD Statement Defining the NST Output Data Set

NST tracing begins when the printer FSA is initialized.

Starting an NST Trace Dynamically

To start an NST trace dynamically and direct its output to the GTF data set, perform the following steps:

1. Ensure that GTF tracing is started.
2. In the PSF startup procedure, ensure that the NST *ddname* parameter is not specified in the PARM parameters on the EXEC statement. Any DD statements defining data sets to receive NST trace data are ignored.

3. Start the printer FSA with the START command.
4. Type a PSF operator interface command. For a printer name of PRT1 and an FSSname of FSS5, that command would be as follows:

```
MODIFY FSS5,TRACEON,,MODE=NOTIFY,FORMAT=GTF
```

Figure 20. PSF Operator Interface Command

5. Type one of the following PSF operator interface commands:
   - If you want tracing of all components, type:

```
MODIFY FSS5,TRACEON,PRT1,COMP=ALL
```

Figure 21. PSF Operator Interface Command to Trace All Components

   - If you want to restrict the amount of trace data to the minimum, type:

```
MODIFY FSS5,TRACEON,PRT1,COMP=PPWTR
```

Figure 22. PSF Operator Interface Command for Minimal Data

NST tracing begins at the next data set boundary. In this example, if an FSA external trace is active when the command in step 4 above is entered, the active FSA external trace stops, and the NST trace begins. To start both the NST and FSA external traces simultaneously, see “Starting NST and FSA Full External Traces Dynamically” on page 43.

Starting an FSA Full External Trace at PSF Initialization

To start an FSA full external trace at PSF initialization and direct its output to a data set called PSF.FSATRC, specify the following in the PSF startup procedure, or in the print-job JCL if you are using PSF in direct-printing mode:

1. Specify TRACE=YES on the PRINTDEV statement. TRACE=YES is the default on the PRINTDEV statement, so you can omit the TRACE parameter.
2. Specify PARM=(,FULL) on the EXEC statement.

   Note: If PSF is in direct-printing mode, do not include the PARM parameters.
3. Include a DD statement for a new DSN containing the PSF full trace. For example,

```
//PRT2      DD    DSNAME=PSF.FSATRC,DISP=OLD
⋮
//PRT2      CNTL                    PRINTER 2 DEFINITION
//PRT2      PRINTDEV
//          TRACE=YES
⋮
//PRT2      ENDCNTL
```

Figure 23. Starting an FSA Full External Trace at PSF Initialization

Allocate at least 25 cylinders for the trace data set.

FSA full external tracing begins when the printer FSA is initialized.

Starting an FSA Full External Trace Dynamically

You can start an FSA full external trace and direct its output to either a PSF-owned trace data set or to a GTF trace data set.

Using a PSF-Owned Trace Data Set: To start an FSA full external trace dynamically and direct its output to a data set called PSF.FSATRC, perform the following steps:

1. Specify either TRACE=NO or TRACE=YES on the PRINTDEV statement. IBM recommends specifying TRACE=YES, so that an internal trace is started at PSF initialization. TRACE=YES is the default if you omit the TRACE parameter.
2. Specify PARM=(,INTR) on the EXEC statement. INTR specifies that only an internal trace will start at PSF initalization. INTR is the default if you omit this PARM parameter.
3. Include a DD statement in the PSF startup procedure to define the data set to receive the trace output. For a printer name of PRT2, that statement would be as follows:

```
//PRT2      DD   DSNAME=PSF.FSATRC.DISP=OLD
⋮
//PRT2      CNTL                    PRINTER 2 DEFINITION
//PRT2      PRINTDEV
//          TRACE=YES
⋮
//PRT2      ENDCNTL
```

Figure 24. Specifying the Data Set to Receive the Trace Output

4. Start the printer FSA with the START command.
5. Type a PSF operator interface command. For an FSSname of FSS5, that command would be as follows:

```
MODIFY FSS5,TRACEON,PRT2,MODE=FULL
```

Figure 25. A PSF Operator Interface Command for an FSSname of FSS5

FSA full external tracing begins when the FSA is idle, or at the next data set boundary.

Note: To start an FSA SYNC trace instead of an FSA full trace, specify MODE=SYNC instead of MODE=FULL in the command above.

Using the GTF Trace Data Set: The following example starts PSF full tracing and also includes FSI events for PRT3 in FSS1, where FSS1 is the functional subsystem name. The output is directed to the GTF trace data set. To print the output in an ESA environment, use IPCS. To view the data, use IPCS with the COMMANDS option, GTF USR(FD0,FD4).

To start an FSA full external trace dynamically and direct its output to the GTF trace data set, perform the following steps:

1. Set GTF to accept PSF input, as follows:

START GTF	**S GTF.identifier,devname,volserial,(time=yes)**
	where:
	identifier= user name for this GTF session.
	devname= device number or type of the output device that is to contain the trace data set.
	volserial= serial number of magnetic tape or DASD volume to contain the trace data set.
	time=yes GTF is to time-stamp every record.
GTF responds	**xx AHL100A SPECIFY TRACE OPTIONS**
Enter	**r xx,trace=usrp,jobnamep**
GTF responds	**xx AHL101A SPECIFY TRACE EVENT KEYWORDS--USR=,JOBNAME=**
Enter	**r xx,usr=(fd0,fd4),jobname=(FSS1)**
	Note: Jobname= is the PSF Startup Procedure Name.
GTF responds	**xx AHL102A CONTINUE TRACE DEFINITIONS or REPLY END**
Enter	**r xx,end**
GTF responds	**AHL103I Trace Options Selected --USR=(FD0,FD4),Jobname=(FSS1)**
GTF responds	**xx AHL125A RESPECIFY Trace Options or Enter U**
Enter	**r xx,u**
GTF responds	**AHL031A GTF Initialization Complete**

2. START the PSF TRACE, and DIRECT the OUTPUT to GTF.
   a. The PSF startup procedure must specify PARM=(,INTR) on the EXEC statement, so that only an internal trace is started at PSF initialization. INTR is the default if you omit this PARM parameter.
   b. Start the printer with the appropriate START command.
   c. Type the following PSF Operator Interface Command and press Enter:

```
MODIFY FSS1,TRACEON,PRT3,FORMAT=GTF,MODE=FULL
```

Figure 26. A PSF Operator Interface Command Specifying Full Tracing

   d. PSF FULL tracing for PRT3 in FSS1 begins at the next data set boundary, and is directed to the GTF trace data set.
   e. Run the failing job.
   f. Type the following command to stop PSF tracing:

```
MODIFY FSS1,TRACEOFF,PRT3
```

Figure 27. Specifying the Command to Stop PSF Tracing

g. Stop GTF. (**P GTF**).

Note: When you are attempting to start a PSF trace and write the output to the GTF trace data set, PSF may issue the following message:

```
MSGAPS610I  RC04  GTF RETURN CODE RC04
```

Figure 28. PSF-Issued Message When Writing Output to the GTF Data Set

This message means that GTF was not started with the correct USR event IDs. If you use the following command to start PSF tracing, you must specify **USR=(FD0,FD4)**.

```
MODIFY FSSname,TRACEON,PRTxxx,FORMAT=GTF
```

Figure 29. Specifying the Correct GTF USR Event ID

If you do not want both types of event, start GTF with the appropriate event ID. If you want FD0, add **EID=PSF** to the MODIFY command. If you want only the FD4 entries, add **EID=FSI** to the MODIFY command.

When starting a PSF NST trace, specify **USR=(FD0,FD4)** to direct its output to the GTF trace data set.

Starting NST and FSA Full External Traces at PSF Initialization

When you start both the NST and the FSA full external traces at PSF initialization, you must specify that the outputs of the two traces be directed to different data sets. In the following example,

- PSF.NSTDS contains the output of the NST trace.
- PSF.FSATRC contains the output of the FSA full external trace.
- The printer name is PRT4.

Perform the following steps:

1. In the PSF startup procedure, specify TRACE=YES on the PRINTDEV statement for the FSA that is to be traced by the notify subtask. TRACE=YES is the default on the PRINTDEV statement, so you can omit the TRACE parameter.
2. Use PARM parameters on the EXEC statement in the PSF startup procedure to do the following:
   - Identify the *ddname* of the DD statement defining the NST trace output data set. In this example, the *ddname* used is NSTDD.
   - Specify that an FSA full external trace is to be started.

```
PARM=(NSTDD,FULL)
```

Figure 30. An FSA Full External Trace Directed to the NSTDD Output Data Set

3. Include a DD statement defining the NST output data set.

```
//NSTDD    DD   DSNAME=PSF.NSTDS,DISP=OLD
```

Figure 31. The DD Statement Defining the NST Output

4. Include a DD statement defining the data set that is to receive the FSA full trace output.

```
//PRT4      DD   DSNAME=PSF.FSATRC,DISP=OLD
⋮
//PRT4      CNTL                    PRINTER 4 DEFINITION
//PRT4      PRINTDEV
//          TRACE=YES
⋮
//PRT4      ENDCNTL
```

Figure 32. The DD Statement Defining the Data Set to Receive the Trace Output

NST and FSA full external tracing begin when the printer FSA is initialized.

Starting NST and FSA Full External Traces Dynamically

To start the NST and FSA full external traces dynamically and direct the outputs of both traces to the GTF data set, perform the following steps:

1. Specify either TRACE=NO or TRACE=YES on the PRINTDEV statement. IBM recommends specifying TRACE=YES, so that an internal trace is started at PSF initialization. TRACE=YES is the default if you omit the TRACE parameter.
2. Specify PARM=(,INTR) on the EXEC statement. INTR specifies that only an internal trace will start at PSF initalization. INTR is the default if you omit this PARM parameter.
3. In the PSF startup procedure, make sure that the NST *ddname* parameter is not specified in the PARM parameters on the EXEC statement. Any DD statements defining data sets to receive NST trace data will be ignored.
4. Start the printer FSA with the START command.
5. Start GTF, using the procedures described in *OS/390 MVS System Commands* or *MVS/ESA System Commands*.
6. Enter the PSF operator interface commands. For a printer name of PRT5 and an FSSname of FSS5, those commands would be as follows:

```
MODIFY FSS5,TRACEON,,MODE=NOTIFY,FORMAT=GTF
MODIFY FSS5,TRACEON,PRT5,MODE=FULL,FORMAT=GTF
```

Figure 33. Commands for Printer PRT5 and FSSname FSS5

NST and FSA full external tracing begins at the next data set boundary.

Stopping a Trace

You can stop a trace by using the PSF operator interface or by stopping the printer FSA and editing the PSF startup procedure to remove trace specifications. Both methods are described on the following pages.

Stopping a Trace with the PSF Operator Interface

The syntax of the PSF operator interface command used to stop traces is as follows:

```
{MODIFY | F} FSSname,TRACEOFF
[,  [ printer-name
]  [,MODE=NOTIFY] ]
```

Figure 34. The PSF Operator Interface Command for Stopping Traces

Note: The comma is required if you specify any keywords after the TRACEOFF keyword.

To stop a trace, the PSF operator types the MODIFY (or F) command with the TRACEOFF parameter. The following list describes the parameters you can use with the MODIFY command to stop a trace.

FSSname
Specifies the name of the FSS for which tracing should be stopped. The *FSSname* parameter must match the FSSNAME parameter of the FSSDEF statement for the FSS. If you do not also specify a printer FSA with the *printer-name* parameter, tracing will not start for any printers after this command is entered. This parameter is required.

TRACEOFF
Specifies that tracing should be stopped for one or more FSAs or for the notify subtask. This parameter is required.

printer-name
Specifies the name of a specific printer FSA for which tracing should be stopped. This parameter is optional and cannot be specified for NST traces. If *printer-name* is not specified for FSA external traces, the tracing of any active FSAs managed by the FSS will not be affected. When an FSA is initialized, however, trace specifications in the startup procedure for any of the FSAs managed by the FSS will be ignored.

printer-name is a positional parameter. If you specify the MODE parameter but do not specify a *printer-name*, you must type a comma in place of the *printer-name*.

To stop a trace when no printer is specified, type the following:

```
MODIFY,FSSnameTRACEOFF,,MODE=NOTIFY
```

Figure 35. Stopping a Trace When no Printer is Specified

To stop a trace when a printer is specified, type the following:

```
MODIFY,FSSnameTRACEOFF,PRI1,MODE=NOTIFY
```

Figure 36. Stopping a Trace When a Printer is Specified

The *printer-name* specified must match either of the following:

- For JES2, the PRT*nnnn* statement
- For JES3, the JNAME parameter of the DEVICE statement

For more information about the JES2 PRT*nnnn* statement and the JES3 JNAME parameter, refer to *PSF for OS/390: Customization*.

MODE=NOTIFY
Specifies that only NST tracing is to be stopped. Any active FSA traces will remain active. MODE=NOTIFY cannot be specified if a *printer-name* is specified.

For more information about when tracing will be stopped, see “When Operator Interface Commands Are Processed” on page 32.

Stopping Traces without the PSF Operator Interface

To stop tracing an FSA in deferred-printing mode, you can stop the printer. If tracing was started at initialization, and you do not want it to start again, edit the PSF startup procedure to remove the trace specifications. For information about how to edit the startup procedure, see “Specifying Trace Parameters in the PSF Startup Procedure” on page 27.

To stop tracing a job in direct-printing mode, either stop the job, or stop the printer. If you do not want tracing started for the next job printed in direct-printing mode, ensure that the PRINTDEV statement in the JCL for that job does not specify tracing. For information about how to change the JCL, see “Specifying Trace Parameters in Direct-Printing Mode JCL” on page 37.

Formatting and Printing Trace Data

PSF no longer formats trace data while PSF is running; therefore, data must be formatted when PSF has stopped. Following is sample JCL to start the PSF trace post formatter.

```
//APSWTRCF JOB 'ACCOUNT #','NAME',MSGLEVEL=(1,1)
//*************************************************************
//* PSF TRACE FORMATTER INVOCATION JCL
//*************************************************************
//STEP01   EXEC PGM=APSTRFMT,REGION=100K
//*                           /* REGION = (3 * BLKSIZE) + 20K
//SYSUDUMP DD SYSOUT=*        /* BLKSIZE = TRACEIN BLOCKSIZE
//TRACEIN  DD UNIT=unit,        <- UNIT MIGHT BE TAPE OR DASD.
//            DSN=tracein,      <- SET TO PSF GENERATED TRACE
//*                                      DATA SET NAME.
//            DISP=SHR,
//            VOL=SER=volser    <- SERIAL NUMBER OF
//*                                     VOLUME.
//TRACEOUT DD UNIT=unit,        <- UNIT MIGHT BE TAPE OR DASD.
//            DSN=traceout,     <- SET TO DATA SET NAME WHERE
//*                                 FORMATTED RECORDS ARE
//*                                 PLACED.
//            DISP=disp,        <- DISPOSITION OF TRACE OUT.
//            VOL=SER=volser    <- SERIAL NUMBER OF VOLUME.
//SYSPRINT DD SYSOUT=*
//SYSIN    DD *
       TYPE=SHORT
/*
//
```

Figure 37. JCL to Invoke a PSF Trace Formatter

The TRACEIN DD card identifies the trace data generated by PSF. Therefore, the attributes of that data set should be reflected in the DD card.

The TRACEOUT DD card identifies the data set into which the formatted trace job is stored. The parameters specified on the DD statement are device-dependent. The DCB parameters you should specify are as follows:

- **Record length:** This must be 117, which is the default.
- **Block size:** This must be a multiple of 117. If it is not specified, or is not a multiple of 117, it defaults to 1287.
- **Record format:** This must be FBA, U, or FB. The default is FBA.
- **Organization:** Sequential (PS).

You can specify three TYPE options on the SYSIN DD card:

SHORT (DEFAULT)
: Excludes some PSF data, specifically PPCC trace entries. For some entries, only the first 32 bytes of data are traced. In a truncated entry, a '<' is placed in the space between the address and the start of the data in the trace output data set.

TITLES
: Only headers are printed for the trace entry being formatted.

LONG
: All data is included in the trace output data set.

Printing GTF Data

Print GTF trace data sets by using the Interactive Problem Control System (IPCS). For information about using IPCS, refer to the *IPCS User's Guide* for your operating system.

Terminating a Printer FSA

If you cannot purge or cancel a printer using a JES command, you can use the PSF operator interface to terminate the printer FSA. Figure 38 shows the syntax of the MODIFY command for terminating a printer FSA.

```
{MODIFY |
F}FSSname,FORCE,printer-name
```

Figure 38. MODIFY Command Format for Terminating a Printer FSA

To terminate a printer FSA, the operator types the MODIFY (or F) command with the FORCE parameter. The following list describes the parameters used with the MODIFY command to terminate a printer FSA. All of the parameters are required.

FSSname
: Specifies the name of the FSS that manages the printer FSA to be terminated. The *FSSname* parameter must match the FSSNAME parameter of the FSSDEF statement for the FSS.

FORCE
: Specifies that the printer FSA specified by *printer-name* be terminated.

printer-name
: Specifies the printer FSA to be terminated. For JES2, *printer-name* can use either the PRINTR*nn* or PRT*nnnn* format. For JES3, *printer-name* can be 1 to 8 characters, with the first character being alphabetic.

Note: When you issue the FORCE command, the FSA terminates with abend code 024-E50. PSF issues message APS627I when it processes the FORCE parameter. If the FSA is tracing to an external trace data set when the FORCE parameter is issued, a C03 system abend may result for the trace data set when the FSS address space is terminated.

If the FORCE command is unsuccessful on JES3 systems, use the JES3 command shown in Figure 39 to terminate the printer FSA.

```
*FAIL,PRTXX
```

Figure 39. JES3 Command to Terminate the Printer FSA

Dumps

Dumps containing information useful in PSF diagnosis can be generated when any of the following conditions occur:

- A *conditional dump* is produced when the DUMP parameter is specified in the PRINTDEV statement of the PSF startup procedure or in the JCL for direct-printing mode.
- A standard MVS abend dump is produced when PSF abends. PSF issues a message containing an abend reason code. Abends reported with PSF abend reason codes of X'0140', X'0158', X'0178', X'0617', X'0653', X'0E00' through X'0E7F', and X'0F18' through X'0F1F' do not produce a dump.
- When the system operator sets a SLIP trap or types the DUMP command, an *SVC dump* is produced.

Each of these dumps is explained in the following sections.

Conditional Dump

You can request a conditional dump of PSF control blocks by specifying the DUMP parameter on the PRINTDEV statement of the PSF startup procedure, or, when you are using PSF in direct-printing mode, on the print-job JCL. You can request that a conditional dump occur when a specific PSF message or PSF return reason code is met.

When a conditional dump occurs, the PSF task abends. If a PSF message identifier is specified to cause the conditional dump, an abend code of X'024 C20' is reported. If a PSF return reason code is specified to cause the conditional dump, an abend code of X'024 D20' is reported.

In deferred-printing mode, the dump goes directly to SYS1.DUMPxx and is printed with IPCS. For information about routing the dump output in direct-printing mode, see “Dumps in Direct-Printing Mode” on page 50.

The information in the conditional dump follows standard dump format. Figure 40 contains the syntax of the DUMP parameter in the PRINTDEV statement.

```
DUMP=([reasoncode|ABD0nnn] [,msgid,count])
```

Figure 40. Syntax of the DUMP Parameter in the PRINTDEV Statement

For restartable abends, use the following syntax:

```
DUMP=(ABD0xxx),
```

where *xxx* is the abend reason code.

The DUMP parameters are as follows:

reascode
: Specifies an 8-character PSF return reason code or restartable abend reason code. For a list of PSF return reason codes, see Appendix C, PSF Reason Codes.

msgid

Specifies a PSF message identifier. The following messages cannot be trapped and should not be specified. If you specify them, PSF ignores them.

