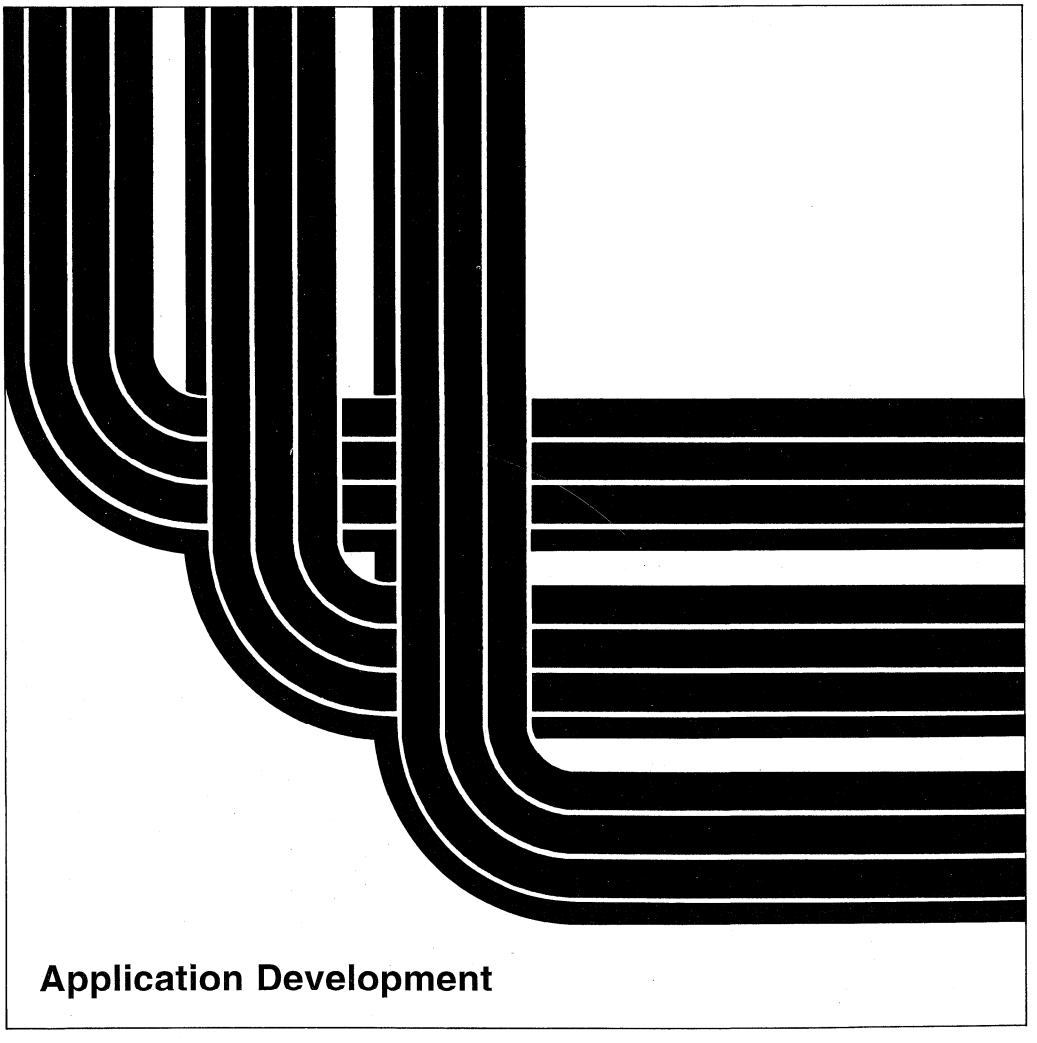
Application System/400

SC41-8194-02

Guide to Programming for Printing

Version 2



Application Development

Application System/400

SC41-8194-02

Guide to Programming for Printing

Version 2

Take Note!

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

Third Edition (November 1993)

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Refer to the "Summary of Changes" on page xi for a summary of changes made to the Operating System/400 program and how they are described in this publication.

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Programming Interface Information

This guide is intended to help you work with printing and spooling on the AS/400 system.

This guide documents General-Use Programming Interface and Associated Guidance Information provided by the OS/400 system program (5738-SS1).

General-Use programming interfaces allow the customer to write programs that obtain the services of the OS/400 system program.

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About This Guide

This guide provides information about printing on the AS/400 system.

This guide is intended for the application programmer and system programmer.

