Note

Before using this information and the product it supports, read the information in “Notices” on page 207.

This edition applies to these IBM products:
- Version 2 Release 2 of z/OS (5650-ZOS)
- Version 2 Release 1 of Infoprint Coaxial Printer Support for z/OS (5655-N62)

This edition applies to all subsequent releases and modifications until otherwise indicated in new editions.

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# Contents

## Figures

- vii

## Tables

- ix

## About this publication

- xi

Who should read this publication .......... xi
How to read syntax diagrams .......... xi
Where to find more information .......... xii
  Preventive Service Planning information .......... xii
  Infoprint Server migration information .......... xii
  Documents .......... xiii
  Infoprint Server online help .......... xiv

## How to send your comments to IBM

- xv

If you have a technical problem .......... xv

## Summary of changes

- xvi

z/OS Version 2 Release 2 .......... xvii
z/OS Version 2 Release 1 .......... xviii

## Chapter 1. Introducing Infoprint Server

- 1

Printer Inventory Manager .......... 3
Windows client .......... 6
Print Interface .......... 7
  Print Interface with an SAP R/3 application server on the z/OS system .......... 11
  Print Interface with an SAP R/3 application server on a remote system .......... 12
NetSpool .......... 14
IP PrintWay .......... 16
Transform Interface .......... 21
Transforms .......... 22
Infoprint Central .......... 23

## Chapter 2. Using Infoprint Server z/OS

- 25

UNIX commands .......... 25
  Online help for Infoprint Server commands .......... 25
  Messages sent from Infoprint Server commands .......... 26
  Transforming files to and from AFP format .......... 26
    Transforms to AFP format .......... 26
    Transforms from AFP format .......... 26
  How do you... .......... 27
    Print a file? .......... 27
    Send a file to an email destination? .......... 27
    Print or email files with special requirements? .......... 27
    Find out where the printers are? .......... 28
    Find out whether a file is printing? .......... 28
    Cancel an Infoprint Server job? .......... 28
    Transform data remotely? .......... 28
  cancel--Cancel a print job .......... 30
    Format .......... 30
    Description .......... 30
    Operand .......... 30
    Examples -- cancel .......... 30
  Environment variables .......... 30
  Files .......... 31
  Exit values .......... 31
  Portability .......... 31
lp--Print a file .......... 32
  Format .......... 32
  Description .......... 32
  Options .......... 32
  Operand .......... 34
  Results .......... 34
  Sending a file to an email destination .......... 35
  Examples -- lp .......... 36
  Environment variables .......... 40
  Files .......... 41
  Exit values .......... 41
  Portability .......... 41
lpstat--Show printer names and locations and status of print jobs .......... 42
  Format .......... 42
  Description .......... 42
  Options .......... 44
  Operand .......... 45
  Examples -- lpstat .......... 45
  Environment variables .......... 45
  Files .......... 46
  Exit values .......... 46
  Portability .......... 46
remotexf--Transform data remotely .......... 47
  Format .......... 47
  Description .......... 47
  Options .......... 48
  Operand .......... 49
  Examples -- remotexf .......... 49
  Environment variables .......... 50
  Files .......... 51
  Exit values .......... 51

## Chapter 3. Using job attributes

- 53

UNIX commands .......... 25
  Abbreviations .......... 54
  Attributes files .......... 54
    Creating an attributes file .......... 54
    Using an attributes file .......... 55
  Job attributes and JCL parameters .......... 55
  Job attribute listing .......... 55
    address-text .......... 55
    afp-parameters .......... 56
    building-text .......... 56
    carriage-control-type .......... 56
    chars .......... 57
    copies .......... 58
    department-text .......... 59
    document-codepage .......... 59
    document-format .......... 60
    document-type .......... 60
    duplex .......... 61
### Chapter 4. Printing from batch applications with DD and OUTPUT JCL statements

<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Printing output with IP PrintWay</td>
<td>91</td>
</tr>
<tr>
<td>Specifying the printer definition name</td>
<td>91</td>
</tr>
<tr>
<td>Specifying class, destination, or form</td>
<td>92</td>
</tr>
<tr>
<td>Specifying the printer’s IP address</td>
<td>92</td>
</tr>
<tr>
<td>Sending output to an email destination</td>
<td>93</td>
</tr>
</tbody>
</table>

#### Transforming output data

- Transforming data with the Print Interface subsystem | 97
- Transforming data with IP PrintWay extended mode | 100
- Transforming data with IP PrintWay basic mode | 101

#### Specifying job attributes

- JCL parameters | 102
  - JCL parameters for printing with IP PrintWay | 102
  - JCL parameters for the Print Interface subsystem | 121
  - JCL parameters for distribution information | 126
- AFP parameters for remote printing | 126
- JCL examples | 127

#### Direct output to an IP PrintWay printer by specifying the printer definition name

- Direct output to an IP PrintWay printer by specifying a host name or an IP address | 127
- Direct output to an IP PrintWay printer by specifying DEST, CLASS, or FORMS | 128
- Direct output to multiple IP PrintWay printers | 128
- Specify components in the Printer Inventory | 129
- Specify retry values | 129
- Specify retention periods | 130
- Specify AFP resources for printing on a remote PSF system | 130
- Specify email addresses on the OUTPUT JCL statement | 130
- Send two data sets to an email destination as text data | 131
- Send line or AFP data to an email destination as PDF data and print the AFP data on an AFP printer | 132
- Send line or AFP data to an email destination as AFP data | 132
- Print line or AFP data on a PostScript or PCL printer with IP PrintWay extended mode | 133
- Print line or AFP data on a PostScript or PCL printer with the IP PrintWay basic mode | 134
- Print line or AFP data on a PostScript printer with the Print Interface subsystem | 134
- Print PostScript, PCL, or PDF data on an AFP printer with the Print Interface subsystem | 135
- Print GIF, JPEG, or TIFF data on an AFP printer with the Print Interface subsystem | 136

### Chapter 5. Printing with the AOPPRINT JCL procedure

<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
</table>
| Sending a file to an email destination | 137
| AOPPRINT parameters | 138
| AOPPRINT DD statements | 139
| AOPPRINT results | 139
| AOPPRINT examples | 139
  - Print a file on the default printer | 140
  - Print a file on a specified printer | 140
  - Print multiple copies of a data set | 140
  - Submit and hold a job | 140
  - Specify a code page for ASCII jobs | 140
  - Print with error processing | 140
  - Print in-stream data | 141
  - Send a file to an email destination | 141
- AOPPRINT exit values | 142
## Figures

1. Infoprint Server system diagram .............................................. 2
2. Printer Inventory Manager system diagram .............................. 4
3. Print Interface system diagram ................................................ 8
4. Printing SAP R/3 documents with an SAP R/3 application server that runs on a z/OS system . 11
5. Printing SAP R/3 documents with an SAP R/3 application server that runs on a non-z/OS system ................................. 13
6. NetSpool system diagram ....................................................... 14
7. IP PrintWay system diagram ........................................................ 18
8. Transform Interface system diagram .......................................... 21
9. Summary of JCL parameters for all output processed by IP PrintWay .......................................................... 103
10. SUBSYS parameter for the Print Interface subsystem ................ 121
11. Summary of JCL parameters for the distribution of output ......... 126
12. AOPPRINT JCL parameters: format ........................................ 138
# Tables

1. Syntax notation ........................................... xi
2. Documents for Infoprint Server .................. xiii
3. Documents for IBM transform products .......... xiv
4. Documents for Ricoh products .................. xiv
5. Transforms that work with Infoprint Server .... 22
6. How to specify job attributes .................... 53
7. References for transforms and filters ........... 62
8. input-bin-number default mapping ................ 67
9. Sending output to an email destination ........ 94
10. Comparison of transform methods ............... 96
11. State of retained data sets for RETAINF ....... 116
12. State of retained data sets for RETAINS ......... 117
13. How retry limit and retry time work together .. 118
14. Parameters of the DD JCL statement that the Print Interface subsystem supports ........ 123
15. Parameters of the OUTPUT JCL statement that the Print Interface subsystem supports ........ 125
16. NetSpool output data streams .................... 149
17. Printing from Windows systems ................. 157
18. Comparison of Windows printing protocols ...... 158
19. Supported email header fields ................... 179
20. Email header fields and corresponding job attributes, JCL parameters, and printer definition fields .................. 181
21. Job attributes and JCL parameters validated for the printer .................. 183
22. JCL parameters and corresponding job attributes .................. 185
23. SCS code points ........................................... 187
24. Presentation Position X'34xxmn' .................. 191
25. Presentation Page Media (2BD2) nn (count byte) .................. 192
26. Presentation Page Media (2BD2) FC (forms control byte) .................. 192
27. Presentation Page Media (2BD2) SD (source drawer byte) .................. 192
28. Presentation Page Media (2BD2) DDO (destination drawer offset) .................. 193
29. Presentation Page Media (2BD2) DD (destination drawer byte) .................. 193
30. Presentation Page Media (2BD2) DX (duplex or simplex byte) .................. 193
31. SCS Set Attribute (X'28xxyy') .................. 194
32. Set Horizontal Format parameters ................ 194
33. Set Horizontal Format ................................. 195
34. Set Vertical Format parameters ................. 196
35. Set Vertical Format convert to PCL ............. 196
36. 3270 data stream command codes ................ 199
37. 3270 data stream control codes ................ 200
38. 3270 data stream attribute types ................ 201
About this publication

This publication describes how to print jobs with Infoprint Server, a separately priced feature of z/OS®. This publication applies to z/OS Version 2 Release 2.

This publication describes how to:
- Submit jobs to Infoprint Server from these operating systems:
  - z/OS UNIX System Services
  - z/OS with Job Control Language (JCL)
  - z/OS with Virtual Telecommunications Access Method (VTAM®) applications
    (the term VTAM refers to the z/OS Communications Server SNA Services element of z/OS)
  - These remote systems with Transmission Control Protocol/Internet Protocol (TCP/IP) installed:
    - Windows
    - Advanced Interactive Executive (AIX®)
    - z/OS
    - Virtual Machine (VM) or z/VM®
    - IBM® i
    - Novell NetWare
- Query printer names, printer locations, or print job status
- Cancel print jobs
- Transform print jobs from one data format to another

Who should read this publication

This publication is for anyone who prints documents with Infoprint Server.

How to read syntax diagrams

This section explains the general notations that this document uses in syntax diagrams. For ease of reading, this document breaks some examples into several lines. However, when you enter a command, enter it all on one line. Do not press Enter until you type the entire command.

Table 1. Syntax notation

<table>
<thead>
<tr>
<th>This notation:</th>
<th>Means:</th>
<th>You enter:</th>
<th>For example:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apostrophes</td>
<td>String</td>
<td>As shown</td>
<td>SEND '123'</td>
</tr>
<tr>
<td>Bold</td>
<td>Keyword</td>
<td>As shown</td>
<td>CLASS</td>
</tr>
<tr>
<td>Braces</td>
<td>List of items</td>
<td>The braces and one or more items from the list</td>
<td>(GT10 GT12)</td>
</tr>
<tr>
<td>Brackets</td>
<td>Optional item</td>
<td>One item or no items</td>
<td>aopstop [now]</td>
</tr>
<tr>
<td>Comma</td>
<td>Separator</td>
<td>As shown</td>
<td>DISPLAY C,K</td>
</tr>
</tbody>
</table>
Table 1. Syntax notation (continued)

<table>
<thead>
<tr>
<th>This notation:</th>
<th>Means:</th>
<th>You enter:</th>
<th>For example:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>This document shows:</td>
</tr>
<tr>
<td>Ellipsis</td>
<td>Repeatable item</td>
<td>One or more items</td>
<td>file1 file2</td>
</tr>
<tr>
<td>Lowercase</td>
<td>Item the system defines</td>
<td>As shown, in lowercase</td>
<td>lp</td>
</tr>
<tr>
<td>Lowercase italics</td>
<td>Variable item</td>
<td>A value for the item</td>
<td>MOUNT devnum</td>
</tr>
<tr>
<td>Parentheses</td>
<td>List of items</td>
<td>The parentheses and one or more items from the list</td>
<td>(GT10,GT12)</td>
</tr>
<tr>
<td>Special characters</td>
<td>Various symbols</td>
<td>As shown</td>
<td>%filter-options</td>
</tr>
<tr>
<td>Underline</td>
<td>Default</td>
<td>The item, or you can omit it</td>
<td>KT REF</td>
</tr>
<tr>
<td>Uppercase</td>
<td>Item the system defines</td>
<td>As shown, in uppercase</td>
<td>PRMODE</td>
</tr>
<tr>
<td>Vertical bar</td>
<td>UNIX pipe (the output of the first is input to the second)</td>
<td>As shown</td>
<td>ls</td>
</tr>
<tr>
<td>Vertical bar in braces</td>
<td>Required choice</td>
<td>One item</td>
<td>{NOW</td>
</tr>
<tr>
<td>Vertical bar in brackets</td>
<td>Optional choice</td>
<td>One item or no items</td>
<td>[PORTNO</td>
</tr>
</tbody>
</table>

Where to find more information

This section describes where to find information that is related to z/OS and Infoprint Server.

Preventive Service Planning information

Before you install Infoprint Server, review the current Preventive Service Planning (PSP) information, also called the PSP bucket. You also periodically review the current PSP information. The PSP upgrade ID depends on your z/OS operating system; for example, ZOSV2R2. The subset for Infoprint Server is INFOPRINT.

To obtain the current PSP bucket, contact the IBM Support Center or use z/OS SoftwareXcel (IBMLink). If you obtained z/OS as part of a CBPDO, HOLDDATA and PSP information is included on the CBPDO tape. However, this information might not be current if the CBPDO tape was shipped several weeks before installation.

Infoprint Server migration information

This table lists documents that can help you upgrade from previous releases of z/OS and from IP PrintWay™ basic mode to IP PrintWay extended mode.
### Documents

These tables list related documents that can help you use Infoprint Server and transform products. For documents for all z/OS products, see [z/OS Information Roadmap](#).

#### Table 2. Documents for Infoprint Server

<table>
<thead>
<tr>
<th>Document</th>
<th>Form number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>z/OS Infoprint Server Introduction</td>
<td>SA38-0692</td>
<td>Introduces Infoprint Server. This document contains printing scenarios that show how you can use Infoprint Server in your installation.</td>
</tr>
<tr>
<td>z/OS Infoprint Server Customization</td>
<td>SA38-0691</td>
<td>Describes customization tasks for Infoprint Server. This document describes Infoprint Server environment variables, configuration files, startup procedures, how to write exit routines and filter programs, and how to use the Infoprint Server API.</td>
</tr>
<tr>
<td>z/OS Infoprint Server Operation and Administration</td>
<td>SA38-0693</td>
<td>Describes operator procedures and administrative tasks for Infoprint Server. This document describes how to start and stop Infoprint Server and how operators can use Infoprint Central. It describes how administrators can create entries in the Printer Inventory by using either ISPF panels or the Printer Inventory Definition Utility (PIDU) program and define NetSpool printer LUs to VTAM.</td>
</tr>
<tr>
<td>z/OS Infoprint Server Printer Inventory for PSF</td>
<td>SA38-0694</td>
<td>Describes the Printer Inventory for PSF for PSF customers who do not purchase an Infoprint Server license. It describes the tasks that are required to customize Infoprint Server, start and stop Infoprint Server, create PSF FSS and FSA definitions in the Printer Inventory, and diagnose problems in Infoprint Server.</td>
</tr>
<tr>
<td>z/OS Infoprint Server User's Guide</td>
<td>SA38-0695</td>
<td>Describes user tasks for Infoprint Server. This document describes how to submit print jobs from remote systems (including Windows systems), the local z/OS system, and Virtual Telecommunications Access Method (VTAM) applications. It describes z/OS UNIX commands; the AOPPRINT JCL procedure; the AOPBATCH program; DD and OUTPUT JCL parameters that Infoprint Server supports; and how to download and install the Infoprint Port Monitor for Windows.</td>
</tr>
</tbody>
</table>
### Table 2. Documents for Infoprint Server (continued)

<table>
<thead>
<tr>
<th>Document</th>
<th>Form number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>z/OS Infoprint Server Messages and Diagnosis</strong></td>
<td>GA32-0927</td>
<td>Describes messages from Infoprint Server. This document also describes how to use Infoprint Server tracing facilities to diagnose and report errors.</td>
</tr>
</tbody>
</table>

### Table 3. Documents for IBM transform products

<table>
<thead>
<tr>
<th>Document</th>
<th>Form number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IBM Infoprint Transforms to AFP for z/OS</strong></td>
<td>G550-0443</td>
<td>Describes IBM Infoprint Transforms to AFP for z/OS (5655-N60)</td>
</tr>
<tr>
<td><strong>IBM Print Transforms from AFP for Infoprint Server for z/OS</strong></td>
<td>G325-2634</td>
<td>Describes these products:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• IBM Print Transform from AFP to PCL for Infoprint Server for z/OS (5655-TF2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• IBM Print Transform from AFP to PDF for Infoprint Server for z/OS (5655-TF1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• IBM Print Transform from AFP to PostScript for Infoprint Server for z/OS (5655-TF3)</td>
</tr>
<tr>
<td><strong>IBM Infoprint XT for z/OS</strong></td>
<td>GI11-9492</td>
<td>Describes IBM Infoprint XT for z/OS (5655-O15)</td>
</tr>
</tbody>
</table>

### Table 4. Documents for Ricoh products

<table>
<thead>
<tr>
<th>Ricoh Document</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>InfoPrint Transform Manager for AIX, Linux, and Windows: Planning and Installing</strong></td>
<td>Describes InfoPrint Transform Manager and provides installation and configuration information about the product</td>
</tr>
<tr>
<td><strong>InfoPrint Transform Manager for Linux: afp2pdf Transform Installation and User’s Guide</strong></td>
<td>Describes the InfoPrint Transform Manager for Linux AFP to PDF transform</td>
</tr>
</tbody>
</table>

### Infoprint Server online help

The Infoprint Server ISPF panels contain integrated online help for each panel and field. To view the help, place your cursor on a panel or in a field on a panel and press the Help function key (F1).

Infoprint Central contains an integrated online help system. To view the general help system and help for individual web pages, select the question mark (?) on the title bar.

The `man` command provides online help for z/OS UNIX commands. The syntax is:

```bash
man command_name
```

TSO/E provides online help for the AOPCMND command. The syntax is:

```bash
HELP AOPCMND
```
How to send your comments to IBM

We appreciate your input on this publication. Feel free to comment on the clarity, accuracy, and completeness of the information or provide any other feedback that you have.

Use one of the following methods to send your comments:
1. Send an email to mhvrcfs@us.ibm.com.
2. Send an email from the "Contact us" web page for z/OS (http://www.ibm.com/systems/z/os/zos/webqs.html).

Include the following information:
• Your name and address.
• Your email address.
• Your telephone or fax number.
• The publication title and order number:
  z/OS V2R2 Infoprint Server User's Guide
  SA38-0695-01
• The topic and page number that is related to your comment.
• The text of your comment.

When you send comments to IBM, you grant IBM a nonexclusive right to use or distribute the comments in any way appropriate without incurring any obligation to you.

IBM or any other organizations use the personal information that you supply to contact you only about the issues that you submit.

If you have a technical problem

Do not use the feedback methods that are listed for sending comments. Instead, take one of the following actions:
• Contact your IBM service representative.
• Call IBM technical support.
Summary of changes

This section describes the release enhancements that were made.

z/OS Version 2 Release 2

The following changes are made for z/OS Version 2 Release 2.

New

- The IBM HTTP Server powered by Domino® that Infoprint Central previously used is replaced with the IBM HTTP Server - Powered by Apache. See “Infoprint Central” on page 23.
- Chapter 1, “Introducing Infoprint Server,” on page 1, which was omitted from the previous edition, is now in the publication.
- Two new job attributes are added so that IP PrintWay extended mode can include data from an existing text job attribute or a message inline at the beginning of each email. See “mail-inline-message” on page 70, “mail-inline-text-attribute” on page 71, and Table 21 on page 183.

Changed

- Information about Infoprint Central help is updated. See “Infoprint Server online help” on page xiv.
- The description of Infoprint Central in Chapter 1, “Introducing Infoprint Server,” on page 1, is updated.
- The location of Infoprint Port Monitor V3.1 files that are included with Infoprint Server are added to “Windows client” on page 6. Also, web pages for downloading the AFP Printer Driver and the AFP Viewer plug-in are updated.
- The results in “Send a file to an email destination specified in job attributes” on page 40 are updated.
- An AOPRINT example, “Print with error processing” on page 140, is updated.
- A note is added to “Using the LPR command” on page 166 that specifies the limit for sending print jobs.

Deleted

- References to “Windows Server 2003” and “Windows XP” as supported operating systems for Infoprint Port Monitor are removed.
- The “SNMP subagent” section is removed from Chapter 1, “Introducing Infoprint Server,” on page 1, because the aopsnmpd daemon is no longer supported in Infoprint Server V2R2. The SNMP subagent allowed the IBM Network Printer Manager (NPM) to manage PSF-driven printers. Now that most PSF-driven printers are TCP/IP-connected and have a built-in SNMP agent, the Infoprint server SNMP subagent is no longer used. As an alternative to using a network management system to monitor PSF-controlled printers, you can use Infoprint Central.
  Also, references to “Simple Network Management Protocol (SNMP) subagent”, “SNMP”, and “SNMP subagent” are removed from:
  - The Infoprint Server components that are listed after Figure 1 on page 2
  - Figure 2 on page 4 and the list of components in bullet 2
An example for the PRTATTRS JCL parameter is removed. See page 113.

A rule for storing SUBSYS attributes in an attributes file is deleted. See “JCL parameters for the Print Interface subsystem” on page 121.

z/OS Version 2 Release 1

Refer to the following publications for specific enhancements for z/OS Version 2 Release 1:

- z/OS Summary of Message and Interface Changes
- z/OS Introduction and Release Guide
- z/OS Planning for Installation
- z/OS Migration
Chapter 1. Introducing Infoprint Server

Infoprint Server supports LAN and host printing on your z/OS system. It works together with data stream transforms that other transform products provide. Figure 1 on page 2 shows how most of the components of Infoprint Server fit into your system. The components of Infoprint Server and the transform products are shaded. Components of Infoprint Server are displayed in yellow, while transform products are displayed in blue. Following the figure is a description of each component.
Printer Inventory and Printer Inventory Manager
The Printer Inventory Manager controls the Printer Inventory. The Printer Inventory consists of files in a z/OS UNIX file system (HFS or zFS) that contain information about printers and print jobs. The Printer Inventory also contains information about system configuration.

Infoprint Server Windows Client
The Infoprint Server Windows client consists of the Infoprint Port Monitor, which sends print requests and job attributes to Print Interface.
Print Interface
Print Interface processes print requests from remote clients and from the local z/OS system and allocates output data sets on the JES spool. Print Interface accepts various data formats and can transform input data streams to EBCDIC line data, ASCII text data, AFP, PCL, PostScript, PDF, or other data formats that the printer accepts. A separate transform product is required for some transforms.

NetSpool
NetSpool processes print requests from VTAM applications, such as CICS® and IMS™, and allocates output data sets on the JES spool. NetSpool accepts SCS, 3270, and binary data streams and can transform input data streams to EBCDIC line data, PCL, PDF, AFP, or other data formats that the printer accepts. A separate transform product is required for some transforms. However, a separate transform product is not required to convert input data streams to the line or PCL formats.

IP PrintWay
IP PrintWay transmits data sets from the JES spool to printers or print servers in a TCP/IP or SNA network and to email destinations. IP PrintWay accepts various data formats and can transform input data streams to ASCII text data, PCL, PostScript, PDF, or other data formats that the printer accepts. A separate transform product is required for some transforms.

Transform Interface
Transform Interface communicates with other transform products to transform data to another data format. It manages the transforms that run on z/OS, and it sends data to transforms that run on other systems, including Linux, AIX, and Windows systems.

Infoprint Central (not shown in figure)
Infoprint Central is a web-based application that lets help desk operators work with print jobs (output data sets) on the JES spool, printers that are controlled by IP PrintWay extended mode or PSF, and NetSpool logical units. It also lets operators check system status, view printer definitions, and view, start, and stop job selection rules.

Transforms (separate products)
Transform products can transform data streams from one data format to another. These products are separate from Infoprint Server.

PSF for z/OS (separate product)
PSF for z/OS can use system configuration information that is stored in the Printer Inventory. In addition, PSF V4R4 and later can write messages for print jobs and printers to the Infoprint Server common message log.

Printer Inventory Manager
The Printer Inventory Manager component of Infoprint Server controls the Printer Inventory. The Printer Inventory consists of Hierarchical File System (HFS) or z/OS File System (zFS) files that contain information about the printing environment. The administrator must create and manage information in the Printer Inventory.

Note: The Printer Inventory cannot be shared by Infoprint Server running at the same or different levels on other systems.

The objects in the Printer Inventory are:
Printer definitions
Contain information about printers and email destinations.

Printer pool definitions
Contain information about groups of printer definitions that you want to broadcast data to (applies only to NetSpool).

FSS definitions
Contain configuration information for IP PrintWay basic mode functional subsystems (FSSs) and PSF FSSs.

FSA definitions
Contain configuration information for IP PrintWay basic mode functional subsystem applications (FSAs) and PSF FSAs.

Job selection rules
Contain rules that IP PrintWay extended mode uses to determine which print jobs to select from the JES spool for printing.

System configuration definition
Contains configuration information for Infoprint Server. Infoprint Server creates this definition automatically. Administrators can modify it if the dynamic configuration function is enabled.

Figure 2 shows how the administrator can create objects in the Printer Inventory and which components of Infoprint Server use the Printer Inventory.

1. The administrator can use Infoprint Server ISPF panels and the Printer Inventory Definition Utility (PIDU) to create and maintain the Printer Inventory. PIDU is useful for creating many printer definitions at the same time and for backing up the Printer Inventory.

2. These Infoprint Server components use information in the Printer Inventory:
   - NetSpool uses information in printer definitions and in printer pool definitions.
   - Print Interface uses information in printer definitions.
IP PrintWay uses information in printer definitions. Also, IP PrintWay basic mode uses configuration information in FSS and FSA definitions, and IP PrintWay extended mode uses job selection rules.

Infoprint Central displays Printer Inventory information.

3. PSF and the AFP Download Plus feature of PSF can, as an option, use configuration information that is specified in FSS and FSA definitions in the Printer Inventory. For information, see z/OS Infoprint Server Printer Inventory for PSF. The system programmer can alternatively specify this configuration information in PSF and AFP Download Plus startup procedures and exits. When the printer configuration information is specified in the Printer Inventory:

- The information can be changed without restarting all FSAs in the FSS. Only the FSAs with changed configuration information need to be restarted.
- Authorized operators can use Infoprint Central to work with PSF printers. (Operators can work with AFP Download Plus senders in the same way they work with PSF printers.) For example, operators can start and stop (that is, drain) printers, change JES work-selection criteria, and turn TCP/IP-connected printers online and offline.
- PSF V4R4 and later can write messages for print jobs and printers to the Infoprint Server common message log. Authorized users can view these messages in Infoprint Central. Infoprint Server administrators can use the aoplogu command to select messages in a particular time range and copy them to a file or view them on the terminal.

More functions that the Printer Inventory Manager provides are:

Common message log
The common message log displays messages from Infoprint Server, from some transform products, and from PSF for z/OS V4R4 and later in one place. The log contains messages from all components of Infoprint Server except for IP PrintWay basic mode. For information about whether a transform can write messages to the common message log, see the documentation for the transform.

IP PrintWay extended mode writes its messages only to the common message log. Other components, such as NetSpool and Print Interface, write their messages to the common message log and also to other locations, such as the NetSpool message-log data set and the system console log.

You can view and process messages in the common message log in these ways:

- Authorized users can use Infoprint Central to view messages for selected print jobs, IP PrintWay printers, PSF printers, and NetSpool LUs.
- Infoprint Server administrators can use the aoplogu command to select messages in a particular time range and copy them to a file or view them on the terminal.

Hardcopy log
Infoprint Server administrators can select messages to send to the z/OS system log (SYSLOG) or operations log (OPERLOG) for message automation.

Historical Inventory
The Historical Inventory contains information about print jobs that Infoprint Server processed but that are no longer on the JES spool because
they finished processing or were deleted. Authorized users can use Infoprint Central to view information about these print jobs.

**Migration program**

The Infoprint Server migration program copies configuration information from PSF and AFP Download Plus startup procedures to the Printer Inventory. It automatically creates PSF FSS and FSA definitions in the Printer Inventory.

**Security**

You can use RACF® to restrict access to the Printer Inventory, the common message log, operator commands that start and stop Infoprint Server daemons, and Infoprint Central actions.

**Printer Inventory for PSF**

PSF customers who do not purchase an Infoprint Server license can specify PSF and AFP Download Plus configuration information in the Printer Inventory. For information, see [z/OS Infoprint Server Printer Inventory for PSF](#).

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**Windows client**

The Infoprint Server Windows client consists of this program:

**Infoprint Port Monitor for Windows**

Software that runs on a Windows workstation. You can use this program to print files on z/OS printers just like you print files on local Windows printers. You can submit the files from any Windows application that has a printing function. After the Infoprint Port Monitor is installed and configured on the Windows system, it automatically sends documents to the Print Interface component of Infoprint Server.


**Note:** Infoprint Port Monitor V3.1 can run on 32-bit Windows systems or on 64-bit Windows systems that are based on x64 architecture. However, it cannot run on 64-bit Windows systems that are based on Intel Itanium architecture.

Infoprint Port Monitor V3.1 is included with Infoprint Server at:

```
/usr/lpp/Printsrv/win/En_US/aopwin32.exe
```

You can also download the Infoprint Port Monitor ([http://www-01.ibm.com/support/docview.wss?uid=psd1P1000597](http://www-01.ibm.com/support/docview.wss?uid=psd1P1000597)).

**Note:** Infoprint Server also supports printing from a Windows system with the Server Message Block (SMB) protocol and the Internet Printing Protocol (IPP). To use the SMB and IPP protocols, Windows users do not need to install the Infoprint Port Monitor.

You might want to use these products if your installation has AFP printers or prints AFP documents:

**AFP Printer Driver for Windows**

Creates output files in AFP format. Files in AFP format can be printed on AFP printers. The driver can create output files that contain documents, overlays, or
page segments. It can also create inline form definitions for printing documents with special options, such as printing on both sides of the paper.

**AFP Viewer plug-in for Windows**

You can use this product to view documents in AFP format. For example, documents that are downloaded from the z/OS system or documents on the web. You can also use the viewer to print AFP documents on AFP printers and on non-AFP printers.

**Note:** You can download the AFP Printer Driver for Windows and the AFP Viewer plug-in for Windows from these websites:

- [Ricoh AFP Printer Driver website](http://support.rpp.ricoh-usa.com/internet/dcfdata.nsf/vwWeb/P4000384)
- [Ricoh AFP Viewer plug-in website](http://support.rpp.ricoh-usa.com/internet/dcfdata.nsf/vwweb/p4000233)

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**Print Interface**

The Print Interface component of Infoprint Server processes print requests received from both remote clients and local users. Figure 3 on page 8 shows the steps that occur from the time Print Interface receives a print request until it allocates an output data set on the JES spool. An explanation of each step follows.
1. Users can submit print requests and query job status from remote clients in the Internet Protocol network with one of these TCP/IP protocols:

**LPR protocol**

The LPR protocol is defined by RFC 1179. Clients that use this protocol include:

- The Infoprint Port Monitor for Windows. Infoprint Server provides this client (see “Windows client” on page 6).
- The `lprafp` command for Windows and UNIX systems. You can use this command to specify Infoprint Server job attributes. You can download the `lprafp` command from the z/OS downloads website [http://www.ibm.com/systems/z/os/zos/downloads/](http://www.ibm.com/systems/z/os/zos/downloads/) in the “As-is z/OS downloads” section, select Infoprint Server for z/OS.
- TCP/IP commands such as `lpr`, `enq`, and `lpq`.
- An SAP R/3 application server that runs on a remote system.

**Internet Printing Protocol (IPP)**

IPP is a standard protocol for printing over the Internet. An IPP client must run in the remote system.

**Server Message Block (SMB) printing protocol**

SMB is the standard printing protocol that Windows systems use. The
z/OS SMB server must be installed on the z/OS system to receive print requests. The z/OS SMB server uses Print Interface callable services to allocate output data sets on the JES spool and return print job status to the client.

2. Users can submit print requests from the local z/OS system with one of these methods:

**Print Interface subsystem**

By using the Print Interface subsystem, you can transform and print output data that is created by a batch application with minimal changes to your JCL.

**AOPPRINT**

By using the AOPPRINT JCL procedure, you can print existing MVS™ data sets and UNIX files.

**z/OS UNIX printing commands (lp, lpstat, and cancel) that Infoprint Server provides**

By using these commands, you can print MVS data sets and UNIX files, query the status of a print job, and cancel a print job. You can run these commands from the z/OS UNIX command line or from a UNIX application.

**Infoprint Server SAP Output Management System (OMS)**

By using the Infoprint Server SAP OMS and the SAP R/3 Application Server for z/OS, SAP R/3 users can submit a print job and receive immediate notification about job events.

3. Print Interface runs as a UNIX application that uses the services of z/OS UNIX System Services.

Print Interface accepts data in any format, including but not limited to these formats: line data, MO:DCA-P (also known as AFP), PostScript, PDF, PCL, SAP (OTF and ABAP), XML, and text.

4. Each print request specifies the name of a printer definition in the Printer Inventory. The printer definition can describe a printer or an email destination. Print Interface uses information in the printer definition to determine items, such as how to process the data or whether to transform the data.

5. Print Interface can, in most cases, automatically detect the data format of the input data and validate that the printer accepts that data format. Print Interface can convert data between EBCDIC and ASCII. Also, it can use other transform products to transform data into other formats for printing or emailing.

6. For each print request, Print Interface dynamically allocates an output data set on the JES2 or JES3 spool. In a JES2 environment, you can request that Print Interface allocate output data sets on the spool of the primary JES2 subsystem or a secondary JES2 subsystem. Print Interface uses JES allocation parameters that are specified in the printer definition, including:

- JES work-selection parameters, such as class, forms name, and destination. These parameters cause JES to direct the output data sets to the correct program, such as PSF or IP PrintWay.
- Advanced Function Presentation (AFP) parameters, such as the name of a form definition and page definition. PSF uses these parameters when printing data on AFP printers.

Some additional functions that Print Interface provides include:
Transforms
Print Interface can transform data to line data or text format without using a separate transform product. It can:
- Transform text data into line data for printing on AFP printers.
- Transform line data (for example, in a sequential data set or a partitioned data set) into text data for printing on a network printer or emailing.

Print Interface can also transform data to AFP format for printing on AFP printers, and it can transform data to PCL, PostScript, or PDF format for printing or emailing. To do these transforms, Print Interface can use the transform products that are described in “Transforms” on page 22.

Validation of print requests
Print Interface can validate, with some exceptions, that the document can print as requested on the selected printer. For example, Print Interface can reject documents with data formats that the printer does not support or that are too large to print on the selected printer.

Notification of completion
Print Interface can notify users on the local z/OS system when document processing is complete and the data set is removed from the JES spool. It can also notify users who request mail notification with a command, such as `lpr`, that uses the LPR to LPD protocol.

Operator control
The operator can use tools, such as SDSF and Infoprint Central, to find output data sets that Print Interface writes to the JES spool. Infoprint Central can display additional status, such as whether the output data sets (called print jobs) are completed successfully, are retained because of failed transmission to LAN printers, or are deleted before printing.

Identification of output
Print Interface retains the user ID of the job submitter for printing on separator pages and for display on the JES spool, so that the user ID can be printed on separator pages and the operator can see the name of the job submitter when the data set is on the JES spool.

Double-byte character set (DBCS) support
Print Interface can convert DBCS data from one code page to another before it writes the data to the JES spool.

Filters
You can write filter programs to modify data before Print Interface writes the data to the JES spool. For example, a filter can add separator pages or transform data from one format to another.

SAP Output Management System (OMS)
Print Interface provides an SAP OMS with a Callback daemon to support printing with the SAP R/3 Application Server for z/OS. SAP users can use the OMS and Callback daemon to print, cancel jobs, obtain job status, and receive immediate notification about job events.

The SAP-certified functions that Print Interface provides are:
- OMS Polling Interface
- OMS/XOM Callback Interface
- OMS Operations Supplement

For more information about SAP certification, see the SAP website. “Print Interface with an SAP R/3 application server on the z/OS system” on page 11 describes this support.
The Print Interface LPD can print documents that are received from an SAP R/3 application server that is running on another system, such as an AIX or Windows system. "Print Interface with an SAP R/3 application server on a remote system" on page 12 describes this support.

Print Interface with an SAP R/3 application server on the z/OS system

Figure 4 shows how the Print Interface SAP Output Management System (OMS), Callback daemon, and the SAP R/3 Application Server for z/OS fit into your system. When the SAP R/3 Application Server runs on the same z/OS system, the Print Interface OMS receives print and status requests, and the Callback daemon provides immediate notification of job events. The SAP R/3 Application Server for z/OS and its spool work process must run on the same system as Infoprint Server. The Print Interface Callback daemon can return notification of job events to SAP R/3 application servers that run on other SAP R/3 systems, if the SAP spool work process runs on the z/OS system.

Figure 4. Printing SAP R/3 documents with an SAP R/3 application server that runs on a z/OS system
1. From an SAP R/3 GUI, users make print, cancel, job query, and device query requests to the SAP R/3 Application Server. These print requests specify the name of an SAP R/3 output device that is defined to the SAP R/3 system. The SAP administrator associates each output device with a printer definition in the Infoprint Server Printer Inventory.

2. For a status request, the Print Interface SAP OMS returns the status of a print job or a list of print jobs that the printer is processing.

3. For a print request, Print Interface automatically detects the data format. It calls Transform Interface to transform the data to another format if the administrator specified a filter in the printer definition. For example, if the data format is PCL or PostScript, Transform Interface can call the PCL to AFP transform or the PostScript to AFP transform to transform the data to AFP format for printing on an AFP printer.

4. Print Interface creates an output data set on the JES spool. From the JES spool, IP PrintWay, PSF, or JES can print the document.

5. IP PrintWay selects data sets from the JES spool and transmits them to remote printers, print servers, or email destinations.

6. PSF selects data sets from the JES spool and prints them on AFP printers. The printers can be local, TCP/IP-attached, or SNA-attached.

7. As print jobs complete (successfully or unsuccessfully), the Print Interface SAP callback daemon sends notification back to the SAP R/3 system.

Print Interface with an SAP R/3 application server on a remote system

Figure 5 on page 13 shows how the Print Interface LPD and an SAP R/3 application server that runs on a remote system (such as AIX or Windows) fit into your system. When no SAP R/3 application server is running on the z/OS system, the Infoprint Server LPD (as opposed to the Infoprint Server OMS) receives print and status requests, and notification of job events does not occur.
1. From an SAP R/3 GUI, users make print, cancel, job query, and device query requests to an SAP R/3 application server that runs on a remote system such as Windows, AIX, or Solaris. These print requests specify the name of an SAP R/3 output device that is defined to the SAP R/3 system. The SAP administrator associates each output device with a printer definition in the Infoprint Server Printer Inventory.

2. For a status request, the Print Interface LPD returns the status of a print job or a list of print jobs that the printer is processing.

3. For a print request, Print Interface automatically detects the data format. It calls Transform Interface to transform the data to another format if the administrator specified a filter in the printer definition. For example, if the data format is PCL or PostScript, Transform Interface can call the PCL to AFP transform or the PostScript to AFP transform to transform the data to AFP format for printing on an AFP printer. The transform that you need depends on the type of output the SAP R/3 output device creates.
4. Print Interface creates an output data set on the JES spool. From the JES spool, IP PrintWay, PSF, or JES can print the document, or IP PrintWay can send it to an email destination.

5. IP PrintWay selects data sets from the JES spool and transmits them to remote printers or print servers or sends them to email destinations.

6. PSF selects data sets from the JES spool and prints them on AFP printers. The printers can be local, TCP/IP-attached, or SNA-attached.

NetSpool

The NetSpool component of Infoprint Server intercepts print data from VTAM applications, such as CICS and IMS; transforms the data streams to EBCDIC line data, PCL, PDF, or other formats that the printer accepts; and creates output data sets on the JES2 or JES3 spool. You can configure NetSpool so that you do not need to change existing VTAM applications. That is, existing VTAM applications can send print requests to NetSpool in the same manner as they currently send print requests to SNA network printers.

Figure 6 shows the steps that occur from the time VTAM applications send print requests to NetSpool printer logical units (LUs) until NetSpool allocates output data sets on the JES spool. An explanation of each step follows.

1. VTAM applications, such as CICS or IMS, establish communication sessions with NetSpool printer logical units (LUs) instead of with SNA-network printers. Each NetSpool printer LU must be defined to VTAM as an application logical-unit (LU).

   NetSpool can process these types of VTAM data streams:
• SNA character string (SCS) data over an LU type 1 session
• 3270 data over an LU type 3 or LU type 0 session
• A binary data stream over an LU type 0, type 1, or type 3 session

2. NetSpool runs as a VTAM application on the same or different z/OS system. NetSpool can process VTAM print requests sent to different NetSpool printer LUs.

3. The administrator defines each NetSpool printer LU in a printer definition or printer pool definition in the Printer Inventory. NetSpool uses information in the printer definition to format data into lines and pages, transform data to a format that the printer accepts, and group the data into output data sets.

4. NetSpool can transform SCS and 3270 data streams to EBCDIC line data or ASCII PCL data streams. Also, it can use other transform products to convert line data to other formats for printing or emailing.

5. NetSpool dynamically allocates output data sets on the JES2 or JES3 spool with JES allocation parameters that are specified in the printer definition, including:
   • JES work-selection parameters, such as class, forms name, and destination. These parameters cause JES to direct the output data sets to the correct program, such as IP PrintWay or PSF.
   • Advanced Function Presentation (AFP) parameters, such as the name of a form definition and page definition. PSF can use these parameters when printing data on AFP printers.
   • Distribution information, such as name and address, which can be printed on output header pages.

More functions that NetSpool provides are:

Transforms

NetSpool can transform data to line data or PCL format without using a separate transform product. It can:
• Transform SCS and 3270 data streams into line data streams. Line data can be printed on AFP printers.
• Transform SCS and 3270 data streams into PCL data streams. PCL data can be printed on network printers.

For information about how NetSpool transforms SCS and 3270 data streams to line or PCL format, see z/OS Infoprint Server User’s Guide.

NetSpool can transform data to PDF or PostScript format by using one of the transform products that are described in “Transforms” on page 22 (NetSpool first transforms SCS and 3270 data to line data, and then uses the transform).

Validation of print requests

NetSpool can validate, with some exceptions, that the document can print as requested on the selected printer. For example, NetSpool can reject documents that are too large to print on the selected printer.

Operator control

The operator can control NetSpool LUs from Infoprint Central, from the system console, or from extended MCS consoles. For example, the operator can display the status of NetSpool LUs, stop them, and start them.

The operator can use tools such as SDSF and Infoprint Central to find output data sets that NetSpool writes to the JES spool. Infoprint Central can display additional status such as whether the output data sets (called
print jobs) completed successfully, were retained because of failed transmission to LAN printers, or were deleted before printing.

Broadcasting output
You can print output to several printers at the same time. Also, you can print output and send it to email destinations at the same time. To do this, the administrator creates a printer pool definition in the Printer Inventory. When VTAM application data is submitted to a printer pool definition, NetSpool creates multiple output data sets on the JES spool.

Exits and filters
System programmers can write and install exits to customize NetSpool processing. NetSpool exits can add data to the beginning of output data sets, map graphic escape characters to other printable characters, and modify or delete transparent data in SCS data streams. System programmers can also write filter programs to provide their own data stream transforms.

Binary data support
The administrator can request in the printer definition that NetSpool treat the data stream as binary data. NetSpool writes binary data to the output data set as variable length records without formatting the data and without rejecting unsupported commands, orders, or data. This function is useful if you want to pass through all data without change and without including transparent (TRN) controls.

Owner and job attribute support
VTAM application programmers can embed the owner job attribute and other Infoprint Server job attributes in the application’s print data that is sent to NetSpool. Application programmers might want to embed the owner job attribute to help identify the owner of printed output or the user to charge in an accounting system for printing jobs. Application programmers might want to embed other job attributes, such as forms, page-definition, or form-definition. Also, the administrator can specify a NetSpool default owner in the printer definition.

IP PrintWay
The IP PrintWay component of Infoprint Server transmits output data sets from the JES spool to remote printers or print servers and to email destinations. You can run either IP PrintWay basic mode or IP PrintWay extended mode:

- IP PrintWay basic mode, the original mode of operation, uses the z/OS Functional Subsystem Interface (FSI) to obtain output data sets from the JES spool. IBM does not plan more enhancements to IP PrintWay basic mode.
- IP PrintWay extended mode uses the z/OS SYSOUT Application Programming Interface (SAPI) to obtain output data sets from the JES spool. It provides better performance, improved usability, and more function than IP PrintWay basic mode.

IP PrintWay basic mode and IP PrintWay extended mode use the same printer definitions in the Printer Inventory.

IP PrintWay can use one of these protocols to transmit output data sets to printers:

LPR
The LPR protocol is a TCP/IP protocol that is defined by RFC 1179. An LPD that adheres to RFC 1179 must be running in the remote printer or system.
Direct-sockets
The direct sockets printing protocol is a TCP/IP protocol in which data is transmitted directly to a designated port. The remote printer or print server must support direct sockets printing.

Internet Printing Protocol (IPP)
IPP is a standard TCP/IP protocol for printing over the Internet. An IPP Server must be running in the remote printer or system.

Virtual Telecommunications Access Method (VTAM)
IP PrintWay can print on printers that are defined to VTAM as LU type 0, LU type 1, or LU type 3. Supported output data streams are SNA character string (SCS) and Data Stream Compatible/Data Stream Extended (DSC/DSE).

Infoprint Coaxial Printer Support for z/OS (5655-N62) is required to print on VTAM controlled printers.

Email
IP PrintWay can use the z/OS UNIX sendmail function to send print output to one or more email addresses. IP PrintWay can optionally transform the output to another format with a separate transform product. It can send the output as an email attachment or include text and line data inline in the body of the email. You can specify the recipients of the email in a header in the document, in JCL parameters on the OUTPUT JCL statement, in Infoprint Server job attributes, or in the printer definition. You can also specify a standard greeting in the printer definition.

Tip: IP PrintWay basic mode cannot transmit data sets larger than 2 gigabytes to a remote LPD. Also, depending on the IP PrintWay options the administrator selects in the printer definition, IP PrintWay basic mode might not be able to transmit data sets larger than 2 gigabytes to a remote printer that uses the IPP or direct-sockets printing protocol, or to email destinations. This restriction does not apply to IP PrintWay extended mode.

Figure 7 on page 18 shows the steps that occur from the time IP PrintWay selects output data sets from the JES spool until it transmits them to the printer or email destination and then deletes them from the JES spool. An explanation of each step follows.
1. IP PrintWay selects output data sets from the JES2 or JES3 spool. IP PrintWay can select output data sets that were allocated on the JES spool by NetSpool or Print Interface, or data sets submitted from z/OS batch jobs with JCL. The data sets can contain line data, ASCII text data, or formatted data, such as PCL, PostScript, SAP, or MO:DCA-P (AFP) data.

2. IP PrintWay extended mode uses the SAPI interface to select output data sets from the JES2 or JES3 spool. IP PrintWay basic mode runs as a JES functional subsystem (FSS). An IP PrintWay basic mode functional subsystem application (FSA) uses the FSI interface to select output data sets from the JES spool.

   In a JES2 environment, you can configure IP PrintWay to select output data sets from the spool of either the JES2 primary subsystem or a JES2 secondary subsystem.

3. IP PrintWay uses information in printer definitions in the Printer Inventory to process data sets, select the transmission protocol, and obtain printer addresses. IP PrintWay can, instead, use the printer’s IP address that is specified on the OUTPUT JCL statement or in an Infoprint Server job attribute.

   IP PrintWay recognizes data sets allocated on the JES spool by Print Interface and NetSpool and does not convert data from EBCDIC to ASCII or format the data if Print Interface or NetSpool is already converted data to ASCII. For other data sets, IP PrintWay can convert data between EBCDIC and ASCII, can add a header to each page, and can format data with the carriage-control characters in line data, an FCB, or pagination attributes that are specified in the printer definition.

4. In most cases, IP PrintWay extended mode can automatically detect the input data format and transform data into the format that is required by the printer.
or email destination. IP PrintWay basic mode can transform data by resubmitting the data stream to Print Interface. To do transforms, IP PrintWay uses transforms that other transform products provide.

5. When you run IP PrintWay extended mode, operators can use Infoprint Central to work with output data sets that IP PrintWay is processing or retained on the JES spool. In addition, you can use Infoprint Central to work with data sets that IP PrintWay has not yet selected for processing.

When you run IP PrintWay basic mode, the IP PrintWay transmission queue data set contains information about output data sets that IP PrintWay is processing or retained on the JES spool. Operators must use Infoprint Server ISPF panels to manage these data sets.

6. IP PrintWay transmits data sets to the printer, print server, or email destination with the protocol that is selected in the printer definition: LPR, direct sockets, IPP, email, or VTAM. IP PrintWay can also transmit LPD options and IPP job attributes to the printer's LPDs and IPP Servers. For example, IP PrintWay can transmit information that the LPD prints on a separator page.

More functions that IP PrintWay provides include:

**Retry**

IP PrintWay can try an unsuccessful transmission again for a specified number of times at a specified interval. Retry limits and retry times can be specified in the printer definition and on an OUTPUT JCL statement. In addition to the requested retransmissions, IP PrintWay tries an unsuccessful transmission automatically for a short time after transmission.

If an error occurs in the middle of a print job, IP PrintWay restarts printing from the beginning of the print job. However, IP PrintWay extended mode can restart printing after the last page that printed successfully if the printer supports Hewlett Packard (HP) Printer Job Language (PJL) and the direct sockets printing protocol. The administrator must request in the printer definition that IP PrintWay extended mode restart printing after the last successful page.

**Retention of jobs on the JES spool**

After successfully transmitting each data set, or after it completes the requested number of transmission attempts, IP PrintWay can retain the data set on the JES spool forever or for a specific time. Retention periods can be specified in the printer definition or on an OUTPUT JCL statement.

**Transforms**

IP PrintWay can transform line data to text format for printing on a network printer or emailing without using a separate transform product.

IP PrintWay can transform data to PCL, PDF, or PostScript format for printing or emailing by using one of the transform products that are described in “Transforms” on page 22.

**Validation of print requests**

IP PrintWay extended mode can validate, with some exceptions, that the document can print as requested on the selected printer. For example, IP PrintWay extended mode can reject documents with data formats that the printer does not support or that are too large to print on the selected printer.

**Operator control**

When you run IP PrintWay extended mode, the operator can use tools, such as SDSF and Infoprint Central, to work with output data sets (called print jobs) that are intended for IP PrintWay or that IP PrintWay retained. In addition,
you can use Infoprint Central to delete, hold, and move print jobs that IP PrintWay extended mode is processing. Infoprint Central can display additional status, such as whether the print jobs are completed successfully, were retained because of failed transmission to LAN printers, or were deleted before printing.

When you run IP PrintWay basic mode, the operator must use Infoprint Server ISPF panels to work with output data sets that IP PrintWay is processing or retained on the JES spool.

Job selection rules
When you run IP PrintWay extended mode, the administrator defines job selection rules in the Printer Inventory to specify which print jobs to select. The operator can use Infoprint Central to start and stop these job selection rules, or the administrator can automate the starting and stopping of job selection rules.

Printer selection using an OUTPUT JCL statement
On an OUTPUT JCL statement, a user can select the printer definition by specifying either the name of the printer definition in the FSSDATA parameter or the DEST, CLASS, or FORMS parameter (or a combination of these parameters) associated with the printer definition.

Users can also specify the IP address for the printer directly on the OUTPUT JCL statement, thereby eliminating the need for the administrator to create a printer definition for each printer in the Printer Inventory.

SMF accounting
For each data set processed, IP PrintWay writes a System Management Facilities (SMF) type 6 record. The SMF type 6 record identifies the job submitter and the address of the printer. It also contains the number of bytes that were transmitted to the printer. IP PrintWay extended mode records additional information in the type 6 record. For example, IP PrintWay extended mode includes accounting information from the JOB JCL statement and the number of pages that printed successfully if the printer supports Hewlett Packard (HP) Printer Job Language (PJL) and the direct sockets printing protocol. The administrator must request in the printer definition that IP PrintWay extended mode record the number of pages.

Exits and filters
You can use IP PrintWay to write exits to customize IP PrintWay processing. For example, exits can change the IP address of the remote printer, add separator pages, specify printer commands in document headers and trailers, and modify SMF accounting records. You can also write filter programs to provide your own data stream transforms.

Transmission order
IP PrintWay preserves the order of the data sets on the JES spool when it transmits data sets. IP PrintWay retains this order even if the transmission of the data sets must be tried again. If a JES output group contains more than one output data set, IP PrintWay acquires all of the data sets in the output group before it transmits any of them and can transmit these data sets to the printer as a single file. Although the data sets are a single file, each data set starts printing on a new page.

Printer commands
The administrator can specify printer commands for IP PrintWay to send to the printer before or after the data to be printed. Printer commands can be used to change fonts or switch between simplex and duplex printing. The
Transform Interface

The Transform Interface component of Infoprint Server communicates with transforms that transform products provide. Transforms convert data from one format to another, for example, from PCL to AFP format and from AFP to PDF format.

Transform Interface can communicate with transforms that run on the z/OS system and on non-z/OS systems. For a list of the transform products that Transform Interface supports, see “Transforms” on page 22.

Figure 8 shows how Transform Interface fits into your system. An explanation of each step follows.

1. When they process a print request, Print Interface, NetSpool, and IP PrintWay extended mode call Transform Interface to transform data from one format to another if the administrator specifies a transform filter in the printer definition. The administrator can specify a different transform filter for each data format. Infoprint Server and other transform products provide these transform filters:

- Some transform products provide transform filters. For example, Infoprint Transforms to AFP for z/OS provides the pdf2afp.dll filter, which transforms data from PDF to AFP.
- aoprxf.so: This filter sends data to Ricoh InfoPrint Transform Manager for Linux to be transformed.
- aoprfm.dll: This filter sends data to Ricoh InfoPrint Manager for AIX or Windows for transform.

Tip: IP PrintWay basic mode transforms data by resubmitting it to the Print Interface component. This function is called the resubmit for filtering function.

2. z/OS job submitters can specify one of these z/OS UNIX commands to transform data without printing it:
A transform command: IBM transform products provide z/OS UNIX transform commands (such as pdf2afp).

\texttt{remotexf} command: This command sends data to Ricoh InfoPrint Transform Manager for Linux for transform.

3. Transform Interface communicates with the transform:
   - If the transform runs on z/OS, the Infoprint Server Transform Manager (part of Transform Interface) starts and stops the transform daemons with configuration information that is specified by the administrator.
   - If the transform runs on a non-z/OS system, the Infoprint Server Transform Interface sends the data to the transform.

4. The transform converts the data from one format to another.

## Transforms

IBM provides several separately priced transform products that convert data from one format to another. These products run on the z/OS system. Ricoh provides other transform products that run on other systems.

Table 5 lists the transform products that you can use with Infoprint Server, the transforms that each product provides, and where you can find more information about the transforms and how to customize them.