Table 6. Messages That Should Not Be Specified

APS000I	APS001I	APS002A	APS003A	APS004I	APS005I
APS006I	APS022I	APS023I	APS038I	APS042I	APS044I
APS045I	APS046I	APS047I	APS048I	APS049I	APS050I
APS051I	APS053I	APS054I	APS055I	APS060I	APS062I
APS063I	APS064I	APS065I	APS066I	APS067I	APS068I
APS069I	APS070I	APS071I	APS072I	APS588E	APS589E
APS590E	APS591I	APS592E	APS593W	APS594I	APS595I
APS596E	APS597E	APS598E	APS599E	APS605I	APS606I
APS607I	APS608I	APS610I	APS611I	APS612I	APS613I
APS620A	APS621I	APS622I	APS623I	APS624I	APS625I
APS626I	APS628I	APS629I	APS630I	APS635I	APS636I
APS637I	APS638I	APS639I	APS646I	APS647I	APS648I
APS649I	APS650I	APS651I	APS661I	APS667I	APS668I
APS669I	APS670I	APS671I	APS683I	APS684I	APS685I
APS686I	APS687I	APS692I	APS693I	APS694I	APS695I
APS955I	APS957I				

For more information on PSF messages, refer to *PSF for OS/390: Messages and Codes*.

count

Specifies a decimal number ranging from 1 to 99. PSF produces a dump immediately before processing the specified number of the messages indicated by *msgid*. For example, specify **4** for a count of 4, or specify **15** for a count of 15 messages. Specify a count only when you also specify *msgid*.

The time at which PSF produces a dump depends on what is specified on the DUMP parameter, as follows:

If the variable is:	**A formatted dump is printed:**
Reason code	When PSF encounters the reason code value when exiting from a module.
Message identifier	When PSF issues a message for the *n*th time (where *n* is the message count). If you do not specify a message count, the dump occurs on the first occurrence of the message.
Message count	When PSF issues the message identified by the message identifier for the *n*th time, where *n* is the message count.

When both a message ID and a reason code are specified on the DUMP parameter, a dump occurs at the first occurrence of either situation. For example:

```
DUMP=(04052200,APS558I,3)
```

Figure 41. Specifying Both a Message ID and a Reason Code on the DUMP Parameter

A dump occurs if either of the following occurs:

- PSF issues reason code 04052200.
- PSF issues message APS558I for the third time.

The following example specifies that a dump is to occur when module APSDDS exits with reason code 04052200 (a data set cannot be printed because of an I/O error):

```
DUMP=(04052200)
```

Figure 42. Specifying that a Dump Occurs When Module APSDDS Exits with RC 04052200

The following example specifies that a dump is to occur after message APS558I is issued for the third time (a page is too complex to be processed):

```
DUMP=(,APS558I,3)
```

Figure 43. Specifying that a Dump Occurs After Message APS558I Is Issued a Third Time

Dumps in Direct-Printing Mode

When you request a dump in direct-printing mode, you must include a SYSUDUMP, SYSABEND, or SYSMDUMP DD statement in your print job JCL. These statements describe the format in which the output is to be printed, as follows:

SYSUDUMP Provides a dump of control information and the main storage as it relates to the load module. This information is formatted by the abend dumping service and is ready for printing.

SYSABEND Provides a dump of the control information and the main storage as it relates to the load module. Additional data, if any, depends on what is defined on the OS/390 system. This information is formatted by the abend dumping service and is ready for printing.

SYSMDUMP Provides a dump of the control information and the main storage as it relates to the load module. Additional data, if any, depends on what is defined on the OS/390 system. This information is not formatted by the abend dumping service. The interactive problem control system (IPCS) program can be used to view and print dumps.

MVS Abend Dump

A standard MVS abend dump is automatically invoked by MVS during an abend if the PSF startup procedure contains a SYSUDUMP, SYSABEND, or SYSMDUMP DD statement.

SVC Dump

An SVC dump is recorded on SYS1.DUMPxx and can be caused by PSF abending or by the system operator issuing the DUMP command.

Reading a Dump

For a description of how to read an MVS dump, refer to *OS/390 MVS Diagnosis: Procedures*. For help in using it to solve a PSF problem, refer to *OS/390 MVS Diagnosis: Tools and Service Aids*.

The IPCS program is used to view dumps at the display terminal and print them. Refer to the IPCS publications for your operating system, *OS/390 MVS IPCS User's Guide* and *OS/390 MVS IPCS Commands* or *MVS/ESA IPCS User's Guide* and *MVS/ESA IPCS Commands*.

Appendix A. Message-to-Module Cross-Reference

This appendix lists all the message identification numbers issued by Print Services Facility and the modules that produce each message. Use this appendix when building a keyword string with the MSG*x* keyword.

Note: The modules followed by an asterisk produce the message when you have the Download for OS/390 feature installed.

Table 7 (Page 1 of 12). Message-to-Module Cross-Reference

Message	Modules
APS000I	APSADPSS
APS001I	APSADPSS
APS002A	APSAOPEN
APS003A	APSAOPEN
APS004I	APSADPSS
APS005I	APSAOPEN
APS006I	APSAOPEN
APS021I	APSPPDSP
APS022I	APSPPIEP APSKAFPD*
APS023I	APSPPFSA APSKFSA*
APS024I	APSPPODR APSKODR*
APS025I	APSPPFSP
APS026I	APSPPDVP APSPPDCM
APS030I	APSPPDVP
APS031I	APSPPDSP APSKDSP*
APS032I	APSPPDSP APSKDSP*
APS033I	APSPPDSP APSKDSP*
APS034I	APSPPDSP APSKDSP*
APS035I	APSPPDSP APSKDSP*
APS036I	APSPPDSP
APS037I	APSPPDSP
APS038I	APSPEFSA
APS039I	APSPPDCM
APS040I	APSPIPER

Table 7 (Page 1 of 12). Message-to-Module Cross-Reference

Message	Modules
APS041I	APSPPODR APSPPFAC APSKODR*
APS042I	APSPPATR APSPPODR APSPPFAC APSPPFSP APSKODR*
APS043I	APSPPODR APSPPFAC APSPPFSP APSKODR*
APS044I	APSPPATR
APS045I	APSPPFSA
APS046I	APSPPIEP APSKAFPD*
APS047I	APSPPSMF APSKSMF*
APS048I	APSPPIEP APSKAFPD*
APS049I	APSPPSMF APSKSMF*
APS050I	APSPEFSA APSPEFSS APSPENST
APS051I	APSPEFSA APSPEFSS APSPENST
APS052I	APSPPGDS
APS053I	APSPEFSA
APS054I	APSPPATR
APS055I	APSPEFSA APSPEFSS APSPENST
APS056I	APSPPGDS
APS057I	APSPPDVP APSKDVP*

Table 7 (Page 2 of 12). Message-to-Module Cross-Reference

Message	Modules
APS060I	APSPPFSA
APS061I	APSPPDVP
APS062I	APSPNTFY APSKNTFY*
APS063I	APSPNTFY
APS064I	APSPNTFY
APS065I	APSPNTFY
APS066I	APSPNTFY
APS067I	APSPNTFY
APS068I	APSPNTFY APSKNTFY*
APS069I	APSPNTFY APSKNTFY*
APS070I	APSPNTFY APSKNTFY*
APS071I	APSPNTFY APSKNTFY*
APS072I	APSPNTFY APSKNTFY*
APS073I	APSPPDVP
APS075I	APSPSMDS
APS076I	APSPSMDS
APS077I	APSPSMDS
APS078I	APSPSMDS
APS079I	APSPPDVP
APS080I	APSPPDVP
APS081I	APSPPDVP
APS095I	APSUEXTI*
APS074I	APSPPDVP
APS100I	APREPGEX
APS101I	APSDDS
APS102I	APSLRBS APSLRIDS APSLRLIB
APS103I	APSDCPL APSDFNL
APS104I	APRSTMAZ
APS105I	APSDGET
APS106I	APRSTMAZ
APS107I	APSDECH

Table 7 (Page 2 of 12). Message-to-Module Cross-Reference

Message	Modules
APS108I	APSDECH
APS109I	APSDECH
APS110I	APRENVAZ APROCAAZ APRFDPAZ
APS111I	APRCS2AZ
APS112I	APSDGET
APS113I	APRSTMAZ
APS114I	APRSTMAZ
APS115I	APSDGET
APS116I	APRSTMAZ
APS117I	APRCS2AZ APRSTMAZ APRPDPAZ
APS118I	APRSTMAZ
APS120I	APRENVAZ APRCS2AZ APRCP2AZ APRCF2AZ APRFDPAZ
APS121I	APRDOCEX
APS122I	APRCS2AZ
APS123I	APRBPGEX
APS125I	APSDFNL
APS126I	APRCS2AZ
APS127I	APRCS2AZ
APS128I	APRBPGEX
APS129I	APRCS2AZ
APS130I	APSDDS
APS131I	APSDDS
APS132I	APSDDS
APS135I	APRENVAZ APRFDPAZ
APS138I	APRENVAZ APRFDPAZ
APS139I	APRFDPAZ
APS140I	APRMSGEX
APS141I	APRFDPAZ
APS143I	APRFDPAZ
APS145I	APRFDPAZ
APS146I	APRFDPAZ

Table 7 (Page 3 of 12). Message-to-Module Cross-Reference

Message	Modules
APS147I	APRFDPAZ
APS152I	APRFDPAZ
APS154I	APRFDPAZ
APS155I	APRLCCAZ
APS156I	APRFDPAZ
APS157I	APRINVAZ
APS158I	APRINVAZ APRBLPAZ
APS159I	APRSTMAZ
APS162I	APRINVAZ
APS163I	APRIMGAZ
APS165I	APRCS2AZ
APS166I	APRENVAZ
APS167I	APRENVAZ
APS169I	APRCFIEX APRIPSEX APRIOBEX APSDLOAD
APS170I	APRFDPAZ
APS171I	APRENVAZ
APS172I	APRFDPAZ
APS178I	APRFDPAZ
APS179I	APRFDPAZ
APS181I	APRFDPAZ
APS186I	APRCP2AZ
APS188I	APRFDPAZ
APS190I	APRFDPAZ
APS191I	APRFDPAZ
APS192I	APRCS2AZ
APS193I	APRCS2AZ
APS194I	APSDFNL
APS195I	APSDFNL
APS196I	APSDFNL
APS197I	APRCS2AZ
APS199I	APSDLOAD
APS206I	APSDDS
APS207I	APRCS2AZ
APS209I	APRIBPAZ

Table 7 (Page 3 of 12). Message-to-Module Cross-Reference

Message	Modules
APS210I	APRENVAZ APROSTAZ APROCAAZ
APS211I	APSDECH
APS212I	APRENVAZ APRIMGAZ APRCS2AZ APROCAAZ APRFDPAZ
APS214I	APRMSGEX
APS215I	APRMSGEX
APS217I	APROSTAZ
APS218I	APRIBPAZ
APS219I	APRIBPAZ
APS220I	APSDDS
APS221I	APRFDPAZ
APS222I	APRCS2AZ
APS223I	APRMSGEX
APS225I	APSPPDVP
APS226I	APSDDS
APS227I	APRLCCAZ
APS228I	APRBPGEX
APS229I	APSDSECD
APS230I	APSDSECD
APS231I	APSDSECD
APS232I	APSDSECD
APS233I	APSDSECD
APS234I	APSDSECD
APS235I	APSDSECD
APS236I	APSDSECD
APS237I	APSDSECD
APS239I	APSDLOAD
APS240I	APSDSECD
APS241I	APRBPGEX
APS242I	APSMSGEX
APS244I	APRENVAZ
APS245I	APRIMGAZ
APS246I	APSDSECD APRBPGEX
APS247I	APSDSECD

Table 7 (Page 4 of 12). Message-to-Module Cross-Reference	
Message	**Modules**
APS248I	APSDECH
APS249I	APRCS2AZ
APS250I	APREAGAZ APRPDPAZ APRFDPAZ
APS251I	APRFDPAZ
APS252I	APRLCCAZ
APS253I	APRFDPAZ
APS254I	APRFDPAZ
APS255I	APRIBPAZ
APS256I	APRIBPAZ
APS257I	APRIMGAZ
APS258I	APRSTMAZ
APS259I	APRENVAZ APROCAAZ APRFDPAZ
APS260I	APRIMGAZ APROSTAZ APROCAAZ
APS261I	APRENVAZ
APS262I	APRENCAZ
APS263I	APROSTAZ
APS264I	APRENVAZ
APS265I	APRLCCAZ
APS267I	APREAGAZ
APS268I	APRENVAZ
APS269I	APRENVAZ APROCAAZ APRFDPAZ
APS270I	APRPDPAZ
APS271I	APRFDPAZ
APS272I	APRFDPAZ
APS273I	APRFDPAZ
APS274I	APRFDPAZ
APS275I	APRMSGEX
APS276I	APROCAAZ
APS277I	APROCAAZ
APS278I	APROCAAZ
APS279I	APRCS2AZ
APS280I	APRCS2AZ

Table 7 (Page 4 of 12). Message-to-Module Cross-Reference	
Message	**Modules**
APS281I	APRCS2AZ
APS282I	APRPRPAZ
APS283I	APRMSGEX
APS284I	APRMSGEX
APS285I	APRMSGEX
APS286I	APRMSGEX
APS287I	APRMSGEX
APS288I	APRMSGEX
APS289I	APRMSGEX
APS290I	APRMSGEX
APS291I	APRMSGEX
APS292I	APRMSGEX
APS293I	APRMSGEX
APS294I	APRMSGEX
APS295I	APRMSGEX
APS296I	APRMSGEX
APS297I	APRMSGEX
APS298I	APRMSGEX
APS299I	APRMSGEX
APS300I	APRMSGEX
APS301I	APRMSGEX
APS301I	APRPDPAZ
APS307I	APRPDPAZ
APS308I	APSDMSGF
APS309I	APRPDPAZ
APS310I	APRPDPAZ
APS312I	APRPDPAZ
APS314I	APRPDPAZ
APS315I	APRPDPAZ
APS316I	APRPDPAZ
APS317I	APRPDPAZ
APS319I	APRPDPAZ
APS320I	APRPDPAZ
APS321I	APRPDPAZ
APS322I	APRPDPAZ
APS323I	APRPDPAZ
APS324I	APRPDPAZ
APS326I	APRCMPAZ

Table 7 (Page 5 of 12). Message-to-Module Cross-Reference

Message	Modules
APS327I	APRPLNAZ
APS328I	APRMSGEX
APS329I	APRPDPAZ
APS330I	APRPLNAZ
APS331I	APRMSGEX
APS334I	APRPDPAZ
APS335I	APRCMPAZ
APS337I	APRPDPAZ
APS339I	APRPDPAZ
APS340I	APRCNTAZ
APS342I	APRCNTAZ
APS343I	APRMSGEX
APS344I	APRPDPAZ
APS345I	APSDMSGF
APS346I	APRPLNAZ
APS350I	APRMSGEX
APS352I	APRPLNAZ
APS353I	APRCMPAZ
APS354I	APRDOCEX
APS355I	APRMSGEX
APS356I	APRMSGEX
APS359I	APRMSGEX
APS360I	APSDDS APRMSGEX
APS362I	APSDECH
APS363I	APRBPGEX
APS364I	APRMSGEX
APS365I	APRMSGEX
APS366I	APRMSGEX
APS370I	APRMSGEX
APS371I	APRMSGEX
APS372I	APRMSGEX
APS373I	APRMSGEX
APS374I	APRMSGEX
APS375I	APRMSGEX
APS376I	APRMSGEX
APS377I	APRMSGEX
APS378I	APRMSGEX

Table 7 (Page 5 of 12). Message-to-Module Cross-Reference

Message	Modules
APS380I	APRMSGEX
APS382I	APRMSGEX
APS383I	APREAGAZ
APS384I	APREAPAZ
APS385I	APREAPAZ
APS386I	APROSTAZ
APS387I	APROSTAZ APRIOBEX
APS388I	APROSTAZ APRIMGAZ
APS389I	APRMSGEX
APS390I	APRMSGEX
APS391I	APRMSGEX
APS392I	APRMSGEX
APS393I	APRMSGEX
APS394I	APRMSGEX
APS395I	APRIBPAZ
APS396I	APRMSGEX
APS397I	APRMSGEX
APS398I	APRMSGEX
APS399I	APRMSGEX
APS400I	APSESNTB
APS401I	APSESNTB
APS402I	APSESNTB
APS403I	APSESNTB
APS404I	APSESNTB
APS405I	APSESNTB
APS406I	APSESNTB
APS407I	APSESNTB
APS408I	APSESNTB
APS409I	APSESNTB
APS410I	APSESNTB
APS411I	APSESNTB
APS412I	APSESNTB
APS413I	APSESNTB
APS414I	APSESNTB
APS415I	APSESNTB
APS416I	APSESNTB

Table 7 (Page 6 of 12). Message-to-Module Cross-Reference	
Message	**Modules**
APS417I	APSESNTB
APS418I	APSESNTB
APS419I	APSESNTB
APS420I	APSESNTB
APS421I	APSESNTB
APS422I	APSESNTB
APS423I	APSESNTB
APS424I	APSESNTB
APS425I	APSESNTB
APS426I	APSESNTB
APS427I	APSESNTB
APS428I	APSESNTB
APS429I	APSESNTB
APS430I	APSESNTB
APS431I	APSESNTB
APS432I	APSESNTB
APS433I	APSESNTB
APS434I	APSESNTB
APS435I	APSETB19
APS436I	APSESNTB
APS437I	APSESNTB
APS438I	APSESNTB
APS439I	APSESNTB
APS440I	APSESNTB
APS441I	APSESNTB
APS442I	APSESNTB
APS443I	APSESNTB
APS444I	APSESNTB
APS446I	APSESNTB
APS447I	APSESNTB
APS448I	APSESNTB
APS449I	APSESNTB
APS450I	APSESNTB
APS451I	APSESNTB
APS452I	APSESNTB
APS453I	APSESNTB
APS454I	APSESNTB
APS455I	APSESNTB

Table 7 (Page 6 of 12). Message-to-Module Cross-Reference

Message	Modules
APS456I	APSESNTB
APS457I	APSESNTB
APS458I	APSESNTB
APS459I	APSESNTB
APS460I	APSESNTB
APS461I	APSESNTB
APS462I	APSESNTB
APS463I	APSESNTB
APS464I	APSESNTB
APS465I	APSESNTB
APS466I	APSESNTB
APS467I	APSESNTB
APS468I	APSETB19
APS469I	APSESNTB
APS470I	APSESNTB
APS471I	APSESNTB
APS473I	APSESNTB
APS474I	APSESNTB
APS475I	APSESNTB
APS476I	APSESNTB
APS477I	APSESNTB
APS478I	APSETB19
APS479I	APSEATCD
APS480I	APSEMSG
APS481I	APSESNTB
APS482I	APSESNTB
APS483I	APSESNTB
APS484I	APSESNTB
APS485I	APSESNTB
APS486I	APSESNTB
APS487I	APSESNTB
APS488I	APSESNTB
APS489I	APSESNTB
APS490I	APSEMSG
APS491I	APSESNTB
APS492I	APSESNTB
APS493I	APSESNTB
APS494I	APSESNTB