Some system operators could also find this manual helpful in understanding printer files and spooling support.

Attention

The commands, parameters, and displays shown in this guide reflect the assistance level of intermediate (*INTERMED).

The level of assistance (ASTLVL) is specified in the user profile. Following is a list of values for assistance levels:

*SYSVAL

*BASIC

*INTERMED

*ADVANCED

For more information about assistance levels, see the online help information

You should be familiar with the different types of printers your business uses. You should be familiar with job and queue management.

You may need to refer to other IBM manuals for more specific information about a particular topic. The *Publications Guide*, GC41-9678, provides information on all the manuals in the AS/400 library.

Summary of Changes

Advanced Function Printing (AFP) Using PSF/2

A new chapter (Chapter 9) provides configuration considerations and examples on doing advanced function printing using the Print Service Facility/2 program.

Working with the Host Print Transform Function

A new chapter (Chapter 12) explains what the host print transform function is and how to enable it with various ASCII emulators supported by the AS/400 system.

What Does a Font Look Like?

A new appendix (Appendix I) provides instructions and DDS source code to create a program that prints the image of an FGID, font character set, or coded font. The program source code is available in C, COBOL, Pascal, and RPG.

Allow Direct Print Function

The allow direct print function, which provides the capability of sharing a printer between the printer writer and direct print jobs, is described in Chapter 3.

Job and File Separators

Job and file separators can now be specified on the printer device description. This new function is discussed in Chapter 3.

Printing and RJE

Chapter 15 contains new and changed information for printing using Remote Job Entry (RJE).

QWP4019 Program

Chapter 13 contains information on an IBM-supplied program called QWP4019. QWP4019, which works with printers configured as 3812 SCS or 5219 printers, allows you to set flags on and off in the printer device description. Setting these flags on enables printer functions not accessible through the Create Device Description (Printer) (CRTDEVPRT) or Change Device Description (Printer) (CHGDEVPRT) commands.

Miscellaneous Changes

Minor changes have been made throughout this guide to update information on printing and spool support.

Part 1. Introduction to Printing on the AS/400 System

Chapter 1. Understanding Printing Elements of the AS/400 System

How is printing done on this system?

Where did my printed output go?

How can I control where my printouts go?

How can I print something on a different printer?

To know the answer to these and other printing questions you need to:

- Understand the elements that make printing happen.
- Understand which elements have precedence over other elements. For example; your job description has precedence over your user profile in determining which printer your output will print on.

After reading through this chapter and the examples in Appendix A, "Examples of Working with Printing Elements," you will be familiar with the elements that make printing happen and you will be able to:

- Display your user profile.
- Change your user profile.
- Create an output queue.
- Move spooled files from one output queue to a different output queue.
- Start printers printing.
- Stop printers from printing.
- Assign a printer to print spooled files from an output queue that it is currently not assigned to.

Note to Readers

There are examples in Appendix A, "Examples of Working with Printing Elements" on page A-1 of this guide that show you how the printing elements work together to enable you to manage your printing work.