### Table 5. Transforms that work with Infoprint Server

<table>
<thead>
<tr>
<th>Transform product</th>
<th>Transform</th>
<th>For information, see:</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBM Infoprint Transforms to AFP for z/OS (5655-N60)</td>
<td>PCL to AFP</td>
<td>IBM Infoprint Transforms to AFP for z/OS</td>
</tr>
<tr>
<td></td>
<td>PDF to AFP</td>
<td></td>
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<tr>
<td></td>
<td>PostScript to AFP</td>
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<tr>
<td></td>
<td>SAP to AFP</td>
<td></td>
</tr>
<tr>
<td>IBM Print Transform from AFP to PCL for Infoprint Server for z/OS (5655-TF2)</td>
<td>AFP to PCL</td>
<td>IBM Print Transforms from AFP for Infoprint Server for z/OS</td>
</tr>
<tr>
<td>IBM Print Transform from AFP to PDF for Infoprint Server for z/OS (5655-TF1)</td>
<td>AFP to PDF</td>
<td>IBM Print Transforms from AFP for Infoprint Server for z/OS</td>
</tr>
<tr>
<td>IBM Print Transform from AFP to PostScript for Infoprint Server for z/OS (5655-TF3)</td>
<td>AFP to PostScript</td>
<td>IBM Print Transforms from AFP for Infoprint Server for z/OS</td>
</tr>
<tr>
<td>IBM Infoprint XT for z/OS (5655-O15)</td>
<td>Xerox to AFP</td>
<td>IBM Infoprint XT for z/OS</td>
</tr>
<tr>
<td>Ricoh InfoPrint Transform Manager for Linux</td>
<td>PCL to AFP</td>
<td>Infoprint Transform Manager for AIX, Linux, and Windows Planning and Installing</td>
</tr>
<tr>
<td></td>
<td>GIF to AFP</td>
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<td></td>
<td>JPEG to AFP</td>
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<tr>
<td></td>
<td>PCL to AFP</td>
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<td></td>
<td>PDF to AFP</td>
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<td></td>
<td>PostScript to AFP</td>
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<tr>
<td></td>
<td>TIFF to AFP</td>
<td></td>
</tr>
<tr>
<td>Ricoh InfoPrint Manager for AIX</td>
<td>PCL to AFP</td>
<td>Infoprint Manager for AIX: Procedures</td>
</tr>
<tr>
<td></td>
<td>PDF to AFP</td>
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<tr>
<td></td>
<td>PostScript to AFP</td>
<td></td>
</tr>
</tbody>
</table>
Table 5. Transforms that work with Infoprint Server (continued)

<table>
<thead>
<tr>
<th>Transform product</th>
<th>Transform</th>
<th>For information, see:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ricoh InfoPrint Manager for Windows</td>
<td>PCL to AFP</td>
<td>Infoprint Manager for Windows: Procedures</td>
</tr>
<tr>
<td></td>
<td>PDF to AFP</td>
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<tr>
<td></td>
<td>PostScript to AFP</td>
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</tbody>
</table>

Infoprint Central

Infoprint Central is a web-based print management system primarily for help desk operators. However, authorized job submitters can also use it. Infoprint Central requires the IBM HTTP Server - Powered by Apache and a web browser. No applications other than a web browser need to be installed on users' workstations.

With Infoprint Central you can:

**Work with print jobs**

You can work with print jobs on the JES spool, including Time Sharing Option (TSO) output jobs. Plus, you can see more information about print jobs that Infoprint Server or PSF V4R4 and later processed. For example, you can see whether a print job completed successfully and where it printed - even if the print job is no longer on the JES spool.

You can use several different search criteria to find print jobs. After you find a print job, you can delete, hold, release, move, or change the priority of the print job. And, you can see all messages in the common message log for the print job.

Tip: A print job consists of one or more output data sets submitted together in the same batch job. In JES2, a print job is called an output group.

**Work with printers**

You can work with printers that are defined in the Printer Inventory - including AFP printers that PSF for z/OS controls (called PSF printers), and TCP/IP-attached and SNA-attached printers to which IP PrintWay extended mode sends print jobs (called IP PrintWay printers). You can find and work with IP PrintWay printers only when you run IP PrintWay extended mode.

You can also work with PSF AFP Download Plus senders as if they were PSF printers. An AFP Download Plus sender sends print jobs to a receiver on another system for printing, emailing, or faxing.

You can use various search criteria to find printers. After you find a printer, you can see its status, the printer's job queue, and other properties of the printer. You can do these printer actions:

- PSF printers: Start, stop, space, interrupt, pause (JES2 only), ping, turn online, turn offline, and reset. Also, you can change forms and other job selection criteria, see all messages from PSF V4R4 and later for that one printer, and link to the printer's web page. If the PSF printer is an AFP Download Plus sender, you can do a limited set of PSF printer actions.
- IP PrintWay printers: Start, stop, redirect, restore, ping, turn online, turn offline, and reset. Also, you can see all the messages from Infoprint Server for that one printer, and you can link to the printer's web page.

Some printer actions (ping, turn online, turn offline, and reset) are available only for TCP/IP-attached printers.
Work with NetSpool logical units
You can work with any NetSpool logical units (LUs) that are defined to NetSpool in the Printer Inventory and also defined to VTAM.

You can find LUs by name. After you find a NetSpool LU, you can start and stop it. When you start an LU, that LU is started in both Infoprint Server and VTAM. Likewise, when you stop an LU, that LU is stopped in both Infoprint Server and VTAM. Also, you can display information about the current VTAM session that is established with a NetSpool LU.

You cannot work with NetSpool LUs if more than one NetSpool task uses the same Printer Inventory. Instead, you must use NetSpool commands and VTAM commands.

Display printer definitions
You can display the properties of any printer definition in the Printer Inventory. You can use various search criteria to find printer definitions, including the printer definition name and the printer's location. This can help you find the name of a printer in your area.

Manage IP PrintWay job selection rules
You can display the job selection rules that are defined in the Printer Inventory. IP PrintWay selects only print jobs whose properties match all of the criteria in a started job selection rule. In addition, you can start and stop IP PrintWay job selection rules to change which print jobs IP PrintWay processes.

Check system status
You can see the status of all Infoprint Server daemons and tasks to help determine the cause of a printing problem.

More functions that Infoprint Central provides are:

Security
You can authorize access to Infoprint Central by configuring IBM HTTP Server - Powered by Apache so that it uses an authorized user ID that is authenticated by a z/OS security manager, such as RACF. In addition, you can use RACF to restrict access to print jobs, IP PrintWay printers, PSF printers, NetSpool logical units, IP PrintWay job selection rules, and Infoprint Server daemons.

Auditing
You can find out who used Infoprint Central to do actions on print jobs, IP PrintWay printers, PSF printers, and NetSpool LUs. For example, a message in the log for an Infoprint Server print job identifies who deleted the print job.

Tip: When you log on to Infoprint Central, you can log on to only one z/OS system. You can see all the print jobs, printer queues, and Infoprint Server messages for that one z/OS system only. To see print jobs, printer queues, and messages for more than one system, you can open separate instances of your web browser and log on to several z/OS systems at a time.
Chapter 2. Using Infoprint Server z/OS UNIX commands

Infoprint Server provides these z/OS UNIX commands for printing and transforming documents:

- “cancel--Cancel a print job” on page 30
- “lp--Print a file” on page 32
- “lpstat--Show printer names and locations and status of print jobs” on page 42
- “remotext--Transform data remotely” on page 47

By using the commands, you can:

- Cancel print jobs.
- Print UNIX files and MVS data sets on any printer that your administrator defines in a printer definition in the Infoprint Server Printer Inventory. The printers can be local printers that are attached directly to z/OS, or remote printers in a TCP/IP or SNA network.
- Send UNIX files and MVS data sets to any email destination that your administrator defines in a printer definition in the Infoprint Server Printer Inventory.
- Show printer names and locations and status of print jobs.
- Transform data from one format to another remotely using InfoPrint Transform Manager for Linux transforms.

The commands provide enhanced functions over the commands of the same name that are described in z/OS UNIX System Services Command Reference. For example, you can:

- Specify options such as duplexing or a special overlay.
- Display the status of your print request.
- Cancel a print request.

You do not need to change the printing commands in your UNIX applications when you port them to z/OS because the commands conform to the UNIX standards:

- The cancel and lpstat commands conform to the X/Open Portability Guide Issue 4 Version 2 (XPG4.2) standard.

Online help for Infoprint Server commands

To get online help about Infoprint Server commands, use the man command. You can view man pages only in English. If the correct man pages are not displayed, specify this path on the -M option of the man command, or add it to your MANPATH environment variable ahead of other values:

/usr/lpp/Printsrv/man/En_US
Messages sent from Infoprint Server commands

The Infoprint Server commands send messages to your console. These commands can send messages in English or Japanese. If the messages do not appear in the language you want, add one of these values to your NLSPATH environment variable ahead of the other values in the environment variable:

**English**

```
/usr/lpp/Printsrv/En_US/%N
```

**Japanese**

```
/usr/lpp/Printsrv/Ja_JP/%N
```

In addition, the LANG environment variable controls the language that is used for messages from InfoPrint Transform Manager for Linux.

Transforming files to and from AFP format

Usually, you do not have to worry about transforming your data to another format. If a transform product is installed, Infoprint Server automatically calls the appropriate transform when you submit a print request to a printer definition (for a printer or an email destination) that your administrator configures for transformation.

However, you might want to transform a file without printing it in these situations:

- You intend to print a file many times. In this case, it is more efficient to transform the file once and print the output than to transform the file every time you print it.
- You want to present your document on the web.

Transforms to AFP format

While you use Infoprint Server to submit data in many different formats, Advanced Function Presentation (AFP) printers print the AFP data stream.

**Tip:** Documents in AFP format are also called *Mixed Object Document Content Architecture for Presentation (MO:DCA-P)* documents.

These IBM transform products can convert files to AFP format from non-AFP data streams, such as PCL, PDF, and PostScript:

- IBM Infoprint Transforms to AFP for z/OS (5655-N60)
- IBM Infoprint XT for z/OS (5655-O15)

Transforms from AFP format

IBM transform products can convert files from AFP format into PCL, PDF, and PostScript. You use them to print files in AFP format on PCL and PostScript printers, and transform an AFP file to PDF format for viewing on a workstation.

These IBM transform products can convert files from AFP format:

- IBM Print Transform from AFP to PCL for Infoprint Server for z/OS (5655-TF2)
- IBM Print Transform from AFP to PDF for Infoprint Server for z/OS (5655-TF1)
- IBM Print Transform from AFP to PostScript for Infoprint Server for z/OS (5655-TF3)
How do you...

This section explains what Infoprint Server command you need to use for a printing task and sends you to the right place to get more information.

Print a file?
To print one or more files, use the **lp** command. For example, to print three copies of `myfile1` and `myfile2` on Printer2, which is defined in the Infoprint Server Printer Inventory, enter:

```
lp -d Printer2 -n 3 myfile1 myfile2
```

For more information, see "lp--Print a file" on page 32.

Send a file to an email destination?
To send one or more files to an email destination instead of to a printer, use the **lp** command. Infoprint Server can first transform data in the files into a format that is suitable for viewing; for example, into PDF format.

For example, to send files `myfile1` and `myfile2` to email destination dept123, which is defined in the Infoprint Server Printer Inventory, enter:

```
lp -d dept123 myfile1 myfile2
```

The recipients that are listed in the printer definition receive two separate emails.

For more information, see "lp--Print a file" on page 32.

Print or email files with special requirements?
You can use Infoprint Server job attributes to describe special requirements. Attributes specify things like these:

• Whether to print on one or both sides of the paper
• Resources like fonts, page definitions, form definitions, and overlays
• Text to print on the separator sheet or the subject of the email

Use the **-o** option of the **lp** command to specify attribute values when you print a file or send a print file to an email destination. For example, you want to print file `special.job` on both sides of the paper that is loaded in input tray top of Printer2. You want to print one overlay, O100D, on all the front sides of the paper and another, O1EVEN, on all the back sides. Both overlays are in a library called MYOVR.LIBRARY. Enter:

```
lp -d Printer2 -o "input-tray=top duplex=yes
                    overlay-front=O100D overlay-back=O1EVEN
                    resource-library=MYOVR.LIBRARY" special.job
```

Instead of entering all the attributes on the command line, you can store them in an attributes file. If the attributes file is called myatts, enter:

```
lp -d Printer2 -o attributes=myatts special.job
```

For a list of job attributes and a description of the use and values of each one, see "Job attribute listing" on page 55. For information about attributes files, see "Attributes files" on page 54. For information about the **-o** option of the **lp** command, see "lp--Print a file" on page 32.
Find out where the printers are?
Use the `lpstat` command to display printer definition names and locations. For example, to see the names and locations of all printers and email destinations that are known to Infoprint Server, enter:
```
lpstat -a
```
For more information, see “lpstat—Show printer names and locations and status of print jobs” on page 42.

Find out whether a file is printing?
You can also use the `lpstat` command to display the status of an Infoprint Server job. For example, you submitted several files to print and want to know whether any of them are printing. To display information about all your jobs that are submitted to any printer, enter:
```
lpstat
```
You can also use `lpstat` to display printer location and job status at the same time. For example, you printed a file to Printer3 and want to pick it up if it printed instead of waiting to have it delivered to your output bin. To find out where Printer3 is and whether any job that you submitted to it printed, enter:
```
lpstat -o Printer3
```
For more information, see “lpstat—Show printer names and locations and status of print jobs” on page 42.

Cancel an Infoprint Server job?
Use the `cancel` command to cancel a job that is submitted to Infoprint Server. For example, you realize that you need to make changes in the file that you just sent to print on Printer3.

If you do not remember the Infoprint Server job ID that the `lp` command returned, use the `lpstat` command to display all the jobs that you submitted to Printer3:
```
lpstat -o Printer3
```
Suppose that your job has an ID of 17. To cancel it, enter:
```
cancel 17
```
For more information, see “cancel—Cancel a print job” on page 30.

Transform data remotely?
Use the `remotexf` command to transform data from one format to another remotely with Ricoh InfoPrint Transform Manager for Linux. The command convert files to another format without printing the files.

InfoPrint Transform Manager for Linux transforms convert files to Advanced Function Presentation (AFP) format from:
- Adobe Portable Document Format (PDF)
- Adobe PostScript
- Graphics interchange format (GIF)
- HP Printer Control Language (PCL)
- Joint Photographic Experts Group (JPEG) file information format (JFIF)
- Tagged image file format (TIFF)
InfoPrint Transform Manager for Linux transforms also convert files from AFP format (MO:DCA-P only) to PDF format.

For more information, see “remotexf—Transform data remotely” on page 47.
cancel--Cancel a print job

Format

```
cancel jobid ...
```

Description

The `cancel` command cancels one or more print jobs that you submitted, with these restrictions:

- You can only cancel your own jobs.
- You cannot cancel a job after it started processing.
- In a JES3 environment, you might not be able to cancel a job that is held on the Job Entry Subsystem (JES) spool.

Tip: Use this command only on the system where you submitted the print job so you know that you are working with the correct job.

Operand

`jobid ...` The Infoprint Server job ID of the print job you want to cancel. If you do not know the Infoprint Server job ID, you can determine it by using the `lpstat` command to query all the jobs that you submitted.

The `lp` command and AOPPRINT JCL procedure return the Infoprint Server job ID to you when a job is accepted for printing. Infoprint Server also can return the Infoprint Server job ID to you when you submit a job from a remote system.

The Infoprint Server job ID is not the same as the z/OS job ID, which the z/OS system assigns to each job on the JES spool. When you submit a job with the Print Interface subsystem, the z/OS job ID is returned to you.

Examples -- cancel

Cancel jobs
To cancel jobs 3, 5, and 6, enter:
```
cancel 3 5 6
```

Identify a job and cancel it
You submitted a job to print and want to cancel it, but you do not remember the Infoprint Server job ID. Enter:
```
lpstat
```

The `lpstat` command returns information about all your jobs, including the Infoprint Server job ID and the names of the files in each job. You identify the job that you want to cancel as job 27. To cancel it, enter:
```
cancel 27
```

Environment variables

The `cancel` command uses these environment variables:

**AOPCONF**
Names the Infoprint Server configuration file. This variable takes precedence over the user-specific configuration file (`$HOME/.aopconf`) and...
the system default configuration file (/etc/Printsrv/aopd.conf). For more information about the configuration file, see z/OS Infoprint Server Customization.

**LIBPATH**

The path that is used to locate dynamic link libraries (DLLs).

**NLSPATH**

Names the directory paths that the cancel command searches for message catalogs.

For information about setting and using environment variables, see z/OS V2R2.0 UNIX System Services User’s Guide.

**Files**

$HOME/.aopconf

Contains the user-specific Infoprint Server configuration file. This file takes precedence over /etc/Printsrv/aopd.conf.

/etc/Printsrv/aopd.conf

Contains the system default Infoprint Server configuration file.

**Exit values**

0  Infoprint Server accepted the request.

>0  An error occurred that prevented Infoprint Server from accepting the request. Some possible errors are:

- The command syntax is not valid.
- Infoprint Server is not available.
- There was an error in reading the Infoprint Server configuration file.

**Portability**

There are no extensions to any Portable Operating System Interface for Computer Environments (POSIX) standard or to the XPG4.2 standard for the cancel command.
**lp--Print a file**

**Format**
```
lp [-cmsw] [-d destination] [-n copies] [-o option] ... [-t title] [filename ...]
```

**Description**
The `lp` command prints one or more files, or sends the files to an email destination. The address of the printer is specified in the printer definition in the Infoprint Server Printer Inventory, which your administrator manages. The email addresses are specified in the printer definition or in job attributes.

The files can be:
- MVS data sets, such as partitioned data sets or sequential data sets
- UNIX files, such as files in a Hierarchical File System (HFS), a z/OS File System (zFS), a Network File System (NFS), or a temporary file system (TFS)
- Lists of printable files

If you do not specify any files on the command line, or if you specify a dash (`-`) for the file name, `lp` prints from standard input.

If a transform product is installed, Infoprint Server can automatically transform a file from one data format to another. To transform a file, the administrator must request the transform in the printer definition.

The `lp` command returns an Infoprint Server job ID, which you can use to query or cancel the job.

**Options**
- `-c` Makes a copy of the file and prints that copy. By copying files, you can change the original files after you submit the `lp` command. The printed file does not contain the changes. `-c` is the default.
- `-d destination`
  Selects the printer or the email destination. For `destination`, specify the name of a printer definition in the Infoprint Server Printer Inventory. Contact your administrator for the names of printer definitions or use the `lpstat` command to list printer definition names.
  You can omit this option if there is a default printer. You can define a default printer by setting the LPDEST or PRINTER environment variable. The administrator can also define a default printer. If you do not specify a printer and there is no default, the `lp` command displays an error message.
- `-m` Notifies you by electronic mail when the file is removed from the system spool for any reason. Some reasons are:
  - The file finished printing.
  - The file is transmitted to a local area network (LAN) printer or to the z/OS UNIX sendmail function. You might receive notification before the file finished printing or was sent to the email destination. You might receive notification even though a transmission error occurred.
  If your administrator requested that Infoprint Server retain files on the system spool after transmission, you receive notification after the retention time expires.
- The operator deleted the file.

**Tip:** Notification might be delayed to improve system performance.

**-n copies**

Prints the specified number of copies of each file. You can specify a value 1 - 32640. This option overrides the copies job attribute. The default value is the copies value in the printer definition, or, if none is specified, one copy.

**Tip:** Some IPP-enabled printers and some VTAM controlled printers do not support printing more than one copy. In this case, only one copy prints. This option is ignored when data is sent to an email destination. In this case, only one copy is sent.

**-o option**

Specifies an option, that is, one or more attribute value assignments in the format attribute=value, separated by spaces.

- If a value contains spaces, enclose the value in single or double quotation marks:
  - attribute='value with spaces'
  - attribute="value with spaces"

- If an option contains spaces or characters that can be interpreted by the shell (such as $ & ( ) > < | * #), enclose the option in single or double quotation marks:
  - -o 'attribute1=value1 attribute2=value2'
  - -o "attribute='value with spaces'"
  - -o "attribute=value(1)"

For information about how the shell interprets special characters, see [Z/OS V2R2.0 UNIX System Services User’s Guide](#).

- If both value and option require quotation marks, do either of these:
  - Use two pairs of double quotation marks and place a backslash before each quotation mark that surrounds the value:
    - -o "attribute1=value1 attribute2=value2"
  - Use different quotation marks around the option and value. For example:
    - -o "attribute='value with spaces'"
    - -o 'attribute"value with spaces"'

For a list of the attributes you can specify to describe the job and all the files in it, see "Job attribute listing" on page 55.

Instead of entering a string of attributes on the command line, you can store attributes and values in a file. You use a special attribute that is called attributes to specify the file. For examples, see "Specify the attributes files" on page 38 and "Creating an attributes file" on page 54.

You can also set the AOPOPTIONS environment variable to a string of attributes and values. The lp command treats these attributes as if you specified them before any other values of the -o option on the command line. For an example of using the AOPOPTIONS environment variable, see "Specify the AOPOPTIONS environment variable" on page 38.

To specify more than one attribute, either repeat the -o option or specify the -o option with multiple attributes. For example:

- -o attribute1=value1 -o attribute2=value2
- -o "attribute1=value1 attribute2=value2"
If you specify an attribute more than once, the `lp` command uses the last value.

- **s** Suppresses the message that the `lp` command returns when Infoprint Server accepted the request. This message contains the Infoprint Server job ID. You must know the job ID to query or cancel the job.

- **t** "title"
  Describes the file, which can be printed as the title on a separator page, a page that might be printed before or after the file. If the file is sent to an email destination, this description is the subject of the email. You can specify up to 60 characters. If the text contains spaces or characters that the shell might interpret, enclose the text in single or double quotation marks. This option overrides the [title-text job attribute](#). For information about the default value, see "title-text" on page 85.

  **Tip:** Whether a title is printed on a separator page depends on how the administrator configured the separator page.

- **w** Sends a message to the terminal when the file is printed or deleted. If the submitter is not logged on, sends an email notification when the file is removed from the system spool for any reason. Some reasons are:
  - The file finished printing.
  - The file is transmitted to a LAN printer or to the z/OS UNIX sendmail function. You might receive notification before the file finished printing or was sent to the email destination. You might receive notification even though a transmission error occurred.
  - If your administrator requested that Infoprint Server retain files on the system spool after transmission, you receive notification after the retention time expires.
  - The operator deleted the file.

  **Tip:** Notification might be delayed to improve system performance.

### Operand

`filename`

The path name of each file that you want to print or send to an email destination. To specify data from standard input (keyboard data or the output from another command), omit the file name or specify a dash (`-`) as the file name. To print an MVS data set, specify `//` before the file name.

**Rule:** If you specify more than one file with the same `lp` command, all files must have the same data format. For example, all files must be PostScript files or text files.

### Results

After Infoprint Server accepts the print job, the `lp` command returns an Infoprint Server job ID, which you can use to query and cancel the job. For example, you might receive a message such as:

```
AOP007I Job 14584 successfully spooled to myprinter.
```

The Infoprint Server job ID can help the system operator find your job on the JES spool. The job ID field of the data set that Infoprint Server allocates on the JES spool contains the Infoprint Server job ID.
The Infoprint Server job ID is different, however, from the z/OS job ID, which is a unique job ID that z/OS assigns to the data set. JES operator commands return the z/OS job ID.

Sending a file to an email destination

With the `lp` command, you can send the file to an email destination instead of to a printer. You can specify the email addresses of the primary and secondary recipients in one of these ways:

- You can specify an address list in an alias file that your administrator defines to z/OS UNIX sendmail. For information, see “Specifying the email address list in an alias file” on page 95. Your administrator can specify the name of the alias file in the printer definition, or you can specify it in a job attribute.
- You can specify the email addresses for the recipients by using these job attributes:

  **Use this attribute:**
  
  **To specify the email addresses of the:**
  
  **mail-bcc-addresses**
  
  Blind copy (bcc) recipients of an email. A `bcc` means that other recipients of the email do not see the bcc recipient listed.

  **mail-cc-addresses**
  
  Copy (cc) recipients of an email. A `cc` means that other recipients of the email can see the cc recipient listed.

  **mail-to-addresses**
  
  Primary recipients of an email.

- Your administrator can specify the email addresses in the printer definition in the Printer Inventory.
- In an email header in the document (line data only). For information, see Chapter 11, “Creating an email header,” on page 179.

The email has these characteristics:

- If the file contains text or line data, it can be included in an email attachment or inline in the body of the email. If the file contains data in another format (for example, PDF), the data is included in an attachment. To include text or line data inline, specify the `mail-inline-text` job attribute, or the administrator can select the **Inline text and line data** field in the printer definition.
- The name of the attachment is one of these:
  1. The `mail-file-name` job attribute
  2. The `sysout-dataset-name` job attribute
  3. The last 8 characters of the file name
     
     If the first character is not a letter, #, $, or @, it is converted to a #. If one of the remaining characters is not a letter, number, #, $, or @, it is converted to a #. Lowercase letters are converted to uppercase letters.

     The name of the attachment contains a suffix that indicates the type of data in the file. For example, .txt indicates text data and .pdf indicates PDF data.

     **Tip:** If you specify a file name (in the `mail-file-name` job attribute) with a suffix that indicates the type of data in the file, ask your administrator to request that Infoprint Server not add another suffix. For example, if the file name is `myfile.doc`, ask your administrator to request that Infoprint Server not add suffixes for file names that contain the .doc suffix. For information, see the section about customizing IP PrintWay in z/OS Infoprint Server Customization.
• The subject of the email is the value that is specified in the subject field in the email header, in the -t option, or in the title-text job attribute. If none is specified, the subject is the title that is specified in the Allocation section of the printer definition. If none is specified, the subject is the ID of the user who entered the lp command.

• The sender is the user ID of the user who entered the lp command. You can add a descriptive name or other identifier of the sender in the from field in the email header, or in the mail-from-name job attribute. If none is specified, the From name field in the printer definition is used.

• You can receive replies from the email unless a firewall prevents the z/OS system from receiving replies from the sending system. To receive replies, use the z/OS UNIX mail or mailx command. To receive replies at an email address other than your user ID at your z/OS system, specify the reply email address in the reply-to field of an email header or in the mail-reply-address job attribute. If none is specified, the Reply address in the printer definition is used or replies are sent to your user ID on the z/OS system.

Examples -- lp

Print a file on the default printer
To submit the file File1 to your default printer, enter:

lp File1

Print a file on a specified printer
To submit the file File1 to the printer fred, enter:

lp -d fred File1

Print a file on an undefined LAN printer
You want to print the file File1 on a LAN printer at a remote site. Your administrator did not define this printer. You must specify:

• The name that your administrator defined to represent all remote printers (for example, remote)

• The printer’s Internet Protocol (IP) address

• The remote print queue

Enter:

lp -d remote -o "print-queue-name=text
printer-ip-address=leo.boulder.ibm.com" File1

Print an MVS data set
To submit the MVS data set hlq.FILE1.LISTPS to your default printer, where hlq is your user ID, enter:

lp //FILE1.LISTPS

To submit the MVS data set FILE2.LISTPS to your default printer, enter:

lp "//FILE2.LISTPS"

Print a multi-document job
To submit the files File1 and File2 to the default printer, enter:

lp File1 File2

Each file is spooled to the printer separately.
Print a file-reference document

A file-reference document is a list of similar printable files that are separated by spaces, tabs, or new lines. For example, the file bills.list contains a list of files, each containing one customer’s monthly statement. It looks like this:

```
40009801.dec97
40009802.dec97
40009803.dec97
40009804.dec97
```

To print all the files that are listed in bills.list on your default printer, enter:

```
lp -o document-type=file-reference bills.list
```

The files are concatenated and printed as a single file.

Transform and print a job

If a transform product is installed, you can submit a job in a format different from the ones the printer accepts.

To print the PCL file sample.pcl on the AFP printer printer1, enter:

```
lp -d printer1 sample.pcl
```

If you want to specify options for a file that is being transformed to AFP, you must use the `filter-options` attribute with the `lp` command. For example, to print pages 3 - 10 of the PCL file sample.pcl on the AFP printer printer1 as an overlay, enter:

```
lp -d printer1 -o "filter-options='p 3-10 -t overlay'" sample.pcl
```

If you want to specify job attributes for a file that is being transformed from AFP, you do not use the `filter-options` attribute with the `lp` command. You use `filter-options` to specify only `-c` and `-i` options. For example, to print the AFP file sample.afp on the PCL printer PCLPRT and printing in duplex, enter:

```
lp -d PCLPRT -o 'duplex=yes' sample.afp
```

To print the AFP file sample.afp on the PCL printer PCLPRT by using the transform class US and print in duplex, enter:

```
lp -d PCLPRT -o "filter-options='-c us' duplex=yes" sample.afp
```

Print multiple copies of each file

To print two copies of each file on the default printer, enter one of these:

```
lp -n 2 Title Contents Body1 Body2 Append
```

```
lp -o copies=2 Title Contents Body1 Body2 Append
```

For each file in the job, this command prints two copies of Title, followed by two of Contents, and so forth.

**Tip:** VTAM controlled printers (IP PrintWay basic mode only) and some IPP-enabled printers do not support printing more than one copy. In this case, only one copy prints. If the file is sent to an email destination instead of to a printer, only one copy is sent.

Print a file on both sides of the paper

To print file File1 on the default printer and to print it on both sides of the paper, enter:

```
lp -o duplex=yes File1
```
Specify the attributes files
To print file File5 on the default printer and to specify the two attributes files default.att and special.att, enter:

```
lp -o "attributes=default.att attributes=special.att" File5
```

Suppose that the file default.att contains these lines:

```plaintext
input-tray=bottom
duplex=yes
output-bin=collator
```

The file special.att contains these lines:

```plaintext
input-tray=top
copies=5
title-text='Special Report'
```

The preceding command is equivalent to this command:

```
lp -o "input-tray=top duplex=yes output-bin=collator
copies=5 title-text='Special Report'" File5
```

The value of `input-tray` in special.att overrides the value in default.att because you specified special.att last.

Tip: These examples assume that the attributes files are in the current directory, or that you set the AOPPATH environment variable to include the directories where the attributes files are located. If not, you need to specify the attributes files by their absolute path names.

Override an attribute value in an attributes file
To print file File1 on the default printer and override the value of yes for the `duplex` attribute that is specified in the default.att attributes file, enter:

```
lp -o "attributes=default.att duplex=tumble" File1
```

Specify the AOPOPTIONS environment variable
To set the AOPOPTIONS environment variable to your address, add a line like this one to your .profile file:

```
export AOPOPTIONS="address-text={'13 Division St.' 'Foxboro, MA 02035'}"
```

Until you reset the AOPOPTIONS environment variable, every `lp` command you enter includes this value. For example, this command:

```
lp myfile.ps
```

is equivalent to:

```
lp -o "address-text={'13 Division St.' 'Foxboro, MA 02035'}" myfile.ps
```

Because the `lp` command reads the value of the AOPOPTIONS environment variable before the options you specify on the command line, you can override the values of this variable. For example, if you want a single job to be delivered to a different address, enter:

```
lp -o "address-text={'999 Eclipse Alley' 'Pawtucket, RI 02860'}" myfile.ps
```

Request notification by message
To print file File1 on the default printer and to receive a message when the file is printed, enter:

```
lp -w File1
```
Tip: If the printer is a LAN printer, the `lp` command writes an email when the file is transmitted to the printer. When you receive the email, the file might not have finished printing.

Submit and hold a job
To submit file `File1` to the default printer and to hold it so that it does not print until the operator releases it, enter:

```
lp -o hold=true File1
```

Specify a code page for ASCII files
To print the files `File1` and `File2` and to specify the code page `ISO8859-1`, enter:

```
lp -d Printer1 -o document-codepage=ISO8859-1 File1 File2
```

Print from standard input
You can use the `lp` command to print the output from other commands. For example, to print on your default printer a list of all the files in the current directory, enter:

```
ls -la | lp
```

Paginate line data and print with a header on each page
If your administrator specified the LPD compatibility filter (`lpd_compat.so`) for the printer in the Printer Inventory, you can specify filter options that are equivalent to the FILTER, WIDTH, and LINECOUNT options of the z/OS Communications Server (TCP/IP) LPR command. The LPD compatibility filter can be used with text and line data when you print on an AFP printer or a JES line printer. For a description of the options that the LPD compatibility filter supports, see "filter-options" on page 62.

To print data set `MYDATA`, which contains line data, on the AFP printer `afpprinter`, with a header on each page, a maximum width of 80 characters, and a maximum length of 60 lines, enter:

```
lp -d afpprinter -o "filter-options='-f p -w 80 -l 60'" //"MYDATA"
```

Send multiple files to an email destination specified in the printer definition
To send files `File1` and `File2` to the email address list in printer definition `deptmail`, specify a subject for the email, and specify a form definition that is used when the AFP data is converted to PDF format, enter:

```
lp -d deptmail -t "Monthly Report" -o "form-definition=F1MYDEF" File1 File2
```

This example assumes that the AFP to PDF transform is requested for AFP data in the printer definition named `deptmail`.

**Results:** The recipients that are listed in printer definition `deptmail` receive two emails:

1. The sender of the emails is the user ID of the user who entered the `lp` command. The domain name is the system where sendmail is running.
2. File `File1` is attached to one email, while file `File2` is attached to another email. The names of the attachments are: `FILE1.pdf` and `FILE2.pdf`. The files are in PDF format and can be viewed and printed with Adobe Acrobat Reader.
3. The subject of both emails is `Monthly Report`. 
Send a file to an email destination specified in job attributes

To send file File1 to the email addresses specified in job attributes instead of to the email addresses specified in the printer definition, and also specify a subject, sender name, attachment name, and reply address for the email, enter this command on one line:

```
lp -d emaildest -t "Monthly Report" -o mail-to-addresses={'user1@xyz.com'}
                mail-cc-addresses={'user2@xyz.com'} mail-bcc-addresses={'user3@xyz.com'}
                mail-file-name='February 2004 sales report' mail-from-name='John Q. Sender'
                mail-reply-address='secretary@xyz.com'* File1
```

Results: An email is sent with these specifications:
1. The subject is Monthly Report.
2. The recipient of the email is user1@xyz.com.
3. The copy (cc) recipient is user2@xyz.com.
4. The blind copy (bcc) recipient is user3@xyz.com.
5. If the file is in an attachment, the attachment is called February 2004 sales report.txt.
6. The sender of the email is John Q. Sender<JOHN@SYSTEM1>. The user ID of the user who entered the lp command is JOHN. The domain name of the system where sendmail is running is SYSTEM1.
7. The email address that recipients can reply to is secretary@xyz.com.

Environment variables

The lp command uses these environment variables:

**AOPCONF**
Names the Infoprint Server configuration file. This variable takes precedence over the user-specific configuration file ($HOME/.aopconf) and the system default configuration file (/etc/Printsrv/aopd.conf). For more information about the configuration file, see [z/OS Infoprint Server Customization](https://www.ibm.com/support/knowledgecenter/SSLTBW_2.2.1/infoprint_server/infoprint_server_customization).**

**AOPOPTIONS**
Specifies a string of attributes and values that the lp command includes before the values of the -o option.

**AOPPATH**
Defines the directory path that the lp command searches for attributes files. The default is your current directory. If the directory where an attributes file is located is not included in the value of AOPPATH, you can specify the file by its absolute path name.

**AOP_MVS_RETURN_CODES**
Specifies whether to return MVS (0, 4, 8) return codes or UNIX (0, 1) exit values. If not specified, the lp command returns UNIX exit values.

**LANG**
The language that is used for messages.

**LC_ALL**
The locale that is used to format date and time information in common log messages.

**LC_CTYPE**
The locale that is used to determine the code page for validating attributes.

**LIBPATH**
The path that is used to locate dynamic link libraries (DLLs).
LPDEST
Names the default printer. This variable takes precedence over PRINTER.

PRINTER
Names the default printer if LPDEST is not defined.

NLSPATH
Names the directory paths that the \texttt{lp} command searches for message catalogs.

For information about setting and using environment variables, see \texttt{z/OS V2R2.0 UNIX System Services User's Guide}.

Files

$HOME/.aopconf
Contains the user-specific Infoprint Server configuration file. This file takes precedence over /etc/Printsrv/aopd.conf.

/etc/Printsrv/aopd.conf
Contains the system default Infoprint Server configuration file.

Exit values

0  Infoprint Server accepted the request.

>0  An error occurred. Some possible errors are:
    • The command syntax is not valid.
    • The selected printer cannot print the type of data in one of the files.
    • The selected printer does not support one of the specified job attributes.
    • Infoprint Server is not available.
    • There was an error in reading the Infoprint Server configuration file.

Note: The AOP_MVS_RETURN_CODES environment variable determines the exit values.

Portability

The \texttt{-m, -o, -s, -t,} and \texttt{-w} options are extensions to the POSIX.2 standard. There are no extensions to the Single UNIX Specification Version 3 standard for the \texttt{lp} command.
Ipstat--Show printer names and locations and status of print jobs

Format

lpstat [-dt] [-a [printername ...]] ... [-o [printername ...]] ...  
[ -p [printername ...]] ... [-u [userid ...]] ... [jobid ...]

Description

The lpstat command writes printer definition names, location information that is specified in the printer definitions, and the status of jobs to standard output.

Tip: Use this command only on the system where you submitted the print job so you know that you are working with the correct job.

For printer definitions in the Infoprint Server Printer Inventory, the lpstat command returns this information:

- The name of the printer definition
- The number of jobs that are submitted to the printer definition
- The location information in the printer definition
- The description information in the printer definition

For jobs that Infoprint Server processed (including jobs that are submitted in any of these ways: from a VTAM application through NetSpool; from a remote system or with the lp command through Print Interface; from batch JCL printed by IP PrintWay extended mode; using the Print Interface subsystem), the lpstat command returns this information:

- The Infoprint Server job ID. The Infoprint Server job ID is a unique job ID assigned to each print job. You can use it to cancel the job with the cancel command.
  The Infoprint Server job ID can help the system operator find your job on the JES spool. In most cases, the job ID field of data sets that Infoprint Server allocates on the JES spool contains the Infoprint Server job ID.
  The Infoprint Server job ID is different, however, from the z/OS job ID, which is a unique job ID that z/OS assigns to the data set. JES operator commands return the z/OS job ID.
- The user ID of the person who submitted the job.
- The state of each file in the job:
  canceled
    The file is canceled and is not processed.
  completed
    The file is processed successfully. It remains on the JES spool for one of these reasons:
    - Other files in the job are still being processed. The file is removed from the spool after all files in the job are processed.
    - Your administrator specified that files are to be retained after transmission to a LAN printer or to a print server. The file is removed from the spool when the retention period expires.
  failed
    Processing failed. The file remains on the JES spool for one of these reasons:
– Transmission to a LAN printer, to a print server, or to the z/OS UNIX sendmail function failed. Your administrator specified that files are to be retained after transmission. The file is removed from the spool when the retention period expires.

– An error occurred during processing. The file is held.

**held**
The file is held on the JES spool and cannot print for one of these reasons:
– The user specified `hold=true` when the job was submitted.

**Tip:** JES3 does not recognize a job that is held for this reason and returns **pending**.
– The operator held the job.

**not_spooled**
The file is not written to the JES spool because an error occurred.

**pending**
The file is waiting to print.

**Tip:** Because JES3 cannot distinguish job states, in a JES3 environment Infoprint Server can return **pending** for files that are selected for processing or held on the JES spool.

**processing**
The file is placed on the JES spool and selected for processing. It might be:
– Transmitting to a local area network (LAN) printer or to a print server
– Printing

**purged**
The file is deleted before printing.

**rejected**
The file is rejected and is not processed. It remains on the JES spool until you cancel it or correct the error.

**retry_waiting**
An error occurred sending this file to the printer. After the retry interval expires, Infoprint Server will process it again. The printer might be turned off.

**spooling**
The file is written to the JES spool.

- The number of bytes in each file in the job.
- The name of each file or file-reference document in the job.

For jobs submitted to the Print Interface subsystem, the file name is in this format:

```
job-name.job-id.dataset-name
```

**job-name**
The name of the z/OS job. The job name can help the system operator locate the data set on the JES spool.

**job-id**
The ID that z/OS assigned to the job. The job ID can help the system operator locate the data set on the JES spool.
dataset-name
The name of the data set specified in the DSNAME parameter on the DD
JCL statement for the data set. This name is the last qualifier of the fully
qualified data set name on the JES spool. If the DSNAME parameter was not
specified, this field is blank.

When lpstat returns information about multiple jobs, the order is not significant.
The first job that is listed might not be the next job to print.

Options

-a [printname ...]
Displays the names and locations of the specified printers. If you do not
specify a printer name, this option displays the names and locations of all
printers that are defined in the Printer Inventory.

If you specify more than one printer name in the -a option, enclose the
entire value in quotation marks. Or, you can repeat the -a option.

-d Displays the name and location of the default printer that the
administrator defined. If there is no default printer, lpstat returns an error
message.

Tip: This option does not display the name or location of a default printer
that you defined with the LPDEST or PRINTER environment variable. To
display the values of these variables, use the z/OS UNIX echo command.

-o [printname ...]
Displays information about the specified printers and all jobs that you
submitted to the specified printers. If you do not specify a printer name,
this option displays information about printers that are defined in the
Printer Inventory and all jobs you submitted to them through Infoprint
Server.

If you specify more than one printer name in the -o option, enclose the
entire value in quotation marks. Or, you can repeat the -o option.

-p [printname ...]
Displays the names and locations of the specified printers. If you do not
specify a printer name, this option displays the names and locations of all
printers that are defined in the Printer Inventory.

If you specify more than one printer name in the -p option, enclose the
entire value in quotation marks. Or, you can repeat the -p option.

-t Displays information about all printers that are defined in the Printer
Inventory and all jobs that are submitted to them through Infoprint Server.

-u [userid ...]
Displays information about all jobs that the specified users submitted to
any printer. If you specify -u without a user name, this option displays
information about all jobs that all users submitted to any printer. If you do
not specify -u, lpstat displays information about all jobs that you
submitted to any printer.

The user ID is case-sensitive. Use the exact uppercase and lowercase
characters.

If you specify more than one user name in the -u option, enclose the entire
value in quotation marks. Or, you can repeat the -u option.
Operand

`jobid` ...

Identifies the job that you want to display information about. Specify the Infoprint Server job ID, not the z/OS job ID.

The `lp` command and AOPPRINT JCL procedure return the Infoprint Server job ID when a job is accepted for printing. Infoprint Server also can return the Infoprint Server job ID to you when you submit a job from a remote system.

Examples -- `lpstat`

**Display the names and locations of all printers**
To display the names of all printer definitions in the Infoprint Server Printer Inventory and the location information in the printer definition, enter:

```
lpstat -a
```

**Display the name and location of the default printer**
To display the name and location of the default printer, enter:

```
lpstat -d
```

**Display information about selected jobs**
To display the status of the jobs whose Infoprint Server job IDs are 14 and 16, enter:

```
lpstat 14 16
```

**Display information about all jobs that you submitted**
To display the status of all the jobs that you submitted to any printer definition, enter:

```
lpstat
```

**Display information about all jobs submitted by a user**
To display the status of all jobs that user MARTHA submitted to any printer definition, enter:

```
lpstat -u MARTHA
```

**Display information about a printer and all jobs that you submitted to it**
To display the location of printer Printer1 and the status of all jobs that you submitted to it, enter:

```
lpstat -o Printer1
```

**Display information about several printers and all jobs that you submitted to it**
To display the location of printers Printer1 and Printer2 and the status of all jobs that you submitted to them, enter:

```
lpstat -o "Printer1 Printer2"
```

**Display information about all printers and all jobs**
To display the status of all printers and all jobs that are submitted by all users in the system, enter:

```
lpstat -t
```

Environment variables

The `lpstat` command uses these environment variables:
AOPCONF
Names the Infoprint Server configuration file. This variable takes precedence over the user-specific configuration file ($HOME/.aopconf) and the system default configuration file (/etc/Printsrv/aopd.conf). For more information about the configuration file, see z/OS Infoprint Server Customization.

LIBPATH
The path that is used to locate dynamic link libraries (DLLs).

NLSPATH
Names the directory paths that the lpstat command searches for message catalogs.

For information about setting and using environment variables, see z/OS V2R2.0 UNIX System Services User’s Guide.

Files
$HOME/.aopconf
Contains the user-specific Infoprint Server configuration file. This file takes precedence over /etc/Printsrv/aopd.conf.

/etc/Printsrv/aopd.conf
Contains the system default Infoprint Server configuration file.

Exit values
0 Infoprint Server accepted the request.
>0 An error occurred that prevented Infoprint Server from accepting the request. Some possible errors are:
  • The command syntax is not valid.
  • Infoprint Server is not available.
  • There was an error in reading the Infoprint Server configuration file.

Portability
There are no extensions to any Portable Operating System Interface for Computer Environments (POSIX) standard or to the XPG4.2 standard for the lpstat command.
remotexf—Transform data remotely

Format

`remotexf [-j "jobattributes"] ... [-o outputfile] [inputfile]`

Description

The `remotexf` command transforms data from one format to another remotely using Ricoh InfoPrint Transform Manager for Linux transforms. The command converts files to another format without printing the files.

InfoPrint Transform Manager for Linux transforms convert files to Advanced Function Presentation (AFP) format from:

- Adobe Portable Document Format (PDF)
- Adobe PostScript
- Graphics interchange format (GIF)
- HP Printer Control Language (PCL)
- Joint Photographic Experts Group (JPEG) file information format (JFIF)
- Tagged image file format (TIFF)

InfoPrint Transform Manager for Linux transforms also convert files from AFP (MO:DCA-P only) format to PDF format.

In addition, if InfoPrint Transform Manager for Linux adds new transforms to the AFP format in the future, you can specify a transform ID value in the `remotexf` command to use the new transforms.

The command automatically detects the format of the input file and uses the appropriate transform, such as PDF to AFP, for that data format. However, you can specify the `document-format` job attribute to override the input format.

The `remotexf` command automatically detects the format of the input file and uses the appropriate transform to AFP, such as PDF to AFP, for that data format. However, if the input file is in AFP (MO:DCA:P) format, the transform does not select the appropriate transform. You must specify the output format in the `output-format` transform attribute.

You can specify only one input file to be transformed. If you do not specify an input file name, or if you specify a dash (-) as the file name, `remotexf` uses standard input. The output file name is also optional. If you do not specify one, the `remotexf` command writes the results to standard output.

Infoprint Server writes error messages for recoverable data stream errors on a trailer error page (a page that is written at the end of the output data) when it creates an AFP document. If you do not want a trailer error page, you can specify the `trailer-error-page` transform attribute in the `xf-options` job attribute. For the AFP to PDF transform, no trailer error page is created.

Notes:

1. For information about the InfoPrint Transform Manager for Linux transforms, including functions, limitations, and transform options, see `InfoPrint Transform Manager for Linux` and `InfoPrint Transform Manager for Linux: afp2pdf Transform Installation and User’s Guide`.

Chapter 2. Using Infoprint Server z/OS UNIX commands  47
2. To use the `remotexf` command, Infoprint Server must be customized. For information, see the section about customizing the Transform Interface in [Infoprint Server Customization](z/OS Infoprint Server Customization).

**Options**

- `-j "jobattributes"`

  Specifies one or more job attributes in the format `attribute=value`, separated by spaces. You can specify `-j` multiple times. If job attributes are repeated, the last value that is specified for the job attribute is used.

  You can specify any of these job attributes:
  - `document-format`, which specifies the format of the input document
  - `filter-options`, which specifies InfoPrint Transform Manager for Linux transform options
  - `xf-options`, which specifies these transform attributes:
    - `fail-on-datastream-error`
    - `output-format`
    - `trailer-error-page`
    - `transform-id`

  **Tip:** Instead of entering a string of job attributes on the command line, you can store job attributes and values in a file. You use a special attribute that is called `attributes` to specify the file.

  For more information about the job attributes, see "Job attribute listing" on page 55. For information about the transform options you can specify in `filter-options`, see [InfoPrint Transform Manager for Linux](InfoPrint Transform Manager for Linux).

  When you specify job attributes:
  - If a value contains spaces, enclose the value in single or double quotation marks:
    - `attribute='value with spaces'`
    - `attribute="value with spaces"
  - If a job attribute (attribute=value) contains spaces or characters that might be interpreted by the shell (such as `$ & ( ) > < | "”), enclose the job attribute in single quotation marks:
    - `-j 'attribute1=value1 attribute2=value2'
  - If both the value and the job attribute require quotation marks, do either of these:
    - Use two pairs of double quotation marks and place a backslash before each quotation mark that surrounds the value:
      - `-j "attribute=value with spaces\""
    - Use different quotation marks around the job attribute and value. For example:
      - `-j 'attribute="value with spaces"'
      - `-j "attribute='value with spaces'"

- `-o outputfile`

  Specifies the output path and file into which the transform output (such as
AFP data) is written. The transform overwrites any existing data in the output file. If you do not specify an output file, the result is written to standard output (STDOUT).

To specify an MVS data set, such as a sequential or partitioned data set, precede the data set name with //.. When you specify a fully qualified name, two sets of quotation marks are required. For example, "//hlq.PDS(MYDOC)" or "//hlq.SEQDS". When you specify a partially qualified name, you need only one set of quotation marks. For example, "//PDS(MYDOC)" or "//SEQDS".

If you specify an MVS data set, allocate and catalog the data set before you run this command. Allocate a data set that is large enough to hold the output data stream. The size of the output data stream depends on the complexity of the document and the type of image compression used. Typically, an output AFP data stream is several times as large as the input data stream. Allocate the AFP output data set with these characteristics:

- Record format: VBM
- Record length: 32 K

Tip: For InfoPrint Transform Manager for Linux, if you do not use the -pragma afpdsrecordlength option, allocate the data set with a record length that is at least 32017 bytes. By default, the transforms to AFP create AFP records that are 32000 bytes. To request that the transforms create AFP records that are a smaller maximum length, you can use the -pragma afpdsrecordlength option. Valid values for the option are 8000 - 32000. The default is 32000. For example, to set the maximum number of bytes in a record to 8000, specify:

```
-j "filter-options='-pragma afpdsrecordlength=8000'
```

### Operand

`inputfile`

Specifies an input file to be transformed. The results are written to a single output file (if one is specified in -o) or to standard output.

If you do not specify an input file, or if you specify a dash (-) for the file name, remotexf uses standard input.

To specify an MVS data set, precede the data set name with //.. When you specify a fully qualified name, two sets of quotation marks are required. For example, "//hlq.PDS(MYDOC)" or "//hlq.SEQDS". When you specify a partially qualified name, you need only one set of quotation marks. For example, "//PDS(MYDOC)" or "//SEQDS".

### Examples -- remotexf

**Transform a file**

To transform the PDF file `myfile.pdf` into an AFP data stream and write the result to a file called `myfile.afp`, enter:

```
remotexf -o myfile.afp myfile.pdf
```

**Transform and print a file**

To transform the PDF file `myfile.pdf` into an AFP data stream and send the result to the default printer with the `lp` command, enter:

```
remotexf myfile.pdf | lp
```
**Transform a file, specifying image size**
To transform the PostScript file `myfile.ps` into an AFP data stream, with an image that is 8 inches high and 5 inches wide, and write the result to a file called `myfile.afp`, enter:

```sh
remotexf -j "filter-options='-l 8i -w 5i'" -o myfile.afp myfile.ps
```

**Transform a file, specifying paper size**
To transform the GIF file `myfile.gif` into an AFP data stream for A4 paper and write the result to a file called `myfile.afp`, enter:

```sh
remotexf -j "filter-options='-paper a4'" -o myfile.afp myfile.gif
```

**Transform a file, specifying resolution**
To transform the PostScript file `myfile.ps` into an AFP data stream in 300-pel resolution and write the result to a file called `myfile.afp`, enter:

```sh
remotexf -j "filter-options='-r 300'" -o myfile.afp myfile.ps
```

**Transform a file, specifying resolution and omitting errors**
To transform the TIFF file `myfile.tif` into an AFP data stream in 300-pel resolution, specify that data stream error messages is not included on the trailer error page, and write the result to a file called `myfile.afp`, enter:

```sh
remotexf -j "filter-options='-r 300' xf-options='trailer-error-page=no'" -o myfile.afp myfile.tif
```

**Transform a file, creating output only if data stream is error-free**
To transform the GIF file `myfile.gif` into an AFP data stream, specifying that the output is created only if it does not have data stream errors, and write the result to a file called `myfile.afp`, enter:

```sh
remotexf -j "xf-options='fail-on-datastream-error=yes'" -o myfile.afp myfile.gif
```

**Transform a file with redirection**
To transform the PostScript file `input.ps` into the AFP output file that is called `output.afp`, enter:

```sh
remotexf < input.ps > output.afp
```

**Environment variables**
The `remotexf` command uses these environment variables:
AOPRXF_CONF
Names the Infoprint Server remote transform configuration file. This variable takes precedence over the default remote transform configuration file (/etc/Printsrv/aoprxf.conf). For more information about the remote transform configuration file, see z/OS Infoprint Server Customization.

LANG
The language that is used for messages.

LIBPATH
The path that is used to locate dynamic link libraries (DLLs).

NLSPATH
Names the directory paths that the remotexf command searches for message catalogs.

For information about setting and using environment variables, see z/OS V2R2.0 UNIX System Services User’s Guide.

Files
/etc/Printsrv/aoprxf.conf
Contains the Infoprint Server default remote transform configuration file.

Exit values
0 The data was transformed successfully. However, the output document might contain error messages that are related to errors in the input data stream. If a recoverable data stream error occurs and the fail-on-datastream-error transform attribute is no, the exit value is 0.

>0 An error occurred. No output document was created. If any data stream errors occur and the fail-on-datastream-error transform attribute is yes, the exit value is >0.
Chapter 3. Using job attributes

A job is a set of one or more documents that you submit to Infoprint Server for printing in a single printing session. A document is either a file or a group of similar files.

Infoprint Server uses job attributes to describe jobs and the documents in jobs. For example, you can specify the number of copies of a document to print by setting a value for the copies job attribute.

You can specify job attributes in different ways, depending on the method you use to submit a print job. Table 6 shows how to specify job attributes for different job submission methods and refers you to the section that contains more information.

### Table 6. How to specify job attributes

<table>
<thead>
<tr>
<th>Job submission method</th>
<th>How to specify job attributes</th>
<th>See page</th>
</tr>
</thead>
<tbody>
<tr>
<td>z/OS UNIX <code>lp</code> command</td>
<td><code>-o</code> option</td>
<td>32</td>
</tr>
<tr>
<td>z/OS UNIX remotexf command</td>
<td><code>-j</code> option and <code>xf-options</code> attribute</td>
<td>47, 88</td>
</tr>
<tr>
<td>JCL parameters with IP PrintWay extended mode</td>
<td><code>PRTATTRS JCL parameter</code></td>
<td>113</td>
</tr>
<tr>
<td>Print Interface subsystem</td>
<td>SUBSYS parameter on the DD JCL statement</td>
<td>121</td>
</tr>
<tr>
<td>AOPPRINT JCL procedure</td>
<td>OPTIONS parameter on the EXEC JCL statement</td>
<td>138</td>
</tr>
<tr>
<td>NetSpool</td>
<td>Embed job attributes in print data</td>
<td>154</td>
</tr>
<tr>
<td>Infoprint Port Monitor for Windows</td>
<td>Infoprint Port Monitor Options window (select during port configuration)</td>
<td>160</td>
</tr>
<tr>
<td>AIX <code>enq</code> command</td>
<td><code>-o</code> option</td>
<td>171</td>
</tr>
<tr>
<td>IBM i LPR command</td>
<td><code>DESTOPT</code> option</td>
<td>173</td>
</tr>
<tr>
<td>IBM i remote queue that is defined with CRTOUTQ</td>
<td>Destination options field</td>
<td>173</td>
</tr>
<tr>
<td><code>lprafp</code> command</td>
<td><code>-o</code> option</td>
<td>177</td>
</tr>
</tbody>
</table>

You can also use the `-j` option of these transform commands: `afpxpcl`, `afpxpdf`, and `afpxpostscript`. For more information about the commands, see the documentation for the transform.

Job attributes are only one of the factors that determine how your job is printed. These values also affect your job:

- Print command options. For example, you can use the `-n` option of the `lp` command to specify the number of copies of a job.
- Values in the data stream. For example, the document can specify an overlay.
- Values in the page definition that are used to print the job. For example, the page definition can specify fonts.
- Values in the form definition that are used to print the job. For example, the form definition can specify duplex printing.
- Printer specifications. Infoprint Server lets the administrator specify printer characteristics for each printer.
The administrator can limit the jobs that a printer can accept. For example, if the administrator specifies that a certain printer can print at most five copies of a job and you submit a job with a value of 10 for the copies job attribute, your job is not accepted.

The administrator can specify default values for jobs that are printed on a printer. For example, the administrator can specify the form definition that the printer uses to print jobs that are submitted without a value for the form-definition attribute.

Printer setup. The way a printer is set up can affect printing. For example, if duplexing is not specified in the PCL or PostScript data stream, the printer setup determines whether documents print on one or both sides of the paper.

Abbreviations

This publication shows attribute names and values in their complete form. Often, you can abbreviate attribute names and values by using the first letter of each word in the name or value. For example, you can use the abbreviation c-c-t for the carriage-control-type attribute. You can use m for the machine value, and specify the attribute and value pair as c-c-t=m.

Sometimes specifying only the first letter in each word is ambiguous. For example, o-b might stand for either output-bin or overlay-back. Here, specify enough of the name so that it is unique, as in o-b1 and o-ba. If the values are ambiguous, Infoprint Server rejects the command and sends an error message.

Attributes files

You can predefine attribute and value pairs in permanent files. You can use the permanent attribute files when you need those attribute values with the lp, afpxpcl, afpxpdf, afpxps, and remotexf commands. You can also use the permanent attribute files when you need to specify those values with the AOPPRINT JCL procedure and when you use the Print Interface subsystem.

Creating an attributes file

- You can list any job attribute in an attributes file.
- You can also list the attribute attributes. Thus, an attributes file can call other attributes files.