Table 7 (Page 7 of 12). Message-to-Module Cross-Reference

Message	Modules
APS495I	APSESNTB
APS496I	APSESNTB
APS497I	APSESNTB
APS498I	APSESNTB
APS500I	APSLINIT APSLOPEN
APS501I	APSLDYNA
APS502I	APSLOPEN
APS503I	APSLDYNA
APS504I	APSLDYNA
APS505I	APSLOPEN APSLDYNA
APS506I	APSLOPEN
APS507I	APSLOPEN
APS515I	APSLMSG
APS516I	APSLWIDS
APS517I	APSLWIDS
APS518I	APSLRBS APSLOPEN
APS520I	APSLOPEN
APS522I	APSLRBS
APS523I	APSLMSG
APS527I	APSLRBS
APS532I	APSLOPEN
APS535I	APSLOPEN
APS537I	APSLCLOS APSLOPEN
APS538I	APSLOPEN APSLRBS
APS539I	APSLRBS
APS547I	APSLABND APSLOPEN
APS548I	APSLMSG APSLRBS APSLABND APSLCLOS APSLOPEN APSLDYNA
APS551I	APSRDEL
APS553I	APSRLOAD
APS554I	APSRLOAD

Table 7 (Page 7 of 12). Message-to-Module Cross-Reference

Message	Modules
APS555I	APSRNAME
APS556I	APSRMFNT
APS557I	APSRQRY
APS560I	APSRMFNT
APS561I	APSRNAME
APS562I	APSRMFNT
APS563I	APSRMPSG APSRMOVL APSRMFNT APSRNAME
APS564I	APSRSRT
APS565I	APSRLOAD
APS566I	APSRLOAD
APS568I	APRGRNEX
APS569I	APRGRNEX
APS570I	APSRLRT
APS571I	APSRROCK
APS573I	APSRNAME APSRMOVL
APS574I	APRGRNEX
APS575I	APROAEEX
APS576	APRGRNEX
APS577I	APSRQRY
APS580I	APSRMARK APSRPGRN
APS581I	APSRCPDS APSRMARK APSRPGRN
APS582I	APSRCPDS APSRPGRN
APS583I	APSRCPDS APSRPGRN
APS584I	APSRCPDS APSRMARK
APS585I	APSRCPDS
APS586I	APSRCPDS APSRPGRN
APS587I	APSRMARK
APS588I	APSRMARK
APS589I	APSRMARK
APS590I	APSRMARK

Table 7 (Page 8 of 12). Message-to-Module Cross-Reference

Message	Modules
APS591I	APSRCPDS
APS592I	APSRCPDS APSRMARK APSRPGRN
APS593I	APSRCPDS
APS594I	APSRCPDS
APS595I	APSRCPDS
APS596I	APSRCPDS
APS597I	APSRCPDS
APS598I	APSRMARK
APS599I	APSRMARK
APS600I	APSJCL
APS601I	APSJCL
APS602I	APSJCL
APS603I	APSJCL
APS604I	APSJCL
APS605I	APSGTRCE APSGTROC
APS606I	APSGSYND
APS607I	APSGTROC
APS608I	APSGTROC
APS609I	APSJCL
APS610I	APSGDUMP
APS611I	APSZTRCE
APS612I	APSZTRCE
APS613I	APSZPRSE APSZTRCE APSZFORC
APS614I	APSJCL
APS615I	APSJCL
APS616I	APSJCL
APS617I	APSJCL
APS620A	APSZCMND
APS621I	APSZINIT
APS622I	APSZINIT
APS623I	APSZRSTR
APS624I	APSZRSTR
APS625I	APSZINIT
APS626I	APSZRSTR

Table 7 (Page 8 of 12). Message-to-Module Cross-Reference

Message	Modules
APS627I	APSZFORC
APS628I	APSZESTI
APS629I	APSZESTI
APS630I	APSZESTI
APS631I	APSEATCD
APS632I	APSEATCD
APS633I	APSEATCD
APS634I	APSEATCD
APS635I	APSZPRSE
APS636I	APSZPRSE
APS637I	APSZFORC
APS638I	APSZCMND
APS639I	APSZCMND
APS641I	APSEATCD
APS642I	APSEATCD
APS643I	APSEATCD
APS644I	APSEATCD
APS646I	APSZPRSE
APS647I	APSZTRCE
APS648I	APSZPRSE
APS649I	APSZCMND
APS650I	APSZPRSE
APS651I	APSZPRSE
APS661I	APSZPRSE
APS664I	APSZPRSE
APS667I	APSZPRSE
APS668I	APSZCMND
APS669I	APSZCMND
APS670I	APSZCMND
APS671I	APSZCMND
APS683I	APSZCMND
APS684I	APSZCMND APSZPRSE
APS685I	APSZPRSE
APS686I	APSZPRSE
APS687I	APSZPRSE
APS691I	APSJCL

Table 7 (Page 9 of 12). Message-to-Module Cross-Reference

Message	Modules
APS692I	APSZCMND APSZRSTR
APS693I	APSZCMND
APS694I	APSZECI APSZESTI APSZINIT APSZRSTR APSZTCI
APS695I	APSZESTI APSZINIT APSZRSTR
APS700I	APSEMSG
APS701I	APSEMSG
APS702I	APSESNTB
APS703I	APSESNTB
APS704I	APSESNTB
APS705I	APSESNTB
APS706I	APSEMSG
APS707I	APSESNTB
APS708I	APSESNTB
APS709I	APSESNTB
APS710I	APSESNTB
APS711I	APSEATCD
APS712I	APSEATCD
APS713I	APSEATCD
APS714I	APSEATCD
APS715I	APSESNTB
APS716I	APSESNTB
APS717I	APSEMSG
APS718I	APSESNTB
APS719I	APSESNTB
APS720I	APSESNTB
APS721A	APSEATCD
APS722I	APSEATCD
APS723I	APSESNTB
APS724I	APSEMSG
APS725I	APSEMSG
APS726I	APSESNTB
APS727I	APSESNTB
APS728I	APSESNTB

Table 7 (Page 9 of 12). Message-to-Module Cross-Reference

Message	Modules
APS729I	APSESNTB
APS730I	APSESNTB
APS731I	APSESNTB
APS732I	APSESNTB
APS733I	APSESNTB
APS734I	APSESNTB
APS735I	APSEATCD
APS736I	APSEATCD
APS737I	APSESNTB
APS738I	APSESNTB
APS739I	APSESNTB
APS740I	APSESNTB
APS741I	APSESNTB
APS742I	APSESNTB
APS743I	APSESNTB
APS746I	APSESNTB
APS747I	APSESNTB
APS748I	APSESNTB
APS749I	APSESNTB
APS750I	APSESNTB
APS751I	APSESNTB
APS753I	APSESNTB
APS754I	APSESNTB
APS755I	APSESNTB
APS756I	APSESNTB
APS757I	APSESNTB
APS758I	APSESNTB
APS759I	APSESNTB
APS760I	APSESNTB
APS761I	APSESNTB
APS762I	APSESNTB
APS763I	APSESNTB
APS764I	APSESNTB
APS765I	APSESNTB
APS766I	APSESNTB
APS767I	APSESNTB
APS768I	APSESNTB
APS769I	APSESNTB

Table 7 (Page 10 of 12). Message-to-Module Cross-Reference

Message	Modules
APS770I	APSESNTB
APS771I	APSESNTB
APS772I	APSESNTB
APS773I	APSESNTB
APS774I	APSESNTB
APS775I	APSEMSG
APS776I	APSEATCD
APS777I	APSESNTB
APS778I	APSESNTB
APS779I	APSESNTB
APS780I	APSESNTB
APS781I	APSE3820
APS782I	APSE3820
APS783I	APSE3820
APS784I	APSE3820
APS785I	APSESNTB
APS786I	APSESNTB
APS787I	APSE3820
APS788I	APSESNTB
APS790I	APSESNTB
APS791I	APSESNTB
APS792I	APSESNTB
APS793I	APSESNTB
APS794I	APSEATCD
APS796I	APSEATCD
APS797I	APSEATCD
APS798I	APSESNTB
APS799I	APSEATCD
APS800I	APSEMSG
APS801I	APSESNTB
APS802I	APSEATCD
APS803I	APSERRM
APS804I	APSESNTB
APS805I	APSESNTB
APS806I	APSESNTB
APS807I	APSE3820
APS808I	APSESNTB
APS809I	APSESNTB

Table 7 (Page 10 of 12). Message-to-Module Cross-Reference

Message	Modules
APS810I	APSESNTB
APS811I	APSESNTB
APS812I	APSESNTB
APS813I	APSESNTB
APS814I	APSESNTB
APS815I	APSESNTB
APS816I	APSESNTB
APS817A	APSERRM
APS818I	APSESNTB
APS819I	APSESNTB
APS820I	APSEMSG
APS821I	APSEMSG
APS822I	APSEATCD
APS823I	APSEATCD
APS824I	APSESNTB
APS825I	APSEATCD
APS826I	APSESNTB
APS827I	APSESNTB
APS828I	APSEATCD
APS829I	APSEATCD
APS830I	APSEMSG
APS831I	APSERRM
APS832I	APSEMSG
APS833I	APSEMSG
APS834I	APSESNTB
APS835I	APSESNTB
APS836I	APSERRM
APS837I	APSEATCD
APS838I	APSESNTB
APS839I	APSEMSG
APS840I	APSESNTB
APS841I	APSESNTB
APS842I	APSEATCD
APS843I	APSEATCD
APS844I	APSEATCD
APS845I	APSEATCD
APS846I	APSERRM
APS847I	APSEATCD

Table 7 (Page 11 of 12). Message-to-Module Cross-Reference

Message	Modules
APS848I	APSESNTB
APS849I	APSESNTB
APS850I	APSEATCD
APS851I	APSERRM
APS852I	APSERRM
APS853I	APSEATCD
APS854I	APSESNTB
APS855I	APSESNTB
APS856I	APSESNTB
APS857I	APSESNTB
APS858I	APSEMSG
APS859I	APSEMSG
APS860I	APSEMSG
APS861I	APSETB19
APS862I	APSETB19
APS863I	APSEMSG
APS864I	APSEATCD
APS866I	APSESNTB
APS867I	APSESNTB
APS868I	APSESNTB
APS869I	APSESNTB
APS870I	APSESNTB
APS871I	APSESNTB
APS872I	APSEATCD
APS873I	APSESNTB
APS874I	APSEATCD
APS875I	APSEMSG
APS876I	APSESNTB
APS877I	APSESNTB
APS878I	APSESNTB
APS879I	APSESNTB
APS880I	APSESNTB
APS881I	APSESNTB
APS882I	APSESNTB
APS883I	APSESNTB
APS884I	APSESNTB
APS885I	APSEMSG
APS886I	APSEMSG

Table 7 (Page 11 of 12). Message-to-Module Cross-Reference

Message	Modules
APS887I	APSESNTB
APS888I	APSESNTB
APS889I	APSESNTB
APS890I	APSESNTB
APS891I	APSESNTB
APS892I	APSESNTB
APS893I	APSESNTB
APS894I	APSESNTB
APS895I	APSEMSG
APS896I	APSESNTB
APS897I	APSESNTB
APS898I	APSESNTB
APS899I	APSESNTB
APS920I	APSCIPRT
APS921I	APSCIPRT
APS922I	APSCESTA
APS923I	APSCCLR
APS924I	APSCCLR
APS925I	APSCSNA
APS926I	APSNORS
APS927I	APSCIPRT
APS928I	APSCESTA
APS929I	APSCCLR
APS930I	APSCOPCI
APS931I	APSCINFO
APS932I	APRMSGEX APSEATCD APSERRM APSE3820
APS933I	APSCCDEV
APS934I	APSCESTA
APS935I	APSCTCP
APS936I	APSCCLR
APS937I	APSCCLR
APS938I	APSCCLR
APS939I	APSPEFSA
APS940I	APSNORS
APS941I	APSNORS

Table 7 (Page 12 of 12). Message-to-Module Cross-Reference

Message	Modules
APS942I	APSCOPCI
APS943I	APSCINIT
APS946I	APSNLINK
APS947I	APSCCLR
APS948I	APSNINIT
APS949I	APSNINIT APSPPFSP
APS950I	APSUEXIT
APS951I	APSUEXTI
APS952I	APSUEXTI
APS953I	APSUEXTI
APS954I	APSUREXT
APS955I	APSUFSSI
APS956I	APSUEXTI
APS957I	APSUFSSI
APS958I	APSUEXTI
APS959I	APSUEXTI
APS960I	APSTOPEN APSTCLOS
APS961I	APSTOPEN
APS962I	APSTOPEN
APS963I	APSTOPEN
APS964I	APSTPREC
APS965I	APSTPREC
APS966I	APSTPREC
APS967I	APSTOPEN
APS970I	APS4MLMC
APS971I	APS4MLD
APS972I	APS4MLD
APS973I	APS4MBCB
APS974I	APS4MLMC
APS975I	APS4MLMC
APS976I	APS4MLD
APS977I	APS4MCLS APS4MLD
APS978I	APS4MLMC
APS979I	APS4MLMC
APS980I	APS4MLD

Table 7 (Page 12 of 12). Message-to-Module Cross-Reference

Message	Modules
APS986I	APSKDVP*
APS987I	APSKDSP*
APS988I	APSKNTFY*
APS989I	APSKDSP* APSKDVP*
APS990I	APSKROUT*
APS991I	APSKROUT*
APS992I	APSKFSA*
APS993I	APSKNTFY*
APS994I	APSKNTFY*
APS995I	APSKAFPD* APSKDVP*
APS996I	APSKROUT*
APS997I	APSKDVP*
APS1700I	APSRFLU
APS1701I	APSRFLU
APS1702I	APSRFLU
APS1703I	APSRFLU
APS1704I	APSRFLU
APS1705I	APSRFLU
APS1706I	APSRFLU
APS1707I	APSRFLU
APS1708I	APSRFLU
APS1709I	APSRFLU
APS1710I	APSRFLU
APS1711I	APSRFLU
APS2500I	APSEMSG
APS2501I	APSEMSG

Appendix B. Cross Reference of Printer Commands and Structured Fields

The following table lists some of the IPDS printer commands (Command Name) that PSF builds, with corresponding MO:DCA structured fields (SF). For more information about IPDS commands, refer to *Intelligent Printer Data Stream Reference*. For more information about MO:DCA structured fields, refer to *Mixed Object Document Content Architecture Reference*.

Note: Sometimes the structured field provides the data for the printer command. In other cases, the receipt of the structured field causes the command to be built.

Table 8 (Page 1 of 4). Cross Reference of Printer Commands to Structured Fields

Command Name	Hex ID	SF	Command Function
Activate Resource (AR)	D62E	BCP BFN BMO BPS CFI CPD FND MCF	Causes a resident resource to become available.
Apply Finishing Operations (AFO)	D602	MFC	Specifies the kind of finishing to be done to a sheet.
Begin overlay (BO)	D6DF	BMO	Identifies data that follows as an overlay.
Begin page (BP)	D6AF	BPG	Identifies data that follows as a page.
Begin page segment (BPS)	D65F	BPS	Identifies data that follows as a page segment.
Deactivate font	D64F	none	Causes a font to become inactive.
Deactivate overlay	D6EF	none	Causes an overlay to become inactive.
Deactivate page segment (DPS)	D66F	none	Causes a page segment to become inactive.
Define user area (DUA)	D6CE	[4]	Defines the user-printable area (UPA) for print labeling.
End	D65D	EIM EFN ECF	Terminates an image, a font, or a font index.

[3] Structured fields used during conversion from IM Image to IO Image.

[4] Security Definition Library Member.

Table 8 (Page 2 of 4). Cross Reference of Printer Commands to Structured Fields

Command Name	Hex ID	SF	Command Function
End page (EP)	D6BF	EMO EPG EPS	Terminates an overlay, a page segment, or a page.
Execute order anystate (XOA)	D633	None	Allowable orders: X'0600' Mark form carrier strip (3800 only) X'0800' Mark form X'0A00' Alternate offset stacker X'0C00' Control edge marks X'F100' Display operator panel message (3800 only) X'F200' Discard buffered data X'F300' Request printer information (3800 only) X'F400' request Resource list X'F600' Exception handling control
Execute order home state (XOH)	D68F	MMC MDD	Allowable orders: X'0100' Print buffered data X'0300' Specify group operation X'0400' Define group boundary X'0500' Erase residual print data X'0700' Erase residual font data X'0B00' Set x adjustment range (3800 only) X'1300' Eject to front facing X'1500' Select input media source X'1600' Set media origin X'0D00' Stack received pages X'0E00' Select media modifications X'F300' Obtain printer characteristics X'F500' Page counters control
Include overlay (IO)	D67D	[4]	Include a page overlay or a secure overlay, and specify its position.
Include page segment (IPS)	D67F	IPS	Causes a loaded page segment to be placed on a page. Includes data from tables built by Resource Manager.
Load code page (LCP)	D618	CPI	Describes the attributes of a code page.
Load code page control (LCPC)	D61A	CPC CPD	Contains code page data.
Load copy control (LCC)	D69F	MCC MMC MMO MSU	Contains the modifications for each copy of each form. Includes medium overlay printer IDs assigned by Resource Manager.
Load equivalence (LE)	D61D	none	Maps suppressions.
Load font (LF)	D62F	FNG	Contains font raster data.
Load font character set control (LFCSC)	D619	FNC	Describes the attributes of an outline font character set.

Table 8 (Page 3 of 4). Cross Reference of Printer Commands to Structured Fields

Command Name	Hex ID	SF	Command Function
Load font control (LFC)	D61F	FNC FNO	Describes the attributes of a raster font.
Load font equivalence (LFE)	D63F	MCF	Determines which fonts can be used on a page. Includes font printer IDs assigned by Resource Manager.
Load font index (LFI)	D60F	FNI	Contains addresses within the LF printer command data for each character and information for individual characters.
Logical page descriptor (LPD)	D6CF	PGD PTD	Establishes page size, length units, and initial values of control sequences.
Logical page position (LPP)	D66D	PGP	Contains the location of a page on a form.
Manage IPDS Dialog (MID)	D601	none	Begins or ends an IPDS dialog within a session.
No operation (NOP)	D603	none	No operation.
Sense error log	24	none	Reads the contents of the error retry log. (This is a CCW.)
Sense intermediate buffer (SIB)	14	none	Reads the contents of the intermediate buffer area. (This is a CCW.)
Sense type and model	D6E4	none	Reads the IPDS standard identification information and printer capabilities.
Set home state	D697	none	Resets the printer to home state (home state operations).
Write bar code (WBC)	D681	BDA	Contains bar code data and its associated parameters.
Write bar code control (WBCC)	D680	OBD OBP MBC BDD	Puts the printer in bar code state and defines the bar code presentation space, the bar code object area, and bar code mapping.
Write graphics (WG)	D685	GAD	Contains graphics data and its associated parameters.
Write graphics control (WGC)	D684	OBD OBP MGO GDD	Puts the printer in graphics state and defines the graphics presentation space, the graphics object area, and graphics mapping.
Write image (WI)	D64D	IRD	Contains IM image raster data.
Write image 2 (WI2)	D64E	IPD IRD[3]	Contains IO image data and its associated parameters.
Write image control (WIC)	D63D	IID IOC ICP	Describes and places an IM image.

Table 8 (Page 4 of 4). Cross Reference of Printer Commands to Structured Fields			
Command Name	**Hex ID**	**SF**	**Command Function**
Write image control 2 (WIC2)	D63E	OBD OBP MIO IDD IOC[3] ICP[3] IID[3]	Puts the printer in IO image state and defines the image presentation space, the IO image object area, and image mapping.
Write object container (WOC)	D64C	OCD	Contains the object container resource.
Write object container control (WOCC)	D63C	BOC	Describes an object container resource.
Write text (WT)	D62D	PTX IPS LND	Contains text and text control sequences. See Table 9 on page 68 for a list of control sequences.

Table 9 presents control sequences in the write-text printer command.