Learning about Printing Elements and Terminology

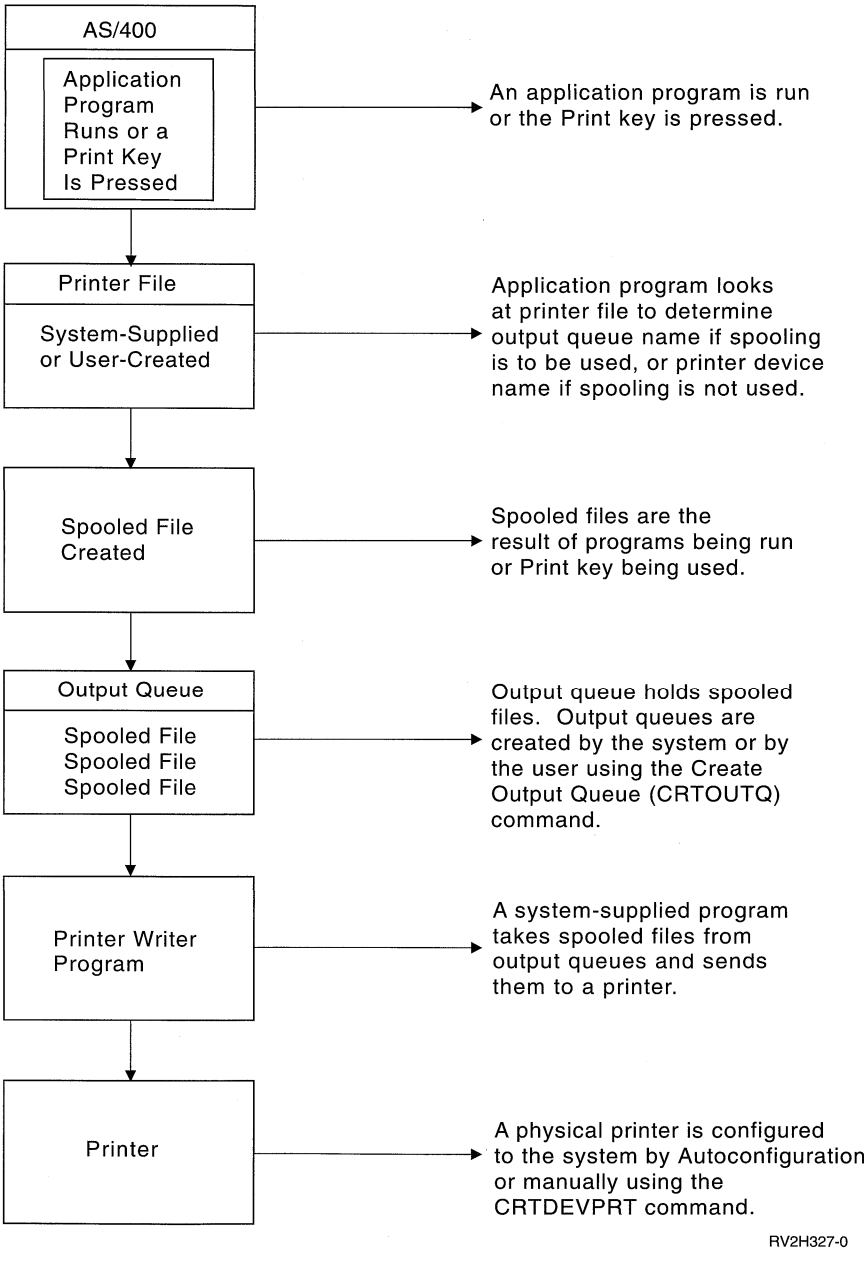
Many elements within the AS/400 system contribute to creating and handling data that you want printed. To understand those elements, you should become familiar with the terminology that describes them.

Read through the following list to familiarize yourself with the elements, but do not worry about trying to memorize each definition. A thorough explanation of the elements and how they interact with each other will follow.

Printing Elements	Element Definition
Spooled File	A file that holds output data waiting to be printed. A spooled file is usually the result of a system program, an application program being run, or the Print key being pressed.
Output Queue	An object that contains a list of spooled files to be printed. Output queues can receive spooled files from more than one application program and more than one user.
Printer Writer	A function of the operating system that writes (sends) the spooled file from an output queue to a printer. In most cases the application program sends the spooled file to an output queue first. Then the printer writer program sends it to a printer.
Print Devices	The physical printers that can be attached to the AS/400 system. Print devices (printers) should not be confused with the printer writer program or printer files.
Printer Files	Files that describe how the system is to operate on data as it passes between a program and a printer. A printer file has many parameters. The spooling parameter (SPOOL) determines if your output goes to an output queue or directly to a printer. The device (DEV) parameter is the name of the printer your output is printed on. The output queue (OUTQ) parameter is the name of the output queue your spooled files are sent to.
Job Description	A system object that defines how a job is to be processed. A job description has many parameters. Printer device (PRTDEV) and output queue (OUTQ) are the two parameters that help determine where your output will go.
Workstation Description	Information collected from the device description for the display. Two of the device description parameters, printer device (PRTDEV) and output queue (OUTQ), help determine where your output will go. Go to "Understanding the Workstation Description" on page 1-20 for more information about the workstation description.
User Profile	An object with a unique name that contains the user's password, the list of special authorities assigned to a user, and the objects the user owns. A user profile has many parameters. Printer device (PRTDEV) and output queue (OUTQ) are the two parameters that help determine where your output will go.
System Values	Values that control information for the operation of certain parts of the system. Users can change system values to redefine their working environment. The system value most important to printing is the default system printer.
Messages	Responses from the system to a user of that system. When printing operations are started, the system often asks the user to respond to a forms alignment message. Also, an application program could send a message asking the user to perform a variety of checks before printing starts. It is important to remember to respond to messages when requesting printing. Failure to respond to messages can prevent a printer from printing.