Tip: If an attributes file calls itself, the command sends an error message.
- Attributes files must not contain any attributes without values.
- When you are creating an attributes file, consider spelling out the complete attribute names and attribute values rather than using abbreviations.
- You can use spaces between the attribute name and the equal sign to align the equal sign and values. This makes your files easier to read and maintain.
- You can use comment lines in attributes files. The comment starts with a number sign, #, and ends at the end of line.

Example: You can create an attributes file called myatts to request five copies of a job, simple duplex printing, and a specific output bin. Your file contains these lines:

```
# These are my job attributes
copies = 5
duplex = yes
output-bin = collator # Collate the job
```
Tip: You can include a number sign, #, as part of an attribute value if you
precede it immediately with a backslash, \\#.

Using an attributes file

Use the -o flag to read an attributes file into the lp command. Use the -j flag to
read an attributes file into the afpxpcl, afpxpdf, afpxps, and remotexf commands.

For example, to print a file that is called myfile, by using the attributes in the
myatts file, enter:

lp -o "attributes=myatts" myfile

The command in the example is equivalent to this command:

lp -o "copies=5 duplex=yes output-bin=collator" myfile

For information about how to specify an attributes file with the AOPPRINT JCL
procedure, see Chapter 5, “Printing with the AOPPRINT JCL procedure,” on page
137.

For information about how to specify an attributes file with the Print Interface
subsystem, see “JCL parameters for the Print Interface subsystem” on page 121.

Job attributes and JCL parameters

If you have previous experience with z/OS, you are accustomed to using the
OUTPUT and DD statements of the Job Control Language to specify processing
options for print jobs. Many job attributes correspond to parameters of the
OUTPUT JCL statement. A few correspond to parameters of the DD and JOB JCL
statements. For a list of JCL parameters with corresponding job attributes, see
Appendix B, “JCL parameters and corresponding job attributes,” on page 185.

Job attribute listing

This section lists job attributes in alphabetical order.

address-text

This multi-valued attribute specifies 1 - 4 lines of address information that can be
printed in the address field of a separator sheet.

Allowed values
You can specify 1 - 4 values. If you specify more than one value, separate the
values by spaces and enclose the list of values in braces {}.

For each value, you can enter a text string of up to 60 characters. If the text string
you specify contains spaces, enclose the text string in single or double quotation
marks. For example:

-o "address-text='Acme Novelties, Inc.' '13 Division St.'
   'Foxboro, MA 02035' USA"

If any string contains double quotation marks, enclose the string in single
quotation marks.

Default value
The default text that the administrator defined for the printer.
Usage guidelines

- Whether the text specified by this attribute is printed depends on how the administrator configures the printer’s separator sheet.
- The address-text attribute is equivalent to the ADDRESS parameter of the OUTPUT JCL statement.

afp-parameters

This single-valued attribute specifies the name of a data set that contains AFP Download Plus parameters. If the data set is a partitioned data set, you must also specify the name of the member that contains the parameters, as shown in the example.

Allowed values

You can enter a valid data set name, with an optional member name. For example:

- USER.AFPPARMS
- USER.PDS(AFPPARMS)

Default value

The default value that the administrator defined for the printer in the printer definition.

Usage guidelines

- The data set must exist and be cataloged.
- This attribute is equivalent to the AFPPARMS parameter of the OUTPUT JCL statement.
- For more information about AFP Download Plus, see PSF for z/OS: AFP Download Plus.

building-text

This single-valued attribute specifies building information that can be printed in the building field of a separator sheet.

Allowed values

You can enter a text string of up to 60 characters. If the text string you specify contains spaces, enclose the text string in single or double quotation marks. For example:

- o "building-text='Building 7: third floor'"

If the string contains double quotation marks, enclose the string in single quotation marks.

Default value

The default text that the administrator defined for the printer.

Usage guidelines

- Whether the text specified by this attribute is printed depends on how the administrator configures the printer’s separator sheet.
- This attribute is equivalent to the BUILDING parameter of the OUTPUT JCL statement.

carriage-control-type

This single-valued attribute identifies the type of carriage control characters that the printer device uses when it interprets and prints this document.
Allowed values
You can enter one of these fixed values:
ansi
machine
none

Default values
1. For MVS data sets, such as partitioned data sets and sequential data sets, Infoprint Server determines the carriage control type from the record format in the data set control block (DCB).
2. For UNIX files, such as z/OS File System (zFS) files, the default is none.

Usage guidelines
- This attribute is most useful for line data documents.
- Use this attribute when you print UNIX files (files in a hierarchical file system) that contain carriage controls.
- For MVS data sets, Infoprint Server determines the carriage control type from the data set. When processing MO:DCA-P (including mixed mode) UNIX files, Infoprint Server usually determines the correct carriage control type. Infoprint Server might be able to properly detect UNIX files that contain line data with machine carriage controls, but for other types of line data in UNIX files, you probably need to specify document-format = line, and if the carriage control type is ansi, carriage-control-type = ansi. For other formats printed from a UNIX file, the default is correct.

chars
This multi-valued attribute identifies 1 - 4 coded fonts that are used to print a line data document or a MO:DCA document in which no fonts are specified.

A coded font is a pair of a character set and a code page. Coded font names begin with a 2-character prefix (X0 or XZ), followed by up to four alphanumeric characters. X042B2 is an example of a coded font name. For more information about coded fonts, see z/OS Font Collection.

Allowed values
You can enter a text string that contains the names of the coded fonts. The name of each font can be 1 - 4 characters.

Tip: Some coded fonts have 6-character names, not counting the prefix. For these coded fonts, see z/OS Font Collection for the 4-character alternative coded font name.

Omit the 2-character prefix from the coded font name or the alternative coded font name.

If you specify more than one coded font, separate the font names by spaces and surround the string of font names with braces. For example:
-o "chars={GT10 GT12}"
Usage guidelines

- This attribute is most useful for line data documents.
- This attribute applies to line data documents printed on an AFP printer.
- Products that transform AFP documents can support this attribute. For information, see the documentation for the transform.
- PSF uses this attribute only if the page definition used to print the job does not specify fonts, or if the default page definition is used.
- If you specify more than one coded font with the chars attribute, the job must contain either shift-out-shift-in (SOSI) codes or table reference characters (TRCs) to use coded fonts other than the first one. IBM suggests that you do not mix SOSI codes and TRCs.
  - If the job contains TRCs, you must specify the table-reference-characters attribute value as true. The TRC characters are used to select the corresponding coded font that is specified with the chars attribute.
  - If the job contains SOSI codes, the first coded font that is specified with the chars attribute is used as the single-byte font and the second coded font is used as the double-byte font.

For more information about using multiple coded fonts, see AFP: Programming Guide and Line Data Reference and PSF for z/OS: User’s Guide.

- This attribute is equivalent to the CHARS parameter of the OUTPUT and DD JCL statements.

copies

This single-valued attribute specifies the number of copies of each document in the job to print.

Allowed values

You can enter an integer 1 - 32640.

Default values

1. The default value that the administrator defined for the printer.
2. 1

Usage guidelines

- Only one copy prints when you print on VTAM controlled printers (IP PrintWay basic mode only) or on Internet Printing Protocol (IPP) printers that do not support the copies IPP job attribute. This attribute is supported for VTAM controlled printers when you use IP PrintWay extended mode.
- Only one copy of the file is sent to an email destination.
- The administrator can limit the number of copies that you can specify. Before it accepts a job, Infoprint Server verifies that the printer can support the value of this attribute.
- The value that you specify for this attribute overrides any value in the form definition that is used to print the job.
- This attribute is similar to the COPIES parameter of the OUTPUT and DD JCL statements.
**department-text**

This single-valued attribute specifies department information that can be printed in the department field of a separator sheet.

**Allowed values**

You can enter a text string of up to 60 characters. If the text string you specify contains spaces, enclose the text string in single or double quotation marks. For example:

- `-o "department-text='Customer Relations'"

If the string contains double quotation marks, enclose the string in single quotation marks.

**Default value**

The default text that the administrator defined for the printer.

**Usage guidelines**

- Whether the text specified by this attribute is printed depends on how the administrator configures the printer's separator sheet.
- This attribute is equivalent to the DEPT parameter of the OUTPUT JCL statement.

**document-codepage**

This single-valued attribute is the name of the code page that is used to create the document. Infoprint Server uses this name as the source when it uses the z/OS UNIX iconv utility to convert data from one code page to another.

**Allowed values**

You can enter the name of an IBM-supplied or custom code page that the iconv utility supports.

**Default values**

1. The default code page that the administrator defined for the printer.
2. The code page for the current locale of z/OS UNIX System Services. This is usually an EBCDIC code page.

**Usage guidelines**

- For the names of IBM-supplied code page names, see [z/OS XL C/C++ Programming Guide](#).
  - If you specify a custom code page, ask your administrator to make sure that conversion tables exist to convert between:
    - The custom code page and the code page that is specified in the Printer code page field in the printer definition for the printer in the Printer Inventory.
    - The code page for the z/OS locale and the custom code page.
  - For information about how to create conversion tables, see information about code set conversion utilities in [z/OS XL C/C++ Programming Guide](#).
- To print an ASCII job, you must use an ASCII code page. If the printer is not defined to use an ASCII code page, you must specify one as the value of this attribute. ISO8859-1 is an example of an ASCII code page.
- Infoprint Server uses this attribute to translate documents before it places them on the Job Entry Subsystem (JES) spool. Because Infoprint Server does not translate data streams such as MO:DCA-P, PCL, or PostScript, it ignores this attribute when it prints these data streams.
**document-format**

This single-valued attribute identifies the format (data type) of this document.

**Allowed values**

You can enter one of these fixed values:

- **jpeg** Joint Photographic Experts Group (JPEG) file information format (JFIF).
- **line-data** A data format whose bytes map to characters. Line data is stored as records, for example, in sequential data sets. The records can contain carriage-control characters and table-reference characters. Line data is typically found in mainframe data sets.
- **modca-p** Mixed Object Document Content Architecture for Presentation (MO:DCA-P) data format.
- **other** Any other data format, such as the Xerox data format.
- **pcl** Printer Control Language (PCL) data format, which is defined by Hewlett-Packard.
- **pdf** Portable Document Format (PDF) data format, which is defined by Adobe.
- **postscript** PostScript data format, which is defined by Adobe.
- **sap** SAP Output Text Format (OTF) or SAP Advanced Business Application Programming (ABAP) Version 1 or Version 2 data format, which is defined by SAP AG.
- **text** A data format whose bytes map to characters. Text data contains no control characters other than line feed (LF), carriage return (CR), horizontal tab (HT), vertical tab (VT), and form feed (FF). Text data is typically found in workstation files.
- **tiff** Tagged image file format.
- **xml** Extensible Markup Language, which includes Extensible Stylesheet Language formatting objects (XSL-FO).

**Default value**

The value that Infoprint Server determines from the contents of the data stream.

**Usage guidelines**

- Before it accepts a job, Infoprint Server verifies that the printer can support the value of this attribute.
- IBM suggests that you do not use this attribute with NetSpool.
- Some code pages, such as IBM-850, include rarely used printable characters in the range of X'01' to X'1F'. If you create a document that includes characters with code points in this range, specify `document-format=text` so that Infoprint Server does not interpret the document's format to be "other" when you want it to be "text".

**document-type**

This single-valued attribute indicates that the document is either a printable document or a list of printable documents.
Allowed values
You can enter one of these fixed values:

- file-reference
- printable

Default value
printable

Usage guidelines
- A printable document contains data that you want to print.
- A file-reference document is a list of similar printable documents. Infoprint Server concatenates these documents into one printable document. Separate the document names with spaces, tabs, or new lines. For example:

  - file1.txt
  - file2.txt
  - file3.txt

  All these documents must have the same format because Infoprint Server processes them all the same way.
- Do not combine file-reference documents and printable documents in the same job.
- Do not specify this job attribute in the SUBSYS JCL parameter.
- Do not specify this attribute when you embed job attributes in VTAM application data that NetSpool processes.
- Do not specify this job attribute when you print from a remote system. The files must be on the z/OS system.

duplex

This single-valued attribute indicates whether to print on one or both sides of the paper and the relative orientation of consecutive pages.

Allowed values
You can enter one of these fixed values:

- no The job is printed on one side of the paper.
- yes The job is printed on both sides of the paper so that the top of side 1 is the top of side 2 (for side binding).

- tumble

  The job is printed on both sides of the paper so that the top of side 1 is the bottom of side 2 (for top binding).

Default values
1. The default value that the administrator defined for the printer.
2. The value in the form definition that is used to print the job.

Usage guidelines
- This attribute applies to documents printed on an AFP printer.
- Products that transform AFP documents can support this attribute. For information, see the documentation for the transform.
- The value that you specify for this attribute overrides any value in the form definition that is used to print the job.
- Before it accepts a job, Infoprint Server verifies that the printer can support the value of this attribute.
This attribute is equivalent to the DUPLEX parameter of the OUTPUT JCL statement.

**fail-on-transform-error**

This single-valued attribute indicates whether transforms fail when data stream errors or warnings occur. Warnings can indicate degraded output.

**Allowed values**

You can enter one of these fixed values:

- **error** The transform fails when an error occurs and does not create an output document. However, the transform continues if warnings occur.
- **no** The transform continues processing when a warning or error occurs and creates an output document.
- **warning** The transform fails when a warning or error occurs and does not create an output document.

**Default values**

1. The value in the Fail on error field in the printer definition for the printer.
2. The value in the AOP_FAIL_ON_ERROR environment variable for the transform.
3. The default for the transform. The default for IBM Infoprint Transforms to AFP for z/OS is no. Other transforms might have different defaults.

**Usage guidelines**

For information about whether a transform supports this attribute, see the documentation for the transform.

**filter-options**

This single-valued attribute passes options to a filter or a transform that converts this document from one data format to another. You can pass options to:

- A transform filter that a transform product provides
- The Infoprint Server LPD compatibility filter (**lpd_compat.so**)
- The Infoprint Server remote transform filter for InfoPrint Manager for AIX or Windows (**aoprform.dll**)
- InfoPrint Transform Manager for Linux transforms
- A filter that your installation writes

**Table 7. References for transforms and filters**

<table>
<thead>
<tr>
<th>For information about:</th>
<th>See:</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBM transforms</td>
<td>IBM Infoprint Transforms to AFP for z/OS</td>
</tr>
<tr>
<td></td>
<td>IBM Print Transforms from AFP for Infoprint Server for z/OS</td>
</tr>
<tr>
<td>aoprform.dll options</td>
<td>z/OS Infoprint Server Operation and Administration</td>
</tr>
<tr>
<td>InfoPrint Transform Manager for Linux options</td>
<td>InfoPrint Transform Manager for Linux</td>
</tr>
<tr>
<td>x2afp options</td>
<td>IBM Infoprint XT for z/OS</td>
</tr>
</tbody>
</table>
Allowed values
You can enter a text string that contains the options. If the string contains blanks, enclose the string in single or double quotation marks. For example:

-0 "filter-options='p 5-12'"
-0 "filter-options='l 8i -w 5i'"

The LPD compatibility filter (lpd_compatible) specifies options that correspond to parameters you can specify on the z/OS Communications Server (TCP/IP) LPR command. It accepts these options:

- **-f filter**
  Specifies the type of filter processing. This option corresponds to the FILTER parameter of the TCP/IP LPR command. The default value is **f**. Valid values are:

<table>
<thead>
<tr>
<th>Filter</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>f</td>
<td>Paginate the data, but do not add a heading. Truncate lines that exceed the maximum width. Discard any ASCII control characters except CR, FF, LF, BS, NL, VT, and HT.</td>
</tr>
<tr>
<td>l</td>
<td>Do not paginate the data or add a heading. Pass through all control characters.</td>
</tr>
<tr>
<td>p</td>
<td>Paginate the data, adding a heading to each page. The heading includes the date and time that Infoprint Server received the data, the title, and the page number. After a page of text, a new page is started with a new page number. Truncate lines that exceed the maximum width.</td>
</tr>
<tr>
<td>r</td>
<td>Interpret the first column of each input line as an ANSI (FORTRAN) carriage control. The ANSI standard limits the carriage control values to blank, “1”, “0”, “+”, and “-”. Truncate lines that exceed the maximum width.</td>
</tr>
</tbody>
</table>

- **-l length**
  Specifies the maximum number of lines to include on a page. This value applies only to filters **f** and **p**. This option corresponds to the LINECOUNT parameter of the TCP/IP LPR command. The default value is 60 lines. To prevent Infoprint Server from inserting page breaks, specify 0.

- **-w width**
  Specifies the maximum number of columns to allow on a line. Lines longer than the number specified (except for the title line) are truncated. The number that is specified does not include the carriage control character at the beginning of each line. This value applies only to filters **f**, **p**, and **r**. This option corresponds to the WIDTH parameter of the TCP/IP LPR command. The default action is that lines are not truncated.

For examples that show how to specify this attribute on the **lp** command, see "Transform and print a job" on page 37 and "Paginate line data and print with a header on each page" on page 39.

Default value
The default filter options that the administrator defined for the printer. If the administrator did not define a filter option, the default value for the option is used.
Usage guidelines

- The filter options that you specify in this attribute take effect only if the administrator specifies the filter for the printer in the Printer Inventory. The administrator can also specify filter options in the Printer Inventory.
- The administrator can control whether the filter options that you specify with this attribute are used. For information about how the administrator can control whether your filter options take effect, see the description of the \%filter-options option in *z/OS Infoprint Server Operation and Administration*.
- The LPD compatibility filter can be used for text and line data when you print to an AFP printer or a JES line printer. For more information about this filter, see *z/OS Infoprint Server Operation and Administration*.

form-definition

This single-valued attribute identifies the form definition that is used when you are printing this document.

**Allowed values**
You can enter a text string of up to 8 characters that contains the identification for this resource. You can specify the form definition name either with or without the F1 prefix.

**Default value**
The default form definition that the administrator defined for the printer.

**Usage guidelines**
- This attribute applies to line data and AFP documents that are printed on an AFP printer.
- Products that transform AFP documents can support this attribute. For information, see the documentation for the transform.
- If the document has an inline form definition, specify either the name of that form definition or dummy.
- To select a form definition from your user library:
  1. See the user library that contains the form definition in the resource-library attribute.
  2. Specify the name of the form definition in the form-definition attribute.
- This attribute is equivalent to the FORMDEF parameter of the OUTPUT JCL statement.

forms

This single-valued attribute identifies the form (medium) on which this job is printed.

**Allowed values**
You can enter a text string of up to 8 characters.

**Default values**
1. The default form that the administrator defined for the printer.
2. The default form that the administrator defined for the installation.

**Usage guidelines**
- This attribute applies to line data and AFP documents that are printed on an AFP printer.
Before it accepts a job, Infoprint Server verifies that the printer can support the value of this attribute.

This attribute is equivalent to the FORMS parameter of the OUTPUT JCL statement.

**hold**

This single-valued attribute indicates whether Infoprint Server holds all data sets in the job on the JES spool.

**Allowed values**

You can enter one of these fixed values or synonyms:

**Fixed value**

- true
- false

**Input synonym**

- yes
- no

**Default values**

1. The default value that the administrator defined for the printer.
2. false

**Usage guidelines**

- A held job remains in the queue until the z/OS operator releases it.

**input-tray**

This single-valued attribute identifies an input tray on the printer device that contains the medium that is used for normal document pages.

**Allowed values**

You can enter any value that the administrator defined. Some typical values are:

- alternate
- bottom
- envelope
- large-capacity
- main
- manual
- middle
- side
- top

**Default values**

1. The default input tray that the administrator defined for the printer.
2. The input tray that the form definition used to print the job specifies.

**Usage guidelines**

- This attribute applies to line data and AFP documents that are printed on an AFP printer.
- The value of this attribute is mapped to an `input-tray-number` value. For example, `letter` might be mapped to `input-tray-number=2`. The administrator defines the mapping from `input-tray` to `input-tray-number` in the printer definition.
The AFP to PCL, AFP to PDF, and AFP to PostScript transforms map the **input-tray-number** to the appropriate printer tray. For example, 2 might be mapped to **PCL input tray 4**. In this example, if you specify **letter** on this attribute and the AFP file is being transformed automatically to PCL, the PCL printer uses input tray 4. For the default **input-tray-number** to printer tray mapping, see “input-tray-number.”

Before it accepts a job, Infoprint Server verifies that the printer can support the value of this attribute.

The value that you specify for this attribute overrides any input tray selection in the data stream or form definition.

If the tray name contains blanks or special characters, enclose the name in single or double quotation marks.

This attribute is similar to the INTRAY parameter of the OUTPUT JCL statement.

**input-tray-number**

This single-valued attribute identifies an input tray number on the printer device that contains the medium that is used for normal document pages.

**Allowed values**

You can enter any number that the AFP printer supports. Some typical values are:

1 - 255

**Default values**

1. The default input tray that the administrator defined for the printer.
2. The input tray that the form definition used to print the job specifies.

**Usage guidelines**

- This attribute applies to line data and AFP documents that are printed on an AFP printer.
- Products that transform AFP documents can support this attribute. For information, see the documentation for the transform.
- The value that you specify for this attribute overrides any input tray selection in the data stream or form definition.
- This attribute is equivalent to the INTRAY parameter of the OUTPUT JCL statement.
- These guidelines apply only to the AFP to PCL, AFP to PDF, and AFP to PostScript transforms:
  - Your administrator sets up the mapping of AFP printer tray numbers to PCL, PDF, or PostScript printer tray numbers. All values greater than 9 map to the same PCL, PDF, or PostScript printer tray number. The defaults are tray 2 for PCL and PostScript output, tray 1 for PDF output.
  - For PDF output, the page size for the entire document is the size of paper the administrator specifies for the selected printer tray.
  - Always specify the AFP printer input bin number, not the PCL, PDF, or PostScript bin number, on this attribute. When you print on a PCL, PDF, or PostScript printer, the transforms use the tray number of the AFP printer to select a corresponding input tray number for the PCL or PostScript printer. The default mapping is shown in Table 8 on page 67. For example, if you want to print from input tray 4 on a PCL printer, specify input-tray-number=2. Contact your administrator to confirm that this mapping is valid for the transform you are using.
Table 8. input-bin-number default mapping

<table>
<thead>
<tr>
<th>Data stream</th>
<th>Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCL</td>
<td>1,4,0,0,0,0,0,0,2</td>
</tr>
<tr>
<td>PostScript</td>
<td>1,2,0,0,0,0,0,0,2</td>
</tr>
<tr>
<td>PDF</td>
<td>1,1,1,1,1,1,1,1,1</td>
</tr>
</tbody>
</table>

Tip: “0” indicates that the paper tray is not installed.

**jes-form-length**

This single-valued attribute indicates the paper length in inches or centimeters. This field is used to change the paper length of the physical paper at the printer without reconfiguring the printer. The value must contain at least one digit and an abbreviation for inches or centimeters.

**Allowed values**

You can enter a value in the format \textit{nn.\textit{mmm}uu}:

\textit{nn} A number 0 - 99. You must specify at least one digit to the left of the decimal point.

\textit{mmm} A number 0 - 999. The decimal point and the digits after it are optional.

\textit{uu} The unit of measurement. One of these fixed values:

<table>
<thead>
<tr>
<th>Value</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>Inches</td>
</tr>
<tr>
<td>cm</td>
<td>Centimeters</td>
</tr>
</tbody>
</table>

For example, these values are valid:

\textit{jes-form-length}=9.5in
\textit{jes-form-length}=12.345cm
\textit{jes-form-length}=21in
\textit{jes-form-length}=8.5cm

**Default value**

The default form length that the administrator defined for the printer.

**Usage guidelines**

- This attribute applies to line data and AFP documents that are printed on an AFP printer.
- This attribute is equivalent to the FORMLEN parameter of the OUTPUT JCL statement.

**jes-priority**

This single-valued attribute indicates the scheduling priority for the job.

**Allowed values**

You can enter an integer 0 - 255.

**Default value**

The default value that the administrator defined for the printer.

**Usage guidelines**

- 255 is the highest priority. 0 is the lowest.
mail-bcc-addresses
This multi-valued attribute specifies the email addresses for the blind copy (bcc) recipients of an email. A bcc means that other recipients of the email do not see the bcc recipient listed.

Allowed values
You can specify 1 - 32 email addresses. If you specify more than one value, separate the values with spaces and enclose the list of values in braces {}. If the email address contains the special character @, enclose the value in braces even if there is only one value.

Each email address can be 1 - 60 characters. You can specify any EBCDIC text characters; however, blanks are not allowed. If the email address contains special characters (such as @ $ & ( ) > < | ’ ” #), enclose the entire email address in single or double quotation marks.

For example:
-o "mail-bcc-addresses={'user1@xyz.com' 'user2@xyz.com' dept01list}"
-o "mail-bcc-addresses={'user1@xyz.com'}"

If the email address contains double quotation marks, enclose the address in single quotation marks.

Default value
The default value that the administrator defined in the printer definition.

Usage guidelines
- The email address can be an alias name that is defined to z/OS UNIX sendmail. For more information, see “Specifying the email address list in an alias file” on page 95.
- This attribute is equivalent to the MAILBCC parameter of the OUTPUT JCL statement.

mail-cc-addresses
This multi-valued attribute specifies the email addresses for the copy (cc) recipients of an email. A cc means that other recipients of the email can see the cc recipient listed.

Allowed values
You can specify 1 - 32 email addresses. If you specify more than one value, separate the values with spaces and enclose the list of values in braces {}. If the email address contains the special character @, enclose the value in braces even if there is only one value.

Each email address can be 1 - 60 characters. You can specify any EBCDIC text characters; however, blanks are not allowed. If the email address contains special characters (such as @ $ & ( ) > < | ’ ” #), enclose the entire email address in single or double quotation marks.

For example:
-o "mail-cc-addresses={user1@xyz.com 'user2@xyz.com' dept01list}"
-0 "mail-cc-addresses={user1@xyz.com}'"

If the email address contains double quotation marks, enclose the address in single quotation marks.

**Default value**
The default value that the administrator defined in the printer definition.

**Usage guidelines**
- The email address can be an alias name that is defined to z/OS UNIX sendmail. For more information, see [Specifying the email address list in an alias file](#) on page 95.
- This attribute is equivalent to the MAILCC parameter of the OUTPUT JCL statement.

**mail-embedded-headers**
This single-valued attribute indicates whether a line-data document contains an email header.

**Allowed values**
You can enter one of these fixed values:

- **yes**  
  IP PrintWay extended mode looks for an email header in the line-data document. It sends the email to the email addresses specified in the header.

- **no**  
  IP PrintWay extended mode does not look for email headers.

**Default value**
The default value that the administrator defined in the printer definition.

**Usage guidelines**
- For more information, see [Chapter 11, “Creating an email header,” on page 179](#).
- IP PrintWay basic mode ignores this attribute.

**mail-file-name**
This single-valued attribute specifies the file name of the attachment to an email.

**Allowed values**
You can specify a name that is 1-60 characters. You can specify any EBCDIC text characters, including blanks. If the name contains blanks or special characters (such as @ $ & ( ) > < " #'), enclose the entire name in single or double quotation marks. For example:
-0 "mail-file-name='February 2004 sales report'

If the name contains double quotation marks, enclose the name in single quotation marks.

**Default value**
The default value in one of these:
- IP PrintWay, spooled by Print Interface:
  1. The **sysout-dataset-name** job attribute
  2. The last 8 characters of the file name
If the first character is not a letter, $, $, or @, it is converted to a #. If one of the remaining characters is not a letter, number, $, $, or @, it is converted to a #. Lowercase letters are converted to uppercase letters.

- IP PrintWay, spooled by NetSpool:
  1. The `sysout-dataset-name` job attribute
  2. The VTAM PLU name of the application that sent the data

Usage guidelines
- This attribute is equivalent to the MAILFILE parameter of the OUTPUT JCL statement.

mail-from-name
This single-valued attribute specifies the descriptive name or other identifier of the sender of an email.

Allowed values
You can specify a name that is 1-60 characters. You can specify any EBCDIC text characters; however, blanks are not allowed. If the name contains blanks or special characters (such as $ & ( ) > < | ' " #), enclose the entire name in single or double quotation marks. For example:
- `"mail-from-name='John Q. Sender'"

If the name contains double quotation marks, enclose the name in single quotation marks.

Default value
The default value that the administrator defined in the printer definition.

Usage guidelines
- This attribute is equivalent to the MAILFROM parameter of the OUTPUT JCL statement.

mail-inline-message
This single-valued attribute specifies data that IP PrintWay extended mode includes inline at the beginning of each email. For example, you can specify a standard greeting and text.

Allowed values
Up to 292 letters, numbers, blanks, and special characters. If the message contains blanks or special characters, enclose the entire message in single or double quotation marks. You can include control values, such as:
- `<LF>` New line
- `<SP>` Blank character

Default value
No inline message is included in the body of the email.

Usage guidelines
- The message that this attribute specifies is included in the email after the text data specified with the `mail-inline-text-attribute` job attribute.
- Infoprint Server converts each blank in the message to `<SP>`. If the message exceeds 292 characters, it is truncated.
- Email programs can interpret control values in different ways.
mail-inline-text
This single-valued attribute indicates whether to include data in a text or line-data document inline in the body of the email.

**Allowed values**
You can enter one of these fixed values:
- **yes** Text and line data is included inline.
- **no** Text and line data is not included inline. The document is sent as an attachment.

**Default value**
The default value that the administrator defined in the printer definition.

**Usage guidelines**
- Documents in other formats (such as AFP and PDF) are always sent as attachments.
- IP PrintWay basic mode ignores this attribute.

mail-inline-text-attribute
This single-valued attribute specifies an existing text job attribute that IP PrintWay extended mode includes inline as a text string at the beginning of each email.

**Allowed values**
You can specify a single-valued text job attribute, such as:
- **building-text**
- **department-text**
- **name-text**
- **room-text**
- **title-text**

For example, if mail-inline-text-attribute=name-text and name-text="Mr. Jones", then Mr. Jones is included on the first line in the email.

**Default value**
No text data is included at the beginning of the email.

**Usage guidelines**
- The text string that this attribute specifies is included at the beginning of the email before the data that is specified with the mail-inline-message job attribute.
- IP PrintWay basic mode ignores this attribute.

mail-reply-address
This single-valued attribute specifies the email address that recipients of an email can reply to.
Allowed values
You can specify a name that is 1 - 60 characters. You can specify any EBCDIC text characters; however, blanks are not allowed. If the name contains special characters (such as @ $ & ( ) > < | ' " #), enclose the entire name in single or double quotation marks. For example:

-o "mail-reply-address='user1@xyz.com'"

If the email address contains double quotation marks, enclose the address in single quotation marks.

Default value
The default value that the administrator defined in the printer definition. If none is specified in the printer definition, most email programs use the sender's email address. The default is userid@domainname. The user ID of the job submitter is userid. The domain name where Infoprint Server is running is domainname.

Usage guidelines
• This attribute is equivalent to the REPLYTO parameter of the OUTPUT JCL statement.

mail-to-addresses
This multi-valued attribute specifies the email addresses for the recipients of an email.

Allowed values
You can specify 1 - 32 email addresses. If you specify more than one value, separate the values by spaces and enclose the list of values in braces {}. If the email address contains the special character @, enclose the value in braces even if there is only one value.

Each email address can be 1 - 60 characters. You can specify any EBCDIC text characters; however, blanks are not allowed. If the email address contains special characters (such as @ $ & ( ) > < | ' " #), enclose the entire email address in single or double quotation marks.

For example:
-o "mail-to-addresses={'user1@xyz.com' 'user2@xyz.com' dept01list}"
-o "mail-to-addresses={'user1@xyz.com'}"

If the email address contains double quotation marks, enclose the address in single quotation marks.

Default value
The default value that the administrator defined in the printer definition.

Usage guidelines
• The email address can be an alias name that is defined to z/OS UNIX sendmail. For more information, see "Specifying the email address list in an alias file" on page 95.
• This attribute is equivalent to the MAILTO parameter of the OUTPUT JCL statement.

name-text
This single-valued attribute specifies name information that can be printed in the name field of a separator sheet.
Allowed values
You can enter a text string of up to 60 characters. If the text string you specify contains spaces, enclose the text string in single or double quotation marks. For example:
-o "name-text='C. J. Brown'"

If the string contains double quotation marks, enclose the string in single quotation marks.

Default value
The default text that the administrator defined for the printer.

Usage guidelines
- Whether the text specified by this attribute is printed depends on how the administrator configures the printer's separator sheet.
- This attribute is equivalent to the NAME parameter of the OUTPUT JCL statement.

output-bin
This single-valued attribute specifies the name of the output bin to which you want Infoprint Server to direct the output from your job.

Allowed values
You can enter any value that the administrator defined. Some typical values are:
  - bottom
  - collator
  - face-down
  - face-up
  - large
  - left
  - middle
  - private
  - right
  - side
  - top

Default values
1. The default output bin that the administrator defined for the printer.
2. The output bin that the form definition used to print the job specifies.

Usage guidelines
- This attribute applies to line data and AFP documents that are printed on an AFP printer.
- Products that transform AFP documents can support this attribute. For information, see the documentation for the transform.
- The value of this attribute is mapped to an output-bin-number value. For example, bottom might be mapped to output-bin-number=2. The administrator defines the mapping from output-bin to output-bin-number in the printer definition.
- Before it accepts a job, Infoprint Server verifies that the printer can support the value of this attribute.
- The value that you specify for the output-bin attribute overrides any output bin that the form definition used to print the job specifies.
• If the bin name contains blanks or special characters, enclose the name in single or double quotation marks.
• This attribute is similar to the OUTBIN parameter of the OUTPUT JCL statement.

**output-bin-number**
This single-valued attribute specifies the number of the output bin to which you want Infoprint Server to direct the output from your job.

**Allowed values**
You can enter any number that the AFP printer supports. Some typical values are:

1 - 16

**Default values**
1. The default output bin that the administrator defined for the printer.
2. The output bin that the form definition used to print the job specifies.

**Usage guidelines**
• This attribute applies to line data and AFP documents that are printed on an AFP printer.
• Products that transform AFP documents can support this attribute. For information, see the documentation for the transform.
• When you print on a PCL or PostScript printer, instead of on an AFP printer, specify the output bin number of the PCL or PostScript printer.
• The value that you specify for the **output-bin-number** attribute overrides any output bin that the form definition used to print the job specifies.
• This attribute is equivalent to the OUTBIN parameter of the OUTPUT JCL statement.

**overlay-back**
This single-valued attribute specifies the name of an overlay that is placed on the back of each page in a two-sided job. An overlay contains predefined data, such as lines, shading, text, boxes, or logos that can merge with variable data on a page.

**Allowed values**
You can enter an overlay name of up to 8 characters. The first character must be alphabetic. For overlays, unlike form definitions and page definitions, you must specify the complete name, including the 01 prefix.

**Default value**
The default overlay that the administrator defined for the printer.

**Usage guidelines**
• This attribute applies to line data and AFP documents that are printed on an AFP printer.
• Products that transform AFP documents can support this attribute. For information, see the documentation for the transform.
• This overlay prints in addition to any overlay specified by the form definition for the job.
• This attribute is equivalent to the OVERLAYB parameter of the OUTPUT JCL statement.
**overlay-front**

This single-valued attribute specifies the name of an overlay that is placed on the front of each page in the job. An overlay contains predefined data, such as lines, shading, text, boxes, or logos that can merge with variable data on a page.

**Allowed values**
You can enter an overlay name of up to 8 characters. The first character must be alphabetic. For overlays, unlike form definitions and page definitions, you must specify the complete name, including the 01 prefix.

**Default value**
The default overlay that the administrator defined for the printer.

**Usage guidelines**
- This attribute applies to line data and AFP documents that are printed on an AFP printer.
- Products that transform AFP documents can support this attribute. For information, see the documentation for the transform.
- This overlay prints in addition to any overlay specified by the form definition for the job.
- This attribute is equivalent to the OVERLAYF parameter of the OUTPUT JCL statement.

**owner**

This single-valued attribute specifies the owner of a NetSpool job. You can embed this attribute in NetSpool print data. The identifying information can be printed on output header pages, or can help identify the user to charge in an accounting system for printing jobs. This attribute applies only to NetSpool.

**Allowed values**
You can enter a text string of up to 8 characters. The first character must be a letter or a national (#, $, @) character. Other characters can be letters, numbers, or national (#, $, @) characters. If the text string contains #, $, or @, enclose the text string in single or double quotation marks. For example:

- `owner='$SMITH'`

Lowercase letters are converted to uppercase letters.

**Default value**
The default owner that the administrator defined in the printer definition. If none is specified in the printer definition, the default value is the ID of the user who started the Infoprint Server daemons.

**Usage guidelines**
- This attribute applies only when you embed job attributes in NetSpool print data. To embed job attributes in NetSpool print data, your administrator must configure the `embedded-attributes-prefix` attribute in the printer definition, and you must precede the job attributes in the print data with the `embedded-attributes-prefix` value that your administrator specified.
- This attribute is equivalent to the USER parameter of the JOB JCL statement.
- You can use this attribute to search for print jobs with Infoprint Central.
page-definition

This single-valued attribute identifies the page definition that is used to print a line data document.

**Allowed values**
You can enter a text string of up to 8 characters. You can specify the page definition name either with or without the `P1` prefix.

**Default value**
The default page definition that the administrator defined for the printer.

**Usage guidelines**
- This attribute applies to line data documents printed on an AFP printer.
- Products that transform AFP documents can support this attribute. For information, see the documentation for the transform.
- If the document has an inline page definition, specify either the name of that page definition or `dummy`.
- This attribute is equivalent to the `PAGEDEF` parameter of the OUTPUT JCL statement.

pdf-encryption-level

This single-valued attribute specifies the level of encryption that is used to encrypt PDF documents. A high level of encryption provides enhanced security. However, some users might not be able to open PDF documents that use a high level of encryption.

**Allowed values**
You can enter one of these fixed values:

- `bits40` A low level of encryption (a 40-bit encryption key) is used. Select this value if you email PDF documents to countries that do not use 128-bit encryption, or for Adobe Acrobat Reader 3.0 - 4.x.
- `bits128` A high level of encryption (a 128-bit encryption key) is used. Select this value for sensitive PDF documents.

**Default value**
`bits128`

**Usage guidelines**
- AFP to PDF transforms can support this attribute. For information, see the documentation for the transform.

pdf-owner-identifier

This single-valued attribute specifies the identifier of the owner of an encrypted PDF document. The owner identifier is associated with a password that is stored in a separate database. An owner password is required to restrict actions with the pdf-protect attribute.

**Allowed values**
You can enter a text string of 1 - 256 characters. You can enter any combination of letters, numbers, blanks, and special characters that the Password exit allows. Your administrator sets up the Password exit. This text string might be case-sensitive,
depending on the Password exit. If the text string you specify contains blanks or special characters (such as \x22$\x22 \& ( ) > < 1 " #), enclose the text string in single or double quotation marks. For example:

```
-j "pdf-owner-identifier='Nurse-Lee@hospital.com'"
```

If the string contains double quotation marks, enclose the string in single quotation marks.

**Default value**
The owner identifier that the administrator specified in the printer definition. If none is specified, there is no default.

**Usage guidelines**
- AFP to PDF transforms can support this attribute. For information, see the documentation for the transform.
- The transform encrypts a PDF document when a user identifier, an owner identifier, or both is specified. Encrypting a PDF document protects it from unauthorized access.
- In most cases, the user and owner identifiers need to be different because the passwords must be different.

**pdf-protect**
This multi-valued attribute specifies one or more actions that users cannot do on encrypted PDF documents.

**Allowed values**
You can enter one or more fixed values to restrict actions. If you specify more than one value, separate the values with spaces and enclose the list of values in braces {}. For example:

```
-j "pdf-protect=all"
-j "pdf-protect={copy update}"
```

<table>
<thead>
<tr>
<th>Value</th>
<th>Actions users cannot do:</th>
</tr>
</thead>
<tbody>
<tr>
<td>all</td>
<td>• All actions (copy, print, update)</td>
</tr>
</tbody>
</table>
| copy   | • Copy or extract content to another document  
        |   • Extract content for accessibility |
| print  | • Print at low resolution (150 dpi)  
        |   • Print at high resolution |
| update | • Change the document  
        |   • Assemble the document (insert, delete, rotate pages)  
        |   • Add comments  
        |   • Complete form fields or sign  
        |   • Create template pages |

**Default value**
The value that the administrator specified in the printer definition. If none is specified, no actions are restricted.

**Usage guidelines**
- AFP to PDF transforms can support this attribute. For information, see the documentation for the transform.
**pdf-user-identifier**

This single-valued attribute specifies the identifier of the user of an encrypted PDF document. The user identifier is associated with a password that is stored in a separate database. The user enters the user password when the encrypted PDF document is opened.

**Allowed values**

You can enter a text string of 1 - 256 characters. You can enter any combination of letters, numbers, blanks, and special characters that the Password exit allows. Your administrator sets up the Password exit. This text string might be case-sensitive, depending on the Password exit. If the text string you specify contains blanks or special characters (such as @ $ & ( ) > < | ' " #), enclose the text string in single or double quotation marks. For example:

```
-j "pdf-user-identifier='Dr-Smith@hospital.com'"
```

If the string contains double quotation marks, enclose the string in single quotation marks.

**Default value**

The user identifier that the administrator specified in the printer definition. If none is specified, any user can open the PDF document without a password.

**Usage guidelines**

- AFP to PDF transforms can support this attribute. For information, see the documentation for the transform.
- The transform encrypts a PDF document when a user identifier, an owner identifier, or both is specified. Encrypting a PDF document protects it from unauthorized access.
- In most cases, the user and owner identifiers need to be different because the passwords must be different.

**print-error-reporting**

This single-valued attribute indicates the type of data fidelity problems (print-positioning errors or invalid-character errors) that the printer reports while it prints this document.

**Allowed values**

You can enter one of these fixed values:

- `all` Report both print-positioning and invalid-character errors.
- `character` Report only invalid-character errors.
- `none` Report no errors.
- `position` Report only print-positioning errors.

**Default value**

The default value that the administrator defined for the printer.

**Usage guidelines**

- This attribute applies to line data and AFP documents that are printed on an AFP printer.
- Products that transform AFP documents can support this attribute. For information, see the documentation for the transform.
• Before it accepts a job, Infoprint Server verifies that the printer can support the value of this attribute.
• This attribute is similar to the DATACK parameter of the OUTPUT JCL statement.

**print-queue-name**

This single-valued attribute specifies the name of the print queue on the target printer.

**Allowed values**
You can enter a text string up to 127 characters.

**Default value**
The default print queue that the administrator defined for the printer.

**Usage guidelines**
• The value in this attribute overrides the print queue name that is specified in the printer definition. You must use this attribute for local area network (LAN) printers that are not defined by your administrator.
• If the printer definition does not specify the LPR protocol, IP PrintWay ignores this parameter.
• This attribute is equivalent to the PRTQUEUE parameter of the OUTPUT JCL statement.

**printer-ip-address**

This single-valued attribute identifies the Internet Protocol (IP) address of the target printer.

**Allowed values**
You can enter a text string of up to 115 characters. The string must be one of these types of address:

**Dotted decimal address**
A series of integers in the range of 0 - 255, separated by periods (decimal address). For example:

9.99.12.85

**Host name**
A series of domain names that can contain alphanumeric characters and dashes (-), separated by periods (.). The first character must be alphabetic or numeric. For example:

printer1.boulder.ibm.com

**Colon-hexadecimal address**
An IPv6 address in colon-hexadecimal format. These rules apply:
• You can omit leading zeros in each hexadecimal value.
• You can omit one sequence of repeat zero values
• You can specify the last two hexadecimal values in dotted decimal notation.

For example:

2001:0db8:85a3:0000:0000:8a2e:0370:7334

If you run IP PrintWay basic mode, do not specify a colon-hexadecimal address because IP PrintWay does not support IPv6.
**Default value**
The IP address that the administrator defined for the printer.

**Usage guidelines**
- The value in this attribute overrides the IP address that is specified in the printer definition. Use this attribute when you submit jobs to LAN printers not defined by your administrator.
- If the printer definition does not specify the LPR or direct sockets printing protocol, IP PrintWay ignores this parameter.
- For printers attached with the i-data 7913 Intelligent Printer Data Stream (IPDS) Printer LAN Attachment, use the IP address of the 7913.
- This attribute is equivalent to the DEST=IP: parameter of the OUTPUT JCL statement.

**resource-directories**
This multi-valued attribute defines the directories that contain TrueType and OpenType fonts that PSF uses to process data sets. PSF searches these directories before it searches system-defined resource directories. PSF searches the directories in the order that you specify them.

**Allowed values**
You can enter up to eight directories. Each directory name can be up to 255 characters. The first character must be a slash. If a name contains blanks or special characters other than a period or a slash (such as $ & ( ) > < ' " #), enclose the name in single or double quotation marks. Separate multiple directories with spaces and surround the string of directories with braces. For example:

```
-o 'resource-directories={/u/myuserid/truetype /u/myuserid/opentype}'
```

**Default values**
1. The default resource directories that the administrator defined for the printer.
2. PSF determines the resource directories.

**Usage guidelines**
- PSF must be enabled for Unicode. If a PSF FSS definition exists, the Unicode enabled field must be selected.
- This attribute is equivalent to the USERPATH parameter of the OUTPUT JCL statement.
- To find out how to install fonts, see [*PSF for z/OS: User's Guide*](#).

**resource-library**
This multi-valued attribute defines the location for document-specific resources: fonts, form definitions, overlays, and page definitions.

**Allowed values**
You can enter up to eight names of cataloged MVS data sets. Each name can be up to 44 characters. Separate multiple library names with spaces and surround the string of library names with braces. For example:

```
-o 'resource-library={FONT.LIBRARY OVERLAY.LIBRARY}'
```

**Default values**
1. The default resource libraries that the administrator defined for the printer.
2. PSF or the transform determines the resource libraries.
Usage guidelines
- This attribute applies to line data and AFP documents that are printed on an AFP printer.
- Products that transform AFP documents can support this attribute. For information, see the documentation for the transform.
- If a resource cannot be found, PSF prints the job and prints error messages at the end of the job. Infoprint Server reports the job as completed. For information about how transforms handle missing resources, see the documentation for the transform.
- If Infoprint Server transforms the data from AFP format to PCL, PostScript, or PDF format, the user who starts the Infoprint Server daemons must have RACF authorization to read the AFP user resource libraries. For more information, see the AFP security information in z/OS Infoprint Server Customization.
- You must have RACF authorization to read any AFP user resource library that you specify in the resource-library job attribute or USERLIB JCL parameter. If you use a job-submission method that does not authenticate your z/OS user ID (for example, the Infoprint Port Monitor), the AFP resource library must allow universal read access.
- This attribute is equivalent to the USERLIB parameter of the OUTPUT JCL statement.

restrict-printable-area
This single-valued attribute indicates whether an area on each page of printed output is reserved for the security label. When an area is reserved for a security label, the printed output is shifted on each page. You cannot print data in the reserved area.

Allowed values
You can enter one of these fixed values:

- yes: An area on each page is reserved for the security label.
- no: An area is not reserved for the security label.

Default value
PSF sets the default based on whether PSFMPL is active.

Usage guidelines
- This attribute does not apply to IP PrintWay printer definitions.
- This attribute is equivalent to the SYSAREA parameter of the OUTPUT JCL statement.

room-text
This single-valued attribute specifies room information that can be printed in the room field of a separator sheet.

Allowed values
You can enter a text string of up to 60 characters. If the text string you specify contains spaces, enclose the text string in single or double quotation marks. For example:
- `o "room-text='Room 306-B'"`

If the string contains double quotation marks, enclose the string in single quotation marks.
**Default value**
The default text that the administrator defined for the printer.

**Usage guidelines**
- Whether the text specified by this attribute is printed depends on how the administrator configures the printer's separator sheet.
- This attribute is equivalent to the ROOM parameter of the OUTPUT JCL statement.

**save-afp-statistics**
This single-valued attribute indicates whether you want PSF to generate an AFP Statistics (AFPSTATS) report. An AFPSTATS report gives you detailed information about the data set, such as where resources were found and what significant events happened.

**Allowed values**
You can enter one of these fixed values:

- **yes**  An AFPSTATS report is generated.
- **no**    An AFPSTATS report is not generated.

**Default value**
An AFPSTATS report is not generated.

**Usage guidelines**
- This attribute is equivalent to the AFPSTATS parameter of the OUTPUT JCL statement.

**shift-out-shift-in**
This single-valued attribute specifies the printer scanning modes that are used when processing EBCDIC line data that prints with either a single-byte or a double-byte font.

**Allowed values**
You can enter one of these fixed values:

- **one**   Each shift-out, shift-in code is converted to a blank and a Set Coded Font Local text control.
- **two**   Each shift-out, shift-in code is converted to a Set Coded Font Local text control.
- **three** Each shift-in code is converted to a Set Coded Font Local text control and two blanks. Each shift-out code is converted to a Set Coded Font Local text control.
- **four**  PSF skips each shift-out, shift-in code and does not count the code when it calculates offsets for the print data set. SOSI4 is used when double-byte character set (DBCS) text is converted from ASCII to EBCDIC. The IBM transforms from AFP (AFP to PCL, AFP to PDF, and AFP to PostScript) do not support SOSI4.

**Default value**
The default value that the administrator defined for the printer.

**Usage guidelines**
- This attribute applies to line data documents printed on an AFP printer.
Products that transform AFP documents can support this attribute. For information, see the documentation for the transform.

For the shift-in, shift-out process to work correctly, either the `chars` attribute or the page definition that is used to print the job must specify two coded fonts. The first must be a single-byte font, and the second must be a double-byte font.

IBM suggests that you do not mix SOSI codes and TRCs in the same job.

This attribute is similar to the `PRMODE` parameter of the OUTPUT JCL statement.

**sysout-dataset-name**

This single-valued attribute specifies the name to assign to the system output data sets (sysout data sets) that Infoprint Server creates on the JES spool. It becomes the last qualifier of the fully qualified data set name on the JES spool. The fully qualified data set name can be printed on a separator page that is created by your installation. It can also be printed on a separator page (banner page) printed by the printer's LPD. If the file is sent to an email destination instead of to a printer and the `mail-file-name` job attribute is not specified, the name you specify in this parameter is used as the name of the email attachment.

**Allowed values**

You can enter a text string of up to 8 characters. The first character must be a letter or a national (#, $, @) character. Other characters can be letters, numbers, or national (#, $, @) characters. If the text string contains #, $, or @, enclose the text string in single or double quotation marks. For example:

```
-o "sysout-dataset-name='$MYFILE'
```

Lowercase letters are converted to uppercase letters.

**Default value**

The last 8 characters of the name of the file. If the first character is not a letter, #, $, or @, it is converted to a #. If one of the remaining characters is not a letter, number, #, $, or @, it is converted to a #.

**Usage guidelines**

- If you use the Print Interface subsystem, the `lpstat` command displays this name.
- If you do not use the Print Interface subsystem, the `lpstat` command displays the original file name instead of this name to provide more information about the file.
- This attribute is similar to the `DSNAME` parameter of the DD JCL statement.

**sysout-job-id**

This single-valued attribute specifies the job ID to assign to the system output data sets (sysout data sets) that Infoprint Server creates on the JES spool. The system operator can use this job ID to locate the sysout data sets on the JES spool.

**Allowed values**

You can enter a text string of up to 8 characters. The first character must be a letter or a national (#, $, @) character. Other characters can be letters, numbers, or national (#, $, @) characters. If the text string contains #, $, or @, enclose the text string in single or double quotation marks. For example:

```
-o "sysout-job-id='123'
```

Lowercase letters are converted to uppercase letters.
**Default values**

1. If you use the Print Interface subsystem, the job ID that z/OS assigns to your job is used.

2. If you do not use the Print Interface subsystem, the Infoprint Server job ID is used. The Infoprint Server job ID is a unique identifier that is composed of the 2-character prefix (default is `PS`) followed by a unique number. You can use this number to query or cancel your job with the `lpstat` or `cancel` commands.

**Usage guidelines**

- You cannot use the value that you specify to query or cancel your job with the `lp` or `lpstat` command.
- The job ID you specify is not written in the SMF type 6 accounting record that either IP PrintWay or PSF writes.
- JES commands do not display this job ID. JES commands display the job ID that z/OS assigns to the job.
- You can use this attribute to search for print jobs with Infoprint Central.
- If this attribute is specified with the `PRTATTRS` JCL parameter, IP PrintWay ignores it.

**sysout-job-name**

This single-valued attribute specifies the job name to assign to the system output data sets (sysout data sets) that Infoprint Server creates on the JES spool. The system operator can use this job name to locate the sysout data sets on the JES spool. This name can be printed on a separator page that is created by your installation. It can also be printed on a separator page (banner page) printed by the printer’s LPD.