Table 9 (Page 1 of 2). Control Sequences in the Write-Text Printer Command		
Hex code (Unchained/ Chained)	**Text control Name**	**Length**
72/73	Overstrike	5
74/75	Set text color	4-5
76/77	Underscore	3
78/79	Temporary baseline move	3, 4, 6
C0/C1	Set inline margin	4
C2/C3	Set intercharacter adjustment	4
C4/C5	Set variable-space increment	4
C6/C7	Absolute move inline	4
C8/C9	Relative move Inline	4
D0/D1	Set baseline increment	4
D2/D3	Absolute move baseline	4
D4/D5	Relative move baseline	4
D8/D9	Begin line	2
DA/DB	Transparent data	2-255
E4/E5	Draw I-axis rule	7
E6/E7	Draw B-axis rule	7
EE/EF	Repeat string	4-255
F0/F1	Set coded font local	3
F2/F3	Begin suppression	3

Table 9 (Page 2 of 2). Control Sequences in the Write-Text Printer Command		
Hex code (Unchained/ Chained)	**Text control Name**	**Length**
F4/F5	End suppression	3
F6/F7	Set text orientation	6
F8/F9	No operation	2-255

Appendix C. PSF Reason Codes

When most PSF modules return control to a calling module, they set a reason code in register 0. System programmers can specify dumps for specific reason codes or for specific message IDs. The following constants define the specific reason codes that are set by PSF modules.

Table 10 (Page 1 of 15). PSF Reason Codes and Return Codes

PSF CODES	DEFINITION	SET BY
X'00000000'	The subcomponent completed successfully.	Any subcomponent
X'02010000'	An unsupported printer was allocated.	APSCIPRT
X'02010004'	The printer software feature was not installed.	APSCIPRT
X'02060800'	An I/O error was detected. The last command that was added has executed.	APSCCOMP APSRROCK
X'02060801'	An I/O error was detected. The last command that was added did not execute.	APSCCOMP APSRROCK
X'02060802'	An I/O error was detected. PSF does not know whether the last command that was added has executed.	APSCCOMP APSCSNA APSCSNIO APSRROCK APSERRM
X'02060803'	An I/O error was detected. The last command was related to a resource but failed to activate that resource.	APSRROCK
X'02061201'	PSF failed to allocate the buffer.	APSCADD APROUTEX
X'02061500'	SNA only: Contact with the printer was lost during I/O.	APSCSNIO
X'02150004'	A null ACK was received, following the read operation.	APSCSNIO
X'02160802'	Intervention and recovery reported on SNA; retry now possible.	APSCSNA
X'04030100'	A CPC structured field is missing.	APSDCPL
X'04030200'	A CPC structured field specifies an invalid null value for the default character name.	APSDCPL
X'04030300'	A CPC structured field specifies an invalid length for a CPI repeating group.	APSDCPL
X'04030400'	A CPI structured field is missing.	APSDCPL
X'04030500'	A CPI structured field data length is invalid.	APSDCPL
X'04030600'	A CPI structured field specifies an invalid null value for a character name.	APSDCPL
X'04030700'	An ECP structured field is missing.	APSDCPL
X'04030800'	The names in the ECP and BCP structured fields do not match.	APSDCPL
X'04050100'	The first structured field of the data set, after processing the BDS structured field, is invalid.	APSDDS
X'04050200'	The first structured field of job header data, after processing a BJH internal structured field, is invalid.	APSDDS
X'04050300'	The first structured field of user data, after processing an EJH internal structured field, is invalid.	APSDDS

Table 10 (Page 2 of 15). PSF Reason Codes and Return Codes		
PSF CODES	**DEFINITION**	**SET BY**
X'04050500'	Printing of the current document, messages, and separator page stops.	APSDDS
X'04050600'	An invalid structured field follows a BTM internal structured field.	APSDDS
X'04050700'	An invalid record type follows an EDH internal structured field.	APSDDS
X'04050800'	An invalid structured field follows a BDH internal structured field.	APSDDS
X'04051B00'	An offset stacker was requested but is unavailable.	APSDDS
X'04052000'	Data set is unprintable and placed on hold queue because of a non-IO error.	APSDDS
X'04052100'	Printing of current document is terminated.	APSDDS
X'04052200'	Data set is unprintable and placed on hold queue because of an IO error.	APSDDS
X'040A0100'	An END internal structured field was received.	APSDGET APRINPEX
X'040A0200'	A record length is invalid because no data was present when a carriage control was expected.	APSDGET APRINPEX
X'040A0300'	A structured field record length was invalid because it was less than the standard introducer length.	APSDGET APRINPEX
X'040A0302'	Although an extension bit was set, a structured field record length was invalid because it was less than the length needed for an introducer extension length field.	APSDGET APRINPEX
X'040A0303'	Although an extension bit was set, the structured field record length was invalid because it was less than the length needed for an extended introducer.	APSDGET APRINPEX
X'040A0400'	The length specified in a structured field introducer is greater than the record length.	APSDGET APRINPEX
X'040A0500'	The structured field introducer flag is invalid.	APSDGET APRINPEX
X'040A0600'	The structured field padding length is invalid.	APSDGET APRINPEX
X'040A0700'	The structured field data length is invalid because it is not the required multiple.	APSDGET APRINPEX
X'040A0703'	The structured field data length is invalid because it is not one of the allowed values.	APSDGET APRINPEX
X'040A0800'	The structured field type is invalid.	APSDGET APRINPEX
X'04100100'	Insufficient main storage is available to build the RRB.	APSDLOAD
X'04100700'	The first record in a code page is not a BCP structured field.	APSDLOAD
X'04100800'	The first record in a font character set is not a BFN structured field.	APSDLOAD
X'04100900'	A double-byte font was requested to be loaded into a printer that does not support double-byte fonts.	APSDLOAD
X'04100A00'	A double-byte font is specified for a printer that does not support double-byte fonts.	APSDLOAD
X'04100B00'	An error was detected while processing a secure resource.	APSDLOAD

Table 10 (Page 3 of 15). PSF Reason Codes and Return Codes

PSF CODES	DEFINITION	SET BY
X'04160000'	General information reason code. Provides environmental messages for objects on stack and position of current record.	APSDDGB
X'04160100'	Group level finishing requested but printer does not support group level finishing.	APSDDGB
X'04160200'	Medium level finishing requested but the printer does not support medium level finishing.	APSDDGB
X'041A0100'	An expected FNC structured field was not found.	APSDFNL
X'041A0300'	The pattern technology identifier in the FNC structured field is invalid.	APSDFNL
X'041A0400'	Bytes 4-9 of the FNC structured field contain an invalid value.	APSDFNL
X'041A0500'	The FNC structured field has an invalid length for the FNO structured field repeating group.	APSDFNL
X'041A0600'	The FNC structured field has an invalid length for the FNI structured field repeating group.	APSDFNL
X'041A0700'	The compression algorithm identifier in the FNC structured field for a single-byte font is invalid.	APSDFNL
X'041A0900'	The compression algorithm identifier in the FNC structured field for a double-byte font is invalid.	APSDFNL
X'041A0A00'	The FNC structured field contains invalid flags for a double-byte font.	APSDFNL
X'041A0B00'	An expected FNO structured field was not found.	APSDFNL
X'041A0C00'	The FNO structured field data length is invalid.	APSDFNL
X'041A0D00'	An FNO structured field contains an invalid baseline extent value.	APSDFNL
X'041A0E00'	An expected FNI structured field was not found.	APSDFNL
X'041A0F00'	The FNI structured field data length is invalid.	APSDFNL
X'041A1000'	The default character name specified in the CPC structured field was not found in the FNI structured field.	APSDFNL
X'041A1100'	The default character entry in the FNI structured field contains an invalid character increment.	APSDFNL
X'041A1200'	The default character entry in the FNI structured field contains an invalid character box size.	APSDFNL
X'041A1300'	The default character entry in the FNI structured field contains an invalid character pattern data address.	APSDFNL
X'041A1500'	The FNI structured field entry for a code point contains an invalid character increment.	APSDFNL
X'041A1600'	The FNI structured field entry for a code point contains an invalid character box size.	APSDFNL
X'041A1700'	The FNI structured field entry for a code point contains an invalid character pattern data address.	APSDFNL
X'041A1800'	An expected FNG structured field was not found.	APSDFNL
X'041A1900'	An expected EFN structured field was not found.	APSDFNL
X'041A1A00'	The names in BFN and EFN structured fields do not match.	APSDFNL
X'041D0100'	The resource library member requested from a System Object Library was not found.	APSDSECD

Table 10 (Page 4 of 15). PSF Reason Codes and Return Codes		
PSF CODES	**DEFINITION**	**SET BY**
X'041D0200'	A keyword in the security definitions library member is wrong.	APSDSECD
X'041D0300'	One of the paper sizes loaded in the printer does not have a match in the security definitions library member.	APSDSECD
X'041D0400'	A required keyword is missing from the security definitions library member.	APSDSECD
X'041D0500'	A paper name in the security definitions library member is wrong.	APSDSECD
X'041D0600'	A TOP argument in the security definitions library member is wrong.	APSDSECD
X'041D0700'	A TOP keyword is out of order in the security definitions library member.	APSDSECD
X'041D0800'	An overlay name contains more than 6 characters in the security definitions library member.	APSDSECD
X'041D0900'	Page labeling is in effect, but secure overlays are specified in the security definitions library member.	APSDSECD
X'041D0A00'	SECOVLY keyword is out of order in the security definitions library member.	APSDSECD
X'041D0B00'	UPADIM or UPAORG keyword is out of order in the security definitions library member.	APSDSECD
X'041D0C00'	The unit used in the security definitions library member is wrong.	APSDSECD
X'041D0D00'	Two decimals are in a value in the security definitions library member.	APSDSECD
X'041D0E00'	A nonnumeric character is in a value in the security definitions library member.	APSDSECD
X'041D0F00'	A value specified in the security definitions library member has more than 6 characters.	APSDSECD
X'041D1000'	A value specified in the security definitions library member has more than 3 digits before the decimal point or more than 2 digits after the decimal point.	APSDSECD
X'041D1100'	A required keyword is missing from the security definitions library member.	APSDSECD
X'041D1200'	First keyword is out of order in the security definitions library member.	APSDSECD
X'041D1300'	The security definitions library member is empty.	APSDSECD
X'041D1400'	An error occurred while reading a record from the security definitions library member.	APSDSECD
X'041D1500'	A PAPERNAM keyword in the security definitions library member has no argument.	APSDSECD
X'041D1600'	A value is not specified for a keyword (PAPERSIZ, UPAORG, or UPADIM) in the security definitions library member.	APSDSECD
X'041D1700'	After a security definitions library member was processed, the attempt to close it failed.	APSDSECD
X'041D1800'	A value specified in inches in the security definitions library member is greater than 22.75 in.	APSDSECD
X'041D1900'	A value specified in millimeters in the security definitions library member is greater than 577.97 mm.	APSDSECD

Table 10 (Page 5 of 15). PSF Reason Codes and Return Codes		
PSF CODES	**DEFINITION**	**SET BY**
X'041D2000'	The X or Y dimension of the user-printable area is zero.	APSDSECD
X'07106600'	PSF cannot obtain storage for the LRE and RRL commands for font.	APRGRNEX
X'07106800'	PSF cannot obtain storage for the LRE and RRL commands for page segment.	APRGRNEX
X'07110400'	Attempted to print with double-byte font character set extension, but the associated printer-resident font could not be activated.	APRGRNEX
X'07240000'	No space is available for an RCB control block.	APSRNAME
X'07242000'	No space for RCB control block—code page.	APSRNAME
X'07242400'	No space for RCB control block—character set.	APSRNAME
X'07242800'	No space for code page root font array.	APSRNAME
X'07242C00'	No space for character set root font array.	APSRNAME
X'07243000'	No space for RCB control block (object container).	APSRNAME
X'07401400'	Requested font rotation for symbol set is not supported by the printer.	APSRMFNT
X'07402400'	An MCF2 is specified without a code page–character set pair.	APSRMFNT
X'07403400'	Map request of double-byte font for symbol set is not supported by the printer.	APSRMFNT
X'07500C00'	The GETMAIN macro unsuccessfully attempted to obtain virtual storage for LRE/RRL for overlay.	APROAEEX
X'07600200'	The code page specified in the resident code page table cannot be found.	APSRSRT
X'07600400'	The character set specified in the resident character set table cannot be found.	APSRSRT
X'07601200'	Grid not found in grid-to-name mapping code page table.	APSRSRT
X'07601400'	Grid not found in grid-to-name mapping character set table.	APSRSRT
X'07602200'	No code page was found in the name-to-grid mapping code-page table.	APSRSRT
X'07602400'	Character set not found in name-to-grid mapping character-set table.	APSRSRT
X'07603400'	Character set mapped to an FGID of zero.	APSRSRT
X'07800400'	Resource load or delete operation was not successful.	APSRROCK
X'07902000'	No space is available for resource MLCB control block.	APSRQRY
X'07902E00'	No space for MLCB—object container.	APSRQRY
X'07904E00'	No space for RRB—object container.	APSRQRY
X'07A15000'	Unable to activate font through GRID.	APSRLOAD
X'07C00400'	Call to selectively delete the specific resource type(s) resulted in no resources being deleted from the printer, because all of the resources specified were required.	APSRDEL
X'07C00800'	Call to selectively or totally delete the specific resource type cannot be satisfied, because none of the resource type specified is available to delete.	APSRDEL

Table 10 (Page 6 of 15). PSF Reason Codes and Return Codes		
PSF CODES	**DEFINITION**	**SET BY**
X'08070100'	First nondocument data set level resource structured field received during restart. This reason code was stored in the RRB along with a return code of 4.	APRINPEX
X'08070101'	PSF is not enabled, and the print data set is not a softcopy publication.	APRINPEX
X'08080100'	Invalid values exist in one or more fields in the BR structured field.	APRBRSEX
X'08080101'	Error in inline resource processing.	APRBRSEX
X'08090100'	FORMDEF not specified.	APRDOCEX
X'080B0100'	No secure overlays.	APRBPGEX
X'080B0200'	Invalid UPA dimensions.	APRBPGEX
X'080B0300'	Multiple copies from different input bins; bin attributes do not match.	APRBPGEX
X'080E0100'	Required main storage space for CFI structured field is not available.	APRCFIEX
X'08110100'	Not enough storage is available to build an RRB.	APRIPSEX
X'08120100'	Reached PIMSG count limit, terminated data set.	APREPGEX APRMSGEX APSDDS
X'08120101'	Current page terminated.	APREPGEX
X'08140100'	Required structured field is missing.	APRMSGEX
X'08140101'	EOF found before end of processing a resource.	APRMSGEX
X'08140102'	SF forms are in an invalid sequence.	APRMSGEX
X'08140103'	Bxx name does not match Exx name.	APRMSGEX
X'08140104'	Length in self-defining parameter on structured field is wrong.	APRMSGEX
X'08140105'	SF length is less than introducer length.	APRMSGEX
X'08140106'	Structured field length is greater than record length in RDW.	APRMSGEX
X'08140107'	Font size invalid in MCF.	APRMSGEX
X'08140108'	Padding length is incorrect.	APRMSGEX
X'08140109'	Length in introducer is not correct for current structured field type.	APRMSGEX
X'08140110'	Incorrect value for structured field.	APRMSGEX
X'08140111'	Incorrect value for structured field.	APRMSGEX
X'08140112'	Image block is missing.	APRMSGEX
X'08140113'	Null name not acceptable for current structured field.	APRMSGEX
X'08140114'	Scale factor value in IOC structured field is not acceptable.	APRMSGEX
X'08140115'	MCF structured field entry ID invalid.	APRMSGEX
X'08140116'	MCF structured field entry ID incomplete.	APRMSGEX
X'08140117'	MCF structured field entry ID does not contain a font character set reference.	APRMSGEX
X'08140118'	MCF structured field font local ID value not acceptable.	APRMSGEX
X'08140119'	Unit Base value in structured field is not supported.	APRMSGEX

Table 10 (Page 7 of 15). PSF Reason Codes and Return Codes

PSF CODES	DEFINITION	SET BY
X'08140120'	The Begin Segment introducer is missing from the first GAD structured field.	APRMSGEX
X'08140121'	X-Direction and Y-direction L-units per unit base values do not match.	APRMSGEX
X'08140122'	The CCM detected an invalid subset order or version parameter in a GDD structured field.	APRMSGEX
X'08140125'	The CCM detected an invalid output option parameter value in a Map Object structured field (MIO, MGO, MBO).	APRMSGEX
X'08140126'	Object type in BR structured field is not supported.	APRMSGEX
X'08140127'	Device does not support object that begins with structured field.	APRMSGEX
X'08140128'	A required self-defining parameter is missing from structured field.	APRMSGEX
X'08140129'	Structured field contained a coded font local ID that was already used in the preceding font.	APRMSGEX
X'08140130'	Include Page Overlay not specified in MPO structured field.	APRMSGEX
X'08140131'	Coded font specified in object environment group not previously specified in MEG or AEG.	APRMSGEX
X'08140132'	Image resolution in IID does not match printer resolution.	APRMSGEX
X'08140133'	An invalid structured field was found between objects.	APRMSGEX
X'08140134'	A duplicate overlay local ID was found in an MMO or MPO structured field.	APRMSGEX
X'08140135'	An invalid overlay local ID was detected in an MMO or MPO structured field.	APRMSGEX
X'08140136'	Either no Environment Group was specified, or at least one error occurred in the Environment Group; no environment to use to print a page.	APRMSGEX
X'08140137'	Zero was specified for L-Units per unit base in structured field.	APRMSGEX
X'08140139'	An IM image object contains invalid or incorrect data.	APRMSGEX
X'08140140'	The media origin override request by installation exit APSUX07 has been ignored and the FORMDEF resource used.	APRMSGEX
X'08140141'	Complex IM image object contains invalid or incorrect data. The complex IM image object cannot be converted to an IO object.	APRMSGEX
X'08140142'	The structured field contains too many repeating groups.	APRMSGEX
X'08140143'	X'4B' triplet missing from IOB structured field.	APRMSGEX
X'08140144'	Parameter in IOB structured field contains unacceptable data.	APRMSGEX
X'08140145'	Structured field not allowed in page segment included with an IOB.	APRMSGEX
X'08140146'	Invalid X'84' triplet in MCF2 structured field.	APRMSGEX
X'08140147'	Object stack is about to overflow.	APRMSGEX
X'08140200'	No medium maps in FORMDEF.	APRMSGEX
X'08140201'	Device does not support multiple copies.	APRMSGEX
X'08140202'	Too many secure overlays specified for medium map.	APRMSGEX
X'08140203'	Duplex is not supported by either printer or bin.	APRMSGEX
X'08140204'	Bin not available.	APRMSGEX