Learning How Printing Is Done on the AS/400 System

The diagram below illustrates many of the elements that control how printing work originates and flows through the system to a printer. Study the diagram to become familiar with the elements. Information on the following pages provides more detail and explains the relationships between the elements.



As the diagram illustrates, there are many elements (such as printer files and output queues) and many actions (creating spooled files, starting printer writer programs) involved in processing your printing requests.

The remainder of the chapter explains the elements and the processes that combine to produce printed output.

Learning Where Printed Output Goes

The next three topics in this chapter discuss **printer files, spooled files**, and **output queues**.

Generally, when the user initiates a print request or runs a program, a printer file is accessed, a spooled file is generated, and that spooled file is sent to an output queue. The next three topics discuss the relationship between printer files, spooled files, and output queues.

Learning about Printer Files

Note: The information in this chapter on printer files is quite brief and intended only to introduce the printer file concept to you. For more detailed information on printer file support, go to Chapter 2, "Printer File Support" on page 2-1.

Printers attached to the AS/400 system are supported by the operating system through **printer files**. Printer files describe how the system is to operate on the data as it passes between your application program and a printer.

Every request for printing is handled by a printer file. You can create your own printer files using the Create Printer File (CRTPRTF) command or you can use system-provided printer files. For example, when the Print key is pressed, a system-provided printer file is used.

Note: There is one exception to this. It applies only to the Print key, and only when the display station is attached to a remote work station controller. In this situation, the printed version of the screen is sent directly to the printer named in the device description for that display station. This is handled by the remote work station controller, not by the AS/400 system.

Printer files contain many parameters that tell the system how the output should be formatted, what font to use for the printed output, whether to print on both sides of the page, and more. The parameters that control how your output is handled and where it goes are:

1. Spool the data (SPOOL)
2. Device (DEV)
3. Spooled output queue (OUTQ)

The following page shows the default printer file, QSYSPRT, with the SPOOL, DEV, and OUTQ parameters identified.

```
  Processor . . . . . : IBM AS/400 Display File Description Processor
File . : PJL          Library . : LAWSON       Type of file . : Printer  Auxiliary Storage Pool ID . : 01
                                  Device File Attributes
  Externally described file . . . . . :           No
  File level identifier . . . . . :           0920325141052
  Creation date . . . . . :           03/25/92
  Text 'description'  . . . . . : TEXT
*******************************************************************************
1   Spool the data  . . . . . : SPOOL      *YES
*******************************************************************************
  Maximum devices . . . . . :             1
  User specified DBCS data  . . . . . : IGCDTA     *NO
  Maximum file wait time  . . . . . : WAITFILE   *IMMED
  Share open data path  . . . . . : SHARE      *NO
  Record format level check . . . . . : LVLCHK     *NO
  Number of record formats  . . . . . :               1
  User buffer length  . . . . . :               0
  Number of devices . . . . . :             1
  Separate indicator area . . . . . : INDARA     No
Printer Attributes
*******************************************************************************
2   Device  . . . . . : DEV        *JOB
*******************************************************************************
  Printer device type . . . . . : DEVTYPE    *AFPDS
  Page size                       PAGESIZE
    Length  . . . . . :           66
    Width . . . . . :           132
    Measurement Method  . . . . . :           *ROWCOL
  Lines per inch  . . . . . : LPI        6
  Characters per inch . . . . . : CPI        10
  Front margin  . . . . . : FRONTMGN   *DEVD
  Back margin . . . . . : BACKMGN    *FRONTMGN
  Overflow line number  . . . . . : OVRFLW      60
  Fold records  . . . . . : FOLD       *NO
  Degree of page rotation . . . . . : PAGRTT     *AUTO
  Hardware justification  . . . . . : JUSTIFY      0
  Print on both sides . . . . . : DUPLEX     *NO
  Defer Write . . . . . : DFRWRT     *YES
  Unprintable character action    RPLUNPRT
    Replace character . . . . . :           *YES
    Replacement character . . . . . :           ' '   X'40'
  Print text  . . . . . : PRTTXT     *JOB
  Align page  . . . . . : ALIGN      *NO
  Control character . . . . . : CTLCHAR    *NONE
  Channel values  . . . . . : CHLVAL     *NORMAL
  Fidelity . . . . . : FIDELITY   *CONTENT
                                  Device File Attributes
  Printer quality . . . . . : PRTQLTY    *STD
  Form feed . . . . . : FORMFEED   *DEVD
  Source drawer . . . . . : DRAWER     1
  Font                            FONT
    Identifier  . . . . . :           *CPI
    Point size  . . . . . :           *NONE
  Character identifier  . . . . . : CHRID      *DEVD
  Font character set  . . . . . : FNTCHRSET  *FONT
  Coded font . . . . . : CDEFNT     *FNTCHRSET
  Form type . . . . . : FORMTYPE   *STD
  Pages per side  . . . . . : MULTIUP    1
  Unit of measure . . . . . : UOM        *INCH
  Front side overlay  . . . . . : FRONTOVL   *NONE
  Back side overlay . . . . . : BACKOVL    *FRONTOVL
  DBCS extension characters . . . . . : IGCEXNCHR  *YES
  DBCS character rotation . . . . . : IGCCHRRTT  *NO
  DBCS characters per inch  . . . . . : IGCCPI     *CPI
  DBCS SO/SI spacing  . . . . . : IGCSOSI    *YES
  DBCS Coded font . . . . . : IGCCDEFNT  *SYSVAL
                                  Spooling Description
*******************************************************************************
3   Spooled output queue  . . .     : OUTQ       *JOB
*******************************************************************************
  Max spooled output records  . . . . . : MAXRCDS       100000
  Spooled output schedule . . . . . : SCHEDULE   *FILEEND
  Copies  . . . . . : COPIES       1
  Page range to print             PAGERANGE
    Starting page . . . . . :                       1
    Ending page . . . . . :           *END
  File separators . . . . . : FILESEP      0
  Hold spooled file . . . . . : HOLD       *NO
  Save spooled file . . . . . : SAVE       *NO
  Output priority (on OUTQ) . . . . . : OUTPTY     *JOB
  User data . . . . . : USRDTA     *SOURCE
  Maximum file wait time. . . . . :           *IMMED
  Share open data path. . . . . :           *NO
  Record format level check . . . . . :           *YES
  Authority . . . . . :           *LIBCRTAUT
  Replace file. . . . . :           *YES
```