**Allowed values**

You can enter a text string of up to 8 characters. The first character must be a letter or a national (#, $, @) character. Other characters can be letters, numbers, or national (#, $, @) characters. If the text string contains #, $, or @, enclose the text string in single or double quotation marks. For example:

```-o "sysout-job-name='MYJOB'"```

Lowercase letters are converted to uppercase letters.

**Default values**

1. If you use the Print Interface subsystem, the job name that is specified on the JOB JCL statement, or the name that is assigned by the z/OS system, is used.

2. If you do not use the Print Interface subsystem, the first 8 characters of your user ID are used.

**Usage guidelines**

- Whether the job name specified by this attribute is printed depends on how your administrator configures the printer’s separator sheet or how the printer’s LPD is implemented.
- The job name that you specify is written in the SMF type 6 accounting record that either IP PrintWay or PSF writes.
- This attribute is equivalent to the job name you can specify on a JOB JCL statement.
- You can use this attribute to search for print jobs with Infoprint Central.
- If this attribute is specified with the `PRTATTRS` JCL parameter, IP PrintWay ignores it.
**table-reference-characters**

This single-valued attribute specifies whether the document contains table-reference characters (TRCs). A TRC selects a font character set named by the `chars` attribute or in the page definition that is used to print the job. A TRC is the first character of each line in the document unless the first character is a carriage control character. In that case, the TRC is the second character.

**Allowed values**

You can enter one of these fixed values or synonyms:

- **Fixed value**
  - `true`
  - `false`

- **Input synonym**
  - `yes`
  - `no`

**Default value**

The default value that the administrator defined for the printer.

**Usage guidelines**

- This attribute applies to line data documents printed on an AFP printer.
- Products that transform AFP documents can support this attribute. For information, see the documentation for the transform.
- If the value of this attribute is `true` and the page definition does not identify fonts, you must specify fonts with the `chars` attribute.
- If the line data contains TRCs and you do not specify this attribute, your printed output is not correct because TRCs are interpreted as text characters instead of font identifiers.
- IBM suggests that you do not mix SOSI codes and TRCs in the same job.
- This attribute is equivalent to the TRC parameter of the OUTPUT JCL statement.
- For more information about using table-reference characters, see *AFP: Programming Guide and Line Data Reference*.

**title-text**

This single-valued attribute describes the contents of the file. This value can be printed on a separator page that is created by your installation. It can also be printed on a separator page (banner page) printed by the printer’s LPD. If the file is sent to an email destination, this value is the subject of the email.

**Allowed values**

You can enter a text string of up to 60 characters. If the text string you specify contains spaces, enclose the text string in single or double quotation marks. For example:

```
-o "title-text='Meeting Agenda'"
```

If the string contains double quotation marks, enclose the string in single quotation marks. For example:

```
-o "title-text='A New Interpretation of "Finnegans Wake"'"
```
**Default values**

1. For a separator page created by an IP PrintWay or PSF exit: The default value is the title that your administrator specified in the Allocation section of the printer definition. If none is specified, there is no default value.

2. For the LPD’s separator page: The default value is the title that your administrator specified in the Allocation section of the printer definition. If none is specified, the default value is the title or file name that your administrator specified in the Protocol section of the printer definition. If none is specified, the default value is the data set name.

3. For the subject of an email: The default value is the title that is specified in the Allocation section of the printer definition. If none is specified, the default value is the job name. Depending on how the print request was submitted, the job name might be the ID of the user who submitted the print request.

**Usage guidelines**

- Whether the text specified by this attribute is printed depends on how your administrator configures the printer’s separator sheet or how the LPD is implemented.
- This attribute is equivalent to the TITLE parameter of the OUTPUT JCL statement.

**trailer-transform-error-page**

This single-valued attribute indicates whether the transform writes messages for data stream errors and warnings to a trailer page. The trailer page is the last page in the output document. Warnings can indicate degraded output.

**Allowed values**

You can enter one of these fixed values:

- **error** The transform writes error messages, but not warning messages, to a trailer page. This option does not apply when `fail-on-transform-error=error` or `fail-on-transform-error=warning` because no output document is created when an error occurs.

- **no** The transform does not write messages to a trailer page.

- **warning** The transform writes error and warning messages to a trailer page. This option does not apply when `fail-on-transform-error=warning` because no output document is created when an error or warning occurs.

**Default values**

1. The value that is selected in the Trailer error page field in the printer definition for the printer.

2. The value in the AOP_TRAILER_ERROR_PAGE environment variable for the transform.

3. The default for the transform. The default for IBM Infoprint Transforms to AFP for z/OS is **warning**. Other transforms might have different defaults.

**Usage guidelines**

For information about whether a transform supports this attribute, see the documentation for the transform.
**x-image-shift-back**

This single-valued attribute specifies the X offset of the logical page origin to the right of the physical page origin on the back side of a double-sided sheet.

**Allowed values**

You can enter a number from 000.000 - 999.999, followed by the unit of measure (optional). The default unit of measure is millimeters. No blank spaces are allowed. These units are valid:

<table>
<thead>
<tr>
<th>Unit</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>IN</td>
<td>Inches</td>
</tr>
<tr>
<td>CM</td>
<td>Centimeters</td>
</tr>
<tr>
<td>MM</td>
<td>Millimeters (default unit)</td>
</tr>
<tr>
<td>PELS</td>
<td>Picture elements (1/240 inch)</td>
</tr>
<tr>
<td>POINTS</td>
<td>Points (1/72 inch)</td>
</tr>
</tbody>
</table>

For example, you can enter these values:

- `x-image-shift-back=25.4`
- `x-image-shift-back=25.4MM`
- `x-image-shift-back=2.54CM`
- `x-image-shift-back=1IN`
- `x-image-shift-back=240PELS`
- `x-image-shift-back=72POINTS`

**Default values**

1. The default X offset that the administrator defined for the printer.
2. The X offset that the form definition used to print the job specifies.

**Usage guidelines**

- This attribute applies to line data and AFP documents that are printed on an AFP printer.
- Products that transform AFP documents can support this attribute. For information, see the documentation for the transform.
- This attribute overrides the X-offset value in the form definition that is used to print the job.
- This attribute is similar to the OFFSETXB parameter of the OUTPUT JCL statement.

**x-image-shift-front**

This single-valued attribute specifies the X offset of the logical page origin to the right of the physical page origin on the front of the sheet.

**Allowed values**

You can enter a value 0 - 999.999, followed by the unit of measure (optional). The default unit of measure is millimeters. No blanks are allowed. For information about the allowed values, see "x-image-shift-back".

**Default values**

1. The default X offset that the administrator defined for the printer.
2. The X offset that the form definition used to print the job specifies.
Usage guidelines

- This attribute applies to line data and AFP documents that are printed on an AFP printer.
- Products that transform AFP documents can support this attribute. For information, see the documentation for the transform.
- This attribute overrides the X-offset value in the form definition that is used to print the job.
- This attribute is similar to the OFFSETXF parameter of the OUTPUT JCL statement.

xf-options

This multi-valued attribute specifies transform attributes that apply only when you use InfoPrint Transform Manager for Linux, which converts a document from one data format, such as PostScript, to another, such as AFP format. Administrators can also specify these transform attributes in the remote transform filter (aoprxf.so) in the Printer Inventory.

Tip: These transform attributes are different from the InfoPrint Transform Manager for Linux transform options, which you specify in the filter-options job attribute.

Allowed values

You can enter one or more of these transform attributes:

fail-on-datastream-error

Indicates whether the transformation of the document fails if the data stream has errors. Use this transform attribute if you want to make sure that output is produced only if it does not have errors.

Values are:

- yes: The transformation of the document fails if the data stream has any errors, including recoverable data stream errors. Output is produced only if it does not have any errors. If any data stream errors occur, the exit value for the transform is >0. Error messages for data stream errors are not included on a trailer error page (a page that is written at the end of the output data).
- no: The transformation of the document does not fail if the data stream has a recoverable error. Output is produced even if it has errors. If a recoverable data stream error occurs, the exit value for the transform is 0. This is the default.

output-format

Specifies the format of the output document. To use the AFP to PDF transform, you must specify this attribute.

Values are:

- modca-p: Mixed Object Document Content Architecture for Presentation (MO:DCA-P) format. This is the default.

trailer-error-page

Indicates whether error messages for recoverable data stream errors are included on a trailer error page (a page that is written at the end of the output data). Use this transform attribute if you want to make sure that error pages are not created.
This attribute does not apply to the AFP to PDF transform because Infoprint Server does not create a trailer error page for this transform.

Values are:

- **yes**: Error messages are included on a trailer error page. This is the default.
- **no**: A trailer error page is not created.

**transform-id**

Specifies an InfoPrint Transform Manager for Linux transform ID for a specific transform. You do not need to specify this transform attribute to use any of the transforms that InfoPrint Transform Manager for Linux currently supports. However, if it adds new transforms to the AFP format in the future, you can use this transform attribute to specify them. Values are listed in [InfoPrint Transform Manager for Linux](#).

You can enter a text string that contains the transform attributes. If the string contains blanks, enclose the string in single or double quotation marks. For example:

```bash
-j "xf-options='fail-on-datastream-error=no trailer-error-page=yes'"
```

**Default value**

The values that the administrator specified for the printer. If none are specified, the default values are used.

**Usage guidelines**

- The values that you specify in this job attribute take effect only if you specify them on the `remotexf` command or if the administrator specifies the `aoprxf.so` filter for the printer in the Printer Inventory. The administrator can also specify these values in the Printer Inventory.
- The administrator can control whether the values that you specify with this job attribute are used. For information about how the administrator can control whether your values take effect, see the description of the `%xf-options` option in [z/OS Infoprint Server Operation and Administration](#).

**y-image-shift-back**

This single-valued attribute specifies the Y offset of the logical page origin below the physical page origin on the back side of a double-sided sheet.

**Allowed values**

You can enter a value 0 - 999.999, followed by the unit of measure (optional). The default unit of measure is millimeters. No blanks are allowed. For information about the allowed values, see "x-image-shift-back" on page 87.

**Default values**

1. The default Y offset that the administrator defined for the printer.
2. The Y offset that the form definition used to print the job specifies.

**Usage guidelines**

- This attribute applies to line data and AFP documents that are printed on an AFP printer.
- Products that transform AFP documents can support this attribute. For information, see the documentation for the transform.
This attribute overrides the Y-offset value in the form definition that is used to print the job.

This attribute is similar to the OFFSETYB parameter of the OUTPUT JCL statement.

**y-image-shift-front**

This single-valued attribute specifies the Y offset of the logical page origin below the physical page origin on the front of the sheet.

**Allowed values**

You can enter a value 0 - 999.999, followed by the unit of measure (optional). The default unit of measure is millimeters. No blanks are allowed. For information about the allowed values, see “x-image-shift-back” on page 87.

**Default values**

1. The default Y offset that the administrator defined for the printer.
2. The Y offset that the form definition used to print the job specifies.

**Usage guidelines**

- This attribute applies to line data and AFP documents that are printed on an AFP printer.
- Products that transform AFP documents can support this attribute. For information, see the documentation for the transform.
- This attribute overrides the Y-offset value in the form definition that is used to print the job.
- This attribute is similar to the OFFSETYF parameter of the OUTPUT JCL statement.
Chapter 4. Printing from batch applications with DD and OUTPUT JCL statements

These sections explain how to code the OUTPUT and DD statements of the Job Control Language (JCL) to use Infoprint Server to process an output data set:

- "Printing output with IP PrintWay"
- "Transforming output data” on page 96
- "Specifying job attributes” on page 102
- “JCL parameters” on page 102
- “JCL examples” on page 127

Printing output with IP PrintWay

Using IP PrintWay, you can:

- Print output data sets on a printer or a print server in your Internet Protocol network.
- Print output data sets on a VTAM controlled printer.
- Send output data sets to an email destination.

To direct an output data set to IP PrintWay, you must specify one of these on the DD or OUTPUT JCL statement for the data set:

- The work-selection criteria that your administrator defined to JES for the IP PrintWay basic mode functional subsystem application (FSA)
- The job selection criteria that your administrator defined in the Printer Inventory for IP PrintWay extended mode

For example, if your administrator customized IP PrintWay to select output data sets in output class P, specify class P on the DD or OUTPUT JCL statement for the data set. Ask your administrator for the appropriate selection values to specify.

If you use the Print Interface subsystem, your administrator can specify the selection values in the printer definition in the Printer Inventory. In this case, you do not need to specify them in JCL. For example, if your administrator specifies class P as the output class in the printer definition, you do not need to specify class P on your OUTPUT statement.

To direct your output to a particular printer or email destination, you can use one of these methods, which are described in more detail in the next sections:

- Specify the name of the printer definition that your administrator created for the printer or email destination.
- Specify the output class, destination name, or form name that is assigned to the printer definition.
- Specify the printer’s IP address and either print queue name or port number.

Specifying the printer definition name

You can specify the name of the printer definition that your administrator created for the printer or email destination in the Printer Inventory. You specify the printer definition name in the FSSDATA='printer' parameter on the OUTPUT JCL statement. You can use the FSSDATA='printer' parameter with both IP PrintWay
basic mode and IP PrintWay extended mode. However, if you use the Print Interface subsystem, you instead specify the printer definition name in the SUBSYS parameter on the DD JCL statement. The printer definition name is case-sensitive and must exactly match the name of the printer definition that is created by your administrator in the Infoprint Server Printer Inventory.

IP PrintWay can use the IP address or the email address in the named printer definition to find the printer or email destination. However, if you specify an IP address in the DEST=IP: parameter of the OUTPUT JCL statement, or an email address in the MAILTO parameter of the OUTPUT JCL statement, IP PrintWay uses that address to find the printer or email destination instead of the address in the printer definition. You might want to specify the DEST=IP: parameter or MAILTO parameter when your administrator did not create a printer definition for your printer or email destination.

**Related information:** For an example, see “Direct output to an IP PrintWay printer by specifying the printer definition name” on page 127.

### Specifying class, destination, or form

If you do not know the printer definition name, you can specify a value for at least one of the CLASS, DEST, and FORMS parameters on the OUTPUT JCL statement. You can specify any or all of these values. IP PrintWay sends the print data set to a printer or email destination whose printer definition matches the values that you specify. Ask your administrator to determine the values that you can specify.

**Related administrative task:** The administrator must specify the CLASS, DEST, and FORMS values in the printer definition and select the **Use DEST, CLASS, and FORMS for IP PrintWay printer selection** option in the printer definition.

**Limitation:** If you use the Print Interface subsystem, you cannot use the CLASS, DEST, and FORMS JCL parameters to select the printer definition. Instead, you must specify the name of the printer definition.

**Related information:** For an example, see “Direct output to an IP PrintWay printer by specifying DEST, CLASS, or FORMS” on page 128.

### Specifying the printer's IP address

To print a data set on a printer for which your administrator did not create a printer definition, specify the DEST=IP: parameter on the OUTPUT JCL statement. Specify the IP address or host name of the printer or the system to which the printer is attached. When you specify DEST=IP:, you must also specify either the PRTQUEUE parameter or the PORTNO parameter on the OUTPUT JCL statement.

If you also specify the name of a printer definition in either the FSSDATA or SUBSYS parameter, IP PrintWay uses printing options that are specified in that printer definition, but uses the printer's IP address that is specified in the DEST=IP: parameter. If you do not specify the name of a printer definition, IP PrintWay uses printing options that are specified in the IP PrintWay default printer definition.

**Limitation:** If the resubmit for filtering function is used (IP PrintWay basic mode), do not code the DEST=IP:, PRTQUEUE, and PORTNO parameters on the OUTPUT JCL statement because IP PrintWay ignores these parameters and instead uses the IP address, print queue name, and port number in the printer definition.
Related information: For an example, see “Direct output to an IP PrintWay printer by specifying a host name or an IP address” on page 127.

Sending output to an email destination

When you submit a print request, you can send the output to an email destination instead of to a printer.

You can specify email addresses of the primary and secondary recipients in one of these ways:

- In the to, cc, and bcc fields in an email header (line data only). For information, see Chapter 11, “Creating an email header,” on page 179.
- In the MAILTO, MAILCC, and MAILBCC parameters on the OUTPUT JCL statement.
- In the printer definition in the Printer Inventory.

The email has these characteristics:

- If the output contains text or line data, the output can be sent inline in the body of the email or as an email attachment. To send the output inline, specify the mail-inline-text job attribute. Or, the administrator can select the Inline text and line data field in the printer definition.
- If the output is not text or line data, it is sent as an attachment. The name of the attachment is one of these:
  1. MAILFILE parameter on the OUTPUT statement
  2. DSNAME parameter on the DD statement
  3. Job name
- If your job creates multiple output data sets in the same output group, IP PrintWay can send the output data sets as attachments in the same email. To obtain this function:

  **IP PrintWay basic mode**
  In the printer definition, the administrator selects the Concatenate job option in the Dataset grouping field.

  JES output grouping is not supported when either the resubmit for filtering function or the Print Interface subsystem is used. In these situations, each output data set is sent in a separate email.

  **IP PrintWay extended mode**
  In the printer definition, the administrator selects the Automatic dataset grouping field, or selects the Concatenate job option in the Dataset grouping field.

  JES output grouping is not supported when the Print Interface subsystem is used.

- The subject of the email is one of these:
  1. Subject field in the email header
  2. TITLE parameter on the OUTPUT JCL statement
  3. Title field in the printer definition
  4. Job name

  The title in the printer definition is used only if you use IP PrintWay basic mode resubmit for filtering or the Print Interface subsystem.

- The sender is the user ID of the user who ran the job. You can add a descriptive name of the sender in one of these ways:
1. **From** field in the email header
2. MAILFROM parameter on the OUTPUT JCL statement
3. **From name** field in the printer definition

- To receive replies at an email address other than your user ID at your z/OS system, specify a reply email address in one of these ways:
  1. **Reply-to** field in the email header
  2. REPLYTO parameter on the OUTPUT JCL statement
  3. **Reply address** field in the printer definition

You can receive replies from an email unless a firewall prevents the z/OS system from receiving replies from the sending system. Use the z/OS UNIX `mail` or `mailx` command to view your mail. To use these commands, your ID must be a valid z/OS UNIX user ID. For more information about these commands, see [z/OS UNIX System Services Command Reference](https://www.ibm.com/docs/en/zos-unix/5.4?topic=command).  

Table 9 shows the tasks that are related to sending output to an email destination. Required tasks are required by all installations. Optional tasks are required only if the listed condition applies.

<table>
<thead>
<tr>
<th>Task</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Modifying JCL to send output to an email destination&quot;</td>
<td>Required</td>
</tr>
<tr>
<td>&quot;Specifying the email address list in an alias file&quot; on page 95</td>
<td>Optional: If a z/OS UNIX sendmail alias name is specified in the printer definition</td>
</tr>
</tbody>
</table>

### Modifying JCL to send output to an email destination

If you currently use JCL to print output with IP PrintWay, in most cases you need to make only minimal changes to the JCL. You might need to modify these JCL parameters:

- Specify the name of the printer definition for the email destination in the FSSDATA parameter on the OUTPUT statement, or specify the DEST, CLASS, and FORMS parameters that your administrator associated with the printer definition.
- If you currently specify the IP address of the printer in the DEST=IP: parameter on the OUTPUT statement, remove the DEST=IP: parameter.
- Remove the RETRYL and RETRYT parameters from the OUTPUT statement, or specify values of 0, because retransmissions are not suggested when you send output to email destinations.

You can specify these optional JCL parameters to customize your emails:

**MAILBCC**

The email addresses for the blind copy (bcc) recipients of an email. A bcc means that other recipients of the email do not see the bcc recipient listed.

**MAILCC**

The email addresses for the copy (cc) recipients of an email. A cc means that other recipients of the email can see the cc recipient listed.

**MAILFILE**

The file name of the attachment to an email.

**MAILFROM**

The descriptive name or other identifier of the sender of an email.
MAILTO
The email addresses for the recipients of an email.

REPLYTO
The email address that recipients of an email can reply to.

TITLE
The subject of the email.

To send output data sets that contain either AFP data or line data that requires AFP resources, all AFP resources must be included inline in the data set so that the file can be viewed with the AFP Viewer. If the required AFP resources are not already inline, you can use the IBM AFP Conversion and Indexing Facility (ACIF) program, a feature of PSF, to create a file that contains the AFP resources. Then, you can concatenate that resource file to the data file.

Related information: For examples of JCL to use when you send output to an email destination, see “JCL examples” on page 127.

Specifying the email address list in an alias file
Your administrator can specify one or more alias names in the printer definition, and you can specify alias names in some JCL parameters. An alias name is a name that is defined to z/OS UNIX sendmail that represents one or more actual email addresses. For example, alias name *dept123* might represent the email addresses of all employees in department 123.

The actual email address list can be defined in any UNIX file. If the file is one that you can edit, the administrator does not need to change the printer definition whenever you need to change the address list and you do not need to change your JCL. For example, your administrator can specify that the actual email address list for alias *dept123* is in file /u/user1/dept123.list.

Before you begin: For each address list, your administrator must do these tasks:
• Create a printer definition and specify a sendmail alias name in the definition.
• In the sendmail aliases file /etc/aliases, specify the same alias name and specify the name of a file to contain the actual email address list. Ask your administrator for the name of this file so that you can create it.

To create an alias file:
1. Create a file that uses the name that is defined by your administrator. For example, create file /u/user1/dept123.list by using your preferred editor:
   oedit /u/user1/dept123.list
2. Specify the email addresses in this file:
   user1@xyz.com,user2@xyz.com,user3@xyz.com,user4@xyz.com,user5@xyz.com
3. Change the permissions of the file so that the file is readable by everyone but writable only by the owner:
   chmod 644 /u/user1/dept123.list
4. Change the permissions of the directory so that it is readable and executable by everyone but writable only by the owner:
   chmod 755 /u/user1

For more information about the z/OS UNIX commands that are used in this example, see [z/OS UNIX System Services Command Reference](#).
### Transforming output data

Infoprint Server works with several separate transform products. For information about the transform products that work with Infoprint Server, see [z/OS Infoprint Server Introduction](#).

Infoprint Server can transform data that is created by a batch application from one format to another before the data is printed or sent to an email destination. Infoprint Server provides these methods that you can use to transform and print output data sets:

**Print Interface subsystem**
The Print Interface subsystem can transform data before it writes it to an output data set on the JES spool. IP PrintWay or PSF can then print the data, or IP PrintWay can send it to an email destination. To use the Print Interface subsystem, you specify the SUBSYS parameter on the DD JCL statement for the output data set.

**IP PrintWay extended mode**
IP PrintWay extended mode can transform data in an output data set before it prints the data or sends it to an email destination.

**IP PrintWay basic mode**
IP PrintWay basic mode can send data in an output data set to Print Interface. Print Interface can transform the data and write the transformed data to a new output data set on the JES spool. IP PrintWay then can print the data or send it to an email destination. Your administrator must select the resubmit for filtering function in the printer definition.

Table 10 compares the advantages and limitations of these transform methods.

<table>
<thead>
<tr>
<th>Method</th>
<th>Advantages</th>
<th>Limitations</th>
</tr>
</thead>
</table>
| **Print Interface subsystem** | • You can use standard DD and OUTPUT JCL statements with minimal JCL changes.  
• You can specify Infoprint Server job attributes.  
• The data set can be printed on any printer or sent to an email destination. | • Only one OUTPUT JCL statement for each data set is supported.  
• DEST, HOLD, MODIFY, SEGMENT, and SYSOUT parameters on the DD JCL statement are not supported.  
• JES output grouping is not supported. |
| **IP PrintWay extended mode** | • You can use standard DD and OUTPUT JCL statements with no JCL changes (in most cases).  
• You can specify Infoprint Server job attributes. | • The data set can be sent only to a printer or email destination that IP PrintWay extended mode controls. |
Table 10. Comparison of transform methods (continued)

<table>
<thead>
<tr>
<th>Method</th>
<th>Advantages</th>
<th>Limitations</th>
</tr>
</thead>
</table>
| IP PrintWay basic mode (resubmit for filtering function) | • You can use standard DD and OUTPUT JCL statements with no JCL changes (in most cases). | • The data set can be sent only to a printer or email destination that IP PrintWay basic mode controls.  
• Less efficient than the subsystem because data is written to the JES spool twice.  
• DEST=IP, PRTQUEUE, and PORTNO parameters on the OUTPUT JCL statement are not supported.  
• JES output grouping is not supported.  
• All AFP user libraries must have universal read access, or the administrator must set the AOPRESUBMITUSER environment variable (not suggested). For more information, see the USERLIB parameter. |

You can also use these methods to transform and print existing data sets:

**AOPPRINT JCL procedure**

The AOPPRINT JCL procedure uses Print Interface to transform data in an existing MVS data set or UNIX file and to write the transformed data to an output data set on the JES spool. The output data set on the JES spool can be printed on any printer or sent to an email destination. For more information, see “Printing with the AOPPRINT JCL procedure,” on page 137.

**Transform commands**

The z/OS UNIX transform commands, which you can run by using the AOPBATCH program, transform data in existing MVS data sets or UNIX files. The transform commands write the transformed output to an MVS data set or UNIX file but do not write the data set to an output data set on the JES spool for printing. For more information, see “Transforming data with the AOPBATCH program,” on page 143.

**Transforming data with the Print Interface subsystem**

The Print Interface subsystem can transform data that is created by a batch application from one data format to another and then write the transformed data to an output data set on the JES spool. The output data set on the JES spool can then be printed on any printer or sent to an email destination. You might want to use the Print Interface subsystem in these situations:

• To print PCL, PostScript, and PDF data on AFP printers that PSF controls
• To print line data and AFP data on PCL, PostScript, and PDF printers that IP PrintWay controls
• To send line data and AFP data in PDF format to email destinations with the IP PrintWay email function
• To specify Infoprint Server job attributes

To use the Print Interface subsystem, code these JCL parameters:

• SUBSYS parameter on the DD JCL statement, with these subparameters:
  – Name of the Print Interface subsystem. Ask your administrator for the subsystem name. The subsystem name is usually AOP1.
- Name of a printer definition in the Infoprint Server Printer Inventory. Ask your administrator for the printer definition name.

- Infoprint Server job attributes for special printing requirements. For the job attributes you can specify, see Chapter 3, “Using job attributes,” on page 53.

Most of the Infoprint Server job attributes correspond to parameters on the DD and OUTPUT JCL statements. For example, the copies job attribute corresponds to the COPIES JCL parameter. Therefore, in most cases, specify the JCL parameters that you are familiar with and do not specify job attributes.

However, you might need to specify one of these job attributes:

**document-codepage**
- Specifies a code page for the input data.
- Required only if you print data that uses a different code page than the document code page specified in the printer definition or the default document code page.

**document-format**
- Specifies the data format.
- Required only if you print data whose format Infoprint Server cannot detect.

**filter-options**
- Specifies transform options.
- Your administrator can specify transform options in the printer definition. However, you might want to specify a different transform option for a specific data set.

**xf-options**
- Specifies transform attributes that apply only when you use InfoPrint Transform Manager for Linux, which converts this document from one data format, such as PostScript, to another, such as AFP format.
- Your administrator can specify transform options in the printer definition. However, you might want to specify a different transform option for a specific data set.

- If you code the DSNAME parameter on the DD JCL statement, code the format that is suitable for a sysout data set: &&dsname.
- Print-related parameters on the DD and OUTPUT JCL statements. Your administrator can specify default values for these JCL parameters in the printer definition. Therefore, you can omit any JCL parameters that have suitable defaults. If your administrator does not provide a default value for a JCL parameter, the standard default value applies. However, JES default values for the CHARS, UCS, PAGEDEF, and FCB parameters are not used to transform data.

**Limitations:**
1. You cannot use the DEST, CLASS, and FORMS parameters on the OUTPUT JCL statement to select the IP PrintWay printer definition.
2. Do not code the SEGMENT and SYSOUT parameters on the DD JCL statement. If you do, you receive a JCL error.
3. Do not code the DEST, HOLD, and MODIFY parameters on the DD JCL statement. The Print Interface subsystem ignores these parameters. You can, however, specify the OUTDISP parameter on the OUTPUT JCL statement instead of the HOLD parameter on the DD JCL statement.
4. Specify only one OUTPUT JCL statement for each DD statement. The Print Interface subsystem uses only one OUTPUT JCL statement, in this order:
   a. The first OUTPUT JCL statement referred to in the OUTPUT parameter on the DD statement.
   b. The first OUTPUT JCL statement with DEFAULT=YES in the same job step.
   c. The first OUTPUT JCL statement with DEFAULT=YES in the job.
5. Each output data set that the Print Interface subsystem creates on the JES spool is placed in a separate JES output group from other output data sets in the same job step, regardless of the value that is specified in the GROUPID parameter on the OUTPUT JCL statement.
6. The QSAM and BSAM access methods and the OPEN, CLOSE, and PUT functions are supported. Other access methods and functions (such as CHECKPOINT, GET, and LOCATE) are not supported.
7. JES2 /*OUTPUT JCL statements and JES3 /*FORMAT JCL statements are ignored.
8. If your application writes multiple output data sets that require data transforms, your job and other jobs might not complete if your administrator limits the maximum number of data transforms. Therefore, before you use the Print Interface subsystem, contact your administrator to determine whether the maximum-active attribute in the transform configuration file is suitable for your application.

**Error handling:** When the Print Interface subsystem detects an error, it writes an error message to your job log, and it does not write any output data to the JES spool for the job step. If the subsystem detects an error during PUT and CLOSE operations in your application, it ends abnormally with abend code 09B after it writes an error message. Some situations that can cause an abnormal termination are:
   - The printer does not support the format of the data that your application writes to the DD statement. Your administrator specifies the supported data formats in the printer definition. For information about the supported data formats, see "document-format" on page 60.
   - The data transform is not installed or is not customized correctly.

**Related information:**
- “JCL parameters for the Print Interface subsystem” on page 121
- JCL examples:
  - “Print line or AFP data on a PostScript printer with the Print Interface subsystem” on page 134
  - “Print PostScript, PCL, or PDF data on an AFP printer with the Print Interface subsystem” on page 135
  - “Print GIF, JPEG, or TIFF data on an AFP printer with the Print Interface subsystem” on page 136

**Modifying JCL to use the Print Interface subsystem**
These examples show how to modify the JCL you might use to print a data set to the same printer:

**Examples:**
1. JCL that does not use the Print Interface subsystem:
   ```
   //DD1 DD SYSOUT=E,DEST=PRT003,DSNAME=&MYDATA
   ```
2. JCL that uses the Print Interface subsystem:
These examples assume that these fields for the printer definition printer003 in the Infoprint Server Printer Inventory contain these values:

CLASS
 E
DEST PRT003
FORMS
   Not specified (JES default value is used)

These changes were made in these JCL examples:

- In Example 2, the SYSOUT parameter on the DD JCL statement was replaced with the SUBSYS parameter. In the SUBSYS parameter, the name of the Print Interface subsystem (AOP1) and the name of the printer definition that your administrator defined for the printer (printer003) are specified.
- In Example 2, the class, destination, and forms values are not specified because the printer definition contains the same values as shown in Example 1. However, to override these values in the printer definition, you can code the CLASS, DEST, and FORMS parameters on an OUTPUT JCL statement.

**Transforming data with IP PrintWay extended mode**

IP PrintWay extended mode can transform data in an output data set from one data format to another and then send it to a remote printer or to an email destination. You might want to transform data in these situations:

- To print line data and AFP data on remote PCL, PostScript, and PDF printers
- To send line data and AFP data in PDF format to an email destination
- To specify Infoprint Server job attributes

To use the IP PrintWay extended mode transform function, you do not need to specify any special JCL parameters. When you print a data set that contains line or AFP data, you can specify the same JCL parameters as you usually do when you print on a PSF-controlled printer. However, you must direct the data set to IP PrintWay instead of to the PSF printer.

To specify one or more Infoprint Server job attributes that do not have corresponding JCL parameters, such as `document-codepage` or `document-format`, code the `PRTATTRS` JCL parameter. For a list of valid job attributes, see Chapter 3, "Using job attributes," on page 53.

Most of the Infoprint Server job attributes correspond to parameters on the DD and OUTPUT JCL statements. For example, the `copies` job attribute corresponds to the `COPIES` JCL parameter. Therefore, in most cases, specify the JCL parameters that you are familiar with and do not specify job attributes.

However, you might need to specify one of these job attributes:

**document-codepage**

- Specifies a code page for the input data.
- Required only if you print data that uses a different code page than the document code page specified in the printer definition or the default document code page.

**document-format**

- Specifies the data format.
• Required only if you print data whose format Infoprint Server cannot detect.

filter-options
• Specifies transform options.
• Your administrator can specify transform options in the printer definition. However, you might want to specify a different transform option for a specific data set.

xf-options
• Specifies transform attributes that apply only when you use InfoPrint Transform Manager for Linux, which converts this document from one data format, such as PostScript, to another, such as AFP format.
• Your administrator can specify transform options in the printer definition. However, you might want to specify a different transform option for a specific data set.

Related information:
• “JCL parameters for printing with IP PrintWay” on page 102
• JCL examples:
  – “Print line or AFP data on a PostScript or PCL printer with IP PrintWay extended mode” on page 133
  – “Send line or AFP data to an email destination as PDF data and print the AFP data on an AFP printer” on page 132

Transforming data with IP PrintWay basic mode
IP PrintWay basic mode, with the resubmit for filtering function enabled, can transform data in an output data set from one data format to another (if necessary) and then send it to a remote printer or to an email destination. You might want to use the resubmit for filtering function in these situations:
• To print line data and AFP data on remote PCL, PostScript, and PDF printers
• To send line data and AFP data in PDF format to an email destination

To use the resubmit for filtering function, you do not need to specify any special JCL parameters. When you print a data set that contains line or AFP data, you can specify the same JCL parameters as you usually do when you print on a PSF-controlled printer. However, you must direct the data set to IP PrintWay instead of to the PSF printer. In the printer definition, your administrator can specify default values for some of the parameters that you can specify on the DD and OUTPUT JCL statements. Therefore, you can omit JCL parameters that have suitable defaults.

Limitations:
1. Do not code the DEST=IP:, PRTQUEUE, and PORTNO JCL parameters on the OUTPUT JCL statement because IP PrintWay ignores these parameters.
2. JES output grouping is not supported. Each output data set is placed in a separate JES output group, regardless of the value that is specified in the GROUPID parameter on the OUTPUT JCL statement.
3. All AFP user libraries must have universal read access, or the administrator must set the AOPRESUBMITUSER environment variable (not suggested). For more information, see the USERLIB parameter.

Related information:
• JCL examples:
Specifying job attributes

If you use IP PrintWay extended mode, you can specify one or more job attributes with the PRTATRWS JCL parameter on the OUTPUT JCL statement. For example, you can specify the document-codepage job attribute with the PRTATRWS JCL parameter to control code-page translation for a data set.

By using the PRTATRWS JCL parameter, you can specify Infoprint Server job attributes that do not have corresponding JCL parameters, such as document-codepage or document-format. In addition, if Infoprint Server adds a job attribute in the future, you can use the PRTATRWS JCL parameter to specify the new attribute.

For more information, see "JCL parameters for printing with IP PrintWay."

JCL parameters

This section describes JCL parameters that have special considerations when you print data sets with IP PrintWay or when you use the Print Interface subsystem. You can find detailed information about these types of JCL parameters:

- Parameters for printing with IP PrintWay; see page 102
- Parameters for the Print Interface subsystem; see page 121
- Parameters for distributing output; see page 126
- Parameters for printing with InfoPrint Manager for AIX or InfoPrint Manager for Windows; see page 126

For more information about JCL parameters, see z/OS MVS JCL Reference.

JCL parameters for printing with IP PrintWay

This section describes JCL parameters that IP PrintWay uses when it sends a data set to a printer or to an email destination. You can specify some of these JCL parameters on either the DD or OUTPUT JCL statement. If you specify the same parameter on both JCL statements, the parameter on the DD statement is used.

Tip: IP PrintWay ignores the KEEP and LEAVE subparameters of the OUTDISP parameter (OUTDISP is JES2 only). Unless a retention time is specified in the RETAINF or RETAINS JCL parameter or in the printer definition, IP PrintWay deletes all data sets after it sends the data to a printer or email destination. Therefore, to keep a data set on the JES spool after IP PrintWay processes it, specify RETAINF or RETAINS instead of KEEP or LEAVE.
CLASS=class

Specifies the 1-character alphanumeric output class of the data set. If the Print Interface subsystem does not process the data set, IP PrintWay can use this parameter, in combination with the destination name and form name, to select a printer definition in the Printer Inventory to format and print the data set. Ask your administrator which class to specify.

Defaults:
1. If the Print Interface subsystem processes the data set, the class in the printer definition is used. If none is specified, JES determines the default class.
2. If the Print Interface subsystem does not process the data set, JES determines the default class.

Tips:
1. You can also specify the class in the SYSOUT parameter of a DD JCL statement.
2. If you specify more than one parameter that can be used to find a printer or email destination, IP PrintWay uses these priorities:
   a. The printer's host name or address that is specified by the DEST=IP: parameter, or the email address that is specified in the MAILTO parameter

Figure 9. Summary of JCL parameters for all output processed by IP PrintWay
b. The printer's address or the email address in the printer definition that is specified in the SUBSYS parameter

c. The printer's address or the email address in the printer definition that is specified in the FSSDATA parameter

d. The printer's address or the email address that is specified in the printer definition that matches the values of any combination of the DEST=destination_name, CLASS, and FORMS parameters

**Examples:**

1. In this example, IP PrintWay uses the printer definition that is associated with CLASS P and DEST MYPRINT to process the data set:
   ```
   //OUTDS OUTPUT CLASS=P,DEST=MYPRINT
   //DD1 DD SYSOUT=(,),OUTPUT=(*.OUTDS)
   ```

2. In this example, the Print Interface subsystem and IP PrintWay use the printer definition that is named myprinter to process the data set. CLASS=P does not affect which printer definition is used. However, the Print Interface subsystem allocates the data set on the JES spool in JES output class P and with destination name MYPRINT.
   ```
   //OUTDS OUTPUT CLASS=P,DEST=MYPRINT
   //DD1 DD SUBSYS=(AOP1,'myprinter'),OUTPUT=(*.OUTDS)
   ```

**COPIES=nnn**

Specifies the number of copies you want to print, 1 - 255.

**Tips:**

1. Only one copy prints when you print on VTAM controlled printers (IP PrintWay basic mode only) or on Internet Printing Protocol (IPP) printers that do not support the copies IPP job attribute. This parameter is supported for VTAM controlled printers when you use IP PrintWay extended mode.

To print copies in these cases, specify multiple OUTPUT statements and refer to them in the OUTPUT parameter of the DD statement. For example:
   ```
   //OUTDS1 OUTPUT FSSDATA='printer=myprinter'
   //OUTDS2 OUTPUT FSSDATA='printer=myprinter'
   //DD1 DD SYSOUT=P,OUTPUT=(*.OUTDS1,*.OUTDS2)
   ```

   This work-around creates multiple output data sets on the JES spool. However, this work-around cannot be used if the Print Interface subsystem processes the data set because the subsystem ignores all but the first reference to an OUTPUT statement.

2. Group values that you specify on this parameter are ignored.

3. This parameter is ignored when you send data to an email destination.

4. The administrator can limit the number of copies that you can specify. If you request more than the allowed number of copies, the data set does not print.

5. If you use the Print Interface subsystem to process the data set, you can specify up to 32640 copies in the copies job attribute. Specify the copies job attribute in the SUBSYS parameter on the DD JCL statement.

**Defaults:**

1. If the Print Interface subsystem processes the data set, the number of copies in the printer definition is used. If none is specified, JES determines the default number of copies.
2. If the Print Interface subsystem does not process the data set, JES determines the default number of copies.

Examples:

```plaintext
//DD1 DD COPIES=14
//OUTDS OUTPUT COPIES=14
DEST={node.}destination_name | 'node.IP:host'
```

Specifies either the destination name or the IP address of the printer's host system.

```plaintext
DEST={node.}destination_name
```

Specifies the node name and destination name of the printer's host system.

- **node**
  - Specifies the 1-8 character node name of the printer's host system.
  - The node name is optional. If you specify the node name in the DEST parameter on a DD JCL statement, use this format: DEST=(node,name).

**Defaults:**

1. If the Print Interface subsystem processes the data set, the JES node in the printer definition is used. If none is specified, JES determines the default node.
2. If the Print Interface subsystem does not process the data set, JES determines the default node.

```plaintext
destination_name
```

Specifies the destination name of the printer. The name must consist of 1 to 8 alphanumeric or national ($,#,@) characters. If the Print Interface subsystem does not process the data set, IP PrintWay can use this parameter, in combination with the class and form name, to select a printer definition to format and print the data set. Ask your administrator which destination name to specify.

**Note:** If you use the Print Interface subsystem, specify the DEST parameter on the OUTPUT JCL statement. The subsystem ignores the DEST parameter on the DD statement.

**Examples:** In these examples, IP PrintWay uses the printer definition that is associated with CLASS P and DEST PRT003 to process the data set:

```plaintext
//DD1 DD SYSOUT=P,DEST=PRT003
```

or

```plaintext
//OUTDS OUTPUT DEST=BOULDER.PRT003
//DD1 DD SYSOUT=P,OUTPUT=(.,OUTDS)
```

**DEST= *[node.]IP:host'**

Specifies the node name and the IP address of the printer's host system.

- **node**
  - Specifies the 1-8 character node name of the printer's host system.
  - The node name is optional.

**Defaults:**

1. If the Print Interface subsystem processes the data set, the JES node in the printer definition is used. If none is specified, JES determines the default node.
2. If the Print Interface subsystem does not process the data set, JES determines the default node.

**host**
 Specifies the 1 - 115 character IP address of the printer’s host system in either of these formats (always enclose the IP keyword and value in single quotation marks):

**Dotted decimal**
 A series of integers in the range of 0 to 255, separated by periods (decimal address). For example:

```
9.99.12.85
```

**Host name**
 A series of domain names that can contain alphanumeric characters and dashes (-), separated by periods (.). The first character must be alphabetic or numeric. For example:

```
leo.boulder.xyz.com
```

**Colon-hexadecimal**
 An IPv6 address in colon-hexadecimal format. These rules apply:

- You can omit leading zeros in each hexadecimal value.
- You can omit one sequence of repeat zero values
- You can specify the last two hexadecimal values in dotted decimal notation.

For example:

```
2001:0db8:85a3:0000:0000:8a2e:0370:7334
```

If you run IP PrintWay basic mode, do not specify a colon-hexadecimal address because IP PrintWay basic mode does not support IPv6.

**Default:** The printer’s IP address or host name in the printer definition is used.

**Examples:**
```
//OUTDS OUTPUT DEST='IP:99.153.123.232'
//OUTDS OUTPUT DEST='IP:XYZ.COM'
//OUTDS OUTPUT DEST='NODE01.IP:XYZ.COM'
//OUTDS OUTPUT DEST='IP:2001:0db8:85a3:0000:0000:8a2e:0370:7334'
```

**Tips:**
1. If you specify more than one parameter that can be used to find the printer or email destination, IP PrintWay uses these priorities:
   a. The printer’s host name or address that is specified by the DEST=IP: parameter, or the email address that is specified in the MAILTO parameter
   b. The printer’s address or the email address in the printer definition that is specified in the SUBSYS parameter
   c. The printer’s address or the email address in the printer definition that is specified in the FSSDATA parameter
The printer's address or the email address in the printer definition that matches the values of any combination of the DEST=name, CLASS, and FORMS parameters.

2. If you specify a printer definition name in the FSSDATA or SUBSYS parameter and the printer definition does not specify the LPR or direct sockets printing protocol, IP PrintWay ignores the DEST=IP: parameter.

3. Use the same method to identify the host system, either the host name or the IP address, in all references to the host system. Also, use the same lowercase and uppercase characters. This ensures that data sets transmitted to the same printer are transmitted in the correct order.

4. IP PrintWay basic mode: If the resubmit for filtering function is used, do not specify the DEST=IP: parameter because IP PrintWay ignores it and instead uses the IP address in the printer definition.

5. IP PrintWay extended mode: If your job creates multiple output data sets, see "JCL considerations for IP PrintWay extended mode" on page 120.

**DSNAME=&&dataset_name**

Specifies the data set name to assign to the sysout data set. The z/OS system generates a qualified name for the sysout data set and uses the value that you specify in the DSNAME parameter as the last qualifier in the name.

Begin the name with two ampersands (&&). Follow the ampersands with 1 to 8 alphanumeric or national ($,#,@) characters, a hyphen, or a character X'C0'. The first character after the ampersands must be alphabetic or national ($,#,@).

**Guidelines:** Specify a DSNAME parameter so that you can identify printed output more easily:

1. The fully qualified data set name can be printed on page headers and on separator pages. Therefore, if you specify the DSNAME parameter, you can identify your output more easily. Whether a header or separator page prints depends on the IP PrintWay options your administrator selected in the printer definition and how your administrator configured the printer’s separator page.

2. **IP PrintWay basic mode:** If the resubmit for filtering function is used, the value you specify in the DSNAME parameter is also the last qualifier of the data set name of the second data set that Infoprint Server dynamically allocates on the JES spool while it processes the data. Therefore, if you specify the DSNAME parameter, you can find this second data set on the JES spool more easily.

**Default:** The last qualifier of the fully qualified data set name is a question mark (?).

**Example:**

```bash
//DD1 DD SYSOUT=P,DSNAME=&&FEBSALES
```

The z/OS system generates a data set name such as:

```
userid.jobname.jobid.Dsnumber.FEBSALES
```

**FEBSALES** is the last qualifier of the fully qualified name of the second data set that Print Interface allocates on the JES spool when the resubmit for filtering function (IP PrintWay basic mode) is used. For email, **FEBSALES** is the name of the email attachment if the MAILFILE parameter is not specified.

**DUPLEX={NO | NORMAL | TUMBLE}**

Specifies whether the data set is printed on one or both sides of each sheet.
This parameter only applies to documents printed on an AFP printer or transformed to another format with a transform from AFP.

**NO**  The data set is printed only on the front side of each sheet.

**NORMAL**
The data set is printed on both sides of the sheet so that the top of side 1 is the top of side 2 (for side binding).

**TUMBLE**
The data set is printed on both sides of the sheet so that the top of side 1 is the bottom of side 2 (for top binding).

**Defaults:**
1. IP PrintWay basic mode: NORMAL
2. IP PrintWay extended mode: the duplex value in the printer definition is used

**Example:**

```plaintext
//OUTDS OUTPUT DUPLEX=NORMAL
```

**FCB=** *fcb_name*

Specifies the 1 - 4 character name of the forms control buffer (FCB) member of the SYS1.IMAGELIB library.

IP PrintWay searches the library first for FCB4*fcb_name*, then FCB2*fcb_name*, then FCB3*fcb_name* unless you are printing to a VTAM controlled printer. In this case, IP PrintWay searches the SYS1.IMAGELIB library only for FCB2*fcb_name*.

IP PrintWay extended mode always uses the FCB to format the data if the FCB parameter is specified. However, IP PrintWay basic mode uses the FCB only if the administrator selects the IP PrintWay Use FCB formatting option in the printer definition.

**Defaults:**
1. If the Print Interface subsystem processes the data set, the FCB in the printer definition is used. If none is specified:
   • If IP PrintWay extended mode processes the data set, there is no default FCB.
   • If IP PrintWay basic mode processes the data set, JES can provide a default FCB.
2. If the Print Interface subsystem does not process the data set:
   • If IP PrintWay extended mode processes the data set, the FCB in the printer definition is used.
   • If IP PrintWay basic mode processes the data set, JES can provide a default FCB. If JES does not provide a default FCB and the resubmit for filtering function is used, the FCB in the printer definition is used.

**Examples:**

```plaintext
//DD1 DD FCB=STD2
//OUTDS OUTPUT FCB=STD2
```

**FORMS=** *form_name*

Specifies the 1 - 8 character form name. If the Print Interface subsystem does not process the data set, IP PrintWay can use this parameter, in combination
with the class and destination name, to select a printer definition to format and print the data set. Ask your administrator which form name to specify.

Tips:
1. You can also specify the form name in the SYSOUT parameter of a DD JCL statement.
2. If you specify more than one parameter that can be used to find a printer or email destination, IP PrintWay uses these priorities:
   a. The printer's host name or address that is specified by the DEST=IP: parameter, or the email address that is specified in the MAILTO parameter
   b. The printer's address or the email address in the printer definition that is specified in the SUBSYS parameter
   c. The printer's address or the email address in the printer definition that is specified in the FSSDATA parameter
   d. The printer's address or the email address in the printer definition that matches the values of any combination of the DEST=name, CLASS, and FORMS parameters
3. The administrator can limit the values that you can specify in this parameter. If you specify a value that is not allowed, the data set might not print.

Defaults:
1. If the Print Interface subsystem processes the data set, the form name in the printer definition in the Printer Inventory is used. If none is specified, JES provides a default form name.
2. If the Print Interface subsystem does not process the data set, JES provides a default form name.

Example:
//OUTDS OUTPUT FORMS=WIDE
FSSDATA='printer=printer_definition_name'

Specifies the 1-17 character name of the printer definition in the Printer Inventory.

Rules:
1. Enter the printer subparameter in lowercase.
2. Enter the printer definition name with the same uppercase and lowercase letters that are used in the printer definition. The printer definition name is case-sensitive.

If you specify more than one parameter that can be used to find a printer or email destination, IP PrintWay uses these priorities:
1. The printer's host name or address that is specified by the DEST=IP: parameter, or the email address that is specified in the MAILTO parameter
2. The printer's address or the email address in the printer definition that is specified in the SUBSYS parameter
3. The printer's address or the email address in the printer definition that is specified in the FSSDATA parameter
4. The printer's address or email address in the printer definition that matches the values of any combination of the DEST=name, CLASS, and FORMS parameters
**IP PrintWay extended mode:** If your job creates multiple output data sets, see "JCL considerations for IP PrintWay extended mode" on page 120.

**Defaults:**
1. If the Print Interface subsystem processes the data set and no printer definition is named in the SUBSYS parameter, the Infoprint Server default printer definition is used.
2. If the Print Interface subsystem does not process the data set:
   - If the DEST=IP: parameter is specified, the IP PrintWay default printer definition is used.
   - If the DEST=IP: parameter is not specified, the printer definition that matches the class, destination, and forms name is used.

**Example:**
```plaintext
//OUTDS OUTPUT FSSDATA='printer=Printer5'
MAILBCC=('username[@domainname]',...
```

Specifies the email addresses for the blind copy (bcc) recipients of an email. A bcc means that other recipients of the email do not see the bcc recipient listed.

- **username**
  - Specifies the name of the recipient, or an alias name that is defined in z/OS UNIX sendmail. For example, user1.

- **@domainname**
  - Specifies the domain of the recipient. For example, @xyz.com. The default is the host name that sendmail is running on. If you specify an alias name, omit @domainname.

**Rules:**
1. You can specify 1 - 32 email addresses.
2. Each email address can be 1 - 60 characters.
3. You can specify any characters, including blanks.
4. If the email address contains special characters or lowercase letters, enclose the entire email address in apostrophes.
5. If you specify only one email address, you can omit the parentheses.
6. You cannot specify null values. For example, you cannot specify MAILBCC=(username) or MAILBCC=(username,,username).

**IP PrintWay extended mode:** If your job creates multiple output data sets, see "JCL considerations for IP PrintWay extended mode" on page 120.

**Default:** IP PrintWay sends the email to any bcc recipients specified in the printer definition.

**Example:** In this example, user1@xyz.com receives the email, and user2@xyz.com and all the recipients that are defined in the sendmail alias that is named “dept01list” receive a bcc of the email:
```plaintext
//OUTDS OUTPUT MAILTO='user1@xyz.com',MAILBCC=('user2@xyz.com',dept01list)
```

**MAILCC=('username[@domainname]',[,...])**

Specifies the email addresses for the copy (cc) recipients of an email. A cc means that other recipients of the email can see the cc recipient listed.
username
   Specifies the name for the recipient, or an alias name that is defined in
   z/OS UNIX sendmail. For example, user1.

@domainname
   Specifies the domain for the recipient. For example, @xyz.com. The default
   is the host name that sendmail is running on. If you specify an alias name,
   omit @domainname.

Rules:
1. You can specify 1 - 32 email addresses.
2. Each email address can be 1 - 60 characters.
3. You can specify any characters, including blanks.
4. If the email address contains special characters or lowercase letters, enclose
   the entire email address in apostrophes.
5. If you specify only one email address, you can omit the parentheses.
6. You cannot specify null values. For example, you cannot specify
   MAILCC=(username) or MAILCC=(username,,username).

IP PrintWay extended mode: If your job creates multiple output data sets, see
"JCL considerations for IP PrintWay extended mode" on page 120.

Default: IP PrintWay sends the email to any cc recipients specified in the
printer definition.

Example: In this example, user1@xyz.com receives the email, and
user2@xyz.com and all the recipients that are defined in the sendmail alias that
is named “dept01list” receive a cc of the email:
//OUTDS OUTPUT MAILTO='user1@xyz.com',MAILCC=('user2@xyz.com',dept01list)

MAILFILE='filename'
   Specifies the file name of the attachment to an email.

Rules:
1. The name can be 1 - 60 characters.
2. You can specify any characters, including blanks.
3. If the name contains special characters, blanks, or lowercase letters, enclose
   the entire name in apostrophes.

Default: IP PrintWay uses the last qualifier of the data set name or file name
as the name of the email attachment. You can specify the last qualifier in the
dSNAME parameter of the DD statement. However, the DSNAMES parameter
specifies only 8 characters (see the description of the DSNAMES parameter). If
you do not specify the DSNAMES parameter, IP PrintWay uses the job name.

Tip: If you specify a file name (in the mail-file-name job attribute) with a
suffix that indicates the type of data in the file, ask your administrator to
request that Infoprint Server not add another suffix. For example, if the file
name is myfile.doc, ask your administrator to request that Infoprint Server not
add suffixes for file names that contain the .doc suffix. For information, see the
section about customizing IP PrintWay in z/OS Infoprint Server Customization.

Example: In this example, the email attachment is February 2004 sales
report.txt and the attachment is in text format unless a transform is specified
in the mail printer definition:
MAILFROM='sendername'

Specifies the descriptive name or other identifier of the sender of an email.

Rules:
1. The name can be 1 - 60 characters.
2. You can specify any characters, including blanks.
3. If the name contains special characters, blanks, or lowercase letters, enclose the entire name in apostrophes.

IP PrintWay always includes `userid@domainname` to identify the sender. The user ID of the job submitter is `userid`. The domain name where Infoprint Server is running is `domainname`. For example: `JOHN@SYSTEM1`.

**IP PrintWay extended mode:** If your job creates multiple output data sets, see "JCL considerations for IP PrintWay extended mode" on page 120.

Default: IP PrintWay uses the value that is specified in the printer definition.

Tip: To specify the email address that recipients of an email can reply to, use the REPLYTO parameter.

Example:

This specification:
```
/OUTDS OUTPUT MAILFROM='John Q. Sender'
```

Puts this information in the email:
```text
From: John Q. Sender <JOHN@SYSTEM1>
```

MAILTO=('username[@domainname]'[,...])

Specifies the email addresses for the recipients of an email.

**username**

Specifies the name for the recipient, or an alias name that is defined in `z/OS UNIX sendmail`. For example, `user1`.

**@domainname**

Specifies the domain of the recipient. For example, `@xyz.com`. The default is the host name that sendmail is running on. If you specify an alias name, omit `@domainname`.

Rules:
1. You can specify 1 - 32 email addresses.
2. Each email address can be 1 - 60 characters.
3. You can specify any characters, including blanks.
4. If the email address contains special characters or lowercase letters, enclose the entire email address in apostrophes.
5. If you specify only one email address, you can omit the parentheses.
6. You cannot specify null values. For example, you cannot specify MAILTO=(username) or MAILTO=(username,,username).

**IP PrintWay extended mode:** If your job creates multiple output data sets, see "JCL considerations for IP PrintWay extended mode" on page 120.
Default: IP PrintWay sends the email to the email recipients specified in the printer definition.

Example: In this example, user1@xyz.com, user2@xyz.com, and all the recipients that are defined in the sendmail alias that is named “dept01list” receive the email:

//OUTDS OUTPUT MAILTO=('user1@xyz.com','user2@xyz.com',dept01list)

NOTIFY=([[node.]userid,...])
Specifications up to four user IDs that IP PrintWay notifies when the data set is successfully or unsuccessfully transmitted. Separate the user IDs with commas.

node
   Specifies a 1 - 8 character node name. The node name is optional.
userid
   Specifies a 1 - 8 character user ID.

Defaults:
1. IP PrintWay basic mode: If either the Print Interface subsystem processes the data set or the resubmit for filtering function is used, the notify values in the printer definition apply. Otherwise, no users are notified.
2. IP PrintWay extended mode: The notify values in the printer definition are used.

Example:

//OUTDS OUTPUT NOTIFY=(SEATTLE.JOE,SEATTLE.MARY)

PORTNO=port_number
Specifications the number of the port to use for a direct socket printing connection. The valid range is 100 - 65535.

Tips:
1. Do not code both PORTNO and PRTQUEUE.
2. If you code DEST=IP: but do not specify a printer definition name in either the FSSDATA or SUBSYS parameter, also code either PRTQUEUE or PORTNO.
3. If the printer definition does not specify the direct sockets printing protocol, IP PrintWay ignores this parameter.
4. If you code DEST=IP: and PORTNO but do not specify a printer definition name in either the FSSDATA or SUBSYS parameter, IP PrintWay uses the direct sockets printing protocol to transmit the data to the specified port number.
5. If the resubmit for filtering function is used (IP PrintWay basic mode), do not code PORTNO because IP PrintWay ignores it and instead uses the port number that is specified in the printer definition.

Default: The printer's port number in the printer definition is used.

Example:

//OUTDS OUTPUT PORTNO=2501

PRTATTRS='attribute=value ...'
Specifies one or more Infoprint Server job attributes that you want IP PrintWay extended mode to use.
This parameter specifies job attributes that do not have corresponding JCL parameters, such as `document-codepage` or `document-format`. You can specify any job attribute, but IP PrintWay ignores these attributes: `sysout-job-id`, `sysout-job-name`. For a list of valid job attributes, see Chapter 3, “Using job attributes,” on page 53.

Rules:
1. The list of job attributes can be 1 - 127 characters.
2. Attribute names and values are case-sensitive. All attribute names are lowercase.
3. Enclose the entire list of job attributes in single quotation marks.
4. Separate job attributes with one or more spaces.
5. If an attribute value contains blanks, lowercase letters, or special characters, enclose that attribute value in double quotation marks.
6. You can store attributes and values in a UNIX file (for example, a zFS file) or in an MVS data set. Use the job attribute that is called `attributes` to specify the UNIX file name of the DD name for the MVS data set that contains the attributes. (See “Examples”.)

Default: The first value that is found for each job attribute, in this order:
1. The SUBSYS JCL parameter
2. The PRTATTRS JCL parameter
3. The JCL parameter that corresponds to the job attribute (for example, the FORMDEF JCL parameter corresponds to the `form-definition` job attribute)
4. If the Print Interface subsystem is used, the printer attribute in the printer definition that corresponds to the job attribute (for example, the `form-definition` printer attribute corresponds to the `form-definition` job attribute)

Examples:

```
//OUTDS OUTPUT PRTATTRS='document-codepage="IBM-1147"'
//OUTDS OUTPUT PRTATTRS='hold=yes document-codepage="IBM-1147"'
//OUTDS OUTPUT PRTATTRS='attributes=bigjob.att'
```

PRTOPTNS='component_name'

Specifies the 1 - 16 character name of one or more components that contain printing options you want IP PrintWay to use. Ask your administrator for the name of components suitable for your data set. The component name is case-sensitive. Enter it exactly as the components are defined in the Printer Inventory. If the name contains special characters (such as a dash) or lowercase letters, enclose the name in single quotation marks.

A component is an entity in the Printer Inventory. IP PrintWay uses printing options that are specified in these three types of components: Processing, IP PrintWay Options, and Protocol. If more than one type of component exists with the specified name, IP PrintWay uses options that are specified in all of the components with the specified name. If a component of one of the three types does not exist, IP PrintWay uses default values for the printing options that can be specified in the missing component.

IP PrintWay uses only a subset of all options that can be specified in these components. IP PrintWay ignores other options that are specified in these components and instead uses the options that are specified in the printer definition. For more information about which options IP PrintWay uses from components and about how to define components for use with the PRTOPTNS parameter, see z/OS Infoprint Server Operation and Administration.
Note: If the resubmit for filtering function is used (IP PrintWay basic mode), do not specify the PRTOPTNS parameter. IP PrintWay ignores it and instead uses options that are specified in the printer definition.

Default: IP PrintWay determines the default printing options:
1. The options that are specified in the printer definition are used.
2. For options not specified in the printer definition, IP PrintWay uses hardcoded default values.

Example:
//OUTDS OUTPUT PRTOPTNS='PostScript'

PRTQUEUE='print_queue'
Specifies the 1 - 127 character alphanumeric name of the target print queue.
This parameter might be case-sensitive. For example, on UNIX systems, lp0 and LP0 refer to different print queues. If the name contains special characters (such as a dash) or lowercase letters, enclose the name in single quotation marks.

Tips:
1. Do not code both PORTNO and PRTQUEUE.
2. If you code DEST=IP: but do not specify a printer definition name in either the FSSDATA or SUBSYS parameter, also code either PRTQUEUE or PORTNO.
3. If the printer definition does not specify the LPR printing protocol, IP PrintWay ignores this parameter.
4. If you code DEST=IP: and PRTQUEUE parameter, but do not specify a printer definition name in either the FSSDATA or SUBSYS parameter, IP PrintWay uses the LPR printing protocol to transmit the data to the specified print queue.
5. If the resubmit for filtering function is used (IP PrintWay basic mode), do not code PRTQUEUE because IP PrintWay ignores it and instead uses the print queue name that is specified in the printer definition.
6. TEXT and RAW are queue names on some IBM printers, most HP printers, and most Lexmark printers. Specify the RAW queue for data that contains a carriage return at the end of each line, PCL data, and PostScript data.
7. TEXT and PASS are used for some IBM printers. Specify the PASS queue for text data that contains a carriage return at the end of each line, PCL data, and PostScript data.
8. If you specify the PASS or RAW queue and you run IP PrintWay basic mode, your administrator must also specify 0025 in the Line termination field in the printer definition. This causes IP PrintWay basic mode to add a carriage return at the end of each line when it converts line data to text data. IP PrintWay extended mode adds a carriage return at the end of each line by default.

Default: The print queue name in the printer definition is used.

Example:
//OUTDS OUTPUT PRTQUEUE='RAW'

REPLYTO='username[@domainname]'
Specifies the email address that recipients of an email can reply to.
username
Specifies the name portion of the address, or an alias name that is defined in z/OS UNIX sendmail. For example, user1.

@domainname
Specifies the domain portion of the address. For example, @xyz.com. The default is the host name that sendmail is running on.

Rules:
1. The name can be 1 - 60 characters.
2. You can specify any characters, including blanks.
3. If the name contains special characters or lowercase letters, enclose the entire name in apostrophes.

**IP PrintWay extended mode:** If your job creates multiple output data sets, see "JCL considerations for IP PrintWay extended mode" on page 120.

**Default:** IP PrintWay uses the value that is specified in the printer definition. If none is specified in the printer definition, most email programs use the sender's email address. The default is userid@domainname. The user ID of the job submitter is userid. The domain name where Infoprint Server is running is domainname.

Example:
```plaintext
//OUTDS OUTPUT REPLYTO='user1@xyz.com'
```

**RETAINF={"hhhh:mm:ss" | FOREVER}
**
Specifies the amount of time that IP PrintWay retains the data set on the JES spool after a transmission fails and all requested retransmissions are attempted.

Specify the time in the format `hhhh:mm:ss`:
- `hhhh` is the number of hours (range 0 - 9999)
- `mm` is the number of minutes (range 0 - 59)
- `ss` is the number of seconds (range 0 - 59)

You can omit zeros and colons to the left of the significant portion of the time value. Enclose the entire value in single quotation marks. To retain data sets forever, specify `FOREVER`. In this case, IP PrintWay does not automatically delete the failed data set from the JES spool.

**IP PrintWay extended mode:** If your job creates multiple output data sets, see "JCL considerations for IP PrintWay extended mode" on page 120.

**Default:** IP PrintWay determines the default value:
1. The retain value in the printer definition is used.
2. No retention.

Table 11 explains the state of retained data sets.

<table>
<thead>
<tr>
<th>When IP PrintWay retains a data set in this mode:</th>
<th>In JES2, IP PrintWay treats the data set this way:</th>
<th>In JES3, IP PrintWay treats the data set this way:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic mode</td>
<td>Keeps the acquired data set</td>
<td>Keeps the acquired data set</td>
</tr>
</tbody>
</table>
Table 11. State of retained data sets for RETAINF (continued)

<table>
<thead>
<tr>
<th>When IP PrintWay retains a data set in this mode:</th>
<th>In JES2, IP PrintWay treats the data set this way:</th>
<th>In JES3, IP PrintWay treats the data set this way:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extended mode</td>
<td>• Releases the data set</td>
<td>• Releases the data set</td>
</tr>
<tr>
<td></td>
<td>• Puts the data set in the HELD state</td>
<td>• Puts the data set in the KEEP state</td>
</tr>
</tbody>
</table>

Examples:

1. This OUTPUT statement specifies that IP PrintWay retains the data set on the JES spool for 48 hours:
   ```
   //OUTDS OUTPUT RETAINF='48:00:00'
   ```
2. This OUTPUT statement specifies that IP PrintWay retains the data set on the JES spool until the administrator deletes it or retransmits it:
   ```
   //OUTDS OUTPUT RETAINF=FOREVER
   ```

**RETAINS={’hh:mm:ss’ | FOREVER}**

Specifies the amount of time that IP PrintWay retains the data set on the JES spool after a successful transmission.

Specify the time in the format `hh:mm:ss`:

- `hh` is the number of hours (range 0 to 9999)
- `mm` is the number of minutes (range 0 to 59)
- `ss` is the number of seconds (range 0 to 59)

You can omit zeros and colons to the left of the significant portion of the time value. Enclose the entire value in single quotation marks. To retain data sets forever, specify `FOREVER`. In this case, IP PrintWay does not automatically delete the data set from the JES spool. The operator can delete a retained data set from the JES spool, print it again on the same printer, or move it to another IP PrintWay printer.

**IP PrintWay extended mode:** If your job creates multiple output data sets, see “JCL considerations for IP PrintWay extended mode” on page 120.

**Default:** IP PrintWay determines the default value:

- The retain value in the printer definition is used.
- No retention.

Table 12 explains the state of retained data sets.

Table 12. State of retained data sets for RETAINS

<table>
<thead>
<tr>
<th>When IP PrintWay retains a data set in this mode:</th>
<th>In JES2, IP PrintWay treats the data set this way:</th>
<th>In JES3, IP PrintWay treats the data set this way:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic mode</td>
<td>Keeps the acquired data set</td>
<td>Keeps the acquired data set</td>
</tr>
<tr>
<td>Extended mode</td>
<td>• Releases the data set</td>
<td>• Releases the data set</td>
</tr>
<tr>
<td></td>
<td>• Puts the data set in the HELD state</td>
<td>• Puts the data set in the KEEP state</td>
</tr>
</tbody>
</table>

Examples:

1. This OUTPUT statement specifies that IP PrintWay should retain the data set on the JES spool for 4 hours:
2. This OUTPUT statement specifies that IP PrintWay should not retain the data set on the JES spool:
   \[
   \text{\texttt{\{}\textbackslash OUTDS \texttt{\}} \text{\texttt{\ OUTPUT RETAINS='0'\}}}
   \]

**RETRYL=nnnnn**

Specifies the maximum number of times that IP PrintWay retransmits an unsuccessful transmission. Specify a number 0 - 32767.

**IP PrintWay extended mode:** If your job creates multiple output data sets, see "JCL considerations for IP PrintWay extended mode" on page 120.

**Guidelines:**

1. When you send the output data set to an email destination, omit both the RETRYL and RETRYT parameters.
2. Do not specify this parameter so that the value your administrator specifies in the printer definition is used. The value that you specify can affect IP PrintWay performance.

**Default:** The retry value in the printer definition is used. If none is specified, see Table 13.

**Example:**

\[
\text{\texttt{\{}\textbackslash OUTDS \texttt{\}} \text{\texttt{\ OUTPUT RETRYL=10\}}}
\]

**Table 13. How retry limit and retry time work together**

<table>
<thead>
<tr>
<th>Retry limit</th>
<th>Retry time</th>
<th>IP PrintWay action</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 or blank</td>
<td>Any value</td>
<td>IP PrintWay does not try the transmission again.</td>
</tr>
<tr>
<td>&gt;0</td>
<td>0 or blank</td>
<td>IP PrintWay automatically tries the transmission again one time immediately after the original transmission fails. Then IP PrintWay tries again for the specified number of times at the specified interval. If retry time is blank, IP PrintWay tries again approximately every second.</td>
</tr>
</tbody>
</table>

**RETRYT='hhhh:mm:ss'**

Specifies the time interval between attempts to retransmit an unsuccessful transmission.

Specify the retry time in the format **hhhh:mm:ss**:

- **hhhh** is the number of hours (range 0 - 9999)
- **mm** is the number of minutes (range 0 - 59)
- **ss** is the number of seconds (range 0 - 59)

You can omit zeros and colons to the left of the significant portion of the time value. Enclose the retry time in single quotation marks.

**IP PrintWay extended mode:** If your job creates multiple output data sets, see "JCL considerations for IP PrintWay extended mode" on page 120.

**Guidelines:**

1. When you send the output data set to an email destination, omit both the RETRYL and RETRYT parameters.
Do not specify this parameter so that the value your administrator specifies in the printer definition is used. The value that you specify can affect IP PrintWay performance.

**Default:** The retry value in the printer definition is used. If none is specified, see Table 13 on page 118.

**Examples:** These examples both specify that IP PrintWay retransmits one time immediately, and then waits 1 minute between subsequent retransmissions:

```
//OUTDS OUTPUT RETRYT='0000:01:00'
```

or
```
//OUTDS OUTPUT RETRYT=1:00
```

**SYSOUT=(class,,form_name)**

Specifies the class and the form name.

- **class**
  Specifies a 1-character alphanumeric class.

- **form_name**
  Specifies a 1 - 4 character form name.

You can also specify the output class and the form name in the CLASS parameter and FORMS parameter of an OUTPUT statement. To specify a form name longer than 4 characters, you must use the FORMS parameter of an OUTPUT statement.

**Note:** You must code either the SYSOUT or SUBSYS parameter, but do not code both parameters.

**Example:**
```
//DD1 DD SYSOUT=(P,,WIDE)
```

**TITLE='description of output'**

Describes the output. This value can be printed on an IP PrintWay separator page or on a separator page (banner page) written by the printer’s LPD. Whether this value prints on a separator page depends on how your administrator configured the separator page or how the LPD is implemented. If the output data set is sent to an email destination, this value is the subject of the email.

Specify 1 - 60 characters. If the description contains spaces, special characters, or lowercase characters, enclose the value in quotation marks.

**IP PrintWay basic mode:** If you want to send multiple output data sets in the same job step in the same email, specify the TITLE parameter with the same value for all output data sets.

**Defaults:**

1. For IP PrintWay extended mode, the title value in the printer definition is used.
2. For a separator page that an IP PrintWay exit created:
   - If the resubmit for filtering function (IP PrintWay basic mode) is used, the default value is the fully qualified data set name (to enable the resubmitted and original data sets to be correlated).
If the Print Interface subsystem processes the data set, the default value is the title that is specified in the Allocation section of the printer definition in the Printer Inventory. If no title is specified in the Allocation section, there is no default value.

Otherwise, there is no default value.

3. For the LPD's separator page:
   - If the resubmit for filtering function (IP PrintWay basic mode) is used, the default value is the fully qualified data set name (to enable the resubmitted and original data sets to be correlated).
   - If the Print Interface subsystem processes the data set, the default value is the title that is specified in the Allocation section of the printer definition in the Printer Inventory. If no title is specified in the Allocation section, the default value is the title or file name that your administrator specified in the Protocol section of the printer definition. If none is specified, the default value is the fully qualified data set name.
   - Otherwise, the default value is the title or file name that your administrator specified in the Protocol section of the printer definition. If none is specified, the default value is the fully qualified data set name.

4. For the subject of an email:
   - If the resubmit for filtering function (IP PrintWay basic mode) is used, the default value is the fully qualified data set name (to enable the resubmitted and original data sets to be correlated).
   - If the Print Interface subsystem processes the data set, the default value is the title that is specified in the Allocation section of the printer definition in the Printer Inventory. If no title is specified in the Allocation section, the default value is the job name.
   - Otherwise, the default value is the job name.

Example:

```plaintext
//OUTDS OUTPUT TITLE='Annual Report'
```

**JCL considerations for IP PrintWay extended mode**

You can use the same JCL for IP PrintWay extended mode as you do for IP PrintWay basic mode with these exceptions:

- IP PrintWay basic mode can print data sets in the same JES output group on different printers. However, IP PrintWay extended mode prints all data sets in the same JES output group on the same printer. Also, IP PrintWay extended mode uses the same retry times, and retention values for all data sets in the output group.

If your job creates more than one output data set and you specify different values in the DEST=IP, FSSDATA, MAILBCC, MAILCC, MAILFROM, MAILTO, REPLYTO, RETAINF, RETAINS, RETRYL, or RETRYT parameter for each data set, make sure that JES places each output data set in a different output group. To do this, specify one of these JCL parameters with a different value for each data set: ADDRESS, BUILDING, BURST, CLASS, DEPT, DEST, FCB, FLASH, FORMS, GROUPID (JES2), NAME, OUTDISP (JES2), PRMODE, ROOM, TITLE, or WRITER.

**Examples:**

1. IP PrintWay extended mode prints both output data sets on the same printer (printer1) because JES places both data sets in the same JES output group:
2. JES2: IP PrintWay extended mode prints the output data sets on different printers (printer1 and printer2) because JES2 places each data set in a separate output group:

   //OUTDS1 OUTPUT DEST='IP:printer1',PRTQUEUE='RAW',GROUPID=GROUP1
   //OUTDS2 OUTPUT DEST='IP:printer2',PRTQUEUE='RAW',GROUPID=GROUP2
   //DD1 DD SYSOUT=P,OUTPUT=*.OUTDS1
   //DD2 DD SYSOUT=P,OUTPUT=*.OUTDS2

3. JES2 or JES3: IP PrintWay extended mode prints the output data sets on different printers (printer1 and printer2) because JES places each data set in a separate output group:

   //OUTDS1 OUTPUT DEST='IP:printer1',PRTQUEUE='RAW',TITLE=TITLE1
   //OUTDS2 OUTPUT DEST='IP:printer2',PRTQUEUE='RAW',TITLE=TITLE2
   //DD1 DD SYSOUT=P,OUTPUT=*.OUTDS1
   //DD2 DD SYSOUT=P,OUTPUT=*.OUTDS2

• IP PrintWay basic mode sends each data set that is in the same JES output group to the email addresses specified for the data set. However, IP PrintWay extended mode, by default, sends all data sets that are in the same JES output group to the email addresses specified for the first data set in the output group. The administrator can set the AOP_MAIL_USE_FIRST_ADDRESS=NO environment variable or the mail-use-first-address=no configuration attribute so that IP PrintWay extended mode sends each data set that is in the same output group to the email addresses specified for the data set.
• The PRTATTRS JCL parameter works only with IP PrintWay extended mode. IP PrintWay basic mode ignores it.
• For these JCL parameters, IP PrintWay extended mode uses the values in the printer definition as the default: ADDRESS, BUILDING, DEPT, DUPLEX, FCB, FORMDEF, NAME, PAGEDEF, ROOM, TITLE.
• JES3: If you specify the HOLD=YES parameter on the DD statement, the operator cannot use Infoprint Central to release or delete the data set, or change any characteristics of the data set. To hold an output data set, IBM suggests that you instead specify a held output class on the DD or OUTPUT statement. This suggestion applies whether you print on IP PrintWay extended mode printers or on PSF printers.

**JCL parameters for the Print Interface subsystem**

This section describes how to code the SUBSYS JCL parameter to request that the Print Interface subsystem process a data set. It also describes the parameters of the DD and OUTPUT JCL statements that apply when you use the Print Interface subsystem.

```
DD JCL Statement:

SUBSYS=(subsystem_name[,,'printer_definition_name'][,'attribute=value ...'])
```

*Figure 10. SUBSYS parameter for the Print Interface subsystem*

```
SUBSYS=(subsystem_name[,,'printer_definition_name'][,'attribute=value ...'])
```

Specifies that the Print Interface subsystem is to process this data set.

The Print Interface subsystem supports these positional subparameters:
subsystem_name

Specifies the name of the Print Interface subsystem. This name must be the same as the Inventory name that is specified in the Infoprint Server configuration file. The Printer Inventory name is usually AOP1.

Default: None.

'printer_definition_name'

Specifies the name of the printer definition in the Printer Inventory that the subsystem uses to process the data set. This name is case-sensitive. If the name includes any lowercase characters or special characters, enclose the name in single quotation marks. If you want to omit this parameter, but still specify job attributes, code a comma to indicate that the printer definition name is omitted.

Default: The first printer definition name that is found, in this order:
1. The printer definition name that is specified in the FSSDATA parameter on the OUTPUT JCL statement.
2. The Infoprint Server default printer definition. The name of the Infoprint Server default printer definition is specified in the Printer Inventory. The default name is lp1.

attribute=value ...

Specifies Infoprint Server job attributes that the subsystem uses to process and print the data set. For a list of valid job attributes, see Chapter 3, "Using job attributes," on page 53.

Rules:
1. Attribute names and values are case-sensitive. All attribute names are lowercase.
2. Enclose the entire list of job attributes in single quotation marks.
3. Separate job attributes with one or more spaces.
4. If an attribute value contains blanks or special characters, enclose that attribute value in double quotation marks.
5. You can specify up to 127 characters of job attributes.
6. To continue the SUBSYS parameter on another line, end the first line with a comma at the end of a complete subparameter.
7. If you cannot fit all job attributes on one line, see z/OS MVS JCL Reference for information about how to continue a parameter field that is enclosed in single quotation marks.

Tip: If you want to specify more than 127 characters of job attributes, instead, specify the JCL parameter that corresponds to the job attribute. For example, specify the COPIES JCL parameter instead of the copies job attribute. Or, specify the job attributes in an attributes file.

Overrides: Job attributes override values that are specified in corresponding parameters of the DD and OUTPUT JCL statements. For a list of job attributes and their corresponding JCL parameters, see Appendix B, "JCL parameters and corresponding job attributes," on page 185.

Using an attributes file: You can store attributes and values in an MVS data set or in a UNIX file (such as a zFS file). Follow these rules:

- Specify the name of the MVS data set or the UNIX file in an attribute called attributes.
Because Print Interface must be able to read the attributes data set, make sure that the ID assigned to the Infoprint Server daemons has the necessary authority.

For information about how to specify the attributes in the attributes file, see “Attributes files” on page 54.

**Default:** The first value that is found for each job attribute, in this order:

1. The value in a corresponding JCL parameter that is specified on the DD statement.
2. The value in a corresponding JCL parameter that is specified on the first OUTPUT statement referred to in the OUTPUT parameter on the DD statement.
3. The value in a corresponding JCL parameter that is specified on the first default OUTPUT statement in the job step.
4. The value in a corresponding JCL parameter that is specified on the first default OUTPUT statement in the job.
5. The value that is specified in the printer definition.
6. The JES default value for the corresponding JCL parameter. However, the JES default values for the CHARS, UCS, PAGEDEF, or FCB parameters are not used to transform data.

**Examples:**

1. This example shows how to submit output to the Print Interface subsystem named AOP1:
   ```
   //DD1 DD SUBSYS=(AOP1,'myprinter')
   ```
2. This example shows how to submit output to the subsystem named AOP1 and specify that the output from the transform includes only pages 1 - 10 and is printed on both sides of the sheet. The PCL to AFP, PostScript to AFP, and PDF to AFP transforms support the -p option.
   ```
   //DD1 DD SUBSYS=(AOP1,'myafpprinter',
   // 'filter-options="-p 1-10" duplex=yes')
   ```
3. This example shows how to submit output to the subsystem named AOP1 and specify attributes in a UNIX file named /u/myuserid/myattributes:
   ```
   //DD1 DD SUBSYS=(AOP1,'myprinter', 'attributes=/u/myuserid/myattributes')
   ```

**Parameters of the DD JCL statement that the Print Interface subsystem supports**

Table 14 summarizes the parameters on the DD JCL statement, other than the SUBSYS parameter, that the Print Interface subsystem supports. It also describes the special considerations that apply when you use the Print Interface subsystem.

**Table 14. Parameters of the DD JCL statement that the Print Interface subsystem supports**

<table>
<thead>
<tr>
<th>DD statement parameter</th>
<th>Print Interface subsystem considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>BURST</td>
<td>If you do not specify one of these parameters, the corresponding value in the printer definition is used. If none is specified, the standard default value is used. However, JES default values for the CHARS and UCS parameters are not used to transform data.</td>
</tr>
<tr>
<td>CHARS</td>
<td></td>
</tr>
<tr>
<td>COPIES</td>
<td></td>
</tr>
<tr>
<td>FLASH</td>
<td></td>
</tr>
<tr>
<td>UCS</td>
<td></td>
</tr>
</tbody>
</table>
Table 14. Parameters of the DD JCL statement that the Print Interface subsystem supports (continued)

<table>
<thead>
<tr>
<th>DD statement parameter</th>
<th>Print Interface subsystem considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>COPIES</td>
<td>If you do not specify one of these parameters, the corresponding value in the printer definition is used. If none is specified, the default is 1 copy. The administrator can limit the number of copies that you can print. If you exceed the allowed limit, the Print Interface subsystem does not print any data sets in the job step. If you specify COPIES on both the DD and the OUTPUT JCL statement, COPIES on the DD statement is used.</td>
</tr>
<tr>
<td>DCB</td>
<td>Specify values in the DCB parameter that are suitable for data that your application writes to this DD statement. If you do not specify either the DCB OPTCD=J subparameter or the TRC parameter on the OUTPUT JCL statement, the TRC value in the printer definition is used. <strong>Tip:</strong> If the DCB RECFM parameter is not specified on the DD statement or by the application that writes the data, the default is RECFM=U (undefined records with no carriage controls). Therefore, if the data contains carriage controls, you must specify the type of carriage controls in the DCB RECFM parameter.</td>
</tr>
<tr>
<td>DSNAME</td>
<td>Begin the name with two ampersands (&amp;&amp;). Follow the ampersands with 1 - 8 alphanumeric or national ($,#,@) characters, a hyphen, or a character 'X'C0'. The first character after the ampersands must be alphabetic or national ($,#,@). If you specify another format, you receive a JCL error.</td>
</tr>
<tr>
<td>LRECL</td>
<td>Specify values in this parameter that are suitable for data that the application writes to this DD statement.</td>
</tr>
<tr>
<td>OUTPUT</td>
<td>Refer to only one OUTPUT JCL statement. The Print Interface subsystem ignores all references except for the first one.</td>
</tr>
<tr>
<td>SEGMENT</td>
<td>Not allowed. If you specify one of these parameters with the SUBSYS parameter, you receive a JCL error.</td>
</tr>
<tr>
<td>SYSOUT</td>
<td></td>
</tr>
<tr>
<td>All other DD parameters</td>
<td>The Print Interface subsystem does not use any other DD parameters. However, JES might use them.</td>
</tr>
</tbody>
</table>

**Parameters of the OUTPUT JCL statement that the Print Interface subsystem supports**

Table 15 on page 125 summarizes the parameters of the OUTPUT JCL statement that the Print Interface subsystem supports. It also describes some special considerations that apply when you use the Print Interface subsystem.
### Table 15. Parameters of the OUTPUT JCL statement that the Print Interface subsystem supports

<table>
<thead>
<tr>
<th>OUTPUT statement parameter</th>
<th>Print Interface subsystem considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLASS</td>
<td>IP PrintWay does not use these values to select a printer definition. The Print Interface subsystem and IP PrintWay use only the printer definition that is specified in the SUBSYS parameter or, if none is specified, the printer definition in the FSSDATA parameter. If you do not specify one of these parameters, the corresponding value in the printer definition is used. If none is specified, the standard JES default is used. The administrator can limit the values that you can specify in the FORMS parameter. If you specify a value that is not allowed, you receive a JCL error.</td>
</tr>
<tr>
<td>DEST</td>
<td>If you do not specify one of these parameters, the corresponding value in the printer definition is used. If none is specified, the standard JES default is used. The administrator can limit the values that you can specify in these parameters. If you specify a value that is not allowed, you receive a JCL error.</td>
</tr>
<tr>
<td>FORMS</td>
<td>The Print Interface subsystem uses only one OUTPUT JCL statement, in this order: 1. The first OUTPUT JCL statement referred to in the OUTPUT parameter on the DD statement 2. The first OUTPUT JCL statement with DEFAULT=YES in the same job step 3. The first OUTPUT JCL statement with DEFAULT=YES in the job.</td>
</tr>
<tr>
<td>COPIES</td>
<td>The Print Interface subsystem uses the specified group ID. However, JES always places the output data set that Print Interface allocates on the JES spool in a separate JES output group regardless of the value that is specified in this parameter.</td>
</tr>
<tr>
<td>DATACK</td>
<td>Ignored.</td>
</tr>
<tr>
<td>DUPLEX</td>
<td>The Print Interface subsystem uses the first value that is found for each job attribute, in this order: 1. The SUBSYS JCL parameter 2. The PRTATTRS JCL parameter 3. The JCL parameter that corresponds to the job attribute (for example, the FORMDEF JCL parameter corresponds to the form-definition job attribute) 4. The printer definition</td>
</tr>
<tr>
<td>DEFAULT</td>
<td>All other OUTPUT parameters If you do not specify a parameter on the OUTPUT statement, the corresponding value that is specified in the printer definition is used. If none is specified, the standard JES default is used. However, the JES default values for the PAGEDEF and FCB parameters are not used to transform data.</td>
</tr>
<tr>
<td>JESDS</td>
<td>The Print Interface subsystem does not support these JCL statements: 1. The JES2 /*OUTPUT JCL statement is ignored. 2. The JES2 /*JESDS JCL statement is ignored.</td>
</tr>
</tbody>
</table>

### JCL statements that the Print Interface subsystem does not support

The Print Interface subsystem does not support these JCL statements:

- The JES2 /*OUTPUT JCL statement is ignored.
The JES3 //*FORMAT JCL statement is ignored.

JCL parameters for distribution information

Figure 11 summarizes the parameters that you can specify on an OUTPUT JCL statement to help identify and distribute output:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADDRESS</td>
<td>Address text</td>
</tr>
<tr>
<td>BUILDING</td>
<td>Building text</td>
</tr>
<tr>
<td>DEPT</td>
<td>Department text</td>
</tr>
<tr>
<td>NAME</td>
<td>Name text</td>
</tr>
<tr>
<td>ROOM</td>
<td>Room text</td>
</tr>
<tr>
<td>TITLE</td>
<td>Description of output</td>
</tr>
</tbody>
</table>

Figure 11. Summary of JCL parameters for the distribution of output

The values that you specify in these parameters can be printed on a separator sheet if your installation writes an IP PrintWay exit that creates a separator sheet. IP PrintWay can also pass the value that is specified in the TITLE parameter to a remote printer. Depending on how the printer definition and the printer are configured, this title can print on the separator page (banner page) generated by the printer’s LPD.

For IP PrintWay extended mode, the default for these parameters is the value in the printer definition.

AFP parameters for remote printing

This section lists the JCL parameters that you can specify on an OUTPUT or DD statement for IP PrintWay to send to either InfoPrint Manager or Infoprint Server running on a remote system. IP PrintWay sends these parameters to the target system only if the administrator selects the Remote PSF option in the printer definition in the Printer Inventory.

These JCL parameters specify AFP options that InfoPrint Manager and PSF use when you print on an AFP printer. Also, transform products can use some of these parameters when they transform AFP and line data to another format, such as PCL or PostScript.

IP PrintWay sends the values for these JCL parameters to the target system:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADDRESS</td>
<td>Address text</td>
</tr>
<tr>
<td>BUILDING</td>
<td>Building text</td>
</tr>
<tr>
<td>CHAR</td>
<td>Char text</td>
</tr>
<tr>
<td>CLASS</td>
<td>Class text</td>
</tr>
<tr>
<td>COPIES</td>
<td>Copies</td>
</tr>
<tr>
<td>DATAAC</td>
<td>Data Ac</td>
</tr>
<tr>
<td>DEAF</td>
<td>Deaf</td>
</tr>
<tr>
<td>DEPT</td>
<td>Department text</td>
</tr>
<tr>
<td>DEST</td>
<td>Dest</td>
</tr>
<tr>
<td>DUPLEX</td>
<td>Duplex</td>
</tr>
<tr>
<td>FCB</td>
<td>Fcb</td>
</tr>
<tr>
<td>FORMDEF</td>
<td>Formdef</td>
</tr>
<tr>
<td>FORMS</td>
<td>Forms</td>
</tr>
<tr>
<td>INTRAY</td>
<td>Intray</td>
</tr>
<tr>
<td>OUTBIN</td>
<td>Outbin</td>
</tr>
<tr>
<td>PAGEDEF</td>
<td>Page Def</td>
</tr>
<tr>
<td>OFFSETX</td>
<td>Offset X</td>
</tr>
<tr>
<td>OFFSETY</td>
<td>Offset Y</td>
</tr>
<tr>
<td>OFFSETXB</td>
<td>Offset Xb</td>
</tr>
<tr>
<td>OFFSETYB</td>
<td>Offset Yb</td>
</tr>
<tr>
<td>PRMODE</td>
<td>Prmode</td>
</tr>
<tr>
<td>ROOM</td>
<td>Room</td>
</tr>
<tr>
<td>TITLE</td>
<td>Title</td>
</tr>
<tr>
<td>TRC</td>
<td>Trc</td>
</tr>
<tr>
<td>UCS</td>
<td>Ucs</td>
</tr>
</tbody>
</table>

Note: Values other than SOS1, SOS2, SOS3, and SOS4 are ignored. The transforms from AFP (AFP to PCL, AFP to PDF, and AFP to PostScript) do not support SOS4.

Related information: For information about how IP PrintWay sends these and other JCL values to InfoPrint Manager, see z/OS Infoprint Server Operation and Administration.
JCL examples

In the examples, assume that:

- Class P is a JES work-selection criterion for the IP PrintWay basic mode FSA or an IP PrintWay extended mode job selection criterion.
- Class P and destination DEPT001 are printer-selection values that are specified in a printer definition.
- Class P, destination DEPT002, and form name WIDE are printer-selection values that are specified in another printer definition.
- pc11 is a printer definition that does not specify a form name.
- PS1 is a destination name.
- myoptions is the name of a set of components in the Printer Inventory.
- afpprinter is the printer definition for a printer that is attached to a remote system that is running InfoPrint Manager or Infoprint Server.

The examples are all JES2 examples. For differences between JES2 and JES3, see z/OS MVS JCL Reference.

Direct output to an IP PrintWay printer by specifying the printer definition name

These examples show how to direct an output data set to an IP PrintWay printer by specifying the printer definition name.

Because these examples do not specify retry values, retention periods, or the name of an options component, IP PrintWay uses the values that are defined by your administrator in this printer definition. If these values are not defined in the printer definition, IP PrintWay uses the standard defaults that are described in "JCL parameters" on page 102.

1. In this example, the OUTPUT statement specifies the printer definition name myprinter.

   //PWAYJOB1 JOB ...
   //STEP1 EXEC PGM=USERA
   //OUTDS OUTPUT CLASS=P,FSSDATA='printer=myprinter'
   //DD1 DD SYSOUT=(,),OUTPUT=(*.OUTDS)

2. In this example, the OUTPUT statement specifies the printer definition name myprinter and IP address 99.153.123.232. IP PrintWay uses this IP address instead of the address that is defined in myprinter. It uses the rest of the information in the myprinter printer definition.

   //PWAYJOB2 JOB ...
   //STEP1 EXEC PGM=USERA
   //DD1 DD SYSOUT=(,),OUTPUT=(*.OUTDS)

Direct output to an IP PrintWay printer by specifying a host name or an IP address

These examples show how to direct an output data set to an IP PrintWay printer by specifying the host name or IP address of the target printer and the name of the print queue.

Because these examples do not specify retry values, retention periods, or the name of an options component, IP PrintWay uses default values that are defined in the default printer definition or, if none exists in IP PrintWay basic mode, the standard defaults that are described in "JCL parameters" on page 102.
1. In this example, the OUTPUT statement specifies the printer's host name (PRINTER1.XYZ.COM) and print queue (RAW).

```
//PWAYJOB3 JOB...
//STEP1 EXEC PGM=USERA
//OUTDS OUTPUT CLASS=P,DEST='IP:PRINTER1.XYZ.COM',PRTQUEUE='RAW'
//DD1 DD SYSOUT=(,),OUTPUT=(*.OUTDS)
```

2. In this example, the OUTPUT statement specifies the printer IP address (99.153.123.232) and the name of the print queue (RAW).

```
//PWAYJOB4 JOB...
//STEP1 EXEC PGM=USERA
//DD1 DD SYSOUT=(,),OUTPUT=(*.OUTDS)
```

### Direct output to an IP PrintWay printer by specifying DEST, CLASS, or FORMS

These examples show how to specify the destination, class, or form name to direct an output data set to a printer that IP PrintWay controls. IP PrintWay uses a printer whose printer definition values match the values you specify in the JCL. You can override the name of the print queue in the printer definition, as shown in Example 3.

1. In this example, the DD statement specifies a destination name, class, and form name. The destination name and class match values in a printer definition. The DD statement also specifies a form name, but the printer definition does not specify one. Therefore, IP PrintWay does not use the form name as a printer selection criterion.

```
//PWAYJOB5 JOB...
//STEP1 EXEC PGM=USERA
//DD1 DD SYSOUT=(P,,WIDE),DEST=DEPT001
```

**Note:** If the form name is more than 4 characters, you must specify the name on the OUTPUT statement, as shown in Example 3.

2. In this example, the OUTPUT statement specifies destination name and class. It does not specify a form name. A JES default is used for the form name.

```
//PWAYJOB6 JOB...
//STEP1 EXEC PGM=USERA
//OUTDS OUTPUT CLASS=P,DEST=DEPT001
//DD1 DD SYSOUT=(,),OUTPUT=(*.OUTDS)
```

3. In this example, the OUTPUT statement specifies the destination name, class, and form name. The print queue name (RAW) overrides the name of the print queue that is specified in the printer definition.

```
//PWAYJOB7 JOB...
//STEP1 EXEC PGM=USERA
//OUTDS OUTPUT CLASS=P,FORMS=WIDE,DEST=DEPT002,PRTQUEUE='RAW'
//DD1 DD SYSOUT=(,),OUTPUT=(*.OUTDS)
```

### Direct output to multiple IP PrintWay printers

These examples show how to direct a data set to IP PrintWay and to send it to more than one printer at the same time by specifying multiple OUTPUT statements. The OUTPUT parameter on the DD statement refers to two OUTPUT JCL statements. Therefore, JES creates two output data sets.

1. In this example, the OUTPUT statements specify two different destination names:
2. In this example, the OUTPUT statements specify the host names of two different printers. Because different GROUPID parameters are specified, JES2 places the output data sets in two separate output groups. For more information, see "JCL considerations for IP PrintWay extended mode" on page 120.

//PWAYJOBN JOB ...
//STEP1 EXEC PGM=USERA
//OUTDS OUTPUT DEST='IP:printer1.xyz.com',PRTQUEUE='RAW',GROUPID=GROUP1
//OUTDS2 OUTPUT DEST='IP:printer2.xyz.com',PRTQUEUE='RAW',GROUPID=GROUP2
//DD1 DD SYSOUT=P,OUTPUT=(*.OUTDS1,*.OUTDS2)

Specify components in the Printer Inventory

These examples show how to specify the name of Printer Inventory components that are defined by your administrator and used by IP PrintWay.

1. In this example, the OUTPUT statement specifies the name of a printer definition and the name of components in the Printer Inventory that contain IP PrintWay options. IP PrintWay uses components that are named myoptions instead of the options in the printer definition.

//PWAYJOBA JOB ...
//STEP1 EXEC PGM=USERA
//OUTDS OUTPUT FSSDATA='printer=myprinter',PRTOPTNS='myoptions'
//DD1 DD SYSOUT=P,OUTPUT=(*.OUTDS)

2. In this example, the OUTPUT statement specifies the name of the print queue and the IP address of the host. IP PrintWay uses components that are named myoptions instead of the options in the default printer definition.

//PWAYJOBB JOB ...
//STEP1 EXEC PGM=USERA
//PRTOPTNS='myoptions'
//DD1 DD SYSOUT=(,),OUTPUT=(*.OUTDS)

Specify retry values

These examples show how to specify these IP PrintWay retry values:

- Retry time of 1 minute. IP PrintWay retransmits a failed transmission one time immediately, and then waits 8 minutes between subsequent retransmissions.
- Retry limit of 3 times. If the immediate retransmission fails, IP PrintWay retransmits a maximum of 3 more times.

1. In this example, the OUTPUT statement specifies a printer definition name. IP PrintWay uses the retry values specified on the OUTPUT statement instead of the values in this printer definition.

//PWAYJOBC JOB ...
//STEP1 EXEC PGM=USERA
//OUTDS OUTPUT FSSDATA='printer=myprinter',
//RETRYL=3,RETRYT='0000:09:00'
//DD1 DD SYSOUT=P,OUTPUT=(*.OUTDS)

2. In this example, the OUTPUT statement specifies the name of the print queue and the IP address of the host. IP PrintWay uses the retry values specified on the OUTPUT statement instead of the values in the default printer definition.
Specify retention periods

These examples show how to specify these IP PrintWay retention periods:

- Retention period of 1 day (24 hours) if the transmission is successful
- Retention period of 4 days (96 hours) if the transmission fails

1. In this example, the OUTPUT statement specifies a printer definition name. IP PrintWay uses the retention values specified on the OUTPUT statement instead of the values in this printer definition.

2. In this example, the OUTPUT statement specifies a form and destination name. IP PrintWay uses the retention values specified on the OUTPUT statement instead of the values in the printer definition for the printer that matches this form and destination name.

3. In this example, the OUTPUT statement specifies the name of the print queue and the IP address of the host. IP PrintWay uses the retention values specified on the OUTPUT statement instead of the values in the default printer definition.

Specify AFP resources for printing on a remote PSF system

This example shows how to specify a page definition and coded font for printing on an AFP printer that is attached to a system that is running either InfoPrint Manager or Infoprint Server with PSF. IP PrintWay prefixes P1 to the specified page definition name before it transmits the value.

Specify email addresses on the OUTPUT JCL statement

This example shows how to specify email recipient addresses, the sender's name and reply address, the email subject line, and the email attachment name in parameters on the OUTPUT JCL statement.
This example assumes that the administrator set up a printer definition in the Printer Inventory:

- The IP PrintWay printer definition is named mail.
- The email protocol is selected and an email address is specified for the primary recipient. However, the email address that you specify in the MAILTO parameter on the OUTPUT JCL statement overrides the email address in the printer definition.

```plaintext
//PWAYJOBJ JOB ...
//STEP1 EXEC PGM=USERA
//OUTDS OUTPUT CLASS=P,FSSDATA='printer=mail',
  // MAILTO='user1@xyz.com',MAILCC='user2@xyz.com',
  // MAILBCC='user3@xyz.com',MAILFROM='John Q. Sender',
  // REPLYTO='secretary@xyz.com',
  // MAILFILE='January report',TITLE='Monthly Report'
//DD1 DD SYSOUT=(,),OUTPUT=(*.OUTDS)
```

**Results:**

1. The recipient of the email is user1@xyz.com.
2. The “copy (cc)” recipient of the email is user2@xyz.com. A cc means that other recipients of the email can see the cc recipient listed.
3. The “blind copy (bcc)” recipient of the email is user3@xyz.com. A bcc means that other recipients of the email do not see the bcc recipient listed.
4. The sender of the email is John Q. Sender<JOHN@SYSTEM1>. JOHN is the user ID of the user who ran the job, and SYSTEM1 is the system where z/OS UNIX sendmail is running.
5. The email address that recipients of an email can reply to is secretary@xyz.com.
6. The email attachment is January report.txt. The attachment is in text format unless a transform is specified in the mail printer definition.
7. The subject of the email is Monthly Report.

**Send two data sets to an email destination as text data**

This example shows how to send two output data sets that contain line data as attachments in text format in the same email. This example specifies the subject of the email in the TITLE parameter, and the names of the attachments in the MAILFILE parameters.

This example assumes that the administrator set up the printer definition in the Printer Inventory:

- The IP PrintWay printer definition is named deptmail.
- The email protocol is selected, and the recipient email address list or a z/OS UNIX sendmail alias name is specified.
- No transform is specified for line data. Therefore, IP PrintWay converts line data in the data sets to text format.
- The **Automatic dataset grouping (extended mode)** field or the **Concatenate job** option in the **Dataset grouping** field is selected. This causes IP PrintWay to send output data sets that are in the same JES output group in the same email.

```plaintext
//PWAYJOBJ JOB ...
//STEP1 EXEC PGM=USERA
//OUTDS1 OUTPUT CLASS=P,TITLE='Monthly Report',MAILFILE='Sales',
  // FSSDATA='printer=deptmail'
//OUTDS2 OUTPUT CLASS=P,TITLE='Monthly Report',MAILFILE='Inventory',
  // FSSDATA='printer=deptmail'
//DD1 DD SYSOUT=(),OUTPUT=(*.OUTDS1)
//DD2 DD SYSOUT=(),OUTPUT=(*.OUTDS2)
```
**Results:** The recipients that are listed in the printer definition receive an email:

1. The sender of the email is the user ID who ran the job. For example, USER1@DOMAIN1.
2. The subject of the email is Monthly Report.
3. The email has two attachments: Sales.txt and Inventory.txt. Both attachments are in text format and can be viewed with any text editor.

**Send line or AFP data to an email destination as PDF data and print the AFP data on an AFP printer**

This example shows how to (1) send an output data set with either line or AFP data to one or more email addresses as an attachment in PDF format and (2) print it on an AFP printer that PSF controls. This example specifies the subject of the email in the TITLE parameter and the name of the attachment in the MAILFILE parameter.

This example assumes that the administrator set up a printer definition for the email destination in the Printer Inventory:

- The IP PrintWay printer definition is named deptmail.
- The email protocol is selected and the recipient email address list or a z/OS UNIX sendmail alias name is specified in the printer definition.
- The AFP to PDF transform is specified for the line data and MO:DCA-P data formats.
- AFP resource libraries are specified either in the printer definition or in the transform configuration file, aopxfd.conf. If not, you must specify the USERLIB JCL parameter on the OUTDS1 OUTPUT statement.
- IP PrintWay basic mode: The **Resubmit for filtering** option is selected.

This example also assumes that the system programmer defined the PSF-controlled printer to JES so that JES directs data sets with CLASS F and DEST PRT633 to the PSF-controlled printer.

```plaintext
//IPWAYJOBK JOB ...
//STEP1 EXEC PGM=USERA
//OUTDS1 OUTPUT CLASS=F,FORMDEF=MYDEF,TITLE='Monthly Report',
//    FSSDATA='printer=deptmail',MAILFILE='January Report'
//OUTDS2 OUTPUT CLASS=F,FORMDEF=MYDEF,TITLE='Monthly Report',
//    DEST=PRT633
//DD1 DD SYSOUT=(,),OUTPUT=(*,OUTDS1,*,OUTDS2)
```

**Results:**

1. The recipients that are listed in the printer definition deptmail receive an email:
   - The sender of the email is the user ID who ran the job. For example, USER1@DOMAIN1.
   - The subject of the email is Monthly Report.
   - The email attachment is named January Report.pdf and is in PDF format. The attachment can be viewed with a PDF viewer such as Adobe Acrobat Reader.
2. The file is printed on the PSF-controlled printer that is defined with JES work-selection criteria of CLASS F and DEST PRT633.

**Send line or AFP data to an email destination as AFP data**

This example shows how to send an output data set that contains either AFP data or line data with AFP resources to an email destination as an AFP file. This
example specifies the subject of the email in the TITLE parameter and the name of
the attachment in the MAILFILE parameter.

This example uses the IBM ACIF program to collect AFP resources into a separate
file and concatenate that file to the line or AFP data file so that the email recipient
can view the file with the AFP Viewer plug-in for Windows and also print the file.

This example assumes that the administrator set up the printer definition in the
Printer Inventory:

- The IP PrintWay printer definition is named deptmail.
- The email protocol is selected and the recipient email address list or a z/OS UNIX sendmail alias name is specified in the printer definition.
- No transform is specified for the AFP data format.
- IP PrintWay basic mode: The none formatting option is selected.

```
//PWAYJOB JCL ...
//ACIF EXEC PGM=APKACIF,PARM='PARMDD=PARMS'
//SYSPRINT DD SYSOUT=* 
//INPUT DD DSNAME=MYFILE.AFP,DISP=SHR
//OUTPUT DD DUMMY
//RESOBJ DD DSNAME=&RESLIB,DISP=(,PASS),
///SPACE=(CYL,(5,5),RLSE),
///UNIT=3390, VOL=SER=USR003,
///DCB=(LRECL=12284, BLOCKSIZE=12288,RECFM=VB)
//PARAMS DD *
INDEXOBJ = NONE /* Do not create INDEX output */
RESTYPE = ALL /* Collect all resource types */
CCTYPE = M /* Carriage control type */
MCF2REF = CF /* Collect coded fonts */
FONTLIB = SYS1.FONT300, /* Font libraries */
SYS1.SFNTLIB
USERLIB = MY.USERLIB /* Other user resources */
FDEFLIB = SYS1.FDEFLIB /* Form definition library */
FORMDEF = F1MYFDEF /* Form definition to use */
/*
//IEBGENER EXEC PGM=IEBGENER,COND=(0,NE)
//SYSPRINT DD SYSOUT=* 
//SYSPIN DD DUMMY
//OUTDS OUTPUT CLASS=P,TITLE='Monthly Report',
///FSIZEDATA='printer=deptmail',MAILFILE='January Report'
//SYSUT1 DD DSNAME=*,ACIF.RESOBJ,DISP=(OLD,DELETE)
// DD DSNAME=MYFILE.AFP,DISP=SHR
//SYSUT2 DD SYSOUT=(,OUTPUT=(.*OUTDS)
```

**Results:** The recipients that are listed in the printer definition deptmail receive an email:

1. The sender of the email is the user ID who submitted the job. For example, USER1@DOMAIN1.
2. The subject of the email is Monthly Report.
3. The email attachment is named January Report.afp and is in AFP format with all AFP resources inline. The attachment can be viewed with the AFP Viewer plug-in for Windows.

**Print line or AFP data on a PostScript or PCL printer with IP PrintWay extended mode**

These examples show how to print line data and AFP data on a PostScript or PCL printer. These examples assume that your administrator configured the printer definition in the Printer Inventory to use the AFP to PostScript or AFP to PCL.
transform. Because the AFP to PCL and AFP to PostScript transforms use the same JCL parameters as PSF uses, you can specify the same JCL parameters as you do when you print on an AFP printer.

1. In this example, AFP output is sent to a PostScript printer.

```
//TRJOB1 JOB ...
//STEP1 EXEC PGM=USERA
//OUTDS OUTPUT CLASS=P,DEST=PS1
//DD1 DD SYSOUT=(,),OUTPUT=(*.OUTDS)
```

2. In this example, an AFP job is sent to a PCL printer. It is printed with a user-defined form definition F1MYDEF, which is in the user library MYLIB.

```
//TRJOB2 JOB ...
//STEP1 EXEC PGM=USERA
//OUTDS1 OUTPUT CLASS=P,FORMDEF=MYDEF,USERLIB=MYLIB,FSSDATA='printer=pcl1'
//DD1 DD SYSOUT=(,),OUTPUT=(*.OUTDS1)
```

**Print line or AFP data on a PostScript or PCL printer with the IP PrintWay basic mode resubmit for filtering function**

These examples show how to print line data and AFP data on a PostScript or PCL printer. These examples assume that your administrator configured the printer definition in the Printer Inventory to use the AFP to PostScript or AFP to PCL transform and also selected the Resubmit for filtering option. Because the AFP to PCL and AFP to PostScript transforms use the same JCL parameters as PSF uses, you can specify the same JCL parameters as you do when you print on an AFP printer.

In these examples, the DSNAME parameter specifies a data set name. The last qualifier of the fully qualified data set name on the JES spool is MYFILE. Because the Resubmit for filtering option is selected in the printer definition, Infoprint Server dynamically allocates a second output data set on the JES spool during processing. The last qualifier of this data set's fully qualified name is also MYFILE.

1. In this example, AFP output is sent to a PostScript printer.

```
//TRJOB1 JOB ...
//STEP1 EXEC PGM=USERA
//OUTDS OUTPUT CLASS=P,DEST=PS1
//DD1 DD SYSOUT=(,),OUTPUT=(*.OUTDS),DSNAME=&&MYFILE
```

2. In this example, an AFP job is sent to a PCL printer. It is printed with a user-defined form definition F1MYDEF, which is in the user library MYLIB.

```
//TRJOB2 JOB ...
//STEP1 EXEC PGM=USERA
//OUTDS1 OUTPUT CLASS=P,FORMDEF=MYDEF,USERLIB=MYLIB,FSSDATA='printer=pcl1'
//DD1 DD SYSOUT=(,),OUTPUT=(*.OUTDS1),DSNAME=&&MYFILE
```

**Print line or AFP data on a PostScript printer with the Print Interface subsystem**

These examples show how to print line data and AFP data on a PostScript printer. These examples assume that your administrator created two IP PrintWay printer definitions that are named mypsprinter and anypsprinter in the Infoprint Server Printer Inventory:

- The AFP to PostScript transform is specified in both printer definitions.
- Class P is specified in both printer definitions. Therefore, CLASS=P is not specified on the OUTPUT JCL statement in these examples.
- Printer definition mypsprinter contains the printer's IP address and print queue name.
• Printer definition anypsprinter specifies the LPR transmission protocol, but does not specify your printer’s IP address and print queue name. Example 3 shows how to specify your printer’s IP address and print queue name on the OUTPUT JCL statement.

1. In this example, the Print Interface subsystem that is named AOP1 transforms the data in two data sets to PostScript format and writes the PostScript data to two output data sets on the JES spool. The last qualifiers of the data sets names are DATA1 and DATA2. The subsystem uses options that are specified in mypsprinter. IP PrintWay then prints both data sets on the printer whose address is specified in mypsprinter.

//SSJOB1 JOB ...
//STEP1 EXEC PGM=USERA
//DD1 DD SUBSYS=(AOP1,'mypsprinter'),DSNAME=&&DATA1
//DD2 DD SUBSYS=(AOP1,'mypsprinter'),DSNAME=&&DATA2

2. In this example, the Print Interface subsystem that is named AOP1 transforms the data to PostScript format and writes the PostScript data to an output data set on the JES spool. The subsystem uses options that are specified in mypsprinter. However, it uses form definition F1MYDEF in library MYLIB to transform the data. IP PrintWay then prints the data on the printer whose address is specified in mypsprinter.

//SSJOB2 JOB ...
//STEP1 EXEC PGM=USERA
//OUTDS1 OUTPUT FORMDEF=MYDEF,USERLIB=MYLIB
//DD1 DD SUBSYS=(AOP1,'mypsprinter'),OUTPUT=(*.OUTDS1)

3. In this example, the Print Interface subsystem that is named AOP1 transforms the data to PostScript format and writes the PostScript data to an output data set on the JES spool. The subsystem uses options that are specified in anypsprinter. IP PrintWay then prints the data to queue RAW on the printer with IP address 99.153.123.232.

//SSJOB3 JOB ...
//STEP1 EXEC PGM=USERA
//OUTDS1 OUTPUT Dest='IP:99.153.123.232',PRTQUEUE='RAW'
//DD1 DD SUBSYS=(AOP1,'anypsprinter'),OUTPUT=(*.OUTDS1)

Print PostScript, PCL, or PDF data on an AFP printer with the Print Interface subsystem

These examples show how to print PostScript, PCL, and PDF data on an AFP printer that PSF controls. These examples assume that your administrator created two PSF printer definitions that are named myafpprinter and anyafpprinter in the Infoprint Server Printer Inventory:

• The PostScript to AFP, PCL to AFP, and PDF to AFP transforms are specified in both printer definitions. The %filter-options transform option is also specified to allow job submitters to specify transform options as shown in example 2.

• Printer definition myafpprinter specifies the class and destination name of the PSF-controlled printer. (CLASS and DEST are JES work-selection parameters that are typically used to direct output from the JES spool to a PSF-controlled printer.)

• Printer definition anyafpprinter does not specify the CLASS and DEST values for your PSF-controlled printer. Example 3 shows how to specify your printer’s CLASS and DEST work-selection values on the OUTPUT JCL statement.

1. In this example, the Print Interface subsystem that is named AOP1 transforms the data to AFP format and writes the AFP data to output data sets on the JES spool. The last qualifiers of the data sets names are DATA1 and DATA2. The subsystem uses options that are specified in printer definition myafpprinter.
PSF then prints the data sets on the AFP printer whose CLASS and DEST values match those values that are specified in myafpprinter.

//SSJ0B4 JOB ...
//STEP1 EXEC PGM=USERA
//DD1 DD SUBSYS=(AOP1,'myafpprinter'),DSNAME=&DATA1
//DD2 DD SUBSYS=(AOP1,'myafpprinter'),DSNAME=&DATA2

2. In this example, the Print Interface subsystem that is named AOP1 transforms the data to AFP format and writes the AFP data to an output data set on the JES spool. The subsystem uses options that are specified in printer definition myafpprinter. Because the filter-options attribute is specified in the SUBSYS parameter, it writes only the first 10 pages of the transformed data to the output data set. PSF then prints the data set on the AFP printer whose CLASS and DEST values match those values that are specified in myafpprinter. PSF uses form definition F1MYDEF, which is in library MYLIB, to format the AFP data.

//SSJ0B5 JOB ...
//STEP1 EXEC PGM=USERA
//OUTDS1 OUTPUT FORMDEF=MYDEF,USERLIB=MYLIB
//DD1 DD SUBSYS=(AOP1,'myafpprinter'),
// 'filter-options="-p 1-10"'),
// 'OUTPUT=(*.OUTDS1)

3. In this example, the Print Interface subsystem that is named AOP1 transforms the data to AFP format and writes the AFP data to an output data set on the JES spool. The subsystem uses options that are specified in printer definition anyafpprinter. The subsystem allocates the output data set with CLASS=F and DEST=PRT003. PSF then prints the data set on the AFP printer that processes data sets with CLASS=F and DEST=PRT003.

//SSJ0B6 JOB ...
//STEP1 EXEC PGM=USERA
//OUTDS1 OUTPUT CLASS=F,DEST=PRT003
//DD1 DD SUBSYS=(AOP1,'anyafpprinter'),OUTPUT=(*.OUTDS1)

Print GIF, JPEG, or TIFF data on an AFP printer with the Print Interface subsystem

This example shows how to print GIF, JPEG, or TIFF data on an AFP printer that PSF controls. This example assumes that your administrator created a PSF printer definition that is named myafpprinter in the Infoprint Server Printer Inventory and that you are using InfoPrint Transform Manager for Linux (the administrator specified the remote transform filter aoprxf.so in the printer definition).

The Print Interface subsystem that is named AOP1 transforms the data to AFP format and writes the AFP data to an output data set on the JES spool. The subsystem uses options that are specified in printer definition myafpprinter. PSF then prints the data set on the AFP printer whose values match those values that are specified in myafpprinter. PSF uses form definition F1MYDEF, which is in library MYLIB, to format the AFP data.

//SSJ0B7 JOB ...
//STEP2 EXEC PGM=USERA
//OUTDS1 OUTPUT FORMDEF=MYDEF,USERLIB=MYLIB
//DD1 DD SUBSYS=(AOP1,'myafpprinter'),
// OUTPUT=(*.OUTDS1)
Chapter 5. Printing with the AOPPRINT JCL procedure

The AOPPRINT Job Control Language procedure, provided in SYS1.PROCLIB, is used to submit print requests from z/OS. You can use this procedure to take advantage of all the features of Infoprint Server:
- You can specify job attributes.
- If a transform product is installed, you can automatically transform jobs from one data format to another.
- Infoprint Server validates that data can print on the selected printer.

Tips:
1. Your administrator can customize the AOPPRINT procedure. For information, see z/OS Infoprint Server Customization.
2. For information about the JOB, EXEC, DD, and IF/THEN/ELSE/ENDIF JCL statements, see z/OS MVS JCL Reference.

Sending a file to an email destination

With the AOPPRINT procedure, you can send the file to an email destination instead of to a printer. You can specify the email addresses of the primary and secondary recipients in one of these ways:
- Your administrator can specify the email address list for the recipients in the printer definition in the Printer Inventory.
- You can specify the email addresses for the recipients with these job attributes:
  - **mail-bcc-addresses**
    - Blind copy (bcc) recipients of an email. A bcc means that other recipients of the email do not see the bcc recipient listed.
  - **mail-cc-addresses**
    - Copy (cc) recipients of an email. A cc means that other recipients of the email can see the cc recipient listed.
  - **mail-to-addresses**
    - Primary recipients of an email.
- You can specify the email addresses for the recipients in an email header. For information, see Chapter II, “Creating an email header,” on page 179.

You can specify an address list in an alias file that your administrator defines to z/OS UNIX sendmail. For information, see “Specifying the email address list in an alias file” on page 95. Your administrator can specify the name of the alias file in the printer definition, or you can specify it in a job attribute.

The email has these characteristics:
- If the file contains text or line data, it can be included in an email attachment or inline in the body of the email. If the file contains data in another format (for example, PDF), the data is included in an attachment. To include text or line data inline, specify the **mail-inline-text** job attribute. Or, the administrator can select the **Inline text and line data** field in the printer definition.
- The name of the attachment is the name that is specified in one of these:
  - IP PrintWay extended mode
1. The mail-file-name job attribute
2. DD:SYSIN

IP PrintWay basic mode

1. The mail-file-name job attribute
2. The sysout-dataset-name job attribute
3. DD#SYSIN

The attachment name contains a suffix that indicates the type of data in the file. For example, txt indicates text format and pdf indicates PDF format.

- The subject of the email is the subject in the email header, the value in the title-text job attribute, or the default title that your administrator specified in the Allocation section of the printer definition. If none is specified, the user ID of the user who ran the job is used.
- The sender is the user ID of the user who ran the job at the domain name of the z/OS system. You can add a descriptive name or other identifier of the sender in the mail-from-name job attribute.
- You can receive replies from the email unless a firewall prevents the z/OS system from receiving replies from the sending system. To receive replies, use the z/OS UNIX mail or mailx command. To use these commands, your ID must be a valid z/OS UNIX user ID. You can specify the email address that recipients of an email can reply to in the mail-reply-address job attribute. If none is specified, the value in the printer definition is used.

### AOPPRINT parameters

**ERRCLASS=class**

Specifies the 1 character alphanumeric name of the system output data set (sysout) class for error messages. The name of the data set where error messages are written is specified by the STDERR data definition name (DDname).

**OPTIONS='attribute=value'...**

Specifies job attributes and values to use in processing the job. For descriptions of all job attributes, see "Job attribute listing" on page 55. Enter the attribute names in lowercase. Separate attributes with a space.

**OUTCLASS=class**

**PRINTER=printer_definition_name**

**Figure 12. AOPPRINT JCL parameters: format**

**ERRCLASS=class**

Specifies the 1 character alphanumeric name of the system output data set (sysout) class for error messages. The name of the data set where error messages are written is specified by the STDERR data definition name (DDname).

**OPTIONS='attribute=value'...**

Specifies job attributes and values to use in processing the job. For descriptions of all job attributes, see "Job attribute listing" on page 55. Enter the attribute names in lowercase. Separate attributes with a space.

**OUTCLASS=class**

**PRINTER=printer_definition_name**

**Using an attributes file:** You can store attributes and values in a UNIX file (for example, a zFS file) or in an MVS data set. Use the attribute that is called attributes to specify the file or DD name from which attributes are to be read, as in this example:

```plaintext
OPTIONS='attributes=bigjob.att'
OPTIONS='attributes=//DD:MYATTR'
```

For information about how to create an attributes file, see "Creating an attributes file" on page 54.
OUTCLASS=class
Specifies the 1 character alphanumeric name of the sysout class for informational messages. The name of the data set where informational messages are written is specified by the STDOUT DDname.

Default: Infoprint Server uses the class that is specified by your administrator.

PRINTER=printer_definition_name
Specifies the name of a printer definition that is created by your administrator. The printer definition identifies a printer or an email destination and sets default values for transform options and for some job attributes. The name of the printer definition is case-sensitive. Enter it exactly as your administrator tells you.

Default: Infoprint Server uses the default printer definition that is specified by your administrator.

AOPPRINT DD statements
The AOPPRINT JCL procedure is used to specify these DD statements (notice that you cannot specify an OUTPUT statement; if you specify one, it is ignored):

STDERR
Specifies the system output data set where error messages are to be written. The ERRCLASS parameter defines the class of this data set.

STDOUT
Specifies the system output data set where informational messages are to be written. The OUTCLASS parameter defines the class of this data set.

SYSIN
Specifies the data set to be printed. You can concatenate data sets that have the same data format; for example, line data or AFP data. However, you cannot concatenate data sets that contain PDF data.

AOPPRINT results
After Infoprint Server accepts the print job, AOPPRINT returns an Infoprint Server job ID, which you can use to query and cancel the job. The Infoprint Server job ID is returned in a message in the STDOUT data set. For example:
AOP007I Job 14584 successfully spooled to myprinter.

The SYSOUT data set that AOPPRINT procedure creates has the same job name and job ID as the job that ran the AOPPRINT procedure.

The Infoprint Server job ID can help the system operator find your job on the JES spool. The job ID field of the data set that Infoprint Server allocates on the JES spool contains the same Infoprint Server job ID. The Infoprint Server job ID is different, however, from the z/OS job ID, which is a unique job ID that z/OS assigns to the data set. JES operator commands return the z/OS job ID.

AOPPRINT examples
These examples show how to use the AOPPRINT JCL procedure:
Print a file on the default printer

This example shows how to submit the data set FILE1.LISTPS to your default printer:

```
//JOB1 JOB 707,JONES
//PRINT EXEC AOPPRINT
//SYSIN DD DSNAMEx=FILE1.LISTPS,DISP=SHR
```

Print a file on a specified printer

This example shows how to submit the data set FILE1.LISTPS to the printer fred:

```
//JOB2 JOB D31,'H. EVANS'
//PRINT EXEC AOPPRINT,PRINTER='fred'
//SYSIN DD DSNAMEx=FILE1.LISTPS,DISP=SHR
```

Print multiple copies of a data set

This example shows how to submit a data set to the default printer and specify two copies of the job:

```
//JOB3 JOB 'MARTHA'
//PRINT EXEC AOPPRINT,OPTIONS='copies=2'
//SYSIN DD DSNAMEx=MYJOB.PDF,DISP=SHR
```

Tip: VTAM controlled printers (IP PrintWay basic mode only) and some IPP-enabled printers do not support printing more than one copy. In this case, only one copy prints.

Submit and hold a job

This example shows how to submit the data set FILE1.LISTPS to Printer1 and to hold it so that it does not print until the operator releases it:

```
//JOB5 JOB (DIV1,GROUP7),OPERATOR
//PRHOLD EXEC AOPPRINT,PRINTER='Printer1',OPTIONS='hold=true'
//SYSIN DD DSNAMEx=FILE1.LISTPS,DISP=SHR
```

Specify a code page for ASCII jobs

This example shows how to print the data sets JAN.REPORT and FEB.REPORT on the default printer and to specify the code page ISO8859-1:

```
//JOB6 JOB (DIV1,GROUP7),ANNE BROWN
//PRINT EXEC AOPPRINT,OPTIONS='document-codepage=ISO8859-1'
//SYSIN DD DSNAMEx=JAN.REPORT,DISP=SHR
// DD DSNAMEx=FEB.REPORT,DISP=SHR
```

Print with error processing

This example shows how to print the data set BIGJOB.PCL on Printer1, writing error messages to the data set BIGJOB.ERR. This example calls one program if the job succeeds, or a different program if it fails.