Table 10 (Page 8 of 15). PSF Reason Codes and Return Codes		
PSF CODES	**DEFINITION**	**SET BY**
X'08140205'	Bin disabled.	APRMSGEX
X'08140206'	Orientation in MDD is unacceptable.	APRMSGEX
X'08140207'	Duplexing is disabled.	APRMSGEX
X'08140208'	A PGP structured field specified an invalid duplex value.	APRMSGEX
X'08140209'	The PGP structured field does not contain a page origin value for the front side of a sheet.	APRMSGEX
X'08140210'	An invalid Constant Forms Control value was detected in an MMC structured field.	APRMSGEX
X'08140211'	The set of modifications specified in the MCC structured field includes conflicting constant forms control values for the same side of a sheet.	APRMSGEX
X'08140212'	An attempt was made to process a page using a medium map that specifies only constant data.	APRMSGEX
X'08140213'	Suppression local ID not acceptable in MSU.	APRMSGEX
X'08140214'	Two MMC structured fields were defined with the same ID.	APRMSGEX
X'08140215'	The token name parameters in two repeating groups in an MSU structured field have the same value.	APRMSGEX
X'08140217'	Copy specification in MCC structured field is not acceptable.	APRMSGEX
X'08140220'	More than 8 overlays specified in MMC structured field.	APRMSGEX
X'08140221'	More than 8 suppressions specified in MMC structured field.	APRMSGEX
X'08140224'	The overlay local ID in the MMC was not acceptable.	APRMSGEX
X'08140225'	MMC structured field not found to compare MMC ID in the MMC structured field.	APRMSGEX
X'08140226'	Overlay local ID in MMC structured field was not found in MMO structured field.	APRMSGEX
X'08140227'	Too many copy controls for current medium map.	APRMSGEX
X'08140228'	Simplex/duplex value in MMC structured field not acceptable.	APRMSGEX
X'08140229'	Set of modifications in MCC structured field includes both normal and tumble duplex.	APRMSGEX
X'08140231'	MCC structured field has an odd number of copy groups but specifies duplex.	APRMSGEX
X'08140232'	Modifications in MCC structured field include both simplex and duplex.	APRMSGEX
X'08140233'	Unequal copy counts for duplex in MCC structured field.	APRMSGEX
X'08140234'	Print quality value in MMC structured field not acceptable.	APRMSGEX
X'08140235'	Modifications in MCC structured field select more than one input source.	APRMSGEX
X'08140236'	Bin selection in MMC not acceptable.	APRMSGEX
X'08140237'	Suppression local ID in MMC not acceptable.	APRMSGEX
X'08140238'	Medium map specified in IMM structured field not found.	APRMSGEX
X'08140239'	Offset stacking in MMC structured field not acceptable.	APRMSGEX
X'08140240'	Forms flash in MMC structured field is not acceptable.	APRMSGEX

Table 10 (Page 9 of 15). PSF Reason Codes and Return Codes

PSF CODES	DEFINITION	SET BY
X'08140241'	The MCC structured field in the medium map specifies more than one copy subgroup, and the device does not support this function.	APRMSGEX
X'08140242'	N_UP was requested, but the printer does not support it.	APRMSGEX
X'08140243'	Duplex N_UP was requested, but the printer does not support it.	APRMSGEX
X'08140244'	Simple-up value in MCC structured field is not acceptable.	APRMSGEX
X'08140245'	The set of modifications specified in MCC structured field includes conflicting simple-up values.	APRMSGEX
X'08140246'	Secure overlays and N_UP are not allowed together.	APRMSGEX
X'08140247'	Medium Map contains PMC, but the printer does not support page overlays.	APRMSGEX
X'08140248'	Selected Medium Modification is not available at the device.	APRMSGEX
X'08140249'	Conflicting Selectable Medium Modifications in MMCs under a single MCC.	APRMSGEX
X'08140250'	Output bin is not available or not supported.	APRMSGEX
X'08140251'	Different input bins for front and back of sheet.	APRMSGEX
X'08140252'	Printer does not support enhanced N_UP.	APRMSGEX
X'08140253'	Conflicting N_UP PGP specification.	APRMSGEX
X'08140254'	Invalid sheet side or partition value in the PGP.	APRMSGEX
X'08140255'	Basic and Enhanced N_UP in same PGP repeating group.	APRMSGEX
X'08140256'	Invalid page rotation specified in the PGP.	APRMSGEX
X'08140257'	Invalid value in the PGP.	APRMSGEX
X'08140258'	Printer or input bin does not support Enhanced N_UP.	APRMSGEX
X'08140259'	A conditional eject to a partition that does not exist.	APRMSGEX
X'08140260'	Page rotation is not supported by the printer.	APRMSGEX
X'08140261'	Constant forms control and Enhanced N_UP is not allowed.	APRMSGEX
X'08140262'	Invalid PMC ID in the PMC or PGP.	APRMSGEX
X'08140263'	DUPLEX on the output statement not allowed with enhanced N_UP.	APRMSGEX
X'08140264'	Conflicting Setup IDs in MMCs under a single MCC.	APRMSGEX
X'08140265'	Unpaired X'B4'/X'B5' keywords in an MMC.	APRMSGEX
X'08140266'	System Setup ID specified in the MMC is not available in the device.	APRMSGEX
X'08140267'	Invalid X'78' triplet in the PFC structured field.	APRMSGEX
X'08140268'	Scope of Medium Finishing Control structured field is invalid.	APRMSGEX
X'08140269'	Input bin substituted for a disabled inserter bin.	APRMSGEX
X'08140270'	No back side for a media eject control—no duplex.	APRMSGEX
X'08140271'	Bin selection in MMC is invalid	APRMSGEX
X'08140272'	Different bins for front and back sides of sheet.	APRMSGEX
X'08140273'	Duplicate conflicting values in MMC structured field.	APRMSGEX
X'08140274'	Bin substitution no allowed when mandatory page labeling.	APRMSGEX

Table 10 (Page 10 of 15). PSF Reason Codes and Return Codes		
PSF CODES	**DEFINITION**	**SET BY**
X'08140300'	Data map specified in IDM structured field not found.	APRMSGEX
X'08140301'	No data maps were specified in the PAGEDEF.	APRMSGEX
X'08140302'	This error occurs when the shell called the AFPCCM to process a print file that contains line-mode data failed to provide a PAGEDEF structure.	APRMSGEX
X'08140303'	Reuse record flag set but next LND structured field reusing value equals zero.	APRMSGEX
X'08140304'	LNC value equals zero.	APRMSGEX
X'08140305'	One or more LNDs missing.	APRMSGEX
X'08140306'	Size specified in FDS equals zero.	APRMSGEX
X'08140309'	Suppression name invalid in LND structured field.	APRMSGEX
X'08140311'	Next LND, if reusing value in LND structured field, will cause infinite loop.	APRMSGEX
X'08140313'	Start position + length values in LND structured field exceeds FDS structured field size.	APRMSGEX
X'08140314'	More FDX data was received than was specified in FDS structured field.	APRMSGEX
X'08140315'	A skip-to-channel that does not exist in the DATA map was found.	APRMSGEX
X'08140317'	Repeating group value in CCP structured field is invalid.	APRMSGEX
X'08140318'	Number of repeating groups value in CCP structured field is invalid.	APRMSGEX
X'08140319'	Length of comparison string value in CCP structured field is invalid.	APRMSGEX
X'08140320'	Next CCP ID not found.	APRMSGEX
X'08140321'	Timing of action in CCP structured field invalid.	APRMSGEX
X'08140322'	Medium map action in CCP structured field is invalid.	APRMSGEX
X'08140323'	Data-map action in CCP structured field is invalid.	APRMSGEX
X'08140324'	Comparison value in CCP structured field is invalid.	APRMSGEX
X'08140325'	Data map specified in CCP structured field not found.	APRMSGEX
X'08140326'	Medium map specified in CCP structured field not found.	APRMSGEX
X'08140327'	Condition Procedure flag set, but CCP ID was zero.	APRMSGEX
X'08140328'	CCP ID specified in LND structured field not found.	APRMSGEX
X'08140329'	Next LND, if condition proc value in LND structured field, will cause infinite loop.	APRMSGEX
X'08140330'	Data length specified in LND structured field does not match length of comparison string specified in CCP structured field.	APRMSGEX
X'08140331'	The “next LND if skipping” parameter in an LND is 0.	APRMSGEX
X'08140332'	The “next LND if spacing” parameter in an LND structured field is 0.	APRMSGEX
X'08140333'	The “next LND if skipping” parameter in an LND structured field was larger than the LNC count.	APRMSGEX

Table 10 (Page 11 of 15). PSF Reason Codes and Return Codes

PSF CODES	DEFINITION	SET BY
X'08140334'	The “next LND if spacing” parameter in an LND structured field is larger than the LNC count.	APRMSGEX
X'08140335'	The “next LND if reusing” parameter value in an LND structured field is larger than the LNC count.	APRMSGEX
X'08140336'	The “next LND. if conditional processing” parameter in an LND structured field. is larger than the LNC count.	APRMSGEX
X'08140337'	No PAGEDEF specified.	APRMSGEX
X'08140339'	In an LND structured field, a page overlay was requested, but the printer does not support page overlays.	APRMSGEX
X'08140340'	Date in a PAGEDEF is invalid. The shift-out coded font local identifier was nonzero, but the generate font change flag was not set.	APRMSGEX
X'08140341'	Bar code generation was requested on an LND structured field, but the printer does not support bar code objects.	APRMSGEX
X'08140401'	The requested character rotation is not available in the current font.	APRMSGEX
X'08140402'	The pattern technology in the FNC structured field is incorrect.	APRMSGEX
X'08140405'	The compression algorithm in the FNC structured field is not acceptable.	APRMSGEX
X'08140406'	CPC structured field specified default graphic character was not found in FNI structured field.	APRMSGEX
X'08140408'	The flag byte value in FNC structured field is not acceptable.	APRMSGEX
X'08140409'	The pattern data alignment in FNC structured field is not acceptable.	APRMSGEX
X'08140410'	Bytes 4—9 on the FNC structured field specify metrics that are either invalid or unsupported by this printer.	APRMSGEX
X'08140414'	No FNI structured field corresponding to the font index number of FNO can be found.	APRMSGEX
X'08140415'	The printer does not support outline fonts.	APRMSGEX
X'08140416'	The printer does not support double-byte fonts.	APRMSGEX
X'08140417'	The printer does not support MICR, or MICR is disabled.	APRMSGEX
X'08140418'	The font specified does not contain any raster data.	APRMSGEX
X'08140419'	The resolution of the font does not agree with the resolution of the device.	APRMSGEX
X'08140420'	The vertical point size value is not acceptable.	APRMSGEX
X'08140421'	The character pattern addresses are invalid.	APRMSGEX
X'08140422'	The double-byte outline font is not supported.	APRMSGEX
X'08140423'	The data in a font resource is invalid. It is not a double-byte outline font.	APRMSGEX
X'08140424'	The data in a font resource is invalid. The font resolution in the FNC structured field is invalid.	APRMSGEX
X'08140425'	The data in a font resource is invalid. The font data length in the FNC structured field is invalid.	APRMSGEX

Table 10 (Page 12 of 15). PSF Reason Codes and Return Codes

PSF CODES	DEFINITION	SET BY
X'08140426'	The data in a font resource is invalid. The FNN data count in the FNC structured field is invalid.	APRMSGEX
X'08140427'	The data in a font resource is invalid. The specified font does not contain extension information.	APRMSGEX
X'08140428'	Data in a font resource is invalid. The specified outline font character set is missing FNN structured fields.	APRMSGEX
X'08140429'	The FNM index in the FNI structured field is unacceptable.	APRMSGEX
X'08140430'	Metric technology and resolution values in the font do not match the specified values.	APRMSGEX
X'08140500'	The CPI structured field graphic character ID is null.	APRMSGEX
X'08140501'	CPC structured field default graphic character name is null.	APRMSGEX
X'08140502'	Coded font encoding scheme from MCF does not match the encoding scheme in the code page descriptor.	APRMSGEX
X'08140700'	An inline object container has an unrecognized registration ID.	APRMSGEX
X'08140701'	The registration ID in the BOC does not match the JCL keyword used to call it out.	APRMSGEX
X'08140702'	Byte 6 of the object classification triplet in the BOC is not 'DC'x.	APRMSGEX
X'08160100'	Not enough storage for the RRB control block.	APRIOBEX
X'08160104'	The IOB specifies an invalid or unsupported object type.	APRIOBEX
X'09202810'	The RRB does not point to an IDB. The RRBICBP field, which points to the IDB, is zero.	APSLCLOS
X'09304804'	PSF OPEN has abended.	APSLESTA
X'09304808'	PSF CLOSE has abended.	APSLESTA
X'0930480C'	PSF READ has abended.	APSLESTA
X'09304810'	PSF CONNECT has abended.	APSLESTA
X'09304814'	PSF DISCONNECT has abended.	APSLESTA
X'09304818'	PSF OPEN reset has abended.	APSLESTA
X'0930481C'	PSF INITIALIZATION has abended.	APSLESTA
X'09304820'	PSF TERMINATION has abended.	APSLESTA
X'09304828'	PSF APSIGET has abended.	APSLESTA
X'0930482C'	PSF APSIPUT has abended.	APSLESTA
X'09304834'	The cause of an abend cannot be determined.	APSLESTA
X'09304838'	System RDJFCB has abended.	APSLESTA
X'09304846'	Repositioning of a message data set was unsuccessful.	APSLESTA
X'09304850'	A system READ has abended.	APSLESTA
X'09304854'	A system CHECK has abended.	APSLESTA
X'09304860'	A system FIND has abended.	APSLESTA
X'09304868'	PSF APSLIREP has abended.	APSLESTA
X'09304870'	PSF CLOSE RESET has abended.	APSLESTA
X'09304874'	A system BLDL has abended.	APSLESTA

Table 10 (Page 13 of 15). PSF Reason Codes and Return Codes

PSF CODES	DEFINITION	SET BY
X'09502004'	The object type was not specified in the PRINTDEV statement.	APSLOPEN
X'09502404'	The SOCB contains no free IDB for the object type.	APSLOPEN
X'09504C0C'	The BLDL macro returned a nonzero return code. The member requested with the RRB was not found.	APSLOPEN
X'09504C18'	The FIND macro returned a nonzero return code, and the return code should always be zero.	APSLRBS
X'09504C20'	The OPEN macro was unsuccessful. The DCBOFOPN flag was off. This indicates that the DCB was not opened.	APSLOPEN
X'09504C28'	The RDJFCB macro returned a nonzero return code. The JFCB was not obtained.	APSLOPEN
X'09504CE0'	Insufficient storage for the IDB and the DCB.	APSLOPEN
X'09504CE4'	Insufficient storage for the JFCB.	APSLOPEN
X'09504CE8'	Insufficient storage for the buffers.	APSLOPEN
X'09504CF4'	Insufficient storage for the DSL.	APSLOPEN
X'09600C00'	The SYNAD routine was entered because of an error on a read request.	APSLRBS
X'09600C08'	An I/O error or an end-of-data had already been set before APSLRBS was entered for a prime request. The buffers are not primed.	APSLRBS
X'09600C0C'	An I/O error or an end-of-data had already been set before APSLRBS was entered for a schedule request. I/O is not scheduled.	APSLRBS
X'09603404'	A member was updated while data was being retrieved from it. The member cannot be processed.	APSLRBS
X'0970EF08'	Cached Resource was not found on a load request.	APSLRIDS
X'0970EF18'	Insufficient storage for the input message data set IDB.	APSLRIDS
X'09B00400'	The DCB pointer in the IDBDMCBP field of the IDB is zero.	APSLRJFC
X'09B00404'	DCB is not open.	APSLRJFC
X'09B00408'	The resource ID in DSLLIBT is invalid.	APSLRJFC
X'09B0040C'	The resource library member was not specified in the PRINTDEV statement.	APSLRJFC
X'09B00420'	The CRLCONC field is zero but must be 1–256.	APSLRJFC
X'09B00424'	The CRLRTRVD field is zero but must be 1–256.	APSLRJFC
X'09B00428'	The first data set to retrieve (DSLFIRST) was not successful retrieved by the RDJFCB function.	APSLRJFC
X'09B00C04'	The first data set to retrieve (DSLFIRST) is greater than the number of data sets in the library.	APSLRJFC
X'09B00C08'	The first data set to retrieve (ARLFIRST) is greater than the number of data sets in the library.	APSLRJFC
X'09B01004'	RDJFCB DCB exit code X'13' is not supported.	APSLRJFC
X'09B0100C'	RDJFCB DCB exit code X'13' was unsuccessful—RDJFCB.	APSLRJFC
X'09B01020'	Must be called only by APSLOPEN for type (external).	APSLRJFC
X'09B01024'	For an external request, DSLFIRST must be zero.	APSLRJFC

Table 10 (Page 14 of 15). PSF Reason Codes and Return Codes		
PSF CODES	**DEFINITION**	**SET BY**
X'09B01028'	For an external request, DSLRETRV must be zero or one.	APSLRJFC
X'09B0102C'	Libraries have not been initialized; APSLRJFC is being called before LASI is initialized.	APSLRJFC
X'09B01408'	Not enough storage; RDJFCB.	APSLRJFC
X'09B0140C'	The request to obtain storage for CRL was unsuccessful.	APSLRJFC
X'09B01804'	Abend for RDJFCB.	APSLRJFC
X'09B01808'	Abend X'240' and return code X'0C' from RDJFCB request (RDJFCB DCB exit X'13') are not supported.	APSLRJFC
X'09C00400'	Not enough storage was available for the SVC 99 PARM list.	APSLDYNA
X'09C00404'	The check for RACF authority for USERLIB processing failed. Access to USERLIB libraries is denied.	APSLDYNA
X'09C00408'	The system function for the dynamic allocation of USERLIBs was not successful.	APSLDYNA
X'09C0040C'	The system function for the dynamic concatenation of USER libraries was not successful.	APSLDYNA
X'09FF0404'	End-of-data.	APSLRIDS APSLRBS APSLRLIB
X'09FF040C'	The data set is not initialized and cannot be released. This is the first call to access the data set, a stop-processing request.	APSLRIDS APSLRIDS
X'09FF0408'	More data is at end-of-resource.	APSLRIDS APSLRLIB
X'09FF0C04'	An error exists on an APSIGET request.	APSLRIDS APSLRBS
X'09FF1004'	The message data set has no space available.	APSLWIDS
X'09FF1008'	An error exists on APSIPUT.	APSLESTA
X'09FF1404'	The message data set is empty.	APSLRIDS
X'09FF1C04'	A repositioning request was unsuccessful. PSF could not reposition the caller to the requested block and record. The RRB has not been altered.	APSLIREP
X'09FF3404'	Data management OPEN was unsuccessful.	APSLOPEN APSLRBS
X'09FF3C04'	Data management CLOSE was unsuccessful.	APSLCLOS
X'09FF4C10'	The resource library member that was requested from a system object library was not found.	APSLOPEN
X'09FFFFFF'	The reason for the error could not be determined.	APSLABND APSLESTA
X'0A100000'	Resource exit requests a termination of this data set.	APSUREXT
X'0C000000'	A message was written to the message data set as the only entry in the message data set. This is because the JCL specifies PIMSG=NO, which prints only the message that prematurely ends the print data set.	APSMMSG
X'0C020000'	Insert variables were found in a WTO message, but no insert areas exist.	APSMMSG

Table 10 (Page 15 of 15). PSF Reason Codes and Return Codes		
PSF CODES	**DEFINITION**	**SET BY**
X'0C030000'	A WTO message does not have enough variable insert areas to contain all the insert variables passed for this message.	APSMMSG
X'0C040000'	The requested length of a decimal conversion is greater than 4. The routine will convert 1–4 bytes to decimal.	APSMMSG
X'0C050000'	The length of the message to be buffered exceeded the size of the corresponding buffer. The message was truncated.	APSMMSG
X'0D010000'	Requested space is not available.	APSGGETM
X'0F010200'	PSF is finished with the data set and does not check for extra records (Record Interface). If end-of-file is not reached, a warning message is issued (Record Interface).	APSDDS APSDLOAD APSDSECD APRIPSEX
X'0F100100'	PSF is finished with the data set and should be at end-of-file. If end-of-file is not reached, a warning message is issued (Record Interface).	APSDLOAD APRIPSEX

Glossary

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References

The following cross-references are used in this glossary:

Contrast with. This refers to a term that has an opposite or substantively different meaning.

See. This refers to multiple-word terms in which this term appears.

See also. This refers to related terms that have similar, but not synonymous, meanings.

Synonym for. This appears in the commentary of a less desirable or less specific term and identifies the preferred term that has the same meaning.

Synonymous with. This appears in the commentary of a preferred term and identifies less desirable or less specific terms that have the same meaning.

A

abend. An abnormal end of task before completion because of an error condition that cannot be recovered while the task is running.

access control. In computer security, the methods and facilities used to ensure that a computer system and the data, system software, and application programs stored in it can be accessed only by authorized users in authorized ways.

access method. A method of moving data between main storage and I/O devices.

accumulator. (1) A 3800 hardware feature that supplies a separate storage area to hold data in raster form. It can be used either for composing a sheet of data that combines a large amount of variable and constant data, or for storing an electronic overlay in raster form so that the overlay is merged with variable data as the page is printed. (2) A register in which the result of an operation is formed.

ACK. Acknowledgment.

action code. A software-generated or hardware-generated code that indicates a recovery action. The hardware action code is byte 2 of the sense data.

active environment group. A collection of mapping structured fields, positioning controls, and data descriptors that define the environment for a page. These structured fields form an internal object in a composed text page, page definition, or overlay.

addressable point. For page printers, any point in a presentation surface that can be addressed. Synonymous with *picture element*.

advanced function presentation (AFP). A set of licensed programs or user applications that permits all-points-addressable printing of text and graphics on a page printer.

AFP. Advanced function presentation.

AFPDS. Advanced Function Presentation data stream.

all points addressable (APA). The ability to address, reference, and position text, overlays, and images at any defined position or pel on the printable area of the paper. This capability depends on the ability of the hardware to address and display each picture element.

APA. All points addressable.

APAR. Authorized program analysis report.

application program. (1) A program that performs a particular data processing task, such as inventory control or payroll. (2) A program that produces the print data set.

asynchronous. Without regular time relationship; unexpected or unpredictable with respect to running program instructions.

authorized program analysis report (APAR). A report of a problem caused by a suspected defect in a current unaltered release of a program.

auxiliary data set. A data set that contains job header, data set header, job trailer, or message data. Contrast with *print data set*.

auxiliary resource. Fonts, page segments, overlays, page definitions, or form definitions associated with auxiliary data sets.

B

baseline. The imaginary line on which successive characters are aligned in the inline direction.

bin. A paper supply on cut-sheet printers. See also *cassette*.

BIND. The command sent by VTAM to a logical unit to establish a VTAM program-to-logical-unit session.

bounded-box font. A font designed to use bounded character boxes. Contrast with *unbounded-box font*.

bounded-box relative metrics. Units of measure that are expressed in 1000 units per em-square.

bounded character box. A character-box design that does not require character-positioning information to be included (as untoned pels) in the box. Contrast with *unbounded character box*.

BTS. Burster-trimmer-stacker.

buffer pool. An area of storage in which all buffers of a program are kept.

buffered pages. Pages kept in printer control storage, waiting to be printed.

burst. To separate continuous-forms paper into single sheets.

burster-trimmer-stacker (BTS). A printer hardware feature that separates continuous forms into single sheets, trims the carrier strip from both edges of the forms, and stacks the sheets.

byte multiplexer channel. A multiplexer channel that interleaves bytes of data.

C

carriage control character. An optional character in an input data record that specifies a write, space, or skip operation.

cassette. In a cut-sheet printer, a movable paper storage enclosure. See also *bin*.

CCW. Channel command word.

channel attached. In PSF, a device that is linked to the host system exclusively by use of System/390 channel protocols. For example, a 3900 printer cabled to the host system with a System/390 channel adapter is considered a channel-attached printer. Contrast with *SNA-attached*.

channel code. A number from 1 to 12 that identifies a position in the forms control buffer or a page definition. A carriage control character can select a position defined by a particular channel code.

channel command word (CCW). A command that directs data channel operations. CCWs built by Print Services Facility are sent to channel-attached printers.

channel counter. A counting device that identifies how many pages have been successfully received. Synonymous with *received page counter*.

channel station. In the printer, a page-counting device that counts the number of pages queued for printing.

character. (1) A member of a set of elements that is used to represent, organize, or control data. Characters can be letters, digits, punctuation marks, or other symbols represented in the form of a spatial arrangement of adjacent or connected strokes or in the form of other physical conditions in data media. (2) A letter, numeral, punctuation mark, or special graphic used for the production of text. (3) A byte of data. (4) See also *graphic character*.

character box. The area that completely contains the graphic character raster pattern.

character data. Data in the form of letters and special characters, such as punctuation marks. See also *numeric data*.

character graphic. A visual representation of a character, other than a control character, that is

ordinarily produced by writing, printing, or displaying. (T)

character group. Any number of character graphics and character properties.

character identifier. The standard identifier for a character regardless of its style. For example, all uppercase A's have the same character identifier. Synonymous with *graphic character identifier*.

character increment. The distance between the current print position and the next print position.

character rotation. The alignment of a character with respect to the baseline. This term usually applies to individual characters. Synonym for *rotation*. See also *orientation*.

character set. (1) A finite set of characters upon which agreement has been reached and that is considered complete for some purpose; for example, each of the characters in ISO Recommendation R646 "6- and 7-bit coded character sets for information processing interchange." (2) For page printers, the font library member that contains the character graphics and their descriptions.

checkpoint. A point at which information about the status of a job and the system can be recorded so that the job step can be restarted later. For any print job, the user can specify that PSF take checkpoints based on either the number of logical pages processed or the number of processing seconds elapsed.

coded font. A font library member that associates a code page and a font character set. For double-byte fonts, a coded font associates more than one pair of code pages and font character sets.

coded font local identifier. A 1-byte identifier that the Map Coded Font structured field assigns to each coded font it selects. The identifier is then specified in the text-control sequence preceding the string of text to be printed with the particular font.

coded font section. A font character set and code page pair. A single-byte coded font consists of only one coded font section; a double-byte coded font can consist of more than one.

coded overlay. An overlay that is stored in the printer in a coded (not raster) format. Contrast with *raster pattern overlay*.

code page. A font library member that associates code points and character identifiers. A code page also identifies how undefined code points are handled.

code point. A 1-byte code representing one of 256 potential characters.

color selection. The ability to specify a color other than black to print data in more than one color. Some printers support selection of several colors, depending upon the color of ribbon installed in the printer. Other printers support the selection of black or "color of media," that can cause white lettering on a background that has been shaded black, for example.

command. A request from a terminal or a specification in a batch-processing print file for the operation of a particular program.

committed copy counter. A counting device that identifies the number of copies of a page that have been committed to printing but have not been counted by the committed page counter.

committed page counter. A counting device that identifies the number of pages that have been committed to printing and have been removed from the page buffer. Synonym for *transfer counter*.

common-use forms. A set of paper sizes selected as being the most common in use throughout the world.

communication. See *data communication*.

communication attached. In PSF, a device that is SNA-attached and that uses a communication controller. For example, a 3812 printer attached to a 3174 control unit attached to a 3175 Communication Controller can be considered a communication-attached printer. Contrast with *local-attached*.

compatibility font. An AFP font designed to emulate the uniformly spaced and fixed-pitch fonts used with line printers.

compatibility mode. A mode of operation for printing the output of 3800 Model 1 application programs on a 3800 page printer with little or no change to the application or the JCL.

completion code. An indication that reflects the status of a task set at the time of its termination.

composed text. Text data and text control information that dictates the format, placement, and appearance of data to be printed. Synonym for *presentation text*.

composed-text data. Print data that has been composed into pages. Text-formatting programs such as DCF can produce composed-text data consisting entirely of structured fields.

composed-text page. A page of print data consisting entirely of structured fields.

composed-text print data set. A print data set consisting entirely of structured fields.

compressed pattern storage (CPS). Storage that holds the extended (double-byte) fonts for the 3800 Model 6 or Model 8 printers.

computing system RPQ. A customer request for a price quotation on alterations or additions to the functional capabilities of a computing system, hardware product, or device. The RPQ may be used in conjunction with programming RPQs to solve unique data processing problems. See also *programming RPQ* and *RPQ*.

concatenate. (1) To link together. (2) To join two character strings.

concatenated data set. In MVS and OS/390, a group of logically connected data sets that are treated as one data set for the duration of a job step. See also *data set*, *partitioned data set*, and *library*.

conditional processing. A page-definition function that enables input data records to partially control their own formatting.

condition code. A code that reflects the result of an input/output, arithmetic, or logical operation.

console. A part of a computer used for communication between the operator or maintenance engineer and the computer. (A)

continuous forms. A series of connected forms that feed continuously through a printing device. The connection between the forms is perforated so that the user can tear them apart. Before printing, the forms are folded in a stack arrangement with the folds along the perforations. Contrast with *cut-sheet paper*.

continuous-forms stacker. An output assembly on a continuous-forms printer that refolds and stacks the continuous forms after printing.

control character. A character that starts, changes, or stops any operation that affects the recording, processing, transmitting, or interpreting of data (such as carriage return, font change, and end of transmission).

control record. A subset of structured fields that can be mixed with line-data records in a print data set.

copy group. (1) One or more copies of a page of paper. Each copy can have modifications, such as text suppression, page position, forms flash, overlays, paper source, and duplex printing. (2) In Print Services Facility, an internal object in a form definition that identifies the overlays and defines page placement and modifications to the form. (3) Synonym for *medium map*.

copy modification. The process of adding, deleting, or replacing data on selected copies of certain pages of a print job.

copy separation. The method for distinguishing consecutive copies of a single data set. In the continuous-forms stacker, the method consists of the alternation between one, two, or three vertical bars placed on the left carrier strip between forms. In the burster-trimmer-stacker, or on cut-sheet paper, it consists of offset stacking.

core interchange font. A uniformly spaced, typographic font with specialized characters for different languages.

CPS. Compressed pattern storage.

CSI. Consolidated software inventory data set used by SMP/E.

current print position. The picture element that defines the character reference point or the upper left corner of an image.

cut-sheet paper. The medium that is cut into uniform-size sheets before it is loaded into the printer. Contrast with *continuous forms*.

D

DASD. Direct access storage device.

data check. A synchronous indication of a condition caused by invalid data or incorrect positioning of data. The reporting of some data checks can be suppressed.

data communication. Transfer of information between functional units by means of data transmission according to a protocol. (I)

data control block (DCB). A control block used by access method routines in storing and retrieving data.

data link. Connection between two terminals operating according to a link protocol. Contrast with *telecommunication line*.

data map. An internal object in a page definition that specifies fonts, page segments, fixed text, page size, and the placement and orientation of text. Synonym for *page format*.

data map transmission subcase. An internal object that specifies the information for printing line data. One data-map transmission subcase must appear in each data map of a page definition.

data set. A named set of records stored and processed as a unit. Synonym for *file*. See also

concatenated data set, *partitioned data set*, and *sequential data set*.

data set header. A page in printed output that separates multiple data sets or multiple copies of a data set within a print job. See also *job header*.

DCB. Data control block.

DCF. Document Composition Facility.

default. Pertaining to an attribute, value, or option that is assumed when none is explicitly specified. (I)

deferred-printing mode. A printing mode that spools output through JES to a data set instead of printing it immediately. Output is controlled by use of JCL statements. Contrast with *direct-printing mode*.

device manager. For channel-attached printers, the PSF subcomponent that manages the interface to the printer, builds CCWs, issues I/O requests, and processes I/O interrupts. For SNA-attached printers, the PSF subcomponent that loads the PPCC during device initialization, processes completed I/O, establishes and controls an SNA session through the PPCC, and supplies printer information in the CCB.

direct-access storage device (DASD). A computer storage device in which access time is in effect independent of the location of the data.

Direct Printer Services Subsystem (DPSS). The PSF subcomponent that is the interface between PSF and an application program when the job entry subsystem is not spooling jobs for a printer. DPSS attaches PSF as a subtask for use in direct-printing mode.

direct-printing mode. A printing mode that gives PSF exclusive use of a channel-attached printer. Output is printed immediately and is not spooled through JES. Contrast with *deferred-printing mode*.

disabled mechanism. PSF support that allows jobs to print with alternative options if the printer selected for the job does not support a requested option.

document. One or more pages collected into a single job.

Document Composition Facility (DCF). An IBM licensed program that provides a text formatter called SCRIPT/VS. SCRIPT/VS can process files marked up with a unique set of controls and tags.

document environment group. An internal object that identifies overlay and suppression usage and defines the placement of the page or pages on the form. A document environment group is a required part of every form definition.

double-byte coded font. A font in which the characters are defined by 2 bytes, of which the first defines a coded font section and the second defines a code point. Double-byte coded fonts are required to support languages requiring more than 256 graphic characters. Two bytes are required to identify each graphic character. Kanji is printed using a double-byte font. Contrast with *single-byte coded font*.

double-dot image. In Advanced Function Presentation, an image that is enlarged by doubling the pel pattern horizontally and vertically.

download. To transfer data from a processing unit to an attached device such as a microcomputer for processing.

DPSS. Direct Printer Services Subsystem.

drain. An operator action to halt the flow of jobs to a printer, usually to stop the printer or to change print options.

drained state. The condition in which job flow to the printer is stopped, waiting for an operator command, such as START, to begin sending jobs to the printer for it to resume printing.

DRM. Dynamic reconfiguration management.

duplex printing. Printing on both sides of a sheet of paper. Contrast with *simplex printing*. See also *normal duplex printing* and *tumble duplex printing*.

E

EBCDIC. Extended binary-coded decimal interchange code.

ECB. Event control block.

EID. Event ID.

electronic forms. A collection of constant data that is electronically composed in the host processor and may be merged with variable data on a page during printing.

electronic overlay. A collection of constant data, such as lines, shading, text, boxes, or logos, that is electronically composed in the host processor and stored in a library, and that can be merged with variable data during printing. Contrast with *page segment*. See also *page overlay* and *medium overlay*.

embedded text control. One or more bytes of control information contained in a set of text. The text control itself is not to be printed, but it controls certain operations on following text.

enabled. (1) Pertaining to a state of the processing unit that allows the occurrence of certain types of interruptions. (2) A condition of the printer (physically selected) in which the printer is available to the host processor for normal work. Contrast with *disabled*.

end-user interface. Any product method that enables a customer to obtain the services of a product, for example, coding samples, commands, and command lists, control statements, display panels, job control language, listings of data streams, messages, program link-editing control statements, and text-formatting commands. Not all products have end-user interfaces; some products provide their services through programming interfaces; others provide their services only to other products. Contrast with *programming interface for customers*.

equipment check. An asynchronous indication of a printer malfunction.

ERP. Error recovery procedures.

error recovery procedures (ERP). Procedures designed to help isolate and, where possible, to recover from errors in equipment. The procedures are often used in conjunction with programs that record information on machine malfunctions.

ESA. Enterprise System Architecture.

escape character. The control character X'2BD3' in a text-control sequence that indicates the beginning of the sequence and the end of any preceding text.

ESTAE. Extended specify task abnormal exit.

ETFF. Eject to front facing.

event control block (ECB). A control block used to represent the status of an event.

EWS. Early warning system.

execution. The process of carrying out an instruction or instructions of a computer program by a computer. (I) (A)

exception. A condition that exists when the printer:

- Detects an invalid or unsupported command, order, control, or parameter value from the host.
- Finds a condition requiring host-system notification.
- Detects a condition that requires the host system to resend data.

exception highlighting. The markings placed on the printed page to indicate the location of a data-stream error.

extended binary-coded decimal interchange code (EBCDIC). A coded character set of 256 eight-bit characters.

extended specify task abnormal exit (ESTAE). A macroinstruction that allows a user to intercept an abend.

F

FCB. Forms control buffer.

fixed metrics. Measurement information in specific units such as pels, inches, or centimeters, for individual graphic characters or collections of them. Contrast with *relative metrics*. See also *font metrics*.

floating overlay. Synonym for *page overlay*.

font. (1) A family or assortment of characters of a given size and style, for example, 9-point Bodoni Modern. (A) (2) One size and one typeface in a particular type family, including letters, numerals, punctuation marks, special characters, and ligatures. (3) A paired character set and code page that can be used together for printing a string of text characters. A double-byte font can consist of multiple pairs of character sets and code pages. See *coded font* and *double-byte coded font*.

font character set. Synonym for *character set*.

font metrics. Measurement information that defines individual character values, such as height, width, and space, as well as overall font values, such as averages and maximums. Font metrics can be expressed in specified fixed units, such as pels, or in relative units that are independent of both the resolution and size of the font. See also *character metrics*.

font section. Synonym for *coded font section*.

form. A physical piece of paper or other medium on which output data is printed. For cut-sheet printers, a form is one sheet of paper or other medium. For continuous-forms printers, the form is the area of paper (or other medium) defined to the printer as a single physical page, which for fanfold paper is ordinarily the area between perforations. See also *medium*, *sheet*, and *page*.

format. (1) The shape, size, and general makeup of a printed document. (2) To prepare a document for printing. (3) The arrangement of text on the page.

formatted print records. Line data made up of records formatted for printing on line printers. PSF uses a page definition to print formatted records on page printers.

FORMDEF. A JCL parameter that specifies a form definition. See *form definition*.

form definition. A resource used by PSF that defines the characteristics of the form that includes overlays to be used (if any), paper source (for cut-sheet printers), duplex printing, text suppression, the position of composed-text data on the form, and the number and modifications of a page.

forms control buffer (FCB). A buffer for controlling the vertical format of printed output. The forms control buffer is a line-printer control that is similar to the punched-paper, carriage-control tape used on IBM 1403 printers. On AFP page printers, the forms control buffer is replaced by the page definition. See *page definition*.

forms flash. In the 3800, a function of the printer that makes it possible to print user-prepared photographic images with variable composed-text data. The printer operator must insert a frame containing a photographic negative into the printer when forms flash is used.

FSA. Functional subsystem application.

FSI. Functional subsystem interface.

FSS. Functional subsystem.

functional subsystem (FSS). The PSF address space created by JES.

functional subsystem application (FSA). An area within the PSF functional subsystem that drives and manages a single printer.

functional subsystem interface (FSI). A set of services that allows communication between the JES address space or direct printer services subsystem and the PSF functional subsystem.

fuser counter. A counting device in a printer that identifies how many pages have successfully passed the printer-defined jam-recovery point. See *jam-recovery page counter*.

fuser station. The printer assembly that bonds the toned image to the paper by heat and pressure.

G

generalized trace facility (GTF). An optional OS/VS service program that records significant system events, such as supervisor calls and start I/O operations, for the purpose of problem determination.

graphic character. See *character graphic*.

graphic character identifier. See *character identifier*.

GTF. Generalized trace facility.

H

hard page segment. (1) A page segment that is declared in the Map Page Segment structured field and loaded in the printer as a resource that can be reused during the job without being reloaded to the printer. (2) Within another element, as in inline resource. Contrast with *soft page segment*.

hardware default font. The font used by the printer if no other font is specified.

HCD. Hardware configuration definition.

hexadecimal. Pertaining to a numbering system with base of 16; valid numbers use the digits 0 through 9 and characters A through F, where A represents 10 and F represents 15.

host processor. The processing unit to which the page printers are attached through a data-transfer interface.

host system. (1) A data processing system that prepares programs and the operating environments for another computer or controller. (2) The data processing system to which a network is connected and with which the system can communicate.

I

identification label. In PSF, a protected set of resources (fonts, overlays, page segments) that are used to label PSF output for security purposes. Contrast with *security label*.

image. Toned and untoned pels arranged in a pattern.

image block. A structure that contains the raster pattern and the instructions for placing the pattern on the page.

image cell. A portion of an image that saves storage by defining only part of a raster pattern. Each image cell must also contain information that defines the placement of its raster pattern within the complete image. An image cell can be replicated to fill a defined area.

image data. A pattern of bits with 0 and 1 values that define the pels in an image. (A 1-bit is a toned pel.)

imbedded text control. See *embedded text control*.