```
//JOB8 JOB 'MARTHA'
//PRINT ERR EXEC AOPPRINT,PRINTER='Printer1'
//SYSIN DD DSNAMEx=BIGJOB.PCL,DISP=SHR
//STDERR DD DSNAMEx=BIGJOB.ERR,DISP=(NEW,CATLG,DELETE)
/*
 // IF PRINT.LP.RC =/= 0 THEN
 // FAIL EXEC PGM=BADJOB
 // ELSE
 // SUCCEED EXEC PGM=GOODJOB
 // ENDIF
```
Print in-stream data

This example shows how to print data from the JCL input stream:

```
//JOB9 JOB D10,CHARLIE
//HELLO EXEC AOPPRINT
//SYSIN DD *
   Hello, world!
/*
```

Send a file to an email destination

This example shows how to send a file to an email destination and assumes that:

- The administrator set up a printer definition mail in the Printer Inventory.
- The email protocol is selected and an email address is specified in the printer
  definition mail for the primary recipient. However, the email address that you
  specify in the mail-to-addresses job attribute overrides the email address in the
  printer definition.
- A form definition is to be used when the AFP file is transformed to PDF format.
- The AFP to PDF transform is specified in printer definition mail.
- AFP resources libraries are specified either in the printer definition or in the
  transform configuration file, aopxfd.conf. If the AFP resource libraries are not
  specified elsewhere, specify the libraries in the resource-library job attribute.

```
//JOBA JOB D31,'H. EVANS'
//EMAIL EXEC AOPPRINT,PRINTER='mail',
// OPTIONS='attributes=//DD:MYATTR'
//SYSIN DD DSN=FILE1.AFP,DISP=SHR
//MYATTR DD *
mail-to-addresses={'user1@xyz.com'}
mail-cc-addresses={'user2@xyz.com'}
mail-bcc-addresses={'user3@xyz.com'}
mail-from-name="John Q. Sender"
mail-reply-address='secretary@xyz.com'
mail-file-name="January report"
title-text="Monthly Report"
form-definition=F1MYDEF
/*
```

Rules: In this example, the EXEC statement continues on a second line because a
single line would be longer than 71 characters. When you continue a JCL
statement, observe these rules:

1. Break after a complete parameter or subparameter, at or before column 71. A
   comma belongs with the preceding parameter or subparameter.
2. Code // in columns 1 and 2 of the continuation line.
3. Leave column 3 of the continuation line blank.
4. Continue the interrupted parameter or field, starting in any column 4 - 16.

Results:

1. The recipient of the email is user1@xyz.com.
2. The copy (cc) recipient of the email is user2@xyz.com. A cc means that other
   recipients of the email can see the cc recipient listed.
3. The blind copy (bcc) recipient of the email is user3@xyz.com. A bcc means that
   other recipients of the email do not see the bcc recipient listed.
4. The sender of the email is John Q. Sender<JOHN@SYSTEM1>. JOHN is the user ID
   of the user who ran the job, and SYSTEM1 is the system where z/OS UNIX
   sendmail is running.
5. The email address that recipients of an email can reply to is secretary@xyz.com.
6. File FILE1.AFP is attached to the email. The name of the attachment is January report.pdf. The file is in PDF format because the AFP to PDF transform is specified in the printer definition. The file can be viewed and printed with a PDF viewer such as Adobe Acrobat Reader.

7. The subject of the email is Monthly Report.

---

**AOPPRINT exit values**

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Infoprint Server accepted the request.</td>
</tr>
<tr>
<td>&gt;0</td>
<td>An error occurred.</td>
</tr>
</tbody>
</table>
Chapter 6. Transforming data with the AOPBATCH program

The AOPBATCH program is used to submit a batch job to transform data to and from the Advanced Function Presentation data format by using separate transform products. Infoprint Server provides the AOPBATCH program in SYS1.LINKLIB.

For information about the transform products that work with Infoprint Server, see z/OS Infoprint Server Introduction.

AOPBATCH parameters

The AOPBATCH parameters are the name of the transform command, followed by transform options and arguments, in this format:

EXEC PGM=AOPBATCH,PARM='/transform_name transform_options'

The optional slash indicates that the PARM data that follows is input to AOPBATCH. If you omit the initial slash, your PARM data might be interpreted as C++ runtime options. You must include the initial slash if any of the PARM data itself includes a slash. For example, if the transform name is /mylib/ps2afp, specify: PARM='//mylib/ps2afp ...'.

transform_name

The name of an executable transform program that is in a UNIX file. The name of the transform program is case-sensitive.

For example: afpxpcl, pdfxafp, remotexf.

If the transform program is not in one of the directories that are specified in the PATH environment variable, also specify the path name. You can use the STDENV DD statement to set the PATH environment variable if the default value set by AOPBATCH is not suitable. For information about the defaults set for environment variables, see "AOPBATCH DD statements" on page 144.

transform_options

Options and arguments that are accepted by the transform.

You must specify the transform input data set or file as a transform argument, and you must specify the -o transform option to identify where you want the transform to write its output. (This is because the transform cannot write its output to standard output and cannot read input from standard input.) To identify the transform input and output data set or file, you can specify either a DD statement name or a data set or file name. You must specify a DD statement name if you want to write the transform output to an MVS data set that does not exist.

Specify the names of DD statements to the transform in this format:

/ /DD:DDname

The name of the DD statement is DDname.

When you specify an MVS data set name in the -o option, code two slashes before the data set name and enclose the data set name in two sets of single quotation marks if you specify a fully qualified data set name. If you do not enclose the data set name in quotation marks, a high-level qualifier is added to the name you specify:
• If you are running under TSO (batch or interactive), the TSO user prefix is appended.
• If you are running under MVS batch or IMS (batch or online), the RACF user ID is appended.
• If your system does not use RACF, a high-level qualifier is not added.

For examples of different ways to specify transform input and output data sets and files, see “AOPBATCH examples” on page 145.

AOPBATCH DD statements

The AOPBATCH JCL procedure accepts these standard DD statements:

STDENV
Specifies environment variables for use by the transform. You can specify the environment variables in-stream in the STDENV DD statement, in an MVS data set, or in a UNIX file. Specify the environment variables in the format **variable=value**, with one environment variable per line or record. Sequence numbers in columns 73 - 80 in data that is specified with the STDENV DD statement are ignored and not treated as part of the data.

If you omit the STDENV DD statement or do not specify one of the environment variables, AOPBATCH sets these default values, which are suitable for running Infoprint Server programs if your installation installed Infoprint Server files in the default directories:

```
PATH=/usr/lpp/Printsrv/bin:/bin:/usr/bin
LIBPATH=/usr/lpp/Printsrv/lib:/lib:/usr/lib
NLSPATH=/usr/lpp/Printsrv/%L/%N:/usr/lpp/Printsrv/En_US/%N:/usr/lib/nls/msg/%L/%N
```

AOPBATCH also sets the HOME environment variable to the user’s home directory and sets the LOGIN variable to the user ID.

Tip: The **lp** command and some transform commands return MVS return codes (0, 4, 8) instead of UNIX exit values (0, 1) when you set the AOP_MVS_RETURN_CODES=YES environment variable.

Note: Do not specify the **_BPX_SHAREAS** environment variable. AOPBATCH sets it.

STDERR
Specifies the system output data set where error messages are to be written. The data set can be an MVS data set or a UNIX file. The transforms from AFP (AFP to PCL, AFP to PDF, and AFP to PostScript) do not write messages that are related to errors in the input data stream in this data set. Instead, the transforms write these messages at the end of the output document.

STDOUT
Specifies the system output data set where informational messages are to be written. The data set can be an MVS data set or a UNIX file.

You can also include DD statements to specify MVS data sets that contain input data to be transformed, the transformed output, or job attributes that are input to the transform. Do not use DD names STDIN, STDOUT, or STDERR to specify the transform input and output data sets. Instead, use other DD names, such as INPUT and OUTPUT, which are used in the examples.

Rules:
1. If the output data set is an MVS data set, these requirements apply:
a. You must either allocate and catalog the data set before you run AOPBATCH, or include a DD statement in the AOPBATCH job to allocate the data set.

b. The MVS output data set must be large enough to hold the output data stream. The size of the output data stream depends on the complexity of the document and the type of the image compression. Typically, an output AFP data stream is several times as large as the input data stream.

c. If the output data set is to contain an AFP data stream, allocate a data set with these characteristics:
   • Record format: VBM
   • Record length: 8017 bytes or larger

Notes:
1) For InfoPrint Transform Manager for Linux, if you do not use the 
   -pragma afpdsrecordlength option, allocate the data set with a record length that is at least 32017 bytes. By default, the transforms to AFP create AFP records that are 32000 bytes. To request that the transforms create AFP records that are a smaller maximum length, you can use the 
   -pragma afpdsrecordlength option. Valid values for the option are 8000 - 32000. The default is 32000. For example, to set the maximum number of bytes in a record to 8000, specify:
   -j "filter-options=-pragma afpdsrecordlength=8000"

2) For the Infoprint Transforms to AFP for z/OS, allocate the data set with a record length that is at least 17 bytes larger than the record length specified in the AOP_RECLEN environment variable. AOP_RECLEN is specified in units of kilobytes. Valid values are 8 - 32. The default is 8.

d. If the output data set is to contain a PCL, PDF, or PostScript data stream, allocate a data set with these characteristics:
   • Record format: VB
   • Record length: 1024 or larger is suggested

e. Specify a disposition of SHR or OLD if you want the transform to overwrite any existing data. Otherwise, specify a disposition of MOD to append the output to any existing data. If you do not specify any disposition, the transform overwrites any existing data.

2. If you did not add the Language Environment® runtime libraries (CEE.SCEERUN and CEE.SCEERUN2) and the C++ runtime library (CBC.SCLBDLL) to the system LNKLST, specify these data sets in a STEPLIB DD statement.

3. You can concatenate input data sets that have the same data format; for example, PostScript data or AFP data. However, you cannot concatenate data sets that contain PDF data.

**AOPBATCH examples**

These examples show how to use the AOPBATCH procedure to transform data.

**Specify transform input and output in MVS data sets, and specify environment variables**

This example shows how to transform data when the transform input is in an MVS data set and transform output is written to an MVS data set. The PostScript to AFP transform reads PostScript input from data set HLQ.INPUT.PS and writes AFP output to data set HLQ.OUTPUT.AFP. HLQ represents the high-level qualifier; for example, your TSO or RACF user ID.
This example also shows how to specify environment variables in-stream in the STDENV DD statement. If you installed Infoprint Server and created Infoprint Server configuration files in default directories, you do not need to specify these environment variables and you can omit the STDENV DD statement.

```
//AOPBATCH JOB ...
//TRANSFRM EXEC PGM=AOPBATCH,PARM="/ps2afp -o //DD:OUTPUT //DD:INPUT"
//INPUT DD DSN=HLQ.INPUT.PS,DISP=SHR
//OUTPUT DD DSN=HLQ.OUTPUT.AFP,DISP=(NEW,CATLG,DELETE),
// DCB=(RECFM=VBM,LRECL=32756,BLKSIZE=32760),
// SPACE=(CYL,(1,1))
//STDOUT DD SYSOUT=* 
//STDERR DD SYSOUT=* 
//STDENV DD *
PATH=/usr/lpp/Printsrv/bin:/bin:/usr/bin 
LIBPATH=/usr/lpp/Printsrv/lib:/lib:/usr/lib 
NLSPATH=/usr/lpp/Printsrv/En_US/%N:/usr/lib/nls/msg/En_US/%N
AOPCONF=/etc/Printsrv/aopd.conf 
/*
```

### Specify transform input in a UNIX file and output in an MVS data set

This example shows how to transform data when the transform input is in a UNIX file and transform output is written to an MVS data set. The PDF to AFP transform reads the PDF input from file `/tmp/input.pdf` and writes AFP output to HLQ.OUTPUT.AFP.

```
//AOPBATCH JOB ...
//TRANSFRM EXEC PGM=AOPBATCH,PARM="/pdf2afp -o /tmp/input.pdf"
//OUTPUT DD DSN=HLQ.OUTPUT.AFP,DISP=(NEW,CATLG,DELETE),
// DCB=(RECFM=VBM,LRECL=32756,BLKSIZE=32760),SPACE=(CYL,(1,1))
//STDOUT DD SYSOUT=* 
//STDERR DD SYSOUT=* 
```

### Specify transform input in an MVS data set and output in a UNIX file

This example shows how to transform data when the transform input is in an MVS data set and transform output is written to a UNIX file. The AFP to PDF transform reads the AFP input from data set HLQ.INPUT.AFP and writes PDF output to file `/tmp/output.pdf`.

**Note:** This example uses the `afpxpdf` command, which IBM Print Transform from AFP to PDF for Infoprint Server for z/OS provides.

```
//AOPBATCH JOB ...
//TRANSFRM EXEC PGM=AOPBATCH, 
// PARM="/afpxpdf -o /tmp/output.pdf "'HLQ.INPUT.AFP'"
//STDOUT DD SYSOUT=* 
//STDERR DD SYSOUT=* 
```

### Transform and print data sets

This example shows how to transform data and print the output from the transform in a subsequent step.

In the first step, the PostScript to AFP transform reads PostScript input from MVS data set HLQ.INPUT.PS and writes AFP output to MVS data set HLQ.OUTPUT.AFP, where HLQ represents the high-level qualifier; for example, your TSO or RACF user ID.
In the second step, the AOPPRINT JCL procedure is used to print the output from
the transform to the printer named myprinter, which is defined in the Printer
Inventory. For more information about AOPPRINT, see Chapter 5, “Printing with
the AOPPRINT JCL procedure,” on page 137.

//AOPBATCH JOB ...
//TRANSFRM EXEC PGM=AOPBATCH,PARM='/ps2afp -o //DD:OUTPUT //DD:INPUT'
//INPUT DD DSN=HLQ.INPUT.PS,DISP=SHR
//OUTPUT DD DSN=HLQ.OUTPUT.AFP,DISP=(NEW,CATLG,DELETE),
  // DCB=(RECFM=VBM,LRECL=32756,BLKSIZE=32760),
  // SPACE=(CYL,(1,1))
//STDOUT DD SYSOUT=*
//STDERR DD SYSOUT=*
//PRINT EXEC AOPPRINT,PRINTER='myprinter'
//SYSIN DD DSN=HLQ.OUTPUT.AFP,DISP=SHR

Transform data remotely with InfoPrint Transform Manager for
Linux

This example shows how to transform data to AFP format remotely with an
InfoPrint Transform Manager for Linux transform. The example specifies the
remotexf command, which automatically detects the format of the input file and
uses the appropriate transform for that data format. Infoprint Server reads the
input from the specified file (/tmp/input) and writes AFP output to
HLQ.OUTPUT.AFP.

This example also shows how to specify InfoPrint Transform Manager job
attributes with the -j option, and transform attributes with the xf-options job
attribute. The attributes specify:
• The input file is transformed into an AFP data stream in 300-pel resolution.
• Data stream error messages are not included on the trailer error page.
• The output is created only if it does not have data stream errors.

This example also shows how to specify environment variables in-stream in the
STDENV DD statement. If you installed Infoprint Server and created Infoprint
Server configuration files in default directories, you do not need to specify these
environment variables and you can omit the STDENV DD statement.

//AOPBATCH JOB ...
//TRANSFRM EXEC PGM=AOPBATCH,
  // PARM='/remotexf -j attr=//DD:ATTRS -o //DD:OUTPUT /tmp/input
  // .pcl'
//OUTPUT DD DSN=HLQ.OUTPUT.AFP,DISP=(NEW,CATLG,DELETE),
  // DCB=(RECFM=VBM,LRECL=32756,BLKSIZE=32760),
  // SPACE=(CYL,(1,1))
//ATTRS DD *
  //filter-options="-r 300"
xf-options="trailer-error-page=no fail-on-datastream-error=yes"
/*
//STDOUT DD SYSOUT=*
//STDERR DD SYSOUT=*
//STDENV DD *
  //PATH=/usr/lpp/Printsrv/bin:/bin:/usr/local/bin
  //LIBPATH=/usr/lpp/Printsrv/lib:/lib:/usr/lib
  //NLSPATH=/usr/lpp/Printsrv/En_US/%N:/usr/lib/nls/msg/En_US/%N
  //AOPCONF=/etc/Printsrv/aopd.conf
  //AOPRXF_CONF=/etc/Printsrv/aoprxf.conf
/*
Transform and print data sets only if the transform is successful

This example shows how to transform data to AFP format and print the output only if no warnings or errors occur during the transform. IBM Infoprint Transforms to AFP is required.

In the first step, the PostScript to AFP transform reads PostScript input from data set HLQ.INPUT.PS and writes AFP output to data set HLQ.OUTPUT.AFP, where HLQ represents the high-level qualifier; for example, your TSO or RACF user ID.

The STDENV data set specifies the AOP_MVS_RETURN_CODES environment variable. Because this variable is set to YES, the transform returns MVS return codes: 0 (successful), 4 (warning), 8 (failure).

In the second step, the AOPPRINT JCL procedure prints the AFP output to the printer named mypsfprinter, which is defined in the Printer Inventory. This step runs only if the return code from the transform step is less than 4.

AOPBATCH exit values

AOPBATCH returns one of these values:

<table>
<thead>
<tr>
<th>Value</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>An error occurred while AOPBATCH was trying to write to the STDOUT DD.</td>
</tr>
<tr>
<td>2</td>
<td>An error occurred while AOPBATCH was trying to write to the STDERR DD.</td>
</tr>
<tr>
<td>4</td>
<td>AOPBATCH cannot create the process.</td>
</tr>
<tr>
<td>nn</td>
<td>The exit value from the created process.</td>
</tr>
</tbody>
</table>

Some IBM transforms can return either MVS return codes (0, 4, 8) or UNIX exit values (0, 1) depending on the value of the AOP_MVS_RETURN_CODES environment variable.
Chapter 7. Printing from VTAM applications

The NetSpool component of Infoprint Server is used to print jobs from Virtual Telecommunications Access Method applications, such as Customer Information Control System (CICS) or Information Management System (IMS), without changing the applications. To use NetSpool effectively, you need to understand:

- The data streams that NetSpool supports, including transparent data
- Differences between printing with NetSpool and printing on Systems Network Architecture (SNA) printers
- End-of-file processing in NetSpool
- Page formatting in NetSpool
- Embedding job attributes in print data
- Email support

Data stream support

NetSpool accepts these types of VTAM data streams:

- SNA character string (SCS) data over a logical unit (LU) type 1 session.
- 3270 data over an LU type 3 or LU type 0 session.
- Any printable data. For this type of data, your administrator must select the NetSpool None formatting option in the Printer Inventory.

Table 16 shows that NetSpool converts the input data stream into an output data stream, according to the type of NetSpool formatting and transform filter (optional) that the administrator selects in the printer definition in the Printer Inventory.

<table>
<thead>
<tr>
<th>If the administrator selects this formatting option:</th>
<th>With this transform filter (optional):</th>
<th>NetSpool creates:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Convert to line</td>
<td></td>
<td>EBCDIC variable-length records, each record starts with an American Standards Association (ASA) carriage-control character</td>
</tr>
<tr>
<td>Convert to line</td>
<td>AFP to PDF</td>
<td>A PDF data stream</td>
</tr>
<tr>
<td>Convert to line</td>
<td>AFP to PS</td>
<td>A PostScript data stream</td>
</tr>
<tr>
<td>Convert to PCL</td>
<td></td>
<td>An ASCII text data stream with embedded PCL commands</td>
</tr>
<tr>
<td>Convert to PCL</td>
<td>PCL to AFP</td>
<td>An AFP data stream</td>
</tr>
<tr>
<td>None</td>
<td></td>
<td>Variable-length records without converting or translating any controls or data</td>
</tr>
</tbody>
</table>

NetSpool uses default page-formatting values that are defined by the administrator if the SCS data stream does not contain Set Horizontal Format or Set Vertical Format commands.

The NetSpool Graphic Escape exit is used to replace Graphic Escape characters with other printable characters. For more information about the Graphic Escape exit, see [z/OS Infoprint Server Customization](https://www.ibm.com).
For more information about SCS and 3270 data streams, see:

- Appendix C, “NetSpool support for SCS code points,” on page 187 describes the code points that NetSpool supports for the SCS data stream.
- Appendix D, “NetSpool support for 3270 data streams code points,” on page 199 describes the code points that NetSpool supports for the 3270 data stream.
- SNA--Sessions Between Logical Units describes the SCS data stream.
- 3270 Information Display System Data Stream Programmer’s Reference describes the 3270 data stream.
- IBM 3270 Kanji Data Streams describes double-byte character set (DBCS) SCS and 3270 data streams.

**Transparent data support (SCS data stream)**

The Transparent (TRN) control in SCS data streams identifies the start of a transparent data stream. NetSpool supports transparent data by including TRN controls and transparent data in line data output. NetSpool increases the output column and line position by the number of bytes of transparent data, as specified in a TRN control.

NetSpool provides two installation exits that let the administrator customize the processing of transparent data for all or selected printer names:

- The Beginning of File exit (APIPPTD1) adds transparent data to the beginning of a data set.
- The Transparent Data Control exit (APIPPTD2) inspects, changes, or deletes transparent data whenever it occurs in the data stream.

**Double-byte character set (DBCS) support**

NetSpool supports DBCS data in both SCS and 3270 data streams when it converts data streams to line data. NetSpool does not support DBCS data when it converts data streams to PCL data.

In an SCS data stream, NetSpool supports these controls, which identify DBCS strings:

- Shift Out and Shift In controls
- Set Attribute controls, with the Character Set attribute

In a 3270 data stream, NetSpool supports these controls and orders, which identify DBCS strings:

- Shift Out and Shift In controls
- Set Attribute (SA) orders, with the Character Set attribute
- Start Field Extended (SFE) orders with the Character Set attribute
- Modify Field (MF) orders with the Character Set attribute

In place of these controls and orders, NetSpool inserts Shift Out and Shift In line-data controls where necessary in line data output.

**Tip:** To prevent unwanted blanks in DBCS output, specify the PRMODE=SOSI2 parameter on the OUTPUT JCL statement that NetSpool uses to allocate data sets for the printer name.
### Binary data support

The administrator can create a printer definition that specifies that NetSpool treats input data as binary data. NetSpool writes binary data to the output data set, in variable length records, without examining or converting the data stream.

The administrator can specify the record size and record format (VB, VBA, or VBM) to use in outputting binary data to the spool.

NetSpool does not process TRN controls in binary data.

### Data stream restrictions

For SCS data streams, NetSpool does not support these codes:
- Function Management (FM) headers
  NetSpool cannot handle FM headers because it does not expect FM data requests that it receives to be formatted. NetSpool rejects any request that contains an FM header with an SNA sense code of function error (X'10030000'), indicating an unsupported function.
- Some SCS commands.
  For more information, see Appendix C, “NetSpool support for SCS code points,” on page 187.

For 3270 data streams, NetSpool supports only these codes:
- Orders in the basic function set, as described in *SNA--Sessions Between Logical Units*.
- Shift Out and Shift In controls.
- Set Attribute (SA), Set Field Extended (SFE), and Modify Field (MF) orders, with the Character Set attribute. NetSpool ignores other attributes of the SA, SFE, and MF orders. For more information, see Appendix D, “NetSpool support for 3270 data streams code points,” on page 199.

NetSpool rejects other orders in a 3270 data stream with an SNA sense code of function error (X'10030000'), indicating an unsupported function. The Write Structured Fields (WSF) order is not included in the basic function set and therefore, is not supported.

NetSpool does not reject unsupported commands or orders in binary data.

### Data encryption and compression

Encrypted or compressed data sent to NetSpool are decrypted and decompressed as they arrive at the z/OS system where NetSpool is running. The data remains decrypted and decompressed during processing and after placement on the job entry subsystem (JES) spool.

### Differences from SNA network printing

You might notice differences in these areas when you are sending output from VTAM application programs to NetSpool instead of to an SNA network printer:
- Notification of printing
  When you send output to an SNA network printer, a positive response from the printer means that the data was printed successfully. However, when you send output to NetSpool, a positive response from NetSpool means only that NetSpool successfully created a JES output data set.
• Data set printing
  An SNA-network printer prints each VTAM print request separately. However, NetSpool combines several print requests into one output data set. In the printer definition for each printer in the Printer Inventory, the administrator can select the criteria that NetSpool uses when it combines print requests into one output data set.

• Deferred printing
  When you print output on an SNA network printer, each print request is printed immediately. However, JES or the system operator might defer the printing of data sets that NetSpool creates until system resources are available.

• Printer sharing
  Because an SNA network printer usually has a session limit of 1, your output is usually the only output that is printed on that printer. However, because JES supports printer sharing, data sets from other users might be printed on the same printer. An installation can print distribution information on the header pages to aid in distributing output.

---

End-of-file processing

Printing in a JES environment requires that NetSpool keep all related print data together in an output data set on the JES spool. This ensures that related print data is printed in the correct order and is not interleaved with other output.

For printing in the SNA network, the concept of a data set is not necessary. An application that starts a session with a printer gains exclusive control of that printer during the session. Therefore, data always prints in the correct order and is not interleaved with any other application’s print output.

In contrast, when you print in a JES environment, the sending application is not guaranteed exclusive control of the printer. Between two successive data sets from one application, nothing prevents the printing of data sets from other applications. If the first attempt to print a data set fails, and a later retransmission succeeds, two successive data sets from the same application can be printed in reverse order. Therefore, to guarantee that data that belongs together gets printed in the correct order, without other data between sets, NetSpool batches that data into one data set.

Thus, for printing in a JES environment, NetSpool must determine where one data set ends and the next one begins. NetSpool receives print data from VTAM applications as a stream of request units (RUs). The SNA architecture defines two groupings of RUs that are of interest:

• A *chain* consists of one or more RUs.
• A *bracket* consists of all of the RUs in one or more related chains.

To help determine when end-of-file processing occurs, NetSpool provides these end-of-file rules for defining data sets:

• End-of-bracket (the default rule)
• End-of-session
• End-of-chain
• End-of-file indicated by a specified string of data in the file’s last end-of-chain request
• End-of-file indicated by the expiration of a timer
The administrator can specify which end-of-file rule to use in the printer definition for each printer in the Printer Inventory. If NetSpool does not correctly determine the end of your data sets, ask the administrator to specify another end-of-file rule.

**Page formatting for SCS data streams**

In some cases, SCS data streams used in LU type 1 sessions depend on a page format that is preset for the SNA network printer. To simulate this page format, NetSpool lets the administrator specify page-formatting values in the Printer Inventory. The administrator can specify default values for line length, page length, margins, and tabs. If the administrator does not specify a default page-formatting value, NetSpool uses hardcoded default page-formatting values.

If the print data stream contains the SCS commands Set Horizontal Format (SHF) and Set Vertical Format (SVF), the page-formatting values in these commands take effect immediately and remain in effect for all subsequent print data sets on the same session. If no SHF or SVF command occurs in the print data stream, NetSpool uses the default page-formatting values. For more information about the SCS SHF and SVF commands, see Appendix C, “NetSpool support for SCS code points,” on page 187.

The page-formatting values are:

**MPP=linelength | 80**
Specifies the maximum presentation position, that is, the line length. Specify zero or any integer from 1 through 255, inclusive. Zero, the default, uses the device line length, which NetSpool implements as 80 columns.

**LM=leftmargin | 1**
Specifies where the left margin starts. Specify zero or any integer from 1 through MPP, inclusive. Zero, the default, uses the architectural default of column 1.

**RM=rightmargin | 0**
Specifies where the right margin starts. Specify zero or a number from the left margin (LM) to the line length (MPP), inclusive. Zero, the default, uses the architectural default of the MPP value.

**HT= (tab1, tab2 ... ) | 0**
Specifies positions of horizontal tabs. The first tab is always the same as the left margin (LM) value and does not need to be specified. Each tab can be zero or greater than or equal to LM, or less than RM. Zero, the default, is valid and ignored. The application data stream can add more tab stops but cannot remove default tab stops.

**MPL=pagelength | 1**
Specifies the number of the maximum presentation line, that is, the maximum number of lines to be printed on the page. Specify zero or any integer 1 - 255, inclusive. Zero, the default, uses the architectural default of 1 line.

**TM=topmargin | 1**
Specifies where the top margin (also channel 1) starts. The top margin is also used as the line number for Select Vertical Channel 1. Specify zero or any integer from 1 through the page length (MPL), inclusive. Zero, the default, uses the architectural default of line 1.

**BM=bottommargin | 0**
Specifies where the bottom margin starts. Specify zero or any integer from top margin (TM), which is also channel 1, to the page length (MPL), inclusive.
Zero, the default, uses the architectural default of MPL. A bottom margin of 1 suppresses automatic form feed when the application spaces past the bottom margin.

\[ VT=(\text{tab1}, \text{tab2}, \ldots) \mid 0 \]

Identifies the position of vertical tabs (also channels 2 - 12). The first tab is always the same as the top margin value (TM) and does not need to be specified. The first 11 vertical tabs are also used as the line numbers for Select Vertical Channel 2 - 12. Each tab must be either zero or greater than or equal to top margin (TM), which is also Channel 1, and less than or equal to the bottom margin (BM), inclusive. Zero, the default, is valid and ignored. The application data stream can add more tab stops but cannot remove default tab stops.

If the default page-formatting values are not appropriate for all target printers, the administrator must define appropriate values in one or more printer definitions in the Printer Inventory.

**Tips:**
1. In the ISPF panels that the administrator uses to create a printer definition, the fields for setting SCS page-formatting values are under the heading **SCS Conversion**.
2. The SCS page-formatting values in the printer definition do not apply when NetSpool formats 3270 input data. Instead, when NetSpool formats 3270 data, it uses page-formatting information that is specified in the 3270 data stream, in the Write Control Character (WCC).
3. When the administrator selects the NetSpool **Convert to PCL** formatting option, the administrator can also specify page orientation (portrait and landscape), page density, and line density values for both SCS and 3270 data streams in the Printer Inventory. For SCS data streams only, the administrator can also request that NetSpool automatically determine the appropriate page orientation on a page-by-page basis. In the ISPF panels, the fields for setting these page-formatting values are under the heading **NetSpool PCL Conversion**.

**Embedding job attributes in print data**

You can embed the **owner** job attribute and other job attributes for NetSpool jobs in print data. If you do not embed a job attribute in print data, your administrator can specify a default value for the attribute in the printer definition. If the owner is not embedded or specified in the printer definition, the default value is the ID of the user who started the Infoprint Server daemons.

You might want to embed:

- The **owner** job attribute for a print job to help you identify:
  - The owner of print jobs in Infoprint Central, or the owner of printed output. For example, the ID or name of the user who is printing a job, or the name of the workstation where the user submitted the print request. The identifying information can be printed on the print job's separator page and on a page header.
  - The user to charge in an accounting system for printing jobs. For information about SMF accounting records, see [z/OS Infoprint Server Operation and Administration](#).
- Other job attributes to specify formatting attributes for an application. For example, the **forms**, **page-definition**, or **form-definition** job attributes. For the job attributes you can embed, see "Job attribute listing" on page 55.
To embed the **owner** job attribute or other job attributes in print data, you code a text string that contains the job attributes. Be sure to follow "Rules for coding text strings". NetSpool uses the embedded attributes, and then removes the text string from the data stream before it converts the data stream and puts it on the JES spool.

The text string contains a header and one or more job attributes. For example, this text string embeds the **owner** job attribute “MURPHY” before the print data “Murphy’s print data”:

```
<<ibmjobattr0012owner=MURPHYMurphy's print data
```

The syntax of the text string is:

**Prefix**  The part of the header that indicates that job attributes are embedded in the print data. The prefix must match the *embedded attributes prefix* field in the printer definition in the Printer Inventory.

- To enter character data, enter 1 - 12 letters, numbers, or special characters. Character data is case-sensitive.
- To enter hexadecimal data, enter 1 - 12 bytes of data.

Example: `<<ibmjobattr`

**Continuation field**  The part of the header that indicates whether another text string follows this text string. You might need to use two or more text strings if the text string would be longer than the line length that is specified in the print data.

- **0 or X’F0’**  Another text string does not follow this text string.
- **1 or X’F1’**  Another text string follows this text string.

**Length field**  The part of the header that indicates the total length of all the job attributes.

- To enter character data, enter 1 - 3 numbers, between 1 - 999.
- To enter hexadecimal data, enter 1 - 3 bytes of data between X’F0’ and X’F9’.

Example: `012 or X'F0F1F2'`

**Job attributes**  One or more job attributes, such as the **owner**, **forms**, **page-definition**, or **form-definition**. Separate more than one job attribute with a space. For the attribute names, values, and syntax, see "Job attribute listing" on page 55.

Examples:

```
owner=murphy
owner=smith copies=3
department-text=Purchasing
```

**Rules for coding text strings:**

1. Put the text string in the first request unit (RU) in the first chain at the start of a print request. For example, in a CICS application, include the text string in the data that is sent in the first SEND command of a chain. NetSpool
determines the start of a print request by using the bracket and chaining of the data, and with the end-of-file rules that are specified for the LU in the printer definition.

2. In 3270 data streams, put the text string after the Command Code and the Write Control Character, but before any End Message Control Character (X'19').

3. Consider using a delimiter, such as a carriage return, between the text string and any print data to be sure that the data prints correctly on the page. In 3270 data streams, you can use a Set Buffer Address Control as the delimiter.

4. In data streams that contain double-byte character set (DBCS) data, code the text string as single-byte data.

5. IBM suggests that you do not use embedded job attributes if you specify the Timer end-of-file rule. Results can be unpredictable.

## Sending output to an email destination

You can send VTAM application output to an email destination instead of to a printer. Or, you can send output to both an email destination and to a printer if your administrator creates a printer pool definition in the Printer Inventory.

You can use one or more of these methods to specify email addresses:

- Your administrator can specify the email addresses of the primary and secondary recipients in the printer definition for the email destination in the Printer Inventory.

- You can embed the `mail-to-addresses`, the `mail-cc-addresses`, and the `mail-bcc-addresses` job attributes in the print data. See "Embedding job attributes in print data" on page 154.

- You can specify the email addresses for the recipients in an email header. For information, see Chapter 11, "Creating an email header," on page 179.

The email has these characteristics:

- Data is sent inline in the body of the email or as an email attachment. The name of the attachment is the VTAM PLU name of the application that sent the data.

To send data inline in the body of the email, the administrator can select the Inline text and line data field in the printer definition, or you can embed the `mail-inline-text` job attribute in the print data.

To specify an attachment name, embed the `mail-file-name` job attribute in the print data. The job attribute overrides other values.

- The subject of the email is the member name of the NetSpool startup procedure.

To specify a subject, the administrator can specify a title in the printer definition, you can embed the `title-text` job attribute in the print data, or you can specify the `subject` field in an email header.

- The sender is the ID of the user who started the Infoprint Server daemons.

To specify a descriptive name for the sender, the administrator can specify the descriptive name in the printer definition, you can embed the `mail-from-name` job attribute in the print data, or you can specify the `from` field in an email header.

- The reply address is the sender of the email. However, email recipients should not reply to the sender because typically that user ID cannot receive mail.

To specify a reply address, the administrator can specify a reply address in the printer definition, you can embed the `mail-reply-address` job attribute in the print data, or you can specify the `reply-to` field in an email header.
Chapter 8. Printing from Windows systems

With Infoprint Server, you can print from your Windows system to any printer defined in the Infoprint Server Printer Inventory.

You can use these methods to submit a print request:

- Any Windows application that supports printing, such as a word processor or a viewer application. To print from a Windows application, you can use the IBM Infoprint Port Monitor for Windows, the Server Message Block (SMB) protocol, or the Internet Printing Protocol (IPP). See “Determining the print submission protocol.”
- Windows print command. See “Using the print command” on page 165.
- Windows LPR command. See “Using the LPR command” on page 166.
- IBM lprafp command. See Chapter 10, “Printing with the lprafp command,” on page 177.

To use the LPR or lprafp command, you do not need to install the Infoprint Port Monitor or configure z/OS for SMB or IPP processing.

Table 17 summarizes the tasks that are related to submitting a print request and refers you to the section that describes the task. Required tasks are required by all users. Optional tasks are required only if the listed condition applies.

Table 17. Printing from Windows systems

<table>
<thead>
<tr>
<th>Task</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Determining the print submission protocol”</td>
<td>Optional: To print from a Windows application or with the print command</td>
</tr>
<tr>
<td>“Installing Infoprint Port Monitor for Windows” on page 158</td>
<td>Optional: To use the Infoprint Port Monitor</td>
</tr>
<tr>
<td>“Adding a z/OS printer to your Windows system” on page 159</td>
<td>Optional: To print from a Windows application or with the print command</td>
</tr>
<tr>
<td>“Customizing the AFP Printer Driver” on page 163</td>
<td>Optional: To use the AFP driver and change driver options</td>
</tr>
<tr>
<td>“Sending a file to an email destination” on page 163</td>
<td>Optional: To send files to an email destination instead of to a printer</td>
</tr>
<tr>
<td>“Printing files” on page 164</td>
<td>Required</td>
</tr>
<tr>
<td>“Uninstalling Infoprint Port Monitor for Windows” on page 167</td>
<td>Optional: To remove the Infoprint Port Monitor</td>
</tr>
</tbody>
</table>

Determining the print submission protocol

To print from a Windows application or with the print command, you must determine which protocol you want to use to submit your print request to Infoprint Server. Your administrator must customize Infoprint Server to use each of these protocols. Therefore, consult your administrator to determine which protocols you can use in your installation.

- IBM Infoprint Port Monitor for Windows:
Software that runs on a Windows workstation. You use it to print files on z/OS printers just like you print files on local Windows printers. You can submit the files from any Windows application that has a printing function.


**Note:** Infoprint Port Monitor V3.1 can run on 32-bit Windows systems or on 64-bit Windows systems that are based on x64 architecture. However, it cannot run on 64-bit Windows systems that are based on Intel Itanium architecture.

- **Server Message Block (SMB) protocol:**
  - The standard printing protocol that is provided with Windows systems.
  - Infoprint Server supports the SMB protocol on Windows systems.
- **Internet Printing Protocol (IPP):**
  - Used to print over the Internet from a Windows IPP client.

These protocols support different print functions and have different limitations as summarized in Table 18.

<table>
<thead>
<tr>
<th>Function supported</th>
<th>Infoprint Port Monitor</th>
<th>SMB</th>
<th>IPP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specify job attributes during printing</td>
<td>Yes¹</td>
<td>No</td>
<td>Yes²</td>
</tr>
<tr>
<td>Obtain print job status</td>
<td>Yes³</td>
<td>Yes⁴</td>
<td>Yes⁵</td>
</tr>
<tr>
<td>Define a Windows shared printer</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

2. You can specify any IPP job attributes. However, Infoprint Server supports only the *copies*, *document-name*, and *job-priority* job attributes.
3. You can see the documents that are waiting to print (they are on the Windows print queue for the printer). If an error occurred, you can view the Windows Event Log.
4. When the Windows job status window is open, z/OS system performance might be degraded.
5. You can see the documents that are waiting to print (they are on the Windows print queue for the printer). In addition, you can see the documents that are spooled for the printer definition on z/OS. They are visible while they remain in the Printer Inventory. For example, you can see held jobs (shown as “Paused” on the Windows job status window).

---

### Installing Infoprint Port Monitor for Windows

These instructions for installing the Infoprint Port Monitor might change if the product files are updated. For the latest installation instructions, see the website for the [Infoprint Port Monitor](http://www-01.ibm.com/support/docview.wss?uid=psd1P1000597).

**Before you begin:** Make sure that these software requirements are met:

- Windows operating system is Windows Server 2008, Windows 7, or Windows Vista.
Note: Infoprint Port Monitor can run on 32-bit Windows systems or on 64-bit Windows systems that are based on x64 architecture. However, it cannot run on 64-bit Windows systems that are based on Intel Itanium architecture.

- TCP/IP protocol is operational on your Windows system.
- InfoPrint Manager Select is not installed on the Windows system where you plan to install the Port Monitor.

To install Infoprint Port Monitor V3.1:

1. Be sure that you have Windows administrator authority on your Windows system.
2. If you are currently using an earlier version of the Infoprint Port Monitor, use the Windows “Add or Remove Programs” function to uninstall it.
3. Download the Infoprint Port Monitor V3.1 from one of these locations:
   - z/OS system: Use a file transfer program, such as ftp, to download one of these files in binary:
     - For 32-bit Windows systems: /usr/lpp/Printsrv/win/En_US/aopwin32.exe
     - For 64-bit Windows systems: /usr/lpp/Printsrv/win/En_US/aopwin64.exe
     To download from the z/OS system, you need an account on the z/OS system where Infoprint Server is installed.
     If you use the Internet Explorer web browser, you can select the option to run or open the Infoprint Port Monitor from its current location so that the Infoprint Port Monitor is automatically installed.
4. If the Infoprint Port Monitor was not automatically installed in the previous step, navigate to the Windows folder where you downloaded the Infoprint Port Monitor and double-click the file that you downloaded.
5. Add a Windows printer at a new “Infoprint Port Monitor” port. Configure it to connect to the z/OS printer you want to print on. The z/OS printer must be defined in the Infoprint Server Printer Inventory.

For detailed instructions, see the Infoprint Port Monitor online help. A shortcut to the help (in the “IBM Infoprint Port Monitor” folder) is put on your desktop during the installation of the Infoprint Port Monitor.

Note: Windows printers that you added for the earlier version of the Infoprint Port Monitor are still defined.

---

Adding a z/OS printer to your Windows system

Before you can print on a z/OS printer, you must add the printer to your Windows system. If you are using:

- Infoprint Port Monitor, see “Adding and configuring a local printer for Infoprint Port Monitor for Windows” on page 160. If your Windows administrator already defined the printer as a Windows shared printer, see “Adding a network printer” on page 162.
- Server Message Block (SMB) protocol, see z/OS Distributed File Service SMB Administration.
- Internet Printing Protocol (IPP), see “Adding an Internet printer” on page 162.
Adding and configuring a local printer for Infoprint Port Monitor for Windows

Before you begin
Ask your Infoprint Server administrator for this information:

- The host name or the IP address of the z/OS system where Infoprint Server is running.
- The port number on the z/OS system where the Infoprint Server line printer daemon (aoplpd) is listening. The port number is usually 515.
- The name of the printer. This is the name that your administrator used to define the printer in the Infoprint Server Printer Inventory. When you configure the Infoprint port, you can select this name from a list.
- The name of the printer driver. The printer driver converts your documents to a format that the printer understands. For example, to AFP format or to PostScript format.
- If you use the AFP Printer Driver for Windows, the model number and resolution of the AFP printer.

Steps for adding and configuring a printer
Use the Windows Add Printer wizard to add and configure a printer:

1. Select Control Panel --> Printers or Control Panel --> Printers and Faxes.
2. Select Add Printer, which starts the Add Printer wizard.
3. Select Next.
4. Select Local printer or Local printer attached to this computer. Then, select Next.
5. Select Create a new port. Then, select Infoprint Port Monitor and select Next.
6. In the Infoprint Port window, type a name for the new port. For example, Infoprint-1. Use a name that is not used for any other port. Then, select OK.
7. In the Infoprint Port Configuration window:
   a. Type values in the Host Name and Host Port fields.
   b. Select Get Printer List.
   c. Select the name of the printer from the list.
   d. Select Options. You see the Infoprint Port Monitor Options window. To specify information that can be printed on a printer’s separator sheet, or to specify job attributes that apply to every job you send to this printer:
      1) In the Separator Sheet fields, type your name, department, room, building, and address.
      2) In the Job Attributes field, type Infoprint Server job attributes, which are separated with spaces. For valid job attributes, see Chapter 3, “Using job attributes,” on page 53.

Example:
    title-text="description of contents" copies=2
3) If you want to change any fields in this window before printing, select Prompt for attributes when printing.

Note: Do not select this option if this printer is a Windows shared printer and other users might print to this printer because this window is displayed only on the Windows system where the Infoprint Port Monitor is installed.
4) Select OK.
e. (Optional) If other users might print on this Windows shared printer, select Unattended port.
f. Select OK.

8. Select a printer driver that is suitable for the printer. To select the AFP Printer Driver, download the driver and follow these steps:
   a. Select Have Disk.
   b. Type the path name of the Windows folder that contains the AFP driver files. Then, select OK.
   c. Select the type of printer. If the printer is not on this list, select IBM AFP nnn, where nnn is the resolution of the printer. If you do not know the resolution, select IBM AFP 240.
   d. Select Next or Continue Anyway.

9. If the next window says that the printer driver exists, keep the existing driver, and then select Next.

10. Keep the default name for the printer or type a meaningful name. This is the name that is assigned to the Windows printer on the desktop. If you selected the AFP Printer Driver, keep the default name.

11. Select either Yes or No to make this printer your default printer. Then, select Next.

12. Select Do not share this printer, Share as, or Share name. If you chose to share the printer, enter information to describe it to other users. Then, select Next.

13. Print a test page.

   Note: If you see an error message on the screen that says an attribute you specified in the Infoprint Port Monitor Options window is not correct, reconfigure the port to specify the correct value. If you selected the Port Monitor “Unattended port” option, look for error messages in the Windows Event Log.


Result: You see a new printer icon in the Printers or Printers and Faxes folder.

Steps for reconfiguring a port
You reconfigure an Infoprint port to change separator sheet information, change Infoprint Server job attributes, or print on a different printer:

1. Select Control Panel --> Printers or Control Panel --> Printers and Faxes.

2. In the Printer window, right-click the printer icon. Then, select Properties.

3. In the Properties notebook, select the Ports tab. Then, select Configure Port.

4. In the Infoprint Port Configuration window:
   a. To change separator sheet information or job attributes, select Options. Then, select OK.
   b. Verify that values in the Host Name and Host Port fields are correct.
   c. To select a different printer, select Refresh Printer Selection List. Then, select the name of the z/OS printer from the list.
   d. Select OK.

5. Close the Properties notebook.
Adding a network printer

If your Windows administrator defined the z/OS printer as a shared printer in your Windows network:

1. Ask your Windows administrator for the name that is assigned to the printer.
2. Use the standard Windows procedures to add the z/OS printer as a network printer.

Note: If the Windows administrator defines a printer as shared, individual users cannot be prompted for attributes when printing.

Adding an Internet printer

Before you begin

Ask your Infoprint Server administrator for this information:

• The Uniform Resource Identifier (URI) of the printer.
  The URI of a printer that is defined in the Printer Inventory has this format:
  http://host:port/printers/printername
    host
      The host name or IP address of the z/OS system.
    port
      The port number where the IPP server is listening. The default is that the IPP server listens at port 631. Ask your administrator the port number to use.
    printer_definition_name
      The name of the printer definition in the Printer Inventory.
  For example:
  http://myzoshost:631/printers/myprinter

Be careful to note the exact spelling of the URI. Uppercase and lowercase letters are not equivalent, except in the host part of the URI.

• The manufacturer and model number of the printer.

• The name of the printer driver to use.
  The printer driver converts your documents to a format that the printer understands. This driver might be available online, or your administrator might give it to you on a diskette or CD-ROM.

The AFP Printer Driver for Windows converts your documents to AFP format so you can print on AFP printers. You can download the AFP Printer Driver from the Ricoh AFP Printer Driver website[1](http://support.rpp.ricoh-usa.com/internet/dcfdata.nsf/vwWeb/P4000384). If you use the AFP driver, you need to know the model number and resolution of the AFP printer.

If either the PCL to AFP transform or the PostScript to AFP transform is installed on the z/OS system, you can use a PCL or PostScript driver instead of the AFP driver.

Steps for adding an Internet printer

Use the standard Windows procedure to add a printer, and do these special steps:

1. When the Add Printer wizard asks you whether to install the printer as a local printer or a network printer, select either Network printer or A network printer, or a printer attached to another computer.
2. When the Add Printer wizard asks you how to connect, select **Connect to a printer on the Internet**. Enter the URI of the printer in the **URL** field.

3. When the Add Printer wizard asks you whether to install the printer driver, select **OK**.

While Windows is installing the printer driver, you see the screen where you entered the URI. For some time, it might seem that nothing is happening. Do not cancel the job. Wait for the Add Printer wizard to go on to the next window.

---

**Customizing the AFP Printer Driver**

The AFP Printer Driver for Windows creates AFP output for printing on AFP printers. You can download it from the [Ricoh AFP Printer Driver website](http://support.rpp.ricoh-usa.com/internet/dcfdata.nsf/vwWeb/P4000384).

To customize the AFP Printer Driver:

1. In the Windows Printer directory, highlight the icon for the printer.
2. From the File menu, select **Document Defaults** and **Properties**.
3. Specify the default printing options and printer characteristics. To specify these printing options, select **Inline Form Definition** from the Document Defaults window:
   - Duplex printing (printing on two sides of the paper)
   - Printing of an overlay (electronic form)
   - Paper source on the printer (input tray)

For faster printing of large files, consider turning off the **Print text as graphics** option. Turning off the option causes the driver to create a smaller output file. First, make sure that your printer can do font substitution. Also, if you use True-Type fonts, the document might not print with exact fidelity. For better resolution, you can try changing the **Output Fidelity** options on the driver.

Usually, the printer characteristics, such as whether the printer can do font substitution and handle compressed images, and the supported clip limits, are already set correctly. However, if the name of the AFP Printer Driver is **IBM AFFnnn**, where *nnn* is the resolution of your printer, you might need to change the printer characteristics to match those of the printer. Ask your administrator for the needed information, or consult the printer documentation.

---

**Sending a file to an email destination**

When you submit a print request, you can send the file to an email destination instead of to a printer. You can specify the email addresses of the primary and secondary recipients in one of these ways:

- Your administrator can specify the email address list for the recipients in the printer definition in the Printer Inventory.
- You can specify the email addresses for the recipients by using these job attributes:

  **mail-bcc-addresses**
  - Blind copy (bcc) recipients of an email. A bcc means that other recipients of the email do not see the bcc recipient listed.

  **mail-cc-addresses**
  - Copy (cc) recipients of an email. A cc means that other recipients of the email can see the cc recipient listed.
You can specify an address list in an alias file that your administrator defines to z/OS UNIX sendmail. For information, see "Specifying the email address list in an alias file" on page 95. Your administrator can specify the name of the alias file in the printer definition, or you can specify it in a job attribute.

The email has these characteristics:

- If the file contains text data, it can be included in an email attachment or inline in the body of the email. If the file contains data in another format (for example, PDF), the data is included in an attachment. To include text data inline, specify the mail-inline-text job attribute. Or, the administrator can select the Inline text and line data field in the printer definition.
- The name of the attachment is the name that is specified in one of these:
  1. The mail-file-name job attribute
  2. The sysout-dataset-name job attribute
  3. The last 8 characters of the file name
     - If the first character is not a letter, #, $, or @, it is converted to a #. If one of the remaining characters is not a letter, number, #, $, or @, it is converted to a #. Lowercase letters are converted to uppercase letters.
   - The name of the attachment contains a suffix that indicates the type of data in the file. For example, txt indicates text data and pdf indicates PDF data.

   **Tip:** If you specify a file name (in the mail-file-name job attribute) with a suffix that indicates the type of data in the file, ask your administrator to request that Infoprint Server not add another suffix. For example, if the file name is myfile.doc, ask your administrator to request that Infoprint Server not add suffixes for file names that contain the .doc suffix. For information, see the section about customizing IP PrintWay in z/OS Infoprint Server Customization.

- The subject of the email is the value that is specified to the Port Monitor in the title-text job attribute. If none is specified, the subject is the title that your administrator specified in the Allocation section of the printer definition. If no title is specified in the printer definition, the subject is the job name. If you use the LPR command, you can specify the job name in -J option.
- The sender is the Windows user ID of the user who submitted the print request. You can add a descriptive name or other identifier of the sender in the mail-from-name job attribute.
- The reply address is the value that you specify in the mail-reply-address job attribute. To receive replies from the email, specify the mail-reply-address job attribute because the default is that most mail programs reply to the sender, which is your Windows user ID concatenated with the system where sendmail is running.

### Printing files

You can use these methods to print a file:

- Print function on any Windows application that supports printing. See "Using a Windows application" on page 165.
- Windows `print` command. See "Using the print command" on page 165.
- Windows LPR command. See "Using the LPR command" on page 166.
Using a Windows application

To print from a Windows application, use the print function that the application provides and select the Windows printer that you defined in “Adding a z/OS printer to your Windows system” on page 159.

If you are using the Infoprint Port Monitor and selected Prompt for attributes when printing when you customized the Infoprint Port Monitor, you see the Infoprint Server Options window. (If the Infoprint Port Monitor is busy transmitting a file or if your Windows system is busy, you might not see this window immediately.) In the Job Attributes field, you can add any of the attributes that are described in Chapter 3, “Using job attributes,” or change any of the default attributes that you entered when you added the printer.

For example, if you want to print three copies of this file on one side of the paper, change the Job Attributes field to:

```
copies=3 duplex=no
```

Only AFP printers support the duplex attribute. VTAM controlled printers (IP PrintWay basic mode only) and some IPP-enabled printers do not support the copies attribute. If you send the file to an email destination, only one copy is sent.

Note: If the Windows printer is defined as a shared printer, do not select the Prompt for attributes when printing option because the Infoprint Server Options window is displayed only on the Windows system where the Infoprint Port Monitor is installed.

Using the print command

Some Windows systems provide a print command, which you can use to print on a printer you defined in “Adding a z/OS printer to your Windows system” on page 159. To use the print command, you or your Windows administrator must define the z/OS printer as a Windows shared printer. The print command is used to print a file directly without using a Windows application that supports printing.

You can specify this command and these options when you print with Infoprint Server:

```
print /d:\servername\print_share file
```

- `servername` Specifies the name of the Windows server on which the z/OS printer was defined as a Windows shared printer. The Windows server can be your own Windows system or a different Windows system.
- `print_share` Specifies the name of the Windows printer.
- `file` Specifies the location and name of the file you want to print. You can include multiple files on one command line.
Using the LPR command

Some Windows systems provide an LPR command, which you can use to print on any printer that is defined to Infoprint Server in the Printer Inventory. The LPR command is used to print a file directly without using a Windows application that supports printing.

Attention:

- The LPR command has a limit of 2 GB for sending print jobs.
- The LPR command might timeout and truncate the data when it is used to submit print jobs that take a long time to spool; for example, this might happen if a print job is large or the data stream is being transformed as it is being spooled. To avoid these problems, do not use the LPR command; instead, use one of the other printing methods, such as the Windows print command, the Infoprint Port Monitor for Windows or both. See “Using the print command” on page 165.
- To use the LPR command, the administrator must configure the Infoprint Server LPD to listen at port 515. If the Infoprint Server LPD listens at a different port, use the print command instead. To use the print command, you must configure the Infoprint Port Monitor to submit print requests to the port at which the Infoprint Server LPD is listening.

You can specify this command and these options when you print with Infoprint Server:

```bash
LPR -S server -P printer -J job file
```

- `server`
  Specifies the IP address or host name of the z/OS system on which Infoprint Server is running.

- `printer`
  Specifies the name of the printer definition in the Printer Inventory. This name is case-sensitive.

- `job`
  Specifies a job name that is printed as the title on a separator page. Whether the title is printed depends on how the administrator configured the printer’s separator page. If the file is sent to an email destination, this job name is used as the subject of the email.

- `file`
  Specifies the name of the file you want to print or send to an email destination.

Infoprint Server does not support or require these LPR options:

- `C class`
  Infoprint Server does not support this option. It is ignored if specified.

- `d`
  The LPR sends the data file first. Infoprint Server supports this option. However, IBM suggests that you do not specify it for large files or files that need to be transformed to another data format because it can hurt system performance.

- `o option`
  Indicates the type of print file. This option is not required because Infoprint Server automatically detects the type of file.
Infoprint Server does not support this option.

Uninstalling Infoprint Port Monitor for Windows

To uninstall the Infoprint Port Monitor Version 2.0.0 or later:
1. Select Control Panel --> Add/Remove Programs.
2. Select Infoprint Port Monitor.
3. Follow the instructions in the Add/Remove Programs wizard to remove the Infoprint Port Monitor.
Chapter 9. Printing from remote non-Windows systems

These sections describe how to print from non-Windows workstations where TCP/IP is installed. For detailed information about the syntax of the commands, see the documentation for each remote system.

Tips:
1. Infoprint Server might ignore some command options. For example, it ignores command codes that contain information for printing on separator pages if your administrator did not configure the separator pages to show this information.
2. Infoprint Server accepts commands that are sent from any port on the sending host.
3. If a transform product is installed, your data streams can be automatically transformed into the format that the printer accepts. For example, PCL, PDF, PostScript, and SAP data streams can be transformed to AFP format.
4. To submit print requests from Windows systems and UNIX systems, see Chapter 10, “Printing with the lprafp command,” on page 177.

Submitting a print request

You can use the LPR command to submit a print request. From an AIX system, you can also use the enq command.

Before you begin: Before you use an LPR or enq command, ask your administrator for:
- The host name or IP address of the z/OS system on which Infoprint Server is running.
- The name of the printer definition that is created for the printer. This name is case-sensitive. You must specify this name as the name of the printer or print queue.

The IBM i LPR command and the AIX enq command are used to specify Infoprint Server job attributes, which are described in Chapter 3, “Using job attributes,” on page 53.

For more information about how to submit an LPR or enq command from a particular system, see:
- “Printing from an AIX workstation” on page 171
- “Printing from a remote z/OS system” on page 172
- “Printing from a VM or z/VM system” on page 172
- “Printing from an IBM i system” on page 173

After it receives a print request, Infoprint Server returns either an error message or a job identifier. The job identifier indicates that Infoprint Server accepted the print request. You can use the job identifier to query the status of the print request or to cancel the print request.
Sending a file to an email destination

When you use the LPR or enq command, you can send the file to an email destination instead of to a printer. You can specify the email addresses of the primary and secondary recipients in one of these ways:

- Your administrator can specify the email address list for the recipients in the printer definition in the Printer Inventory.
- You can specify the email addresses for the recipients by using these job attributes:

  **mail-bcc-addresses**
  Blind copy (bcc) recipients of an email. A bcc means that other recipients of the email do not see the bcc recipient listed.

  **mail-cc-addresses**
  Copy (cc) recipients of an email. A cc means that other recipients of the email can see the cc recipient listed.

  **mail-to-addresses**
  Primary recipients of an email.

You can specify an address list in an alias file that your administrator defines to z/OS UNIX sendmail. For information, see “Specifying the email address list in an alias file” on page 95. Your administrator can specify the name of the alias file in the printer definition, or you can specify it in a job attribute.

The email has these characteristics:

- If the file contains text data, it can be included in an email attachment or inline in the body of the email. If the file contains data in another format (for example, PDF), the data is included in an attachment. To include text data inline, specify the **mail-inline-text** job attribute. Or, the administrator can select the *Inline text and line data* field in the printer definition.
- The name of the attachment is the name that is specified in one of these:
  1. The **mail-file-name** job attribute
  2. The **sysout-dataset-name** job attribute
  3. The last 8 characters of the file name
     If the first character is not a letter, #, $, or @, it is converted to a #. If one of the remaining characters is not a letter, number, #, $, or @, it is converted to a #. Lowercase letters are converted to uppercase letters.

The name of the attachment contains a suffix that indicates the type of data in the file. For example, txt indicates text data and pdf indicates PDF data.

**Tip:** If you specify a file name (in the **mail-file-name** job attribute) with a suffix that indicates the type of data in the file, ask your administrator to request that Infoprint Server not add another suffix. For example, if the file name is myfile.doc, ask your administrator to request that Infoprint Server not add suffixes for file names that contain the .doc suffix. For information, see the section about customizing IP PrintWay in z/OS Infoprint Server Customization.

- The subject of the email is the title that is specified in the **title-text** job attribute, or in the title that is specified on the LPR command. If none is specified, the title is the value that your administrator specified in the Allocation section of the printer definition. If none is specified, the subject is the job name.
- The sender is the user who submitted the print request. You can add a descriptive name or other identifier of the sender in the **mail-from-name** job attribute.
• The reply address is the value that you specify in the **mail-reply-address** job attribute. To receive replies from the email, specify the **mail-reply-address** job attribute because the default is that most mail programs reply to the sender, which is your user ID on the remote system concatenated with the system where sendmail is running.

---

### Querying a print request

You can use the **lpq** command to query the names, locations, and descriptions of printers and to query the status of a print request. From an AIX system, you can also use the **qstat** command.

When you query the status of a print request, Infoprint Server returns one of the states that is listed in "**lpstat—Show printer names and locations and status of print jobs**" on page 42.

---

### Printing from an AIX workstation

To print from an AIX system, you must configure a remote queue. During configuration of the remote queue, do these steps:

1. Specify the host name or IP address of the z/OS system as the host name.
2. Specify the name of the printer definition as the queue name.
3. Specify **BSD** as the type of print spooler.
4. Specify the **-X** option for the remote queue in the **backend** option under the queue device name in the **/etc/qconfig** file. You use the **-X** option to specify Infoprint Server job attributes in the **-o** option on the **enq** command.

   If you print large files, especially files that are transformed from one format to another on the z/OS system, also specify the **-T** option to increase the timeout value. The default timeout value is 90 seconds. Depending on the size of your files, you might need to specify a timeout value of a few minutes. For large jobs, you might need to specify an hour or more.

   Also, specify the **-C** option, which sends the control file first. This can improve system performance, especially when you print large files.

   This **backend** option specifies a timeout value of 5 minutes in the **-T** option:

   ```
   backend=/usr/lib/lpd/rembak -X -T 5 -C
   ```

5. After you change the **/etc/qconfig** file, delete the **/etc/qconfig.bin** file. Then, use these commands to stop and restart the queue daemon:

   ```
   stopsrc -s qdaemon
   startsrc -s qdaemon
   ```

After you configure the remote queue, specify the name of the remote queue on the **enq**, **lpr**, or **lp** command.

For example:

```
enq -P remotequeue -o "XAOPattribute=value..." file
lpr -P remotequeue file
lp -d remotequeue file
```

---

**-d remotequeue**

Specifies the name of the remote queue.

**-P remotequeue**

Specifies the name of the remote queue.
Specifies any job attributes you want to use to print the job. If there are any spaces or special characters in the list of job attributes, surround the string with single or double quotation marks.

For a list of job attributes that you can specify, see Chapter 3, “Using job attributes,” on page 53. However, you cannot use the document-type=file-reference job attribute.

If there are errors in the list of attributes and you use the XAOP form of the prefix, the job is rejected. If you use the X form of the prefix, the job is processed without the attributes.

Limitation: The lpr and lp commands do not support the -o option.

file
Specifies the name of the file you want to print.

Note: Infoprint Server might not support all command options.

Printing from a remote z/OS system
To print from a remote z/OS system, use the LPR command from a TSO session:

LPR 'filename' (P printername AT hostaddress TITLE title

filename
Specifies the name of the MVS data set you want to print. This cannot be the name of a UNIX file.

P printername
Specifies the name of the printer definition in the Printer Inventory. This name is case-sensitive.

AT hostaddress
Specifies the IP address or host name of the z/OS host on which Infoprint Server is running.

TITLE title
Specifies a title that can be printed on a separator page if your administrator configured the separator page to do so. If the file is sent to an email destination, the title becomes the subject of the email.

Note: Infoprint Server might not support all command options.

Printing from a VM or z/VM system
To print from a VM or z/VM system, use the LPR command.

For example:
LPR filename (PRINTER printername HOST host_address

filename
Specifies the file name, file type, and file mode of the file you want to print.

PRINTER printername
Specifies the name of the printer definition in the Printer Inventory. This name is case-sensitive.
HOST hostaddress
  Specifies the IP address or host name of the z/OS host on which Infoprint Server is running.

Note: Infoprint Server might not support all command options.

---

**Printing from an IBM i system**

The most convenient way to print from an IBM i system is to do these steps:

1. Define a remote print queue for a printer that your administrator defined to Infoprint Server, if the administrator did not already do so. To do this:
   a. Enter the CRTOUTQ command on the IBM i command line.
   b. Complete the panels:

   **Output queue**
   - The name that you want to give to the remote output queue.

   **Remote system**
   - The host name or IP address of the z/OS system on which Infoprint Server is running.

   **Remote print queue**
   - The name of a printer definition that your administrator created.

   **Writers to autostart**
   - 1

   **Connection type**
   - *IP

   **Destination type**
   - *OTHER

   **Host print transform**
   - Specify *NO to print the AFP data stream. Specify *YES to print the Systems Network Architecture (SNA) character string (SCS) data stream.

   **Manufacturer type and model**
   - *WSCST

   **Workstation customizing object**
   - QSYS/QWPDEFAULT

   **Destination options**
   - Specify any job attributes you want to use to print the job. Use one of these two formats:
     'XAOAPattribute=value...
     'Xattribute=value...

   Surround the entire value, including the X or XAOP prefix and the list of attributes, in single quotation marks, as shown. If any of the attribute values contains special characters, surround the value in double quotation marks.

   For a list of job attributes that you can specify, see Chapter 3, "Using job attributes," on page 53. However, you cannot use the document-type=file-reference job attribute.
If there are errors in the list of attributes and you use the XAOP form of the prefix, the job is rejected. If you use the X form of the prefix, the job is processed without the attributes.

2. Submit the file that you want to print on the remote print queue exactly as you would submit it on a local print queue.

3. To start a remote printer writer, enter:
   STRRMTWTR outputqueuename

   The name of the remote output queue is outputqueuename. The remote printer writer takes files from the output queue and sends them to the printer.

4. To end the remote printer writer, enter:
   ENDRMTWTR outputqueuename

You can also use the LPR command to send files to z/OS. The files must already be on the spool, in a queue that does not have a printer writer started against it. You do not define a remote output queue, but you specify many of the same options for the LPR command as you would for a remote output queue. You can also specify job attributes on the LPR command.

For example:

```
LPR RMTSYS(hostname) PRTQ('printqueue') FILE(filename) 
   JOB(jobid/userid/jobname) SPLNBR(n) MFRTYPMDL(*WSCST) 
   WSCST(QSYS/QWPDEFAULT) TRANSFORM(*NO) 
   DESTOPT('XAOPattribute=value...') 
   RMTSYS(hostname)
```

- **RMTSYS(hostname)**
  Specifies the host name of the z/OS host on which Infoprint Server is running.

- **PRTQ('printqueue')**
  Specifies a print queue that is defined in a printer definition. If the print queue name contains lowercase characters, you must surround it in single or double quotation marks.

- **FILE(filename)**
  Specifies the file name of the file you want to print.

- **JOB(jobid/userid/jobname)**
  Identifies the job by number, user ID of the job owner, and name. You can determine this information by entering the WRKOUTP command to view a list of spooled files.

- **SPLNBR(n)**
  Specifies the spool file number of the file you want to print. You can determine the spool file number by viewing a list of spooled files.

- **MFRTYPMDL(*WSCST)**
  Specifies that the manufacturer, type, and model of the printer are as defined in the workstation customizing object.

- **WSCST(QSYS/QWPDEFAULT)**
  Specifies the workstation customizing object as QSYS/QWPDEFAULT.

- **TRANSFORM({*YES|*NO})**
  Specifies whether to transform the data to ASCII format. Specify *YES for SCS data. Specify *NO for AFP data.

- **DESTOPT('XAOPattribute=value...')**
  **DESTOPT('Xattribute=value...')**
  Specifies any job attributes you want to use to print the job. Surround the entire value, including the X or XAOP prefix and the list of attributes, in single quotation marks.
quotation marks, as shown. If any of the attribute values contains special characters, surround the value in double quotation marks.

For a list of job attributes that you can specify, see Chapter 3, “Using job attributes,” on page 53. However, you cannot use the document-type=file-reference job attribute.

If there are errors in the list of attributes and you use the XAOP form of the prefix, the job is rejected. If you use the X form of the prefix, the job is processed without the attributes.

Note: Infoprint Server might not support all command options.

When you print a text document from an IBM i system by using a workstation customization object of QSYS/QWPDEFAULT, Infoprint Server might not recognize the data format as text. Either Infoprint Server rejects the job or data does not print as expected.

This problem occurs because the host print transform and workstation customization object QSYS/QWPDEFAULT on the IBM i system inserts an initial null byte into the print file before it sends it to Infoprint Server. The null byte prevents Infoprint Server from recognizing the data format as text.

To correct this problem, you can use the following source statements to create a workstation customization object that does not insert an initial null byte. These statements are the same as for the QSYS/QWPDEFAULT object, but with :INITPRT DATA='00'X. removed. For information about how to create a customization object, see Workstation Customization Programming V4R3.

:WSCST DEVCLASS=TRANSFORM.
   :TRANSFRMTBL.
   :SPACE
      DATA = '20'X.
   :CARRTN
      DATA = '0D'X.
   :FORMFEED
      DATA = '0C'X.
   :LINEFEED
      DATA = '0A'X.
   :EWSCST.

Printing from a Novell NetWare client

You can use standard printing procedures to submit jobs to Infoprint Server from clients connected to a Novell NetWare 3.x, 4.x, or 5.x server. Your Novell administrator must create a NetWare print queue on the NetWare server and configure the queue to use the LPD protocol to send print jobs to the Infoprint Server LPD on the z/OS system. You must know the name of the NetWare print queue to submit jobs.
Chapter 10. Printing with the lprafp command

The lprafp command submits print requests from Windows systems and UNIX systems (such as HP-UX and SunOS) and specifies Infoprint Server job attributes. For example, when you use the lprafp command, you can specify the name of a form definition in the form-definition attribute and the number of copies in the copies attribute. However:

- You might use some Windows and UNIX print commands to specify Infoprint Server job attributes. If so, you do not need to use the lprafp command.
- On AIX systems, you can use the AIX enq command instead of the lprafp command. The AIX enq command specifies Infoprint Server job attributes. IBM supports the enq command. For information about the enq command, see “Printing from an AIX workstation” on page 171.

You can download the lprafp command from the z/OS downloads website [http://www.ibm.com/systems/z/os/zos/downloads/] in the “As-is z/OS Downloads” section, select Infoprint Server for z/OS.

Format

lprafp [-n] [-o "XAOPattribute=value..." | -o "Xattribute=value..."] ... [-p printer] [-q delay] [-r retries] [-s server] filename ...

Options

-n Specifies that the lprafp command displays only error messages, not informational messages.

-o "XAOPattribute=value..." | -o "Xattribute=value..."

Specifies the Infoprint Server job attributes that you want to use to print the files. For a list of job attributes, see Chapter 3, “Using job attributes,” on page 53.

Prefix the list of attributes with either XAOP or X. The “X” must be in uppercase.

If you use the:

- XAOP prefix and there are errors in the attributes or values, Infoprint Server rejects the print request. You see a server error message and Infoprint Server writes an error message in the z/OS system console log.
- X prefix and there are errors in the attributes or values, Infoprint Server accepts the print request but does not use the attributes. You do not see a server error message.

Tip: Use the XAOP prefix so you know whether Infoprint Server accepted the print request.

To specify more than one attribute, you can repeat the -o option or you can specify more than one attribute that is separated with spaces. If a space or special character exists anywhere after the XAOP prefix, enclose the entire -o argument in single or double quotation marks.

For example:
-o XAOPattribute1=value
-0 "XAOP attribute1=value"
-0 "XAOPattribute1=value with spaces"
-0 "XAOPattribute1=value attribute2=value"
-0 XAOPattribute1=value -0 XAOPattribute2=value

If an attribute value contains spaces, do not enclose the value itself in quotation marks. For example, this does not work:
-0 XAOPattribute="value with spaces"

-p printer
Specifies the name of the printer definition that your administrator created in the Printer Inventory. The default is the value of the LPR_PRINTER environment variable.

-q delay
Specifies the number of seconds between lprafp command retransmissions. The default is 10 seconds.

-r retries
Specifies the number of times the lprafp command tries the retransmission to the server. The default is 3 times.

-s server
Specifies the host name or IP address of the z/OS system where Infoprint Server is running. The default is the value of the LPR_SERVER environment variable.

## Operand

### filename
Specifies the name of the file to print. You can specify more than one file name.

**Rule:** If you specify more than one file with the same lprafp command, all files must have the same data format. For example, all files must be PostScript files or text files.

## lprafp example

To print two copies of file1 and two copies of file2 on printer myprinter with form definition F1FORM, enter:

```
lprafp -0"XAOP form-definition=F1FORM copies = 2" -p myprinter -s systema.xyz.com file1 file2
```

## Usage notes

- The lprafp command is not supported.
- The LPRAFP Readme file describes how to use the lprafp command to send print requests to InfoPrint Manager, not to z/OS Infoprint Server.
Chapter 11. Creating an email header

You can include an email header in line-data documents to specify the addresses of the email recipients and the subject of the email. Infoprint Server supports a subset of the fields defined in the RFC 2822 Internet Message Format standard. Other fields are ignored.

Table 19 shows the supported fields and values in an email header.

<table>
<thead>
<tr>
<th>Field name</th>
<th>Value</th>
</tr>
</thead>
</table>
| to | A list of 1-32 email addresses for the recipients of the email. Each email address can be 1-60 characters but cannot include blanks. Separate email addresses with one or more blanks, a comma, or both.  
**Example:** to: user1@xyz.com, user2@xyz.com, dept01list |
| cc | A list of 1-32 email addresses of the copy (cc) recipients of the email. A cc means that other recipients of the email can see the cc recipient listed. Each email address can be 1-60 characters but cannot include blanks. Separate email addresses with one or more blanks, a comma, or both.  
**Example:** cc: user3@xyz.com, user4@xyz.com |
| bcc | A list of 1-32 email addresses of the blind copy (bcc) recipients of an email. A bcc means that other recipients of the email do not see the bcc recipient listed. Each email address can be 1-60 characters but cannot include blanks. Separate email addresses with one or more blanks, a comma, or both.  
**Example:** bcc: user5@xyz.com, user6@xyz.com |
| from | The descriptive name of the sender of the email. The name can be 1-60 characters and can include blanks.  
Infoprint Server includes the descriptive name before the sender's actual email address:  
user-id@domain-name. The user-id is the user ID of the job submitter, and domain-name is the domain name where Infoprint Server is running.  
**Example:** This specification in the from field in the header:  
from: John Q. Sender  
Puts this information in the email:  
From: John Q. Sender <JOHN@SYSTEM1> |
| reply-to | The email address that recipients of the email can reply to. The email address can be 1-60 characters but cannot include blanks. If none is specified, the reply address is user-id@domain-name. The user-id is the user ID of the job submitter, and domain-name is the domain name where Infoprint Server is running.  
**Example:** reply-to: sender@xyz.com |
| subject | The subject of the email. The subject can be 1-60 characters and can include blanks.  
**Example:** subject: Annual Report |

The email header fields must be in this format:

```
field name : value
```

Table 19 shows the supported field names. Other fields are allowed but ignored. The field names can include lowercase or uppercase characters. If a field name occurs more than one time, the last one is used.
The colon separates the field name from the value. Blanks are allowed before and after the colon.

Table 19 on page 179 shows the allowed values. Infoprint Server uses z/OS UNIX sendmail, so the email addresses must be in a format that sendmail supports. An email address can be an alias name that is defined to sendmail. The email address cannot contain blanks.

Requirements:
1. The output data set on the spool must contain line data in EBCDIC representation, with or without carriage controls.
2. The Embedded headers field in the printer definition must be selected, or you must specify the mail-embedded-headers=yes job attribute.

Limitations: Email headers are not supported in these situations:
1. Your installation runs IP PrintWay basic mode instead of extended mode.
2. You submit the print request with the z/OS UNIX lp command, the Print Interface subsystem, the Infoprint Port Monitor, or another remote print submission method.

In these situations, the header is included as text in the email or in an attachment. Email addresses in the headers are not used.

Syntax rules:
1. Include an email header field name and colon in the first record.
2. Include at least one of the fields that Infoprint Server supports in the header.
3. Begin each field in data column 1 of the record after the carriage control (if any).
4. To continue a field on the next record, continue the value in column 2 or after.
5. Do not split an email address across records.
6. End the header in the first 32 records. A blank record indicates the end of the header.
7. To include comments, use the comment field. Comments in parentheses are considered text.

Tips:
1. If there is no text after the email header, specify the mail-inline-text job attribute to avoid an empty email attachment. Or, the administrator can select the Inline text and line data field in the printer definition.
2. To send multiple documents in the same print job to different email addresses, the administrator must specify the AOP_MAIL_USE_FIRST_ADDRESS = NO environment variable or the mail-use-first-address=no configuration attribute.
3. You can include email headers in VTAM application data that you send to the NetSpool component of Infoprint Server. Specify each email header field on a new line in the VTAM application data and end the header with a blank line.

The email header fields override the corresponding Infoprint Server job attributes, JCL parameters, and printer definition fields that are shown in Table 20 on page 181. If a field is not specified in the email header, Infoprint Server uses the value in the corresponding job attribute, JCL parameter, or printer definition (in that order).
Table 20. Email header fields and corresponding job attributes, JCL parameters, and printer definition fields

<table>
<thead>
<tr>
<th>Email header field</th>
<th>Job attribute</th>
<th>Parameter on OUTPUT JCL statement</th>
<th>Printer definition field</th>
</tr>
</thead>
<tbody>
<tr>
<td>to</td>
<td>mail-to-addresses</td>
<td>MAILTO</td>
<td>To addresses</td>
</tr>
<tr>
<td>cc</td>
<td>mail-cc-addresses</td>
<td>MAILCC</td>
<td>CC addresses</td>
</tr>
<tr>
<td>bcc</td>
<td>mail-bcc-addresses</td>
<td>MAILBCC</td>
<td>BCC addresses</td>
</tr>
<tr>
<td>from</td>
<td>mail-from-name</td>
<td>MAILFROM</td>
<td>From name</td>
</tr>
<tr>
<td>reply-to</td>
<td>mail-reply-name</td>
<td>REPLYTO</td>
<td>Reply address</td>
</tr>
<tr>
<td>subject</td>
<td>title-text</td>
<td>TITLE</td>
<td>Title</td>
</tr>
</tbody>
</table>
Appendix A. Job attributes and JCL parameters

Table 21 shows Infoprint Server job attributes and corresponding JCL parameters. It shows which job attributes and JCL parameters Infoprint Server can validate for the selected printer. Infoprint Server checks the value that you specify in the job attribute or JCL parameter against the supported values the administrator specified in the printer definition.

<table>
<thead>
<tr>
<th>Job attribute</th>
<th>JCL parameter</th>
<th>Value validated for printer</th>
</tr>
</thead>
<tbody>
<tr>
<td>address-text</td>
<td>ADDRESS</td>
<td>No</td>
</tr>
<tr>
<td>afp-parameters</td>
<td>AFPPARMS</td>
<td>No</td>
</tr>
<tr>
<td>building-text</td>
<td>BUILDING</td>
<td>No</td>
</tr>
<tr>
<td>carriage-control-type</td>
<td>RECFM</td>
<td>No</td>
</tr>
<tr>
<td>chars</td>
<td>CHARS</td>
<td>No</td>
</tr>
<tr>
<td>copies</td>
<td>COPIES</td>
<td>Yes</td>
</tr>
<tr>
<td>department-text</td>
<td>DEPT</td>
<td>No</td>
</tr>
<tr>
<td>document-codepage</td>
<td>none</td>
<td>No</td>
</tr>
<tr>
<td>document-format</td>
<td>none</td>
<td>Yes</td>
</tr>
<tr>
<td>document-type</td>
<td>none</td>
<td>No</td>
</tr>
<tr>
<td>duplex</td>
<td>DUPLEX</td>
<td>Yes</td>
</tr>
<tr>
<td>fail-on-transform-error</td>
<td>none</td>
<td>No</td>
</tr>
<tr>
<td>filter-options</td>
<td>none</td>
<td>No</td>
</tr>
<tr>
<td>form-definition</td>
<td>FORMDEF</td>
<td>No</td>
</tr>
<tr>
<td>forms</td>
<td>FORMS</td>
<td>Yes</td>
</tr>
<tr>
<td>hold</td>
<td>HOLD</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>OUTDISP (JES2 only)</td>
<td>No</td>
</tr>
<tr>
<td>input-tray</td>
<td>none</td>
<td>Yes</td>
</tr>
<tr>
<td>input-tray-number</td>
<td>INTRAY</td>
<td>No</td>
</tr>
<tr>
<td>jes-form-length</td>
<td>FORMLEN</td>
<td>No</td>
</tr>
<tr>
<td>jes-priority</td>
<td>PRTY</td>
<td>No</td>
</tr>
<tr>
<td>mail-bcc-addresses</td>
<td>MAILBCC</td>
<td>No</td>
</tr>
<tr>
<td>mail-cc-addresses</td>
<td>MAILCC</td>
<td>No</td>
</tr>
<tr>
<td>mail-embedded-headers</td>
<td>none</td>
<td>No</td>
</tr>
<tr>
<td>mail-file-name</td>
<td>MAILFILE</td>
<td>No</td>
</tr>
<tr>
<td>mail-from-name</td>
<td>MAILFROM</td>
<td>No</td>
</tr>
<tr>
<td>mail-inline-message</td>
<td>none</td>
<td>No</td>
</tr>
<tr>
<td>mail-inline-text</td>
<td>none</td>
<td>No</td>
</tr>
<tr>
<td>mail-inline-text-attribute</td>
<td>none</td>
<td>No</td>
</tr>
<tr>
<td>mail-reply-address</td>
<td>REPLYTO</td>
<td>No</td>
</tr>
<tr>
<td>mail-to-addresses</td>
<td>MAILTO</td>
<td>No</td>
</tr>
<tr>
<td>name-text</td>
<td>NAME</td>
<td>No</td>
</tr>
<tr>
<td>Job attribute</td>
<td>JCL parameter</td>
<td>Value validated for printer</td>
</tr>
<tr>
<td>-------------------------</td>
<td>---------------</td>
<td>----------------------------</td>
</tr>
<tr>
<td>output-bin</td>
<td>none</td>
<td>Yes</td>
</tr>
<tr>
<td>output-bin-number</td>
<td>OUTBIN</td>
<td>No</td>
</tr>
<tr>
<td>overlay-back</td>
<td>OVERLAYB</td>
<td>No</td>
</tr>
<tr>
<td>overlay-front</td>
<td>OVERLAYF</td>
<td>No</td>
</tr>
<tr>
<td>owner</td>
<td>USER</td>
<td>No</td>
</tr>
<tr>
<td>page-definition</td>
<td>PAGEDEF</td>
<td>No</td>
</tr>
<tr>
<td>pdf-encryption-level</td>
<td>none</td>
<td>No</td>
</tr>
<tr>
<td>pdf-owner-identifier</td>
<td>none</td>
<td>No</td>
</tr>
<tr>
<td>pdf-protect</td>
<td>none</td>
<td>No</td>
</tr>
<tr>
<td>pdf-user-identifier</td>
<td>none</td>
<td>No</td>
</tr>
<tr>
<td>print-error-reporting</td>
<td>DATAACK</td>
<td>Yes</td>
</tr>
<tr>
<td>print-queue-name</td>
<td>PRTQUEUE</td>
<td>No</td>
</tr>
<tr>
<td>printer-ip-address</td>
<td>DEST=IP:</td>
<td>No</td>
</tr>
<tr>
<td>resource-directories</td>
<td>USERPATH</td>
<td>No</td>
</tr>
<tr>
<td>resource-library</td>
<td>USERLIB</td>
<td>No</td>
</tr>
<tr>
<td>restrict-printable-area</td>
<td>SYSAREA</td>
<td>No</td>
</tr>
<tr>
<td>room-text</td>
<td>ROOM</td>
<td>No</td>
</tr>
<tr>
<td>save-afp-statistics</td>
<td>AFPSTATS</td>
<td>No</td>
</tr>
<tr>
<td>shift-out-shift-in</td>
<td>PRMODE</td>
<td>No</td>
</tr>
<tr>
<td>sysout-dataset-name</td>
<td>DSNNAME</td>
<td>No</td>
</tr>
<tr>
<td>sysout-job-id</td>
<td>none</td>
<td>No</td>
</tr>
<tr>
<td>sysout-job-name</td>
<td>job name</td>
<td>No</td>
</tr>
<tr>
<td>table-reference-characters</td>
<td>DCB OPTCD=J</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>TRC</td>
<td>No</td>
</tr>
<tr>
<td>title-text</td>
<td>TITLE</td>
<td>No</td>
</tr>
<tr>
<td>trailer-transform-error-page</td>
<td>none</td>
<td>No</td>
</tr>
<tr>
<td>x-image-shift-back</td>
<td>OFFSETXB</td>
<td>No</td>
</tr>
<tr>
<td>x-image-shift-front</td>
<td>OFFSETXF</td>
<td>No</td>
</tr>
<tr>
<td>xf-options</td>
<td>none</td>
<td>No</td>
</tr>
<tr>
<td>y-image-shift-back</td>
<td>OFFSETYB</td>
<td>No</td>
</tr>
<tr>
<td>y-image-shift-front</td>
<td>OFFSETYF</td>
<td>No</td>
</tr>
</tbody>
</table>
Appendix B. JCL parameters and corresponding job attributes

Table 22 lists parameters of the OUTPUT and DD JCL statements and the Infoprint Server job attributes that correspond to them. Some job attributes, such as document-format, do not have corresponding JCL parameters (these attributes are listed at the end of Table 22). However, if you use IP PrintWay extended mode, you can specify the job attributes with the PRTATTRS JCL parameter. You can also specify job attributes in a batch application when you use the AOPPRINT JCL procedure and when you use the Print Interface subsystem.

Table 22. JCL parameters and corresponding job attributes

<table>
<thead>
<tr>
<th>JCL parameter</th>
<th>Job attribute</th>
<th>See page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADDRESS</td>
<td>address-text</td>
<td>55</td>
</tr>
<tr>
<td>AFPPARMS</td>
<td>afp-parameters</td>
<td>56</td>
</tr>
<tr>
<td>AFPSTATS</td>
<td>save-afp-statistics</td>
<td>82</td>
</tr>
<tr>
<td>BUILDING</td>
<td>building-text</td>
<td>56</td>
</tr>
<tr>
<td>CHARS</td>
<td>chars</td>
<td>57</td>
</tr>
<tr>
<td>COPIES</td>
<td>copies</td>
<td>58</td>
</tr>
<tr>
<td>DATACK</td>
<td>print-error-reporting</td>
<td>28</td>
</tr>
<tr>
<td>DCB OPTCD=J</td>
<td>table-reference-characters</td>
<td>85</td>
</tr>
<tr>
<td>DEPT</td>
<td>department-text</td>
<td>59</td>
</tr>
<tr>
<td>DEST=IP:</td>
<td>printer-ip-address</td>
<td>79</td>
</tr>
<tr>
<td>DSNAME</td>
<td>sysout-dataset-name</td>
<td>83</td>
</tr>
<tr>
<td>DUPLEX</td>
<td>duplex</td>
<td>61</td>
</tr>
<tr>
<td>FORMDEF</td>
<td>form-definition</td>
<td>64</td>
</tr>
<tr>
<td>FORMLEN</td>
<td>jes-form-length</td>
<td>67</td>
</tr>
<tr>
<td>FORMS</td>
<td>forms</td>
<td>64</td>
</tr>
<tr>
<td>HOLD1</td>
<td>hold</td>
<td>65</td>
</tr>
<tr>
<td>OUTDISP (JES2 only)</td>
<td></td>
<td>65</td>
</tr>
<tr>
<td>INTRAY</td>
<td>input-tray</td>
<td>85</td>
</tr>
<tr>
<td></td>
<td>input-tray-number</td>
<td>85</td>
</tr>
<tr>
<td>job name (on JOB statement)</td>
<td>sysout-job-name</td>
<td>84</td>
</tr>
<tr>
<td>MAILBCC</td>
<td>mail-bcc-addresses</td>
<td>68</td>
</tr>
<tr>
<td>MAILCC</td>
<td>mail-cc-addresses</td>
<td>68</td>
</tr>
<tr>
<td>MAILFILE</td>
<td>mail-file-name</td>
<td>69</td>
</tr>
<tr>
<td>MAILFROM</td>
<td>mail-from-name</td>
<td>70</td>
</tr>
<tr>
<td>MAILTO</td>
<td>mail-to-addresses</td>
<td>72</td>
</tr>
<tr>
<td>NAME</td>
<td>name-text</td>
<td>72</td>
</tr>
<tr>
<td>OFFSETXB</td>
<td>x-image-shift-back</td>
<td>87</td>
</tr>
<tr>
<td>OFFSETXF</td>
<td>x-image-shift-front</td>
<td>87</td>
</tr>
<tr>
<td>OFFSETYB</td>
<td>y-image-shift-back</td>
<td>89</td>
</tr>
<tr>
<td>OFFSETYF</td>
<td>y-image-shift-front</td>
<td>89</td>
</tr>
</tbody>
</table>
### Table 22. JCL parameters and corresponding job attributes (continued)

<table>
<thead>
<tr>
<th>JCL parameter</th>
<th>Job attribute</th>
<th>See page</th>
</tr>
</thead>
<tbody>
<tr>
<td>OUTBIN</td>
<td>output-bin</td>
<td>73</td>
</tr>
<tr>
<td></td>
<td>output-bin-number</td>
<td></td>
</tr>
<tr>
<td>OVERLAYB</td>
<td>overlay-back</td>
<td>74</td>
</tr>
<tr>
<td>OVERLAYF</td>
<td>overlay-front</td>
<td>75</td>
</tr>
<tr>
<td>PAGEDEF</td>
<td>page-definition</td>
<td>76</td>
</tr>
<tr>
<td>PRMODE</td>
<td>shift-out-shift-in</td>
<td>82</td>
</tr>
<tr>
<td>PRTATTRS</td>
<td>none</td>
<td>113</td>
</tr>
<tr>
<td></td>
<td>You can specify any job attribute, but IP PrintWay ignores sysout-job-id and sysout-job-name</td>
<td></td>
</tr>
<tr>
<td>PRTQUEUE</td>
<td>print-queue-name</td>
<td>79</td>
</tr>
<tr>
<td>PRTY</td>
<td>jes-priority</td>
<td>67</td>
</tr>
<tr>
<td>RECFM</td>
<td>carriage-control-type</td>
<td>56</td>
</tr>
<tr>
<td>REPLYTO</td>
<td>mail-reply-address</td>
<td>71</td>
</tr>
<tr>
<td>ROOM</td>
<td>room-text</td>
<td>81</td>
</tr>
<tr>
<td>SEGMENT</td>
<td>none</td>
<td></td>
</tr>
<tr>
<td>SYSAREA</td>
<td>restrict-printable-area</td>
<td>81</td>
</tr>
<tr>
<td>TITLE</td>
<td>title-text</td>
<td>85</td>
</tr>
<tr>
<td>TRC</td>
<td>table-reference-characters</td>
<td>85</td>
</tr>
<tr>
<td>USER</td>
<td>owner</td>
<td>75</td>
</tr>
<tr>
<td>USERLIB</td>
<td>resource-library</td>
<td>80</td>
</tr>
<tr>
<td>none</td>
<td>document-codepage³</td>
<td>59</td>
</tr>
<tr>
<td>none</td>
<td>document-format²</td>
<td>60</td>
</tr>
<tr>
<td>none</td>
<td>document-type²</td>
<td>60</td>
</tr>
<tr>
<td>none</td>
<td>fail-on-transform-error³</td>
<td>82</td>
</tr>
<tr>
<td>none</td>
<td>filter-options²</td>
<td>62</td>
</tr>
<tr>
<td>none</td>
<td>mail-embedded-headers²</td>
<td>69</td>
</tr>
<tr>
<td>none</td>
<td>mail-inline-text²</td>
<td>71</td>
</tr>
<tr>
<td>none</td>
<td>pdf-encryption-level²</td>
<td>76</td>
</tr>
<tr>
<td>none</td>
<td>pdf-owner-identifier³</td>
<td>76</td>
</tr>
<tr>
<td>none</td>
<td>pdf-protect²</td>
<td>77</td>
</tr>
<tr>
<td>none</td>
<td>pdf-user-identifier³</td>
<td>78</td>
</tr>
<tr>
<td>none</td>
<td>sysout-job-id</td>
<td>83</td>
</tr>
<tr>
<td>none</td>
<td>sysout-job-name</td>
<td>84</td>
</tr>
<tr>
<td>none</td>
<td>trailer-transform-error-page³</td>
<td>86</td>
</tr>
<tr>
<td>none</td>
<td>xf-options²</td>
<td>88</td>
</tr>
</tbody>
</table>

1. When you use the Print Interface subsystem, you cannot specify the HOLD parameter on the DD JCL statement. However, you can specify the OUTDISP parameter on the OUTPUT JCL statement.
2. If you use IP PrintWay extended mode, you can specify this job attribute with the PRTATTRS JCL parameter.
Appendix C. NetSpool support for SCS code points

The NetSpool component of Infoprint Server converts the Systems Network Architecture character stream (SCS) for a logical unit (LU) type 1 printer into one of these data streams:

- **Line data stream**: If the administrator selects the **Convert to line** formatting option, NetSpool creates EBCDIC variable-length records, each record starts with an American Standards Association (ASA) carriage-control character.
- **PCL data stream**: If the administrator selects the **Convert to PCL** formatting option, NetSpool creates an ASCII text data stream with embedded PCL commands.

NetSpool returns these SNA sense codes for errors that are found in the SCS data stream:

- SNA sense code of function error (X'10030000') for undefined and unsupported code points.
- SNA sense code of parameter error (X'10050000') for supported code points with invalid parameters or without all parameters available in the same chain.
- SNA sense code of data error (X'10010000') for invalid characters in a DBCS string.

NetSpool passes all other unspecified code points to JES as text data to be printed.

For information about SCS data streams, see:

- **SNA - Sessions Between Logical Units**
- **IPDS and SCS Technical Reference**

Table 23 describes the SCS code points that are supported and unsupported when NetSpool creates line data or PCL data streams.

**Table 23. SCS code points**. Yes=Supported; Ignore=NetSpool removes the control code from the data stream and does not report an error; Error=Undefined or unsupported code point-function or parameter error

<table>
<thead>
<tr>
<th>Control code</th>
<th>EBCDIC</th>
<th>Name</th>
<th>Line support</th>
<th>PCL support</th>
</tr>
</thead>
<tbody>
<tr>
<td>BEL</td>
<td>X'2F'</td>
<td>Bell function</td>
<td>Ignore</td>
<td>Ignore</td>
</tr>
<tr>
<td>BS</td>
<td>X'16'</td>
<td>Back space</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>CR</td>
<td>X'0D'</td>
<td>Carriage return</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>EBS</td>
<td>X'36'</td>
<td>Expanded back space</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>ENP</td>
<td>X'14'</td>
<td>Enable presentation</td>
<td>Ignore</td>
<td>Ignore</td>
</tr>
<tr>
<td>ESP</td>
<td>X'E1'</td>
<td>Expanded space</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>FF</td>
<td>X'0C'</td>
<td>Form feed</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>GE</td>
<td>X'08'</td>
<td>Graphic escape&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>HT</td>
<td>X'05'</td>
<td>Horizontal tab</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>IT</td>
<td>X'39'</td>
<td>Indent tab</td>
<td>Ignore</td>
<td>Ignore</td>
</tr>
<tr>
<td>IR</td>
<td>X'33'</td>
<td>Index return</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>INP</td>
<td>X'24'</td>
<td>Inhibit presentation</td>
<td>Ignore</td>
<td>Ignore</td>
</tr>
</tbody>
</table>
Table 23. SCS code points (continued). Yes=Supported; Ignore=NetSpool removes the control code from the data stream and does not report an error; Error=Undefined or unsupported code point-function or parameter error.

<table>
<thead>
<tr>
<th>Control code</th>
<th>EBCDIC</th>
<th>Name</th>
<th>Line support</th>
<th>PCL support</th>
</tr>
</thead>
<tbody>
<tr>
<td>IFS</td>
<td>X'1C'</td>
<td>Interchange file separator</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>IGS</td>
<td>X'1D'</td>
<td>Interchange group separator</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>IRS</td>
<td>X'1E'</td>
<td>Interchange record separator</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>IUS</td>
<td>X'1F'</td>
<td>Interchange unit separator</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>LF</td>
<td>X'25'</td>
<td>Line feed</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>NL</td>
<td>X'15'</td>
<td>New line</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>NULL</td>
<td>X'00'</td>
<td>Null</td>
<td>Ignore</td>
<td>Ignore</td>
</tr>
<tr>
<td>PP</td>
<td>X'34xxnn'</td>
<td>Presentation position</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>PPM</td>
<td>X'2BD2...'</td>
<td>Page presentation media</td>
<td>Ignore</td>
<td>Yes</td>
</tr>
<tr>
<td>RFF</td>
<td>X'3A'</td>
<td>Required form feed</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>RNL</td>
<td>X'06'</td>
<td>Required new line</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>RSP</td>
<td>X'41'</td>
<td>Required space</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>SA</td>
<td>X'28xxxx'</td>
<td>Set attribute</td>
<td>Yes</td>
<td>Ignore/Error</td>
</tr>
<tr>
<td>SBS</td>
<td>X'38'</td>
<td>Subscript</td>
<td>Ignore</td>
<td>Yes</td>
</tr>
<tr>
<td>SCI</td>
<td>X'2BDx'</td>
<td>Set chain image</td>
<td>Ignore</td>
<td>Ignore</td>
</tr>
<tr>
<td>SGEA</td>
<td>X'2BC8'</td>
<td>Set graphic error action</td>
<td>Ignore</td>
<td>Ignore</td>
</tr>
<tr>
<td>SHF</td>
<td>X'2BC1xx'</td>
<td>Set horizontal format</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>SHY</td>
<td>X'CA'</td>
<td>Syllable hyphen</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>SI</td>
<td>X'0F'</td>
<td>Shift in²</td>
<td>Yes</td>
<td>Error</td>
</tr>
<tr>
<td>SLD</td>
<td>X'2BC602xx' or X'2BC601'</td>
<td>Set line density</td>
<td>Ignore</td>
<td>Yes</td>
</tr>
<tr>
<td>SLP</td>
<td>X'04C1'</td>
<td>Select left platen</td>
<td>Ignore</td>
<td>Ignore</td>
</tr>
<tr>
<td>SME</td>
<td>X'046x'</td>
<td>Select magnetic encoder</td>
<td>Error</td>
<td>Error</td>
</tr>
<tr>
<td>SO</td>
<td>X'0E'</td>
<td>Shift out²</td>
<td>Yes</td>
<td>Error</td>
</tr>
<tr>
<td>SOF</td>
<td>X'2BC3'</td>
<td>Start of format</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Table 23. SCS code points (continued). Yes=Supported; Ignore=NetSpool removes the control code from the data stream and does not report an error; Error=Undefined or unsupported code point-function or parameter error

<table>
<thead>
<tr>
<th>Control code</th>
<th>EBCDIC</th>
<th>Name</th>
<th>Line support</th>
<th>PCL support</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPD</td>
<td>X’2BD20229’ or X’2BD20429xxxx’</td>
<td>Set print density</td>
<td>Ignore</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tip: X’2BD20229’ indicates to set the print density to the default setting. ‘xxxx’ specifies the number of characters per inch. This is a 2-byte binary number. The first byte is X’00’ and the second byte is the print density hex value.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPS</td>
<td>X’09’</td>
<td>Superscript</td>
<td>Ignore</td>
<td>Yes</td>
</tr>
<tr>
<td>SRP</td>
<td>X’04C2’</td>
<td>Select right platen</td>
<td>Ignore</td>
<td>Ignore</td>
</tr>
<tr>
<td>SSR</td>
<td>X’0450’</td>
<td>Secure string ID reader</td>
<td>Error</td>
<td>Error</td>
</tr>
<tr>
<td>STT</td>
<td>X’2BD1xx’</td>
<td>Set translate table</td>
<td>Ignore</td>
<td>Ignore</td>
</tr>
<tr>
<td>SUB</td>
<td>X’3F’</td>
<td>Substitute</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>SVF</td>
<td>X’2BC2’</td>
<td>Set vertical format (see Table 34 on page 196 and Table 35 on page 196)</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>TRN</td>
<td>X’35’</td>
<td>Transparent</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>UBS</td>
<td>X’1A’</td>
<td>Unit backspace</td>
<td>Ignore</td>
<td>Ignore</td>
</tr>
<tr>
<td>VCS</td>
<td>X’04xx’</td>
<td>Vertical channel select</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tip: ‘xx’ is a 2-byte order. Byte 2 defines the function:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 50 Magnetic stripe reader - error</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 60, 61 Magnetic stripe writer - error</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 7A-7C Vertical channels 10 through 12 - skip to channel</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 81-89 Vertical channels 01 through 09 - skip to channel</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• C1, C2 Select Left/Right Platten - ignore</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Other - error</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VT</td>
<td>X’0B’</td>
<td>Vertical tab</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>WUS</td>
<td>X’23’</td>
<td>Word underscore</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Table 23. SCS code points (continued). Yes=Supported; Ignore=NetSpool removes the control code from the data stream and does not report an error; Error=Undefined or unsupported code point-function or parameter error

<table>
<thead>
<tr>
<th>Control code</th>
<th>EBCDIC</th>
<th>Name</th>
<th>Line support</th>
<th>PCL support</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>The NetSpool Graphic Escape exit replaces Graphic Escape characters with other printable characters.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Shift Out (SO) indicates the start of a string of double-byte character set (DBCS) data. Shift In (SI) indicates the end. Valid characters in the DBCS string are X'4040' and any pair of bytes, each in the range X'41' to X'FE'. NetSpool rejects invalid characters and DBCS strings that do not complete in the same chain with an SNA sense code of data error (X'10010000').</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Presentation Position command

The Presentation Position command (X'34xxnn') is a 3-byte command that moves the print head to a new horizontal or vertical position. The movement can be absolute or relative to the current column or line. Byte 2 is the function code. Byte 3 is a relative or absolute line or column number. NetSpool supports this command when it converts the input data stream to either a line data or a PCL data stream.

The movement can be absolute or relative to the current column or line. There are variations of movement with or without erase that are intended for display devices only. “Erase to new position and return to former position” commands are ignored. “Move with erase” creates the same output as “move without erase”. Movement to the right inserts blank columns in the line. Movement to the left causes the current line to be written and a new blank line set up for overstrike starting at the specified column. Movement to a higher line number causes the current line and some blank lines to be written. Movement to a lower line number causes the current line, a form feed, and some number of blank lines to be written.
### Table 24. Presentation Position X'34xx'nn'

<table>
<thead>
<tr>
<th>Byte 1 (xx) function code</th>
<th>Byte 2 (xx) function parameter</th>
<th>Function parameter action (line data and PCL)</th>
<th>Byte 3 (nn) value parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>X'34'</td>
<td>X'C0' Absolute, Horizontal (no erase)</td>
<td>Move Presentation Position and do not erase</td>
<td>1-byte binary number that denotes either absolute or relative column number</td>
</tr>
<tr>
<td>X'C1'</td>
<td>Absolute, Horizontal (erase, return)</td>
<td>NetSpool ignores this function code</td>
<td></td>
</tr>
<tr>
<td>X'C2'</td>
<td>Absolute, Horizontal (erase, move)</td>
<td>Erase line to and move to new Presentation Position</td>
<td></td>
</tr>
<tr>
<td>X'C4'</td>
<td>Absolute, Horizontal (no erase)</td>
<td>Move Presentation Position and do not erase</td>
<td></td>
</tr>
<tr>
<td>X'C5'</td>
<td>Absolute, Horizontal (erase, return)</td>
<td>NetSpool ignores this function code</td>
<td></td>
</tr>
<tr>
<td>X'C6'</td>
<td>Absolute, Horizontal (erase, move)</td>
<td>Erase Column to new Presentation Position and move to new Presentation Position</td>
<td></td>
</tr>
<tr>
<td>X'C8'</td>
<td>Absolute, Horizontal (no erase, move)</td>
<td>Move Presentation Position and do not erase</td>
<td></td>
</tr>
<tr>
<td>X'C9'</td>
<td>Absolute, Horizontal (erase, return)</td>
<td>NetSpool ignores this function code</td>
<td></td>
</tr>
<tr>
<td>X'4A'</td>
<td>Absolute, Horizontal (erase, move)</td>
<td>Erase line through, and move to new Presentation Position</td>
<td></td>
</tr>
<tr>
<td>X'4C'</td>
<td>Absolute, Horizontal (erase, move)</td>
<td>Move Presentation Position and do not erase</td>
<td></td>
</tr>
<tr>
<td>X'4D'</td>
<td>Absolute, Horizontal (erase, return)</td>
<td>NetSpool ignores this function code</td>
<td></td>
</tr>
<tr>
<td>X'4E'</td>
<td>Absolute, Horizontal (erase, move)</td>
<td>Erase column through new Presentation Position and move to new Presentation Position</td>
<td></td>
</tr>
</tbody>
</table>

### Presentation Page Media control

The Presentation Page Media control (X'2BD2') selects paper sources and specifies simplex or duplex printing. NetSpool supports this control only when it converts the input data stream to a PCL data stream.

**Byte 1**  X'2B'
Byte 2  X'D2'
Byte 3  \textit{nn} count (see Table 25)
Byte 4  X'48'
Byte 5  X'00'
Byte 6  X'00'
Byte 7  FC forms control (see Table 26)
Byte 8  SD source drawer (see Table 27)
Byte 9  DDO destination drawer offset (see Table 28 on page 193)
Byte 10  DD destination drawer (see Table 29 on page 193)
Byte 11  X'00'
Byte 12  X'00'

Tip: The “l” in the PCL commands in the following tables is a lowercase “l”.

Table 25. Presentation Page Media (2BD2) \textit{nn} (count byte)

<table>
<thead>
<tr>
<th>\textit{nn} (count byte)</th>
<th>Description</th>
<th>PCL command</th>
</tr>
</thead>
<tbody>
<tr>
<td>X'02'</td>
<td>Select tray 1</td>
<td>\texttt{&lt;ESC&gt;&amp;l1H}</td>
</tr>
<tr>
<td>X'05'</td>
<td>Use FC byte to select paper menu/source</td>
<td></td>
</tr>
<tr>
<td>X'06'</td>
<td>Use FC byte to select source drawer</td>
<td></td>
</tr>
<tr>
<td>X'0A'</td>
<td>Use FC, SD, and DX bytes</td>
<td></td>
</tr>
</tbody>
</table>

Table 26. Presentation Page Media (2BD2) FC (forms control byte)

<table>
<thead>
<tr>
<th>FC (forms control byte)</th>
<th>Description</th>
<th>PCL command</th>
</tr>
</thead>
<tbody>
<tr>
<td>X'00'</td>
<td>Ignore</td>
<td></td>
</tr>
<tr>
<td>X'01'</td>
<td>Use SD byte</td>
<td></td>
</tr>
<tr>
<td>X'02'</td>
<td>Select auxiliary tray</td>
<td>\texttt{&lt;ESC&gt;&amp;l4H}</td>
</tr>
<tr>
<td>X'03' X'04'</td>
<td>Select auxiliary tray - manual feed</td>
<td>\texttt{&lt;ESC&gt;&amp;l2H}</td>
</tr>
<tr>
<td>X'FF'</td>
<td>Select tray 1</td>
<td>\texttt{&lt;ESC&gt;&amp;l1H}</td>
</tr>
<tr>
<td>other values</td>
<td>Use SD byte</td>
<td></td>
</tr>
</tbody>
</table>

Table 27. Presentation Page Media (2BD2) SD (source drawer byte)

<table>
<thead>
<tr>
<th>SD (source drawer byte)</th>
<th>Description</th>
<th>PCL command</th>
</tr>
</thead>
<tbody>
<tr>
<td>X'00'</td>
<td>Ignore</td>
<td></td>
</tr>
<tr>
<td>X'01' X'FF'</td>
<td>Select tray 1</td>
<td>\texttt{&lt;ESC&gt;&amp;l1H}</td>
</tr>
<tr>
<td>X'02'</td>
<td>Select tray 2</td>
<td>\texttt{&lt;ESC&gt;&amp;l5H}</td>
</tr>
<tr>
<td>X'03'</td>
<td>Select tray 3</td>
<td>\texttt{&lt;ESC&gt;&amp;l7H}</td>
</tr>
<tr>
<td>X'04'</td>
<td>Select auxiliary feeder</td>
<td>\texttt{&lt;ESC&gt;&amp;l2H}</td>
</tr>
</tbody>
</table>
Table 27. Presentation Page Media (2BD2) SD (source drawer byte) (continued)

<table>
<thead>
<tr>
<th>SD (source drawer byte)</th>
<th>Description</th>
<th>PCL command</th>
</tr>
</thead>
<tbody>
<tr>
<td>X'05'</td>
<td>Select tray 4</td>
<td>&lt;ESC&gt;&amp;l8H</td>
</tr>
<tr>
<td>X'06'</td>
<td>Select tray 5</td>
<td>&lt;ESC&gt;&amp;l9H</td>
</tr>
<tr>
<td>other values</td>
<td>Use tray 1</td>
<td>&lt;ESC&gt;&amp;l1H</td>
</tr>
</tbody>
</table>

Table 28. Presentation Page Media (2BD2) DDO (destination drawer offset)

<table>
<thead>
<tr>
<th>DDO (destination drawer offset)</th>
<th>Description</th>
<th>PCL command</th>
</tr>
</thead>
<tbody>
<tr>
<td>X'00'</td>
<td>Ignore</td>
<td></td>
</tr>
<tr>
<td>other values</td>
<td>Offset</td>
<td>&lt;ESC&gt;&amp;l1T</td>
</tr>
</tbody>
</table>

Table 29. Presentation Page Media (2BD2) DD (destination drawer byte)

<table>
<thead>
<tr>
<th>DD (destination drawer byte)</th>
<th>Description</th>
<th>PCL command</th>
</tr>
</thead>
<tbody>
<tr>
<td>X'00'</td>
<td>Ignore</td>
<td></td>
</tr>
<tr>
<td>X'01'</td>
<td>Select default output bin</td>
<td>&lt;ESC&gt;&amp;l1G</td>
</tr>
<tr>
<td>X'02'</td>
<td>Select output bin 2</td>
<td>&lt;ESC&gt;&amp;l2G</td>
</tr>
<tr>
<td>X'03'</td>
<td>Select output bin 3</td>
<td>&lt;ESC&gt;&amp;l3G</td>
</tr>
<tr>
<td>X'04'</td>
<td>Select output bin 4</td>
<td>&lt;ESC&gt;&amp;l4G</td>
</tr>
<tr>
<td>other values</td>
<td>Select default output bin</td>
<td>&lt;ESC&gt;&amp;l1G</td>
</tr>
</tbody>
</table>

Table 30. Presentation Page Media (2BD2) DX (duplex or simplex byte)

<table>
<thead>
<tr>
<th>DX (duplex or simplex byte)</th>
<th>Description</th>
<th>PCL command</th>
</tr>
</thead>
<tbody>
<tr>
<td>X'00'</td>
<td>Ignore</td>
<td></td>
</tr>
<tr>
<td>X'01'</td>
<td>Simplex</td>
<td>&lt;ESC&gt;&amp;l0S</td>
</tr>
<tr>
<td>X'02'</td>
<td>Duplex</td>
<td>&lt;ESC&gt;&amp;l1S</td>
</tr>
<tr>
<td>X'03'</td>
<td>Tumble duplex</td>
<td>&lt;ESC&gt;&amp;l2S</td>
</tr>
</tbody>
</table>
SCS Set Attribute control

Table 31. SCS Set Attribute (X’28xxxyy’)

<table>
<thead>
<tr>
<th>Byte 1</th>
<th>Byte 2 function parameter</th>
<th>Function description</th>
<th>Byte 3 value</th>
<th>Line data support</th>
<th>PCL support</th>
</tr>
</thead>
<tbody>
<tr>
<td>X’28’</td>
<td>X’00’</td>
<td>Reset characteristics</td>
<td>X’00’</td>
<td>Reset to single-byte character set</td>
<td>NetSpool ignores this function</td>
</tr>
<tr>
<td>X’41’</td>
<td>Highlighting</td>
<td>Any value</td>
<td>NetSpool ignores this function</td>
<td>NetSpool ignores this function</td>
<td></td>
</tr>
<tr>
<td>X’42’</td>
<td>Color</td>
<td>Any value</td>
<td>NetSpool ignores this function</td>
<td>NetSpool ignores this function</td>
<td></td>
</tr>
<tr>
<td>X’43’</td>
<td>Character Set</td>
<td>• X’00’</td>
<td>• Reset character set to single-byte character set.</td>
<td>• Error</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• X’F8’</td>
<td>• Start of double-byte character set data.</td>
<td>• Error</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Other values</td>
<td>• Error</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X’C2’</td>
<td>Field Outlining</td>
<td>Any value</td>
<td>NetSpool ignores this function</td>
<td>NetSpool ignores this function</td>
<td></td>
</tr>
</tbody>
</table>

Note: Set Attribute X’2843F8’ indicates the start of double-byte character set (DBCS) data. Set Attribute X’284300’, X’280000’, or end-of-chain indicates the end. Valid characters in the DBCS string are X’4040’ and any pair of bytes, each in the range X’41’ to X’FF’. NetSpool rejects invalid characters with an SNA sense code of data error (X’10010000’).

NetSpool converts SA code points that indicate the start and end of a DBCS string into Shift Out (SO) and Shift In (SI) line-data controls. NetSpool converts valid SCS code points in the DBCS string to the appropriate line-data controls, delimited by SI and SO line-data controls.

Set Horizontal Format (SHF)

Table 32 describes the parameters that can be used with the SHF code point.

Table 32. Set Horizontal Format parameters

<table>
<thead>
<tr>
<th>SHF parameter</th>
<th>Name</th>
<th>Range</th>
<th>NetSpool default</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPP</td>
<td>Maximum line length</td>
<td>1 - 255</td>
<td>80</td>
</tr>
</tbody>
</table>

(The administrator can change the default in the printer definition in the Printer inventory.)
### Table 32. Set Horizontal Format parameters (continued)

<table>
<thead>
<tr>
<th>SHF parameter</th>
<th>Name</th>
<th>Range</th>
<th>NetSpool default</th>
</tr>
</thead>
<tbody>
<tr>
<td>LM</td>
<td>SCS left margin (position</td>
<td>1 - MPP</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>of first column)</td>
<td></td>
<td>(The administrator can change the default in the printer definition in the Printer inventory.)</td>
</tr>
<tr>
<td>RM</td>
<td>SCS right margin (position</td>
<td>LM - MPP</td>
<td>MPP</td>
</tr>
<tr>
<td></td>
<td>of last column)</td>
<td></td>
<td>(The administrator can change the default in the printer definition in the Printer inventory.)</td>
</tr>
<tr>
<td>HT</td>
<td>SCS horizontal tab settings</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SHF can be converted to a sequence of PCL Left Margin and PCL Right Margin commands. The horizontal tab settings, if specified, are saved for use with the SCS Horizontal Tab control.

The definition in the Content column of Table 33 explains what values you can use in the corresponding column positions.

### Table 33. Set Horizontal Format

<table>
<thead>
<tr>
<th>Bytes</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - 2</td>
<td>X'2BC1'</td>
</tr>
<tr>
<td>3</td>
<td>Count of bytes after byte 2. It must be in the range 1 - 255 (count includes itself).</td>
</tr>
<tr>
<td>4 (optional)</td>
<td>MPP</td>
</tr>
<tr>
<td></td>
<td>• 0 means to leave the hardware default</td>
</tr>
<tr>
<td></td>
<td>• 1 - 255 are valid line lengths in the columns</td>
</tr>
<tr>
<td>5 (optional)</td>
<td>LM</td>
</tr>
<tr>
<td></td>
<td>• 0 means to leave the hardware default</td>
</tr>
<tr>
<td></td>
<td>• 1 - MPP are valid column positions</td>
</tr>
<tr>
<td>6 (optional)</td>
<td>RM</td>
</tr>
<tr>
<td></td>
<td>• 0 means to leave the current MPP (hardware default or this command)</td>
</tr>
<tr>
<td></td>
<td>• LM - MPP are valid column positions</td>
</tr>
<tr>
<td>7 - 257 (optional)</td>
<td>HT</td>
</tr>
<tr>
<td></td>
<td>• 0 is ignored</td>
</tr>
<tr>
<td></td>
<td>• LM-RM are valid column positions</td>
</tr>
</tbody>
</table>
Set Vertical Format (SVF)

Table 34 describes the parameters that can be used with the SVF code point.

Table 34. Set Vertical Format parameters

<table>
<thead>
<tr>
<th>SVF parameter</th>
<th>Name</th>
<th>Range</th>
<th>NetSpool default</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPL</td>
<td>Maximum number of lines per page</td>
<td>1 - 255</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>(The administrator can change the default in the printer definition in the Printer inventory.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TM</td>
<td>SCS top margin (position of first line)</td>
<td>1 - MPL</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>(The administrator can change the default in the printer definition in the Printer inventory.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BM</td>
<td>SCS bottom margin</td>
<td>MPL (If not specified the current MPL is used. The default of 1 indicates that the page length is controlled by form feeds placed in the data stream.)</td>
<td>MPL</td>
</tr>
<tr>
<td></td>
<td>(The administrator can change the default in the printer definition in the Printer inventory.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VT</td>
<td>SCS vertical tab settings</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SVF can be converted to a sequence of PCL Top Margin and PCL Page Length commands. The vertical tab settings, if specified, are saved for use with the SCS Vertical Tab or Vertical Channel Select control.

The definition in the Content column of Table 35 explains what values you can use in the corresponding column positions.

Table 35. Set Vertical Format convert to PCL

<table>
<thead>
<tr>
<th>Bytes</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - 2</td>
<td>X'2BC2'</td>
</tr>
<tr>
<td>3</td>
<td>Count of bytes after byte 2. It must be in the range 1 - 255 (count includes itself).</td>
</tr>
<tr>
<td>4 (optional)</td>
<td>MPL or page length</td>
</tr>
<tr>
<td></td>
<td>• 0 means to leave the hardware default</td>
</tr>
<tr>
<td></td>
<td>• 1 - 255 are valid page lengths in lines</td>
</tr>
<tr>
<td>5 (optional)</td>
<td>TM and Channel 01</td>
</tr>
<tr>
<td></td>
<td>• 0 means to leave the hardware default</td>
</tr>
<tr>
<td></td>
<td>• 1 - MPL are valid line numbers</td>
</tr>
<tr>
<td>6 (optional)</td>
<td>BM</td>
</tr>
<tr>
<td></td>
<td>• 0 means to leave the current MPL (hardware default or this command)</td>
</tr>
<tr>
<td></td>
<td>• TM - MPL are valid line numbers</td>
</tr>
</tbody>
</table>
Table 35. Set Vertical Format convert to PCL (continued)

<table>
<thead>
<tr>
<th>Bytes</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 - 257</td>
<td>VT (7 - 18 are also channels 02 - 12)</td>
</tr>
<tr>
<td>(optional)</td>
<td>• 0 is ignored</td>
</tr>
<tr>
<td></td>
<td>• TM+1-BM are valid line numbers</td>
</tr>
</tbody>
</table>
Appendix D. NetSpool support for 3270 data streams code points

The NetSpool component of Infoprint Server converts 3270 data streams for logical unit (LU) type 0 and type 3 into one of these data streams:

• Line data stream: If the administrator selects the **Convert to line formatting** option, NetSpool creates EBCDIC variable-length records, with each record starting with an American Standards Association (ASA) carriage-control character.

• PCL data stream: If the administrator selects the **Convert to PCL formatting** option, NetSpool creates an ASCII text data stream with embedded PCL commands.

Table 36, Table 37 on page 200, and Table 38 on page 201 describe the code points that are supported for 3270 data streams.

For information about 3270 data streams, see:

- IBM 3270 Information Display System Reference Summary
- IBM 3270 Information Display System 3274 Control Unit Description
- IBM 3270 Information Display System Data Stream Programmer’s Reference
- IBM 3270 Kanji Data Streams

### Command codes

Only one command is allowed in each RU chain. The command must be the first byte of the RU chain.

Table 36 describes the code points that are supported for 3270 data streams.

<table>
<thead>
<tr>
<th>Command code</th>
<th>EBCDIC</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>W</td>
<td>X’F1’</td>
<td>Write</td>
</tr>
<tr>
<td>EW</td>
<td>X’F5’</td>
<td>Erase/Write</td>
</tr>
<tr>
<td>EWA</td>
<td>X’7E’</td>
<td>Erase/Write Alternate</td>
</tr>
<tr>
<td>EAU</td>
<td>X’6F’</td>
<td>Erase All Unprotected</td>
</tr>
</tbody>
</table>

Other command codes: Function not supported—returns SNA sense code X’103000’
The control codes have an EBCDIC value in the range of X'00' through X'3F'. Table 37 describes the code points that are supported for 3270 data streams and also explains if it is fully supported.

Table 37. 3270 data stream control codes. Yes=The control code is supported; Ignore=NetSpool removes the control code from the data stream and does not report an error; Error=NetSpool returns an SNA sense code X'1003000'.

<table>
<thead>
<tr>
<th>Control code</th>
<th>EBCDIC</th>
<th>Name</th>
<th>Line support</th>
<th>PCL support</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR</td>
<td>X'0D'</td>
<td>Carriage Return</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>EM</td>
<td>X'19'</td>
<td>End of Message</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>EUA</td>
<td>X'12'</td>
<td>Erase Unprotected to Address</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>FF</td>
<td>X'0C'</td>
<td>Form Feed</td>
<td>Yes[^1]</td>
<td>Yes[^1]</td>
</tr>
<tr>
<td>GE</td>
<td>X'08'</td>
<td>Graphic Escape[^2]</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>IC</td>
<td>X'13'</td>
<td>Insert Cursor</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>MF</td>
<td>X'2C'</td>
<td>Modify Field (see Table 38 on page 201)</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>NL</td>
<td>X'15'</td>
<td>New Line</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>PT</td>
<td>X'05'</td>
<td>Program Tab</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>RA</td>
<td>X'3C'</td>
<td>Repeat to Address</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>SA</td>
<td>X'28'</td>
<td>Set Attribute (see Table 38 on page 201)</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>SBA</td>
<td>X'11'</td>
<td>Set Buffer Address</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>SF</td>
<td>X'1D'</td>
<td>Start Field</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>SFE</td>
<td>X'29'</td>
<td>Start Field Extended (see Table 38 on page 201)</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>SI</td>
<td>X'0F'</td>
<td>Shift in</td>
<td>Yes</td>
<td>Error</td>
</tr>
<tr>
<td>SO</td>
<td>X'0E'</td>
<td>Shift out</td>
<td>Yes</td>
<td>Error</td>
</tr>
<tr>
<td>SYN</td>
<td>X'32'</td>
<td>SYN Character</td>
<td>Ignore</td>
<td>Ignore</td>
</tr>
<tr>
<td>Other control codes</td>
<td></td>
<td></td>
<td>Error</td>
<td>Error</td>
</tr>
</tbody>
</table>

1. The form feed (FF) control must occupy the first print position on a line. To put the FF control in the first position, place X'0C' after a Write Control Character, an NL control, or a CR control. The FF is printed as a space character.

2. The NetSpool Graphic Escape exit replaces Graphic Escape characters with other printable characters.
Table 38 describes the attribute types that are supported for 3270 data streams.

Table 38. 3270 data stream attribute types. N/A=The attribute type does not apply to the order; X=The attribute type does apply to the order.

<table>
<thead>
<tr>
<th>Attribute type</th>
<th>EBCDIC</th>
<th>SFE, MF orders</th>
<th>SA order</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Character Attribute Reset</td>
<td>X'00'</td>
<td>N/A</td>
<td>X</td>
<td>Sets character set attribute to single-byte character set (default).</td>
</tr>
<tr>
<td>Character Set</td>
<td>X'43'</td>
<td>X</td>
<td>X</td>
<td>When attribute value is X'00' - X'7F', character set attribute is set to single-byte. When attribute value is X'F8' - X'FE', character set attribute is set to double-byte. However, a value in this range is an error when converting to PCL.</td>
</tr>
<tr>
<td>3270 Field Attribute</td>
<td>X'C0'</td>
<td>X</td>
<td>N/A</td>
<td>Field attribute bit definitions supported:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Bit 2 = B'0'</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Field is unprotected.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Bit 2 = B'1'</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Field is protected.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Bits 4,5 = B'11'</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Field is nonprintable.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Bits 4,5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Other settings are ignored.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>All other bit definitions are ignored.</td>
</tr>
<tr>
<td>Other Valid Attributes</td>
<td>X'41', X'42', X'45', X'46', X'C2'</td>
<td>X</td>
<td>X</td>
<td>Ignored. The default is no operation. Attributes are ignored.</td>
</tr>
<tr>
<td>Invalid Attributes</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Function not supported. Returns SNA sense code X'1003000'.</td>
</tr>
</tbody>
</table>
Appendix E. Accessibility

Accessible publications for this product are offered through IBM Knowledge Center (http://www.ibm.com/support/knowledgecenter/SSLTBW/welcome).

If you experience difficulty with the accessibility of any z/OS information, send a detailed message to the "Contact us" web page for z/OS (http://www.ibm.com/systems/z/os/zos/webqs.html) or use the following mailing address.

IBM Corporation
Attention: MHVRCFS Reader Comments
Department H6MA, Building 707
2455 South Road
Poughkeepsie, NY 12601-5400
United States

Accessibility features

Accessibility features help users who have physical disabilities such as restricted mobility or limited vision use software products successfully. The accessibility features in z/OS can help users do the following tasks:

- Run assistive technology such as screen readers and screen magnifier software.
- Operate specific or equivalent features by using the keyboard.
- Customize display attributes such as color, contrast, and font size.

Consult assistive technologies

Assistive technology products such as screen readers function with the user interfaces found in z/OS. Consult the product information for the specific assistive technology product that is used to access z/OS interfaces.

Keyboard navigation of the user interface

You can access z/OS user interfaces with TSO/E or ISPF. The following information describes how to use TSO/E and ISPF, including the use of keyboard shortcuts and function keys (PF keys). Each guide includes the default settings for the PF keys.

- z/OS TSO/E Primer
- z/OS TSO/E User’s Guide
- z/OS V2R2 ISPF User’s Guide Vol 1

Dotted decimal syntax diagrams

Syntax diagrams are provided in dotted decimal format for users who access IBM Knowledge Center with a screen reader. In dotted decimal format, each syntax element is written on a separate line. If two or more syntax elements are always present together (or always absent together), they can appear on the same line because they are considered a single compound syntax element.

Each line starts with a dotted decimal number; for example, 3 or 3.1 or 3.1.1. To hear these numbers correctly, make sure that the screen reader is set to read out
punctuation. All the syntax elements that have the same dotted decimal number (for example, all the syntax elements that have the number 3.1) are mutually exclusive alternatives. If you hear the lines 3.1 USERID and 3.1 SYSTEMID, your syntax can include either USERID or SYSTEMID, but not both.

The dotted decimal numbering level denotes the level of nesting. For example, if a syntax element with dotted decimal number 3 is followed by a series of syntax elements with dotted decimal number 3.1, all the syntax elements numbered 3.1 are subordinate to the syntax element numbered 3.

Certain words and symbols are used next to the dotted decimal numbers to add information about the syntax elements. Occasionally, these words and symbols might occur at the beginning of the element itself. For ease of identification, if the word or symbol is a part of the syntax element, it is preceded by the backslash (\) character. The * symbol is placed next to a dotted decimal number to indicate that the syntax element repeats. For example, syntax element *FILE with dotted decimal number 3 is given the format 3 \* FILE. Format 3* FILE indicates that syntax element FILE repeats. Format 3* \* FILE indicates that syntax element * FILE repeats.

Characters such as commas, which are used to separate a string of syntax elements, are shown in the syntax just before the items they separate. These characters can appear on the same line as each item, or on a separate line with the same dotted decimal number as the relevant items. The line can also show another symbol to provide information about the syntax elements. For example, the lines 5.1*, 5.1 LASTRUN, and 5.1 DELETE mean that if you use more than one of the LASTRUN and DELETE syntax elements, the elements must be separated by a comma. If no separator is given, assume that you use a blank to separate each syntax element.

If a syntax element is preceded by the % symbol, it indicates a reference that is defined elsewhere. The string that follows the % symbol is the name of a syntax fragment rather than a literal. For example, the line 2.1 %OP1 means that you must refer to separate syntax fragment OP1.

The following symbols are used next to the dotted decimal numbers.

? indicates an optional syntax element
The question mark (?) symbol indicates an optional syntax element. A dotted decimal number followed by the question mark symbol (?) indicates that all the syntax elements with a corresponding dotted decimal number, and any subordinate syntax elements, are optional. If there is only one syntax element with a dotted decimal number, the ? symbol is displayed on the same line as the syntax element, (for example 5? NOTIFY). If there is more than one syntax element with a dotted decimal number, the ? symbol is displayed on a line by itself, followed by the syntax elements that are optional. For example, if you hear the lines 5 ?, 5 NOTIFY, and 5 UPDATE, you know that the syntax elements NOTIFY and UPDATE are optional. That is, you can choose one or none of them. The ? symbol is equivalent to a bypass line in a railroad diagram.

! indicates a default syntax element
The exclamation mark (!) symbol indicates a default syntax element. A dotted decimal number followed by the ! symbol and a syntax element indicate that the syntax element is the default option for all syntax elements that share the same dotted decimal number. Only one of the syntax elements that share the dotted decimal number can specify the ! symbol. For example, if you hear the lines 2? FILE, 2.1! (KEEP), and 2.1 (DELETE), you know that (KEEP) is the
default option for the FILE keyword. In the example, if you include the FILE keyword, but do not specify an option, the default option KEEP is applied. A default option also applies to the next higher dotted decimal number. In this example, if the FILE keyword is omitted, the default FILE(KEEP) is used. However, if you hear the lines 2? FILE, 2.1, 2.1.1 (KEEP), and 2.1.1 (DELETE), the default option KEEP applies only to the next higher dotted decimal number, 2.1 (which does not have an associated keyword), and does not apply to ? FILE. Nothing is used if the keyword FILE is omitted.

* **indicates an optional syntax element that is repeatable**
  The asterisk or glyph (*) symbol indicates a syntax element that can be repeated zero or more times. A dotted decimal number followed by the * symbol indicates that this syntax element can be used zero or more times; that is, it is optional and can be repeated. For example, if you hear the line 5.1* data area, you know that you can include one data area, more than one data area, or no data area. If you hear the lines 3*, 3 HOST, 3 STATE, you know that you can include HOST, STATE, both together, or nothing.

**Notes:**

1. If a dotted decimal number has an asterisk (*) next to it and there is only one item with that dotted decimal number, you can repeat that same item more than once.
2. If a dotted decimal number has an asterisk next to it and several items have that dotted decimal number, you can use more than one item from the list, but you cannot use the items more than once each. In the previous example, you can write HOST STATE, but you cannot write HOST HOST.
3. The * symbol is equivalent to a loopback line in a railroad syntax diagram.

+ **indicates a syntax element that must be included**
  The plus (+) symbol indicates a syntax element that must be included at least once. A dotted decimal number followed by the + symbol indicates that the syntax element must be included one or more times. That is, it must be included at least once and can be repeated. For example, if you hear the line 6.1+ data area, you must include at least one data area. If you hear the lines 2+, 2 HOST, and 2 STATE, you know that you must include HOST, STATE, or both. Similar to the * symbol, the + symbol can repeat a particular item if it is the only item with that dotted decimal number. The + symbol, like the * symbol, is equivalent to a loopback line in a railroad syntax diagram.
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Index

Special characters
/etc/Printsrv/aopd.conf file 31, 41, 46
/etc/Printsrv/aoprd.conf file 51
$HOME/.aopconf file 31, 41, 46
%filter-options option 64

Numerics
3270 data stream
  Character Set attribute 150
  DBCS support 150
  MF order 150
  SA order 150
  SFE order 150
  Shift In control 150
  Shift Out control 150
  WSF order 151
3270 data stream support in NetSpool 15
3270 data streams, attributes 201
3270 data streams, command codes 199
3270 data streams, control codes 200

A
ABAP (Advanced Business Application Programming) data format, SAP 60
accessibility 203
contact IBM 203
features 203
ADDRESS parameter (JCL) 126
  equivalent job attribute 56
address-text attribute 55, 56
Advanced Business Application Programming (ABAP) data format, SAP 60
Advanced Function Presentation (AFP) files
  printing or viewing from Windows 164
AFP (Advanced Function Presentation) files
  printing or viewing from Windows 164
AFP data
  printing on non-AFP printer 133, 134
AFP Download Plus
  Printer Inventory 5
  AFP files
  printing from Windows 164
AFP Printer Driver
  configuring 163
  AFP Printer Driver for Windows, overview 6
AFP printers
  configuring on Windows 163
  JCL parameters used by 126
  submitting jobs from Windows 164
AFP resources, using 126
AFP Viewer plug-in for Windows, overview 7
afp-parameters 56
AFPPARMS parameter (JCL) 56
AFPSSTATS parameter (JCL) 82
AIX
  increasing timeout value 171
  printing from 169, 171
  querying jobs and printers from 171
  AOP_MVS_RETURN_CODES 40
  AOPBATCH JCL procedure
    DD names 144
    examples 145
  exit values 148
  AOPBATCH program 143
  AOPCONF environment variable 30, 40, 46
  AOPOPTIONS environment variable 40
  AOPPATH environment variable 40
  AOPPRINT JCL procedure 137
    DD statements 139
    examples 140
  exit values 142
  AOPRXF_CONF environment variable 51
  aopwin32.exe, downloading 159
  aopwin64.exe, downloading 159
  APIPPTD1 exit 150
  APIPPTD2 exit 150
  assistive technologies 203
attribute types, 3270 data streams 201
attributes
  abbreviating 54
  address-text 55
  afp-parameters 56
  building-text 56
  carriage-control-type 56
  chars 57
  copies 58
  corresponding to JCL parameters 185
  department-text 59
  document-codepage 59
  document-format 60
  document-type 60
  duplex 61
  fail-on-transform-error 62
  filter-options 62
  form-definition 64
  forms 64
  hold 65
  holding 65
  in attributes file 54
  input-tray 65
  input-tray-number 66
  jes-form-length 67
  jes-priority 67
  mail-bcc-addresses 68
  mail-cc-addresses 68
  mail-embedded-headers 69
  mail-file-name 69
  mail-from-name 70
  mail-inline-message 70
  mail-inline-text 71
  mail-inline-text-attribute 71
  mail-reply-address 71
  mail-to-addresses 72
  name-text 72
  of jobs 53
  output-bin 73
  output-bin-number 74
  overlay-back 74
  overlay-front 75
attributes (continued)
- owner 75
- page-definition 76
- pdf-encryption-level 76
- pdf-owner-identifier 76
- pdf-protect 77
- pdf-user-identifier 78
- print-error-reporting 78
- print-queue-name 79
- printer-ip-address 79
- resource-directories 80
- resource-library 80
- restrict-printable-area 81
- room-text 81
- save-afp-statistics 82
- shift-out-shift-in 82
- sysout-dataset-name 83
- sysout-job-id 83
- sysout-job-name 84
- table-reference-characters 85
- title-text 85
- trailer-transform-error-page 86
- valid for different printer types 183
- validating for printer 183
- x-image-shift 87
- x-image-shift-front 87
- xf-options 88
- y-image-shift-back 89
- y-image-shift-front 90
- attributes file 54

B
Beginning of File exit 150
bin number, output 74
bin, output 73
binary data support 151
binary data support in NetSpool 16
BM parameter (NetSpool) 153
bottom margin parameter (NetSpool) 153
bracket (SNA architecture) 152
broadcasting data 16
BUILDING parameter (JCL) 126
- equivalent job attribute 56
- building-text attribute 56

C
cancel command
- description 30
- environment variables 30
- examples 30
- exit values 31
- files 31
- format 30
- operand 30
- portability 31
canceling jobs
- cancel command 30
- from z/OS UNIX System Services 30
- carriage controls, subsystem 124
- carriage-control-type attribute 56
CEE.SCEERUN 145
CEE.SCEERUN2 145
- chain (SNA architecture) 152
- chars attribute 57

CHARS parameter
- DD JCL statement
  transmitted to remote system 126
- OUTPUT JCL statement
  transmitted to remote system 126
- CHARS parameter (JCL)
  equivalent job attribute 58
CICS (Customer Information Control System), printing from 149
class
- CLASS parameter (JCL) 103
- example of specifying in JCL 128
- specifying in JCL 92
- SYSOUT parameter (JCL) 119
- CLASS parameter (JCL) 103
code page 59
code points
- 3270 data streams 199
- SCS 187
coded fonts 57
commands
- cancel 30
echo 44
enq 169
lp 32
lpq 171
lpr 169
lprafp 177
lpsat 42
man 25
qstat 171
remotexf 47
TCP/IP printing commands 169
which command to use 27
common message log
- overview 5
- completion message 34, 113
- compression, data 151
- concatenate documents 61
- configuration file, Infoprint Server 31, 41, 46
contact
- z/OS 203
code points, 3270 data streams 200
copies attribute 58
COPIES parameter (JCL) 104
- equivalent job attribute 58
copies, printing multiple 33, 58, 104
CRTCOUTQ command 173
Customer Information Control System (CICS), printing from 149

D
data compression 151
data definition names (ddnames)
- STDENV 144
- STDERR 139, 144
- STDOUT 139, 144
- SYSIN 139
data encryption 151
data formats
- supported
  - Print Interface 60
  - VTAM
    - restrictions 151
    - supported 149
data set, MVS
  printing
    lp command 34
data set, z/OS
  concept 152
  end-of-file 152
data streams
  supported
    Print Interface 60
    VTAM
      restrictions 151
      supported 149
DATAACK parameter (JCL)
  equivalent job attribute 79
  transmitted to remote system 126
DBCS (double-byte character set) support
  3270 data stream 150
  SCS data stream 150
DD JCL statement 91
  CHARS parameter
    equivalent job attribute 58
    transmitted to remote system 126
  COPIES parameter
    equivalent job attribute 58
  DEST parameter 105
  DEST=IP: parameter 105
  DNSNAME parameter 107
  DUPLEX parameter 107
  FCB parameter 108
  transmitted to remote system 126
  parameters and equivalent job attributes 185
  specifying parameters on 102
  SUBSYS parameter 121
  SYSOUT parameter) 119
  UCS parameter
    transmitted to remote system 126
    validation 183
dddnames (data definition names)
  STDENV 144
  STDERR 139, 144
  STDOUT 139, 144
  SYSIN 139
default printer
  defining 32
  displaying name and location 45
  querying 45
deferred printing
  difference between SNA network printers and
  NetSpool 152
definition, printer
  example of specifying in JCL 127
  specifying in JCL 91
department-text attribute 59
DEPT parameter (JCL) 126
  equivalent job attribute 59
description
  cancel command 30
  lp command 32
  lpsstat command 42
  remotexf command 47
  DEST parameter (JCL) 105
  DEST=IP: parameter (JCL) 105
  equivalent job attribute 80
destination
  example of specifying in JCL 128
  specifying in JCL 92, 105
diagram of system flow 8
displaying job status
  from z/OS UNIX System Services 42
  lpsstat command 42
displaying printer information
  from z/OS UNIX System Services 42
  lpsstat command 42
distribution parameters
  specifying on OUTPUT JCL statement 126
document-codepage attribute 59
document-format attribute 60
document-type attribute 60
  DNSNAME parameter (JCL) 107
duplex
  specifying in JCL 107
duplex attribute 61
  DUPLEX parameter (JCL) 107
  equivalent job attribute 61
duplex printing 61
displaying job status
  from z/OS UNIX System Services 42
  lpsstat command 42
displaying printer information
  from z/OS UNIX System Services 42
  lpsstat command 42
distribution parameters
  specifying on OUTPUT JCL statement 126
document-codepage attribute 59
document-format attribute 60
document-type attribute 60
  DNSNAME parameter (JCL) 107
duplex
  specifying in JCL 107
duplex attribute 61
  DUPLEX parameter (JCL) 107
  equivalent job attribute 61
duplex printing 61
displaying job status
  from z/OS UNIX System Services 42
  lpsstat command 42
displaying printer information
  from z/OS UNIX System Services 42
  lpsstat command 42
distribution parameters
  specifying on OUTPUT JCL statement 126
document-codepage attribute 59
document-format attribute 60
document-type attribute 60
  DNSNAME parameter (JCL) 107
duplex
  specifying in JCL 107
duplex attribute 61
  DUPLEX parameter (JCL) 107
  equivalent job attribute 61
duplex printing 61
environment variables (continued)
   NLSPATH  26, 31, 41, 46, 51
   PRINTER  41, 44
   remotexf command  50
ERRCLASS parameter, AOPPRINT JCL procedure  138
error messages
   AOPPRINT JCL procedure
      class  138
      sysout name  139
   English  26
   Japanese  26
examples
   AOPBATCH JCL procedure  145
   AOPPRINT JCL procedure  140
   cancel command  30
   CRTCOUTQ command  173
   ENDWTR command  173
   enq command
      AIX  171
JCL parameters  127
   lp command  36
LPR command
   IBM i  174
   VM  172
   Windows  166
   z/OS, remote system  172
   z/VM  172
lprapf command  178
lpstat command  42
remotexf command  47
STRRMNTWTR command  173
exit values
   AOPBATCH JCL procedure  148
   AOPPRINT JCL procedure  142
   cancel command  31
   lp command  41
   lpstat command  46
   remotexf command  51

form definition  64
form feed support in a 3270 data stream  200
form length  67
form name
   example of specifying in JCL  128
FORMDEF parameter (JCL)
   equivalent job attribute  64
   transmitted to remote system  126
FORMLEN parameter (JCL), equivalent job attribute  67
form-definition attribute  64
format
   cancel command  30
   lp command  32
   lprapf command  177
   lpstat command  42
   remotexf command  47
formats, data
   supported
      Print Interface  60
      VTAM
         restrictions  151
         supported  149
FORMDEF parameter (JCL)
   equivalent job attribute  64
   transmitted to remote system  126
FORMLEN parameter (JCL), equivalent job attribute  67
forms attribute  64
FORMS parameter (JCL)  108
   equivalent job attribute  65
FSSDATA='printer' parameter (JCL)  109
   example  127
Function Management (FM) header  151

H
Historical Inventory, overview  5
hold attribute  65
HOLD parameter (JCL)  121
holding jobs  65
horizontal tab parameter (NetSpool)  153
host name
   specifying in JCL  105
   specifying with job attribute  79
HT parameter (NetSpool)  153

I
IBM I
   printing from  173
IMS (Information Management System), printing from  149
Infoprint Central
   holding jobs  121
   overview  23
Infoprint Port Monitor for Windows
   description  157
   downloading V3.1  159
   installing  159
   overview  6
   uninstalling  167
InfoPrint Transform Manager for Linux
   fail-on-datastream-error  88
   output-format  88
   remotexf command  47
   trailer-error-page  88
   transform-id  89
   xf-options  88
informational messages
AOPPRINT JCL procedure
  class 138
  sysout name 139
  English 26
  Japanese 26
input data streams
  supported
    Print Interface 60
    VTAM
      restrictions 151
      supported 149
input data streams, types supported 14
input tray 65
input-tray attribute 65
input-tray number attribute 66
Internet printers
  defining 162
Internet Printing Protocol (IPP), using from Windows 162
INTRAY parameter (JCL)
  equivalent job attribute 66
IP (Internet Protocol)
  address
    example of specifying in JCL 127
    specifying in JCL 92, 105
    specifying with job attribute 79
IP PrintWay
  basic mode transforms 101
  extended mode JCL considerations 120
  extended mode transforms 100
  overview 16
  printing batch jobs 91
IPP (Internet Printing Protocol), using from Windows 162

J
Japanese messages 26
JCL (job control language)
  ADDRESS parameter 126
    equivalent job attribute 56
  AFPPARMS parameter 56
  AFPSTATS parameter 82
  BUILDING parameter 126
    equivalent job attribute 56
  CHARS parameter
    equivalent job attribute 58
    transmitted to remote system 126
  CLASS parameter 103
  COPIES parameter 104
    equivalent job attribute 58
  DATAACK parameter
    equivalent job attribute 79
    transmitted to remote system 126
  DD statement 91
  DEPT parameter 126
    equivalent job attribute 59
  DEST parameter 105
  DEST=IP parameter 105
    equivalent job attribute 80
  DSNAME parameter 107
  DUPLEX parameter 107
    equivalent job attribute 81
  ERRCLASS parameter 138
    examples 127
  FCB parameter 108
    transmitted to remote system 126
  FORMDEF parameter
    equivalent job attribute 64
  FSSDATA='printer' 109
  INTRAY parameter
    equivalent job attribute 66
  MAILBCC parameter 110
    equivalent job attribute 68
  MAILCC parameter 110
    equivalent job attribute 69
  MAILFILE parameter 111
    equivalent job attribute 70
  MAILFROM parameter 112
    equivalent job attribute 70
  MAILTO parameter 112
    equivalent job attribute 72
  NAME parameter 126
    equivalent job attribute 73
  NOTIFY parameter 113
  OFFSETXB parameter
    equivalent job attribute 87
  OFFSETXF parameter
    equivalent job attribute 88
  OFFSETYB parameter
  OFFSETYF parameter
  OUTBIN parameter
    equivalent job attribute 73
  OUTCLASS parameter 139
  OUTPUT statement 91
  OVERLAYB parameter
    equivalent job attribute 74
  OVERLAYE parameter
    equivalent job attribute 75
  PAGEDEF parameter
    equivalent job attribute 76
    transmitted to remote system 126
  parameters used with IP PrintWay 102
  PORTNO parameter 113
  PRINTER parameter 139
  printing
    AOPBATCH program 143
    AOPPRINT procedure 137
    OUTPUT and DD statements 91
    to IP PrintWay printers 91
  PRMODE parameter
    equivalent job attribute 83
    transmitted to remote system 126
  PRTOPTNS parameter 112, 113
  PRTOPTNS parameter 114
  PRTPRINT parameter 115
    equivalent job attribute 79
  PRTPQUEUE parameter, equivalent job attribute 68
  REPLTO parameter 115
    equivalent job attribute 72
  RETAINF parameter 116
  RETAINS parameter 117
  RETRYL parameter 118
  RETRYT parameter 118
  ROOM parameter 126
    equivalent job attribute 82
  SUBSYS parameter 121

Index 215
JCL (job control language)  
SYSOUT parameter 119
TITLE parameter 119, 126
equivalent job attribute 86
transforming data 91
TRC parameter
 equivalent job attribute 85
transmitted to remote system 126
UCS parameter
 transmitted to remote system 126
USERLIB parameter
equivalent job attribute 81
JES (Job Entry Subsystem)
work-selection criteria
 specifying in JCL 91
jes-form-length attribute 67
jes-priority attribute 67
job attributes
 address-text 55
afp-parameters 56
building-text 56
carriage-control-type 56
carry 57
copies 58
department-text 59
document-codepage 59
document-format 60
document-type 60
duplex 61
fail-on-transform-error 62
filter-options 62
form-definition 64
forms 64
hold 65
holding 65
input-tray 65
input-tray-number 66
jes-form-length 67
jes-priority 67
mail-bcc-addresses 68
mail-cc-addresses 68
mail-embedded-headers 69
mail-file-name 69
mail-from-name 70
mail-inline-message 70
mail-inline-text 71
mail-inline-text-attribute 71
mail-reply-address 71
mail-to-attributes 72
name-text 72
output-bin 73
output-bin-number 74
overlay-back 74
overlay-front 75
owner 75
page-definition 76
pdf-encryption-level 76
def-encryptor-identifier 76
pdf-protected 77
pdf-user-identifer 78
print-error-reporting 78
print-queue-name 79
printer-ip-address 79
resource-directories 80
resource-library 80
restrict-printable-area 81
room-text 81
job attributes  
save-afp-statistics 82
shift-out-shift-in 82
sysout-dataset-name 83
sysout-job-id 83
sysout-job-name 84
table-reference-characters 85
title-text 85
trailer-transform-error-page 86
valid for different printer types 183
validating for printer 183
x-image-shift 87
x-image-shift-front 87
xf-options 88
y-image-shift-back 89
y-image-shift-front 90
job attributes, specifying with PRTATTRS 102
job ID, Infoprint Server 34, 139
job states 42
jobs
canceling
cancel command 30
 from z/OS UNIX System Services 30
displaying status
 from z/OS UNIX System Services 42
lpstat command 42
embedding job attributes in NetSpool 154
notification when complete
 lp command 54
NOTIFY parameter (JCL) 113
printing
AOPPRINT JCL procedure 137
from AIX 171
from IBM I 173
from VM or z/VM 172
from Windows 157, 165, 166
from z/OS 91, 137
 from z/OS (remote system) 172
from z/OS (VTAM applications) 149
from z/OS UNIX System Services 32
lp command 32
OUTPUT and DD JCL statements 91
to IP PrintWay printers 91
priority 67
querying
from AIX 171
from remote systems 171
from z/OS UNIX System Services 42
lpq command 171
lpstat command 42
qstat command 171
validating 183
K
keyboard
navigation 203
PF keys 203
shortcut keys 203
L
LAN (local area network) printers
 not defined by administrator 36
LANG environment variable 40, 51
network printers defining 162
NLSPATH environment variable 26, 31, 41, 46, 51
Notices 207
notification message
difference between SNA network printers and NetSpool 151
requesting in JCL 113
requesting on lp command 34
NOTIFY parameter (JCL) 113
Novell NetWare server
printing from clients of 175
number of copies 33, 58
OFFSETXB parameter (JCL)
equivalent job attribute 87
OFFSETXF parameter (JCL)
equivalent job attribute 88
OFFSETYB parameter (JCL)
equivalent job attribute 90
OFFSETYF parameter (JCL)
equivalent job attribute 90
one-sided printing 61
online help
English 25
 operands
cancel command 30
lp command 34
lprafp command 178
lpsstat command 45
remotexf command 49
options
lp command 32
lprafp command 177
lpsstat command 44
remotexf command 48
options component
equivalent job attribute 73
example of specifying in JCL 129
OPTIONS parameter, AOPPRINT JCL procedure 138
OTF (Output Text Format) data format, SAP 60
OUTBIN parameter (JCL)
equivalent job attribute 73
OUTCLASS parameter, AOPPRINT JCL procedure 139
output bin 73
output class
equivalent job attribute 73
example of specifying in JCL 128
OUTPUT JCL statement (continued)
equivalent job attribute 59
DEST parameter 105
DEST=IP: parameter 105
equivalent job attribute 80
DUPLEX parameter 107
equivalent job attribute 61
FCB parameter 108
 transmitted to remote system 126
FORMDEF parameter
equivalent job attribute 64
 transmitted to remote system 126
FORMLEN parameter, equivalent job attribute 67
FORMS parameter 108
equivalent job attribute 65
FSSDATA=printer 109
INTRAY parameter
equivalent job attribute 66
MAILBCC parameter 110
equivalent job attribute 68
MAILCC parameter 110
equivalent job attribute 69
MAILFILE parameter 111
equivalent job attribute 70
MAILFROM parameter 112
equivalent job attribute 70
MAILTO parameter 112
equivalent job attribute 72
NAME parameter 126
equivalent job attribute 73
NOTIFY parameter 113
OFFSETXB parameter
equivalent job attribute 87
OFFSETXF parameter
equivalent job attribute 88
OFFSETYB parameter
equivalent job attribute 90
OFFSETYF parameter
equivalent job attribute 90
OUTBIN parameter
equivalent job attribute 73
OVERLAYB parameter
equivalent job attribute 74
OVERLAYF parameter
equivalent job attribute 75
PAGEDEF parameter
equivalent job attribute 76
 transmitted to remote system 126
parameters and equivalent job attributes 185
PORTNO parameter 113
PRMODE parameter
equivalent job attribute 83
 transmitted to remote system 126
PRATRNS parameter 102, 113
PRMPTON parameter 114
PRYQUEUE parameter 115
equivalent job attribute 79
PRY parameter, equivalent job attribute 68
REPLYTO parameter 115
equivalent job attribute 72
RETAI1 parameter 116
RETAIINS parameter 117
RETRY parameter 118
RETRYT parameter 118
ROOM parameter 126
equivalent job attribute 82
specifying parameters on 102

OUTPUT JCL statement (continued)
ADDRESS parameter 126
equivalent job attribute 56
AFPPARMS parameter 56
AFSTATS parameter 82
BUILDING parameter 126
equivalent job attribute 56
CHARS parameter
equivalent job attribute 58
 transmitted to remote system 126
CLASS parameter 103
COPIES parameter 104
equivalent job attribute 58
DATAACK parameter
equivalent job attribute 79
 transmitted to remote system 126
DEPT parameter 126

OUTPUT JCL statement (continued)
  TITLE parameter 119, 126
    equivalent job attribute 86
  TRC parameter
    equivalent job attribute 85
    transmitted to remote system 126
  UCS parameter
    transmitted to remote system 126
  USERLIB parameter
    equivalent job attribute 81
    validation 183
Output Text Format (OTF) data format, SAP 60
output-bin attribute 73
output-bin-number attribute 74
output-format 88
overlay
  back of page 74
  front of page 75
overlay-back attribute 74
overlay-front attribute 75
OVERLAYB parameter (JCL)
  equivalent job attribute 74
OVERLAYF parameter (JCL)
  equivalent job attribute 75
overview of Infoprint Server components 1
  AFP Printer Driver for Windows 6
  AFP Viewer plug-in for Windows 7
  Infoprint Central 23
  Infoprint Port Monitor for Windows 6
  IP PrintWay 16
  NetSpool 14
  Print Interface 7
  Printer Inventory 3
  Printer Inventory Manager 3
  Transform Interface 21
  transforms 22
  Windows client 6
owner attribute 75

P
page definition 76
page formatting
  NetSpool 153
page-definition attribute 76
PAGEDEF parameter (JCL)
  equivalent job attribute 76
  transmitted to remote system 126
parameters
  AOPPRINT JCL statement 138
  DD JCL statement 102
  equivalent job attributes 185
  OUTPUT JCL statement 102
partitioned data set, printing
  lp command 34
PCL (Printer Control Language) data format
  definition 60
PDF (Portable Document Format) data format
  definition 60
pdf-encryption-level 76
pdf-owner-identifier 76
pdf-protect 77
pdf-user-identifier 78
Port Monitor
  compared to other Windows printing protocols 158
  description 157
  downloading V3.1 159
  Port Monitor (continued)
    installing 159
    port number
      specifying in JCL 92
    portability
      cancel command 31
      lp command 41
      lpstat command 46
Portable Document Format (PDF) data format
  definition 60
PORTNO parameter (JCL) 113
POSIX standard, extensions to
  cancel command 31
  lp command 41
  lpstat command 46
PostScript data format
  definition 60
Print Interface subsystem
  comparison with AOPBATCH 96
  comparison with AOPPRINT 96
  comparison with resubmit for filtering 96
  description 96
  JCL example 134, 135, 136
  JCL parameters 121
  limitations 98
  SUBSYS parameter 121
  using to transform data 97
Print Interface, overview 7
print queue
  example of specifying in JCL 127
  specifying in JCL 92, 113, 115
  specifying with job attribute 79
print-error-reporting attribute 78
print-queue-name attribute 79
Printer Control Language (PCL) data format
  definition 60
printer definition
  example of specifying in JCL 127
  specifying in JCL 91
PRINTER environment variable 41, 44
Printer Inventory
  overview 3
Printer Inventory Manager
  overview 3
PRINTER parameter, AOPPRINT JCL procedure 139
printer types
  job attributes valid for 183
  printer-ip-address attribute 79
printers
  attributes 183
  default 32
  defining
    as Internet printers 162
    as network printers 162
  defining to Windows
    as local printers 160
  displaying names and locations
    from z/OS UNIX System Services 42
    lpstat command 42
  not defined by administrator 36
  querying
    from AIX 171
    from remote systems 171
    from z/OS UNIX System Services 42
    lpq command 171
    lpstat command 42
    qstat command 171

Index 219
printers (continued)
sharing
  difference between SNA network printers and NetSpool 152
  SNA network differences from NetSpool 151
printers, AFP
  configuring on Windows 163
  JCL parameters used by 126
  submitting jobs from Windows 164
printing
  AOPPRINT JCL procedure 137
  enq command 169
  from AIX 169, 171
  from IBM i 173
  from UNIX 177
  from VM 172
  from Windows 157, 165, 166, 177
  from z/OS 91, 137, 143
  from z/OS (remote system) 172
  from z/OS UNIX System Services 32
  lp command 32
  LPR command 169
  lprafp command 177
  OUTPUT and DD JCL statements 91
remotely
  Novell NetWare 175
  TCP/IP 169
remote systems
  querying jobs from 171
  queue, print
    example of specifying in JCL 127
    specifying in JCL 92, 113, 115
    specifying with job attribute 79
R
  RACF authorization for AFP user libraries 81
remote printers 36
remote printing
  Novell NetWare 175
  TCP/IP 169
remote systems
  querying jobs and printers from 171
remotexf command
  description 47
  environment variables 50
  examples 49
  exit values 51
  files 51
  format 47
  operand 49
  options 48
REPLYTO parameter (JCL) 115
  equivalent job attribute 72
  request unit (RU) 152
  requesting in JCL 113
  requesting on lp command 34
  resource-directories attribute 80
  resource-library attribute 80
  resources, AFP 126
  restrict-printable-area attribute 81
restrictions
  NetSpool 151
  SCS data stream 151
  VTAM data streams 151
resubmit for filtering considerations 93, 107, 113, 114, 115
resubmit for filtering, used to transform data 101
RETAINF parameter (JCL) 116
  description 116
  example 130
RETAINS parameter (JCL) 117
RETAINS parameter (JCL) statement
  description 117
  example 130
retransmission
  example of specifying in JCL 130
  specifying in JCL 116
retry parameters
  example of specifying in JCL 129
  specifying in JCL 118
RETRYL parameter (JCL) 118
  description 118
  example 129
RETRYT parameter (JCL) 118
  description 118
  example 129
return codes
  AOPPRINT JCL procedure 142
  cancel command 31

Q
qstat command 171
querying jobs
  from AIX 171
  from remote systems 171
  from z/OS UNIX System Services 42
  lpq command 171
  lpstat command 42
  qstat command 171

220 z/OS V2R2 Infoprint Server User’s Guide
Index  221

S

SA (Set Attribute) order 150
SAP ABAP (Advanced Business Application Programming) data format 60
SAP OTF (Output Text Format) data format 60
SAP R/3 printing overview 11, 12
save-afp-statistics attribute 82
SCS (SNA Character Stream) APIPPTD1 exit 150
APIPPTD2 exit 150
Beginning of File exit 150
DBCS support 150
FM header 151
restrictions 151
Set Attribute control 150
SHF command 153
Shift In control 150
Shift Out control 150
SVF command 153
transparent data 150
Transparent Data Control exit 150
TRN (Transparent) control 150
SCS data stream support in NetSpool 15
sending comments to IBM xv
sense codes 187
sequential data set, printing
lp command 34
Server Message Block (SMB) protocol 158, 159
sessions, LU supported 149
Set Attribute (SA) order 150
Set Attribute control 150
Set Horizontal Format (SHF) command 153
Set Vertical Format (SVF) command 153
SFE (Start Field Extended order 150
shared network printers defining 162
SHF (Set Horizontal Format) command 153
Shift In control 3270 data stream 150
line data 82
SCS data stream 150
Shift Out control 3270 data stream 150
line data 82
SCS data stream 150
shift-out-shift-in attribute 82
shortcut keys 203
sides to print on 61
simple-text data format 60
SMB (Server Message Block) protocol 158, 159
SNA (Systems Network Architecture) (continued)
chain 152
data set boundaries 152
end-of-file 152
network printers differences from NetSpool 151
SNA Character Stream (SCS) 150
SNA sense codes 187
specifying job attributes using PRTATTRS 102
standard input, printing from
lp command 34
Start Field Extended (SFE) order 150
states, job 42
STDENV DD name 144
STDERR DD name 144
STDERR DD statement 139
STDOUT DD name 144
STDOUT DD statement 139
STDOUT DD name 144
STDOUT DD statement 139
STRRMTWTR command 173
SUBSYS parameter (JCL) 121
subsystem, Print Interface comparison with AOPBATCH 96
comparison with AOPPRINT 96
comparison with resubmit for filtering 96
description 96
JCL example 134, 135, 136
JCL parameters 121
limitations 98
SUBSYS parameter 121
using to transform data 97
SVF (Set Vertical Format) command 153
syntax cancel command 30
lp command 32
lpstat command 42
remotexf command 47
SYSIN DD statement 139
sysout (system output data set) error messages 139, 144
informational messages 139, 144
SYSOUT parameter (JCL) 119
sysout-dataset-name attribute 83
sysout-job-id attribute 83
sysout-job-name attribute 84
system flow diagram 8

T

table-reference-characters attribute 85
tabs, specifying
NetSpool 153, 154
tcp/ip printing commands, using 169
text data format, definition 60
timeout value on AIX, increasing 171
TITLE parameter (JCL) 119, 126
equivalent job attribute 86
title-text attribute 85
TM parameter (NetSpool) 153
top margin parameter (NetSpool) 153
trail-error-page 88
transform attributes 88
Transform Interface overview 21
transform-id 89
transform, passing options to 62
transforming data 47, 96
transforming files to and from AFP format 26
transforms
  overview 22
Transparent (TRN) control 150
Transparent Data Control exit 150
transparent data support
description 150
tray, input 65, 66
TRC parameter (JCL)
equivalent job attribute 85
  transmitted to remote system 126
TRN (Transparent) control 150
tumble duplex printing 61	
two-sided printing 61
types of LU sessions supported 14

U
UCS parameter (JCL)
  transmitted to remote system 126
uninstalling Infoprint Port Monitor for Windows 167
UNIX, printing from 177
URI (Uniform Resource Identifier)
of printer 162
URL (Uniform Resource Locator)
of printer 162
user interface
  ISPF 203
  TSO/E 203
USERLIB parameter (JCL)
equivalent job attribute 81

V
validating print requests 183
vertical tab parameter (NetSpool) 154
viewing
  messages in different languages 26
VM
  printing from 172
VT parameter (NetSpool) 154
VTAM (Virtual Telecommunications Access Method)
data streams supported 149
  LU sessions supported 149
  printing from 149

W
Windows
  defining z/OS printers
    as Internet printers 162
    as local printers 160
    as network printers 162
downloading files 159
installing print programs 158
printing from 157, 164, 165, 166, 177
selecting print programs 158
Windows client
  overview 6
  work-selection criteria
    specifying in JCL 91
Write Structured Fields (WSF) order 151
WSF (Write Structured Fields) order 151

X
X offset
  back of page 87
  front of page 87
x-image-shift-back attribute 87
x-image-shift-front attribute 87
xf-options 88

Y
Y offset
  back of page 89
  front of page 90
y-image-shift-back attribute 89
y-image-shift-front attribute 90

Z
z/OS
  printing from
    AOPPRINT JCL procedure 137
    OUTPUT and DD JCL statements 91
    remote system 172
to IP PrintWay printers 91
VTAM applications 149
z/OS data set
  concept 152
  end-of-file 152
z/OS printers
  defining
    as Internet printers 162
    as network printers 162
defining to Windows
    as local printers 160
z/OS UNIX System Services
canceling jobs from 30
displaying job status from 42
displaying printer information from 42
printing from 32
querying jobs and printers from 42
z/VM
  printing from 172