IML. Initial microprogram load.

impact printer. A printer in which printing results from mechanical impacts. Contrast with *nonimpact printer*.

initial microprogram load (IML). (1) The action of loading microprograms into computer storage. (2) The action of loading licensed internal code from a diskette to writable control storage.

initial program load (IPL). (1) The initialization procedure that causes an operating system to begin. (2) The process of loading system programs and preparing a system to run jobs.

initialize. (1) In programming languages, to give a value to a data object at the beginning of its lifetime. (I) (2) To set counters, switches, addresses, or contents of storage to zero or other starting values at the beginning of, or at prescribed points in, the operation of a computer routine. (A) (3) To prepare for use; for example, to initialize a diskette. See also *initial program load*.

inline. The direction of successive characters in a line of text. Synonymous with *inline direction*.

inline direction. The direction of successive characters in a line of text.

inline resource. A resource contained in the print data set.

input/output (I/O). Pertaining to a device whose parts can perform an input process and an output process at the same time. (I)

installation exit. The subcomponent that calls exits, provides defaults for job header, trailer, and data-set header separator-page exits, and supports customer-written exits for logical records, SMF records, message processing, and resource management.

intelligent printer data stream (IPDS). An all-points-addressable data stream that allows text, images, and graphics to be positioned at any defined point on a printed page.

interface. A shared boundary. An interface can be a hardware component used to link two devices, or it can be a portion of storage or registers accessed by two or more computer programs.

interleaving. (1) The simultaneous accessing of two or more bytes or streams of data from distinct storage units. (2) The alternating of two or more operations or functions through the overlapped use of a computer family.

internal object. Groups of structured fields that can be included as part of a resource or a print data set but cannot be accessed separately.

intervention-required exception. An error that causes printing to stop until an operator performs a required action.

I/O. Input/output.

I/O error manager. The PSF subcomponent that analyzes I/O errors, determines the recovery action, and directs I/O error recovery and cleanup.

IOS. I/O supervisor.

IPDS. Intelligent printer data stream.

IPL. Initial program load.

ISO forms. Pertaining to a set of paper sizes selected from those made standard by the International Organization for Standardization for use in data processing.

J

jam-recovery copy counter. A counting device in a printer that identifies how many copies of a page have successfully passed the printer-defined jam-recovery point but have not been counted by the jam-recovery page counter.

jam-recovery page counter. A counting device in a printer that identifies how many pages have successfully passed the printer-defined jam-recovery point. See also *fuser counter*.

JCL. Job control language.

JES. Job entry subsystem.

job control language (JCL). A control language used to identify a job to an operating system and to describe the requirements of the job.

job entry subsystem (JES). A system facility for spooling, job queuing, and managing I/O.

job header. A page in the printed output that indicates the beginning of a user job. A job can contain one or more data sets. See also *data set header*.

job separation. The ability to identify job boundaries by placing marks or sheets of paper between successive jobs.

job trailer. A page in the printed output that indicates the end of a user job.

K

kanji. Nonphonetic Chinese characters used in Japanese written language. In a font representing kanji characters, each character is represented by a double-byte font.

kerning. The printing of adjacent graphic characters so they overlap on the left or right side.

L

landscape page presentation. The position of a printed sheet that has its long edges as the top and bottom and its short edges as the sides. Contrast with *portrait page presentation*.

LASI. Library access system interface.

library. A partitioned data set or a series of concatenated partitioned data sets.

library access system interface (LASI). The PSF subcomponent that gets resources from the libraries and stores and obtains records in a message data set.

library member. Synonym for *resource object*.

ligature. A single character representing two or more input characters. For example, *ff* and *ffi* are characters that can be presented as ligatures

line data. Data prepared for printing on a line printer, such as a 3800 Model 1.

line descriptor. Specifications that describe how input data records are formatted into individual print lines. Line descriptors are interpreted by PSF when formatting printed output.

line merging. Printing two or more records of line data at the same location on the page. Line merging is used with line data to mix different fonts on the same line, to underscore or overstrike, and on impact printers to create darker print.

line printer. A device that prints a line of characters as a unit. Contrast with *page printer*.

lines per inch (lpi). (1) The number of lines that can be printed vertically within an inch. (2) A unit of measurement for the specification of the placement of the baseline.

local-attached. In PSF, an SNA-attached device that does not have a communications controller in its configuration. For example, a 3812 printer connected to a channel-attached 3174 control unit that is defined to the host system through VTAM is considered a local-attached printer. Contrast with *communication attached*.

local identifier. A 1-byte identifier assigned to parts of the data stream to facilitate PSF processing. For example, the Map Coded Font structured field assigns each coded font a local identifier. When a coded font is required for processing, this identifier is specified in the Set Coded Font Local text control.

logical page. (1) The area on a surface of a form that is formatted for printing. (2) A collection of data that can be printed on one side of a sheet of paper. See also *form* and *page*.

logical page origin. (1) The point on the logical page from which positions of images, graphics, page overlays, and text with 0-degree inline direction are measured. (2) The point on the logical page represented by Xp=0, Yp=0 in the Xp coordinate system.

logical unit (LU, L-unit). (1) In SNA, a port through which an end user accesses the SNA network to communicate with another end user and through which the end user accesses the functions provided by system services control points (SSCP). A logical unit can support at least two sessions, one with an SSCP and one with another logical unit, and may be able to support many sessions with other logical units. (2) A unit of linear measurement. For example, in Mixed Object Document Content Architecture (MO:DCA) and AFP data streams, the following measurements are used:

1 L-unit = 1/1440 inch
1 L-unit = 1/240 inch

logon mode. In VTAM, a subset of session parameters specified in a logon-mode table for communication with a logical unit.

logon-mode table. In VTAM, a table of macro-generated constants that associate a logon-mode name with a set of session parameters. Each logon mode is identified by a logon-mode name.

lpi. Lines per inch.

LU (logical unit) base. The linear measurement base. The value defines, for any object, the meaning of the L-unit values. See also *logical unit*.

L-unit. See *logical unit*.

LU type 1. An SNA logical unit type that provides a communication protocol among host application programs and terminals. Some printers also use this protocol to communicate with host application programs.

LU type 6.2. An SNA logical unit type that converges functions from existing LU types to provide a single, interchangeable communication protocol. See also *Page Printer Communication Component*.

M

macro. Synonym for *macroinstruction*.

macroinstruction. An instruction that causes the execution of a predefined sequence of instructions.

magnetic ink character recognition (MICR). Recognition of characters printed with ink that contains particles of a magnetic material. (I) (A)

mandatory print labeling (MPL). A class defined to the resource access control facility (RACF) that causes PSF to automatically perform separator page labeling, data page labeling, and the enforcement of the user-printable area.

marking. A method that refers to the updating of certain structured fields that identifies a resource as printer-resident.

media origin. The first hardware-addressable point on the physical page; the reference point from which the logical page origin is positioned by the medium map. This point is represented by Xm=0, Ym=0 in the Xm, Ym coordinate system. The media origin is defined relative to the top edge of the media.

medium. The physical material (for example, paper) on which data is printed. See also *form*.

medium map. An internal object in a form definition that controls the modifications to a form, page placement, and overlays. Synonymous with *copy group*.

medium overlay. An electronic overlay that is invoked by the medium map of a form definition for printing at a fixed position on the form. See *page overlay*.

member ID. The member name of a resource object minus the 2-character prefix. For example, BITR is the member ID of the font whose member name is X1BITR.

member name. The name under which a file is stored in a library. For example, X1BITR is the member name of a font in the font library.

message data set. (1) A data set on disk storage that contains queues of messages awaiting transmission to particular terminal operators or to the host system. (2) In PSF, a virtual data set built by LASI in memory to store error messages for printing at the end of the document.

MICR. Magnetic ink character recognition.

metrics. Synonym for *font metrics*.

mixed-pitch font. A font that simulates a typographic font. The characters are in a limited set of pitches, for example, 10 pitch, 12 pitch, and 15 pitch.

MODCA. Mixed Object Document Content Architecture.

MODCA-P. Mixed Object Document Content Architecture for Presentation.

MOF. Metric-only font.

monospaced font. A font in which the spacing of the characters does not vary. Contrast with *proportionally spaced font*.

MPL. Mandatory print labeling.

multiple-entry font. A font with multiple entries in the Map Coded Font structured field. The only fonts that have multiple entries are double-byte fonts that are defined dynamically. (The MCF points directly to a set of code page and font character set pairs.)

multiple-up. The printing of more than one page of application data on a single surface of a sheet of paper.

multiplexer. (1) A device that takes several input signals and combines them into a single output signal in such a manner that each of the input signals can be recovered. (T) (2) A device capable of interleaving events of two or more activities or capable of distributing events of an interleaved sequence to the respective activities. (A)

multiplexer channel. A channel designed to operate with a number of I/O devices simultaneously. Several I/O devices can transfer records at the same time by interleaving items of data.

multiplexing. In data transmission, a function that permits two or more data sources to share a common transmission medium so that each source has its own channel. (I) (A)

multipoint network. More than two devices sharing the same transmission line at the same time.

MVS. Multiple Virtual Storage.

MVSCP. MVS Configuration Program.

MVS/ESA. Multiple Virtual Storage/Enterprise System Architecture.

N

NACK. Negative acknowledgment.

NCP. Network Control Program.

NCP generation. The process performed in the host processor of assembling and link-editing a macroinstruction program to produce a Network Control Program.

nested resource. A resource mapped in an overlay.

Network Control Program (NCP). An IBM licensed program that provides communication controller support for single-domain, multiple-domain, and interconnected network capability.

nonimpact printer. A printer in which printing is not the result of mechanical impacts, for example, thermal printers, electrostatic printers, and photographic printers. Contrast with *impact printer*.

nonprocess runout (NPRO). An operation that moves paper through the paper path without printing.

nonswitched line. A telecommunication line on which communications do not have to be established by dialing. Contrast with *switched line*.

normal duplex printing. Printing on both sides of the paper so that the sheets can be bound on the long edge of the paper. Contrast with *simplex printing*. See also *tumble duplex printing*.

notify subtask (NST). (1) A PSF subcomponent that returns processed data sets to JES or Direct Printer Services Subsystem and performs checkpoint processing on data sets as they are printed. (2) An external trace that contains information pertaining to the releasing and checkpointing of data sets by PSF.

NPRO. Nonprocess runout.

NST. Notify subtask.

null name. A token name with X'FFFF' in the first 2 bytes.

null value. A parameter for which no value is specified.

numeric data. (1) Data represented by numerals. (2) Data in the form of numerals and special characters, for example, a date represented as 81/01/01. See also *character data*.

O

object. A resource or a sequence of structured fields contained within a larger entity, such as a page segment or a composed page.

offset stacking. A function that allows the printed output pages to be offset for easy separation of print jobs.

OGL/370. Overlay Generation Language/370.

option. (1) A specification in a statement that may be used to influence the execution of the statement. (2) A choice offered from a list of possibilities.

orientation. The number of degrees an object is rotated relative to a reference: for example, the orientation of an overlay relative to the logical page origin. This usually applies to blocks of information. Character rotation applies to individual characters. See also *text orientation*.

origin. A pel position from which the placement and orientation of text, images, and page segments are specified. For example, pages, overlays, and page segments have origins.

overlay. See *electronic overlay*.

Overlay Generation Language/370 (OGL/370). An IBM licensed program that allows designing objects for electronic overlays, such as lines, boxes, shadings, and irregular shapes, to create graphics.

P

page. (1) A collection of data that can be printed on a one side of a sheet of paper or a form. (2) The boundary for determining the limits of printing. See also *logical page* and *physical page*.

PAGEDEF. A JCL parameter that specifies a page definition. See *page definition*.

page definition. A resource used by PSF that defines the rules of transforming line data into composed pages and text controls.

page environment. The size of the page or overlay control data to be used in blocks of composed text, and the page segments or fonts to be used.

page format. See *data map*.

page mode. The mode of operation in which a page printer can accept a page of data from a host processor to be printed on an all-points-addressable output

medium. Data may consist of pages composed of text, images, overlays, or page segments.

page origin. See *logical page origin*.

page overlay. An electronic overlay that can be invoked for printing and positioned at any point on the page by an Invoke Page Overlay structured field in the print data. See *medium overlay*.

page position. A control in the copy group to assign the top left boundary point of the logical page on a sheet for a data set. The page position is determined from the media origin.

page printer. A device that prints one page as a unit. (I) (A) Contrast with *line printer*.

Page Printer Communication Component (PPCC). The access method that provides the SNA communication interface between printers and PSF.

Page Printer Formatting Aid/370 (PPFA/370). An IBM licensed program that allows the creating and storing of form definitions and page definitions, which are resource objects for print-job management. These stored objects can then be used to format printed output.

page segment. A resource that can contain text and images and can be included on any addressable point on a page or electronic overlay. A page segment assumes the environment of an object in which it is included.

paging. (1) The transfer of pages between real storage and auxiliary storage. (I) (A) (2) In System 370 virtual storage systems, the process of transferring pages between real storage and external page storage.

parameter. (1) A variable that is given a constant value for a specified application and that may denote the application. (I) (A) (2) An item in a menu for which the user specifies a value or for which the system provides a value when the menu is interpreted. (3) Data passed between programs or procedures.

partial page. A page that does not contain all the intended data. Partial pages can be printed after an error is sensed.

partitioned data set (PDS). A data set in direct access storage that is divided into partitions, called members, each of which can contain a program, part of a program, or data. Contrast with *sequential data set*.

pass-through. To gain access to another network.

pattern storage (PST). An area of storage that holds the raster patterns for fonts and images.

PDS. Partitioned data set.

pel. Picture element.

pending page queue (PPQ). In PSF, a list of pages that has been processed by PSF but has not been released from JES.

physical page. A single surface (front or back) of a form. See also *form* and *page*.

physical unit (PU). The part of a communication controller or cluster controller that manages the resources attached to the node.

picture element (pel). The smallest unit that can be addressed by a page printer. See *addressable point*.

pipeline. (1) A serial arrangement of processors or a serial arrangement of registers within a processor. Each processor or register performs part of a task and passes results to the next processor; several parts of different tasks can be performed at the same time. (2) The hardware path between the channel station or received-page station and the stacker.

pitch. The character size represented by the number of characters that can be printed horizontally in an inch; for example, 10 pitch has 10 graphic characters per inch. Uniformly spaced fonts are measured in pitch. Contrast with *point*.

pixel. Synonym for *pel*.

PLR. Priority level resource.

point. A unit of about 1/72 inch used in measuring type. Contrast with *pitch*.

point size. The height of a font in points.

point-to-point network. An arrangement by which two devices share the same transmission line at the same time.

POR. Power-on reset.

portrait page presentation. The position of a printed sheet that has its short edges as the top and bottom and its long edges as the sides. Contrast with *landscape page presentation*.

power-on reset (POR). See *initial microprogram load*.

PPCC. Page Printer Communication Component.

PPFA/370. Page Printer Formatting Aid/370.

PPQ. Pending page queue.

PPWTR. Page printing writer.

preprinted form. A sheet of paper containing a preprinted design of constant data into which variable data can be printed. See also *electronic overlay* and *forms flash*.

presentation text. Synonym for *composed text*.

printable area. The area on a sheet of the paper where print can be placed.

print data set. A data set created by an application program that contains the actual information to be printed and, optionally, some of the data that controls the format of the printing. The two kinds of print data sets are composed data and line data. Data sets can also contain both composed pages and line data.

print data stream. The data stream that is created by PSF and transmitted to the printer.

print direction. (1) The direction in which characters are added to a line. (2) In PSF, the specification of inline direction for the printing of text.

print job. The data that the user submits to PSF to be printed. A print job can request the printing of multiple data sets.

print labeling. A controlled method of placing identification labels on each page of PSF printed output.

print position. Any location on a medium where a character can be printed.

print quality. (1) The measure of printed output against existing standards and in comparison with jobs printed previously. (2) The ability of some page printers to print data at more than one level of print quality, such as “draft” and “near-letter” quality.

Print Services Facility (PSF). A licensed program that manages and controls the input data stream and output data stream required by supported IBM page printers. PSF combines print data with other resources and printing controls to produce AFP output.

priority level resource (PLR). A marked resource known to PSF and deleted according to a modified deletion algorithm. When PSF is deleting resources using reasonable resource loaded value, PSF deletes all non-PLR resources before deleting any PLR resources. A frequently used resource can be marked as PLR with the Resource Exit, thus improving its chances of being retained at the data set end.

processor. In a computer, a functional unit that interprets and executes instructions. (I) (A)

programming interface for customers. Any product method that allows a customer-written program to obtain the services of the product, for example, CSECT names, data areas or control blocks, data sets or files, exits, macros, parameter lists, and programming languages). Not all products have programming interfaces for customers. Some products provide their services through end-user interfaces; others provide their services only to other products. Contrast with *end-user interface*.

programming request for price quotation (PRPQ). A customer request for a price quotation on alterations or additions to the functional capabilities of system control programming or licensed programs. The RPQ may be used in conjunction with computing system RPQs to solve unique data processing problems.

program status word (PSW). An area in storage used to indicate the order in which instructions are executed, and to hold and indicate the status of the computer system.

program temporary fix (PTF). A temporary solution or bypass of a problem diagnosed by IBM as resulting from a defect in a current unaltered release of the program.

proportionally spaced font. A typographic font, or in some usages a mixed-pitch font. See *typographic fonts* and *mixed-pitch fonts*.

protocol. The meanings of and the sequencing rules for requests and responses by which network addressable units (PU, LU, SSCP, and VTAM programs) in a communication network coordinate and control data transfer operations and other operations.

PSF. Print Services Facility.

PST. Pattern storage.

PSW. Program status word.

PTF. Program temporary fix.

PU. Physical unit.

R

RACF. Resource Access Control Facility.

raster overlay. See *raster pattern overlay*.

raster pattern. A pattern of bits with 0 (off) and 1 (on) that define the pels in an image. A 1-bit is a toned pel.

raster pattern overlay. An overlay loaded in the printer as a raster pattern rather than as a sequence of printer commands. Contrast with *coded overlay*.

raster pattern storage (RPS). An area of storage that holds raster patterns for fonts and images.

RCB. Resource control block.

RDW. Record descriptor word.

real storage. The main storage in a virtual storage system. Physically, real storage and main storage are identical. Conceptually, however, real storage represents only part of the range of addresses available to the user of a virtual storage system. Conventionally, the total range of addresses available to the user was provided by the main storage. (I) (A)

reasonable resource loaded value (RRLV). A value used by PSF to keep the number of resources loaded at a manageable level. At data set end, PSF deletes resources for a particular resource type until this value is reached.

received page counter. A counting device in a printer that identifies how many pages have been successfully received and syntax checked. Synonymous with *channel counter*.

record descriptor word (RDW). Data preceding a variable record that specifies the length of the entire record including the RDW.

record interface. Coordinates the transmission of printer resources needed to print a document.

recovery termination manager (RTM). A program that handles all normal and abnormal termination of tasks by passing control to a recovery routine associated with the terminated function.

region size. The amount of main storage available for a program to run.

relative metrics. Measurement information that is defined in relation to some other units. Relative values are expressed as fractional parts of a unit square design space (Em-square), whose sides correspond to the vertical size of the font. This allows the same value to be used for different point sizes and different raster-pattern resolutions. Use of relative metrics requires definition of the units of measure for the Em-square, the point of the font, and perhaps the pel resolution of the raster. Contrast with *fixed metrics*. See also *font metrics* and *bounded-box relative metrics*.

reload function. The Resource Exit can request that a resource be “reloaded.” PSF will not use an existing version of the resource but will load the resource from a host library.

Remote PrintManager (RPM). An IBM PC-based licensed program that allows PSF printer resources (fonts, overlays, and page segments) to reside in PC disk storage for an attached printer.

repositioning. A process in which Print Services Facility, following an indication from the printer or from JES of a potentially recoverable error, locates the correct spool record for recomposing one or more pages for printing.

request for price quote (RPQ). See *computing system RPQ*.

request unit (RU). In SNA, a message unit that contains control information such as a request code, or function management (FM) headers and end-user data, or both. Synonymous with *request*.

resident resource. A resource that resides in a printer (fonts or symbol sets) or in Remote PrintManager (fonts, page segments, and overlays). Resident resources are identified by the APSRMARK utility of PSF or by the resident font resource table APSRFTBL.

resolution. In computer graphics, a measure of the sharpness of an image, expressed as the number of lines and columns on the display screen or the number of pels per unit of linear measure.

resource. (1) A collection of printing instructions used by Print Services Facility in addition to the print data set, to produce the printed output. PSF resources include coded fonts, font character sets, code pages, page segments, overlays, form definitions, and page definitions. (2) Any source of aid used for performing a task, for example disk storage space, computer processing time, and communications lines.

Resource Access Control Facility (RACF). An IBM licensed program that provides for access control by identifying and by verifying the users to the system, authorizing access to protected resources, logging the detected unauthorized attempts to enter the system, and logging the detected accesses to protected resources.

resource-constrained condition. Occurs when the printer does not have enough storage for the resources required to print the current page.

resource manager. Any control program function responsible for allocation of a resource. In PSF, maintains the resource control structure used to manage resources, directs retrieval of resources from libraries, deletes resources from the printer, calls for Resource Exit functions, and includes the APSRMARK utility that allows marking resources as printer resident or in Remote PrintManager.

resource name. The name under which a resource object is stored, the first 2 characters of which indicate the resource type:

X0-XG	Coded font
T1	Code page

C0-CG Font character set
S1 Page segment
F1 Form definition
P1 Page definition
O1 Overlay

resource object. A member in a resource library. Synonym for *library member*.

rotation. Synonym for *character rotation*. See also *orientation*.

routine. A program or sequence of instructions called by a program that may have some general or frequent use. (I) (A)

RPM. Remote PrintManager.

RPQ. Request for price quote. See *computing system RPQ*.

RPS. Raster pattern storage.

RRB. Record resource block.

RRLV. Reasonable resource loaded value.

RTM. Recovery termination manager.

RU. Request unit.

rule. A solid or patterned line of any weight, extending horizontally or vertically across a column, row, or page.

S

SDLC. Synchronous Data Link Control.

security definition. In MVS and OS/390, a member containing the definitions for one identification label. These definitions include instructions for the overlay name, and the size and origin of paper to be used.

security definitions library. In MVS and OS/390, a partitioned data set or a series of concatenated partitioned data sets that contain the security definitions for an entire system.

security label. In a trusted computing base, a security label used to maintain multiple levels of security on a system. This label is a combination of a security class and a security level. Contrast with *identification label*.

security overlay. An overlay, such as one created using Overlay Generation Language, that resides in a secure library and is used to place security resources on a page.

segment. Synonym for *page segment*.

sense data. (1) Data describing an I/O error. Sense data is presented to a host system in response to a Sense I/O command. (2) In SNA, the data sent with a negative response indicating the reason for the response.

sequence number. A 2-byte field in the structured field introducer that identifies the position of the structured field in the data set.

sequential data set. In MVS and OS/390, a data set whose records are organized on the basis of their physical positions, such as on magnetic tape. Contrast with *partitioned data set*.

sheet. A single piece of paper. For cut-sheet printers, a synonym for *form*

shift-out, shift-in (SOSI). Special EBCDIC control codes that exist in the data stream to indicate the switches between double-byte and single-byte fonts.

simplex printing. Printing on only one side of the paper. Contrast with *duplex printing*.

single-byte coded font. A font in which the characters are defined by a 1-byte code point. A single-byte coded font has only one coded font section. Contrast with *double-byte coded font*.

single-entry font. Fonts with a single entry in the Map Coded Font structured field. This includes all single-byte fonts and those double-byte fonts being defined as coded fonts.

skip. (1) To ignore one or more instructions in a sequence of instructions. (2) A move of the current print position to another location.

SMF. System management facilities.

SMP/E. System Modification Program/Extended.

SNA. Systems Network Architecture.

SNA-attached. In PSF, a device that is linked to the host system through VTAM and uses an SNA protocol to transfer data. It does not need to be physically connected to the host; some printers are attached to a control unit, a communication controller, or both, and they can transfer data over telecommunication lines. For example, a 3820 attached to a communication controller using the LU 6.2 communication protocol to transfer data to a communication controller is considered an SNA-attached printer. Contrast with *channel-attached*.

soft page segment. A resource that is not declared in the Map Page Segment structured field but is sent to the printer inline with data. Contrast with *hard page segment*.

SOSI. Shift-out, shift-in.

spot carbon. Paper from which carbon is omitted in certain areas to suppress printing of data on specific copies.

SRM. System Resource Manager.

SSCP. System services control point.

SSI. Subsystem Interface.

stacked-page counter. A counting device that identifies how many pages have been successfully stacked.

startup procedure. A procedure used to start PSF and to specify PSF initialization parameters and libraries that contain system resources.

station ID. For the 3800, a 2-byte pipeline counter that is incremented when the last copy of a page reaches the point in the hardware represented by that counter.

storage. (1) A unit into which recorded text can be entered, in which it can be retained and processed, and from which it can be retrieved. (T) (2) The action of placing data into a storage device. (I) (3) A storage device. (A)

structured field. A self-identifying string of bytes and its data or parameters.

structured field introducer. The first 8 bytes of a structured field that indicate its length, type, and number.

subgroup. A set of modifications within a copy group that applies to a certain number of copies of a form. A copy group can contain more than one subgroup.

subpage. A part of a logical page on which line data may be placed. In the page definition, multiple subpages can be placed on the physical page based on changes in the print data.

subsystem interface (SSI). See *functional subsystem interface*.

supervisor call (SVC). An instruction that interrupts a program being run and passes control to the supervisor to perform a specific service indicated by the instruction.

suppression. See *text suppression*.

suppression local ID. A value assigned in the Map Suppression coded field to a suppression named in a Line Descriptor structured field. This value is contained in the Begin and End Suppression text controls.

suppression number. An identification number from 1 to 127 generated by the Map Suppression structured field and assigned to text designated for suppression in the data map transmission subcase.

swapping. A process that interchanges the contents of an area of real storage with the contents of an area in auxiliary storage.

switched line. A telecommunication line on which communications are established by dialing. Contrast with *nonswitched line*.

switched major node. In VTAM, a major node whose minor nodes are physical and logical units attached by switched SDLC links.

SVC. Supervisor call.

symbol set. A type of font that resides in a printer but has fewer attributes than can be specified for resident coded fonts.

synchronous. (1) Pertaining to two or more processes that depend on the occurrences of a specific event such as common timing signals. (I) (A) (2) Occurring with a regular or predictable time relationship.

Synchronous Data Link Control (SDLC). A discipline for managing synchronous information transfer over a data link connection.

SYSGEN. System generation. (A)

SYSIN. System input stream.

SYSOUT. System output stream.

system input stream (SYSIN). A data definition (DD) statement used to begin an in-stream data set.

system management facilities (SMF). An optional control program that provides the means for gathering and recording information that can be used to evaluate system use.

System Modification Program (SMP). An IBM licensed program used to install software and software changes.

system output stream (SYSOUT). A data definition (DD) statement used to identify a data set as a system output data set.

Systems Network Architecture (SNA). The description of the logical structure, formats, protocols, and operational sequences for transmitting information units through networks, and controlling the configuration and operation of those networks. See also *Page Printer Communication Component*.

systems services control point (SSCP). In SNA, a focal point with an SNA network for managing the configuration, coordinating network-operator and problem-determination requests, and providing directory support or other session services for end users of the network.

T

table reference character (TRC). An optional control character in an input record that identifies the font to be used to print the record. The table reference character corresponds to a font number defined in a font list in a page definition or to the order of font names listed in the job control CHARS parameter.

telecommunication line. The part of a data circuit external to the equipment that connects to a data-switching exchange. Contrast with *data link*.

terminate. (1) In SNA products, a request unit that is sent by a logical unit (LU) to its system services control point (SSCP) to cause the SSCP to start a procedure for ending one or more designated LU-LU sessions. (2) To stop the operation of a system or device. (3) To stop execution of a program.

text. A graphic representation of information on an output medium. Text can consist of alphanumeric characters and symbols arranged in paragraphs, tables, and columns.

text control. Structured field data that controls the format, placement, and appearance of text.

text control sequence. A text control and its associated data.

text orientation. A description of the appearance of text as a combination of print direction and character rotation.

text suppression. The intentional omission of portions of text in copy groups specified in a parameter in the form definition.

throughput. (1) A measure of the amount of work performed by a computer system over a period of time, for example, number of jobs per day. (I) (A) (2) In data communication, the total traffic between stations per unit of time.

token name. An 8-byte name that can be given to all internal objects and resources.

token ring. A network configuration in which tokens are passed in a circuit from node to node. A node that is ready to send can capture the token and insert data for transmission.

trace. A record of the execution of a computer program. It exhibits the sequences in which the instructions were executed. (A)

transaction ID. An identifier assigned by Document Processor, associated with an I/O buffer, and representing a form of resource.

transfer counter. A counting device that identifies how many pages have been committed to printing and have been removed from the page buffer. Synonym for *committed page counter*.

transmission. (1) The sending of data from one place for reception elsewhere. (A) (2) The sending of a print data set to a printer.

TRC. Table reference character.

tumble duplex printing. Duplex printing for sheets that are to be bound on the short edge of the paper regardless of whether the printing is portrait or landscape. Contrast with *normal duplex printing*.

two-channel switch. A hardware feature by means of which an I/O device can be attached to two channels. A dynamic switch can be added, which allows both interfaces to be enabled at the same time with channel selection determined by programming.

typeface. A collection of fonts all having the same style, weight, and width. Each font differs from the others by point size or type family.

type size. (1) A measurement in pitch or points of the height and width of a graphic character in a font. (2) One of the many attributes of a font; other attributes, for example, are weight and width.

typographic font. A font in which the distance between characters varies. The distance from one character to another is adjusted to improve the visual flow of text by eliminating excess space.

U

UCS. Universal character set.

unbounded-box font. A font designed to use unbounded character boxes. Contrast with *bounded-box font*.

unbounded character box. A character box design that requires the character position information to be included (as untoned pels) within the box. Contrast with *bounded character box*.

unformatted print records. Line data made up of fields of data that have not been formatted into print

lines. PSF uses a page definition to format these records for printing on page printers.

uniformly spaced font. A font in which the characters have the same character increment. Contrast with *proportionally spaced font*.

units of measure. Counting methods that are either specific or relative. See also *font metrics* and *bounded-box relative metrics*.

universal character set (UCS). A printer feature that permits the use of a variety of character arrays. Synonymous with *font*.

UPA. User-printable area.

user library. A private print-resource library owned by an individual user, accessed only when the name is specified by the owner in the JCL USERLIB parameter.

user printable area (UPA). The area within the valid printable area (VPA) where user-generated data can print without causing an exception condition. See also *valid printable area*.

utility program. (1) A computer program in general support of computer processes, for example, a diagnostic program, a trace program, or a sort program. (T) Synonymous with service program. (2) A program designed to perform an everyday task such as copying data from one storage device to another. (A)

V

valid printable area (VPA). The intersection of the physical page with the current logical page or the current overlay. See also *user printable area*.

value. A quantity assigned to a constant, a variable, a parameter, or a symbol in a command.

virtual storage. (1) The storage space that may be regarded as addressable main storage by the user of a computer system in which virtual addresses are mapped into real addresses. The size of virtual storage is limited by the addressing scheme of the computer system and by the amount of auxiliary storage available, not by the actual number of main storage locations. (I) (A) (2) Addressable space that is apparent to the user as the processor storage space, from which the instructions and the data are mapped into the processor storage locations. Synonymous with *virtual memory*.

Virtual Telecommunications Access Method (VTAM). A set of programs that maintains control of the communication between terminals and application programs running under DOS/VS, OS/VS1, and OS/VS2 operating systems.

VPA. Valid printable area.

VTAM. Virtual Telecommunications Access Method.

W

WCS. Writable control storage.

writable control storage (WCS). Printer storage into which data can be entered, held, and retrieved. Writable control storage contains licensed internal-code instructions and other control information, such as the print buffer.

write-to-operator (WTO). An optional user-coded service that enables the writing of a message to the system console operator that informs the operator of errors and system conditions that may need correcting.

WTO. Write-to-operator.

X

X-axis. In printing, an axis perpendicular to the direction in which the paper moves through the printer. See also *Y-axis*.

X-extent. A measurement along the X-axis.

Xm, Ym coordinate system. The media coordinate system.

Xp, Yp coordinate system. The logical page coordinate system.

Y

Y-axis. In printing, an axis parallel with the direction in which the paper moves through the printer. See also *X-axis*.

Y-extent. A measurement along the Y-axis.

Bibliography

This bibliography lists the titles of publications containing additional information about PSF, Advanced Function Presentation, the MVS and OS/390 operating systems, and related products.

The titles and order numbers may change from time to time. To verify the current title or order number, consult your IBM marketing representative.

Print Services Facility (PSF) for OS/390

Publication	Order Number
IBM IP PrintWay Guide	S544-5379
IBM NetSpool Guide	G544-5301
PSF for AIX: Upload Configuration Guide for SNA	S544-5422
PSF for AIX: Upload Configuration Guide for TCP/IP	S544-5423
PSF for OS/390 Collection Kit CD-ROM	SK2T-9267
PSF for OS/390: Customization	S544-5622
PSF for OS/390: Diagnosis	G544-5623
PSF for OS/390: Download for OS/390	G544-5624
PSF for OS/390: Introduction	G544-5625
PSF for OS/390: Licensed Program Specifications	G544-5626
PSF for OS/390: Messages and Codes	G544-5627
PSF for OS/390: Program Directory	None
PSF for OS/390: User's Guide	S544-5630
AFP Conversion and Indexing Facility: User's Guide	S544-5285
PSF: Security Guide	S544-3291
Program Directory for IP PrintWay Feature of PSF for OS/390	None
Program Directory for NetSpool Feature of PSF for OS/390	None

Advanced Function Presentation (AFP)

Publication	Order Number
Advanced Function Presentation: Printer Information	G544-3290
Advanced Function Presentation: Printer Summary	G544-3135
Advanced Function Printing: Host Font Data Stream Reference	S544-3289
AFP Toolbox for Multiple Operating Systems User's Guide	G544-5292
AFP Workbench for Windows and OS/2: Using the Viewer Application	G544-3813
Guide to Advanced Function Presentation	G544-3876
Overlay Generation Language/370 User's Guide and Reference	S544-3700
IBM Page Printer Formatting Aid: User's Guide	S544-5284
Printing and Publishing Cluster Collection CD-ROM	SK2T-2921

Advanced Function Presentation (AFP) Architecture

Publication	Order Number
Advanced Function Presentation: Programming Guide and Line Data Reference	S544-3884
Bar Code Object Content Architecture Reference	S544-3766
Font Object Content Architecture Reference	S544-3285
Graphics Object Content Architecture Reference	SC31-6804
Image Object Content Architecture Reference	SC31-6805
Intelligent Printer Data Stream Reference	S544-3417
Mixed Object Document Content Architecture Reference	SC31-6802
Presentation Text Object Content Architecture Reference	SC31-6803

Advanced Function Presentation for Microfilm

To order any of the following microfilm publications, see your representative for Anacomp, Inc.

Publication	Order Number
DataMASTER II for XFP2000-Linked Systems Operator Guide	DMIIR21
XFP2000 Bit-Mapped Imaging User's Guide	NW-04-9403
XFP2000 COM System Operator Guide	8000R21
XFP2000 Message Guide	8KMSGR11
XFP2000 Reference	XF-07-9201, XF-07-9302
XFP2000 Software Release Notes	XF-14-9301
XFP2000 User's Guide	XF-04-9302
XFP2000 Workstation Executive Installation and Operations Guide	XF-12-9201

Fonts

Publication	Order Number
ABOUT TYPE: IBM's Technical Reference for 240-pel Digitized Type	S544-3516
IBM AFP Fonts: Font Samples	S544-3792
IBM AFP Fonts: Font Summary	G544-3810
IBM AFP Fonts: Font Summary for AFP Font Collection	S544-5633
IBM AFP Fonts: IBM's Typographic Primer for Digitized Type	G544-3183
IBM AFP Fonts: Introduction to Typography	G544-3122
IBM AFP Fonts: Technical Reference for Code Pages	S544-3802
IBM AFP Fonts: Technical Reference for IBM Chinese, Japanese, and Korean Fonts	S544-5330
IBM AFP Fonts: Technical Reference for IBM Expanded Core Fonts	S544-5228
IBM AFP Fonts: Type Transformer User's Guide	G544-3796

Text Processing

Publication	Order number
DCF/DLF General Information	GH20-9158
Document Composition Facility: Bar Code User's Guide	S544-3115
Document Composition Facility: SCRIPT/VS Text Programmer's Guide	SH35-0069
Publishing Systems BookMaster General Information	GC34-5006
Publishing Systems BookMaster User's Guide	SC34-5009
Using DisplayWrite/370	SH12-5172

InfoPrint Manager for AIX

Publication	Order Number
IBM InfoPrint Manager for AIX: Administrator's Guide	S544-5595
IBM InfoPrint Manager for AIX: User's and Operator's Guide	S544-5596

Print Services Facility (PSF) for AIX

Publication	Order Number
AIX and Related Products Documentation	SC23-2456
Facts About PSF for AIX	G544-5305
IBM Page Printer Formatting Aid/6000: User's Guide Version 2.1	S544-3918
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IBM Print Services Facility for AIX: Licensed Program Specifications	G544-3815
IBM Print Services Facility for AIX: Print Administration	S544-3817
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IBM Print Services Facility for AIX: Print Submission	S544-3878

Print Services Facility for OS/2 (PSF/2)

Publication	Order Number
IBM Print Services Facility for OS/2: A Guide to Using PSF/2	G544-5225
IBM Print Services Facility for OS/2: An Installation Cookbook for AS/400 and Token Ring Networks	G544-3966
IBM Print Services Facility for OS/2: An Installation Cookbook for System/370 and Token Ring Networks	G544-3965
IBM Print Services Facility for OS/2: Facts about PSF/2	G544-3890
IBM Print Services Facility for OS/2: Network Configuration Guide for System/370 and Communication Manager/2	S544-3911
IBM Print Services Facility for OS/2: Printer Attachments Guide	G544-5215

EDMSuite OnDemand

Publication	Order Number
EDMSuite OnDemand: Administrator's Reference	G544-5293
EDMSuite OnDemand: Installation and Configuration Guide for UNIX Servers	G544-5598
EDMSuite OnDemand: Installation and Configuration Guide for Windows NT Servers	G544-5526
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Printers

Publication	Order Number
Reference Manual for the IBM 3800 Printing Subsystem Models 3 and 6	GA32-0050
IBM PagePrinter 3812 Introduction and Planning Guide	G544-3265
IBM 3816 Page Printer Operating Instructions	GA34-2075
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IBM 3827 Page Printer Product Description	G544-3194
IBM 3828 Advanced Function MICR Printer Product Description	G544-3361
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IBM 3912 and 3916 Page Printer Getting Started	S544-3898
IBM LaserPrinter 4028 Introduction and Planning Guide	S544-4258
User's Guide for the IBM LaserPrinter 4029 Series	ZA40-0542
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i-data

Publication	Order Number
i-data 7913 IPDS Printer LAN Attachment for Ethernet Installation Guide	none
i-data 7913 IPDS Printer LAN Attachment for Token Ring Installation Guide	none

OS/390 Version 2 Release 6

Publication	Order Number
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OS/390 HCD Planning	GC28-1750
OS/390 HCD User's Guide	SC28-1848
OS/390 JES2 Commands	GC28-1790
OS/390 JES2 Initialization and Tuning Guide	SC28-1791
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Publication	Order Number
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MVS/ESA SP V5 Initialization and Tuning Reference	GC28-1452
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