SPOOL Parameter = *YES

*YES is the default value for the SPOOL parameter.

When the SPOOL parameter is set to *YES, the output from an application program (a spooled file) is sent to an output queue (OUTQ). When SPOOL = *YES, the system looks at the OUTQ parameter in the printer file to find out which output queue (OUTQ) to send the spooled file to. For example, the OUTQ value in your printer file could be OUTQ1.

However, in the default printer file, QSYSPRT, the value specified is *JOB. This means that the QSYSPRT printer file tells the system to look at your **job description** to determine the name of the output queue (OUTQ). For more information about the job description, see "Understanding the Job Description" on page 1-16.

SPOOL Parameter = *NO

When the SPOOL parameter is set to *NO, the output from an application program is sent directly to a printer. When SPOOL = *NO, the system looks at the DEV parameter in the printer file to find out which printer to send the output to. For example, the DEV value in your printer file could be PRT01.

However, in the default printer file, QSYSPRT, the value specified is *JOB. This means that the QSYSPRT printer file tells the system to look at your **job description** to determine the name of the printer device (DEV). For more information about the job description, see "Understanding the Job Description" on page 1-16.

Device (DEV) Parameter

The device parameter indicates the name of a printer device description. If SPOOL = *NO is specified, the device parameter identifies the printer device used to produce the printed output. If SPOOL = *YES is specified, the device (DEV) parameter is ignored unless *DEVD is specified for the output queue parameter. In that case, the default output queue for the specified printer is used for the spooled files. For more information about output queues, see "Learning about Output Queues (CRTOUTQ)" on page 1-9.

Output Queue (OUTQ) Parameter

The output queue parameter indicates which output queue your spooled files are sent to. For example, if you have a program that creates large print jobs you might consider sending them to an output queue that will hold those spooled files until most of your printer work for the day is done. Doing this can help users who have lots of small jobs get their jobs printed in a reasonable amount of time. For more information about output queues, see "Learning about Output Queues (CRTOUTQ)" on page 1-9.

Learning about Spooling and Spooled Files

Note: The information in this chapter on spooling is quite brief and intended only to introduce the spooling concept to you. A more detailed explanation of spool support is provided in Chapter 3, "Spool Support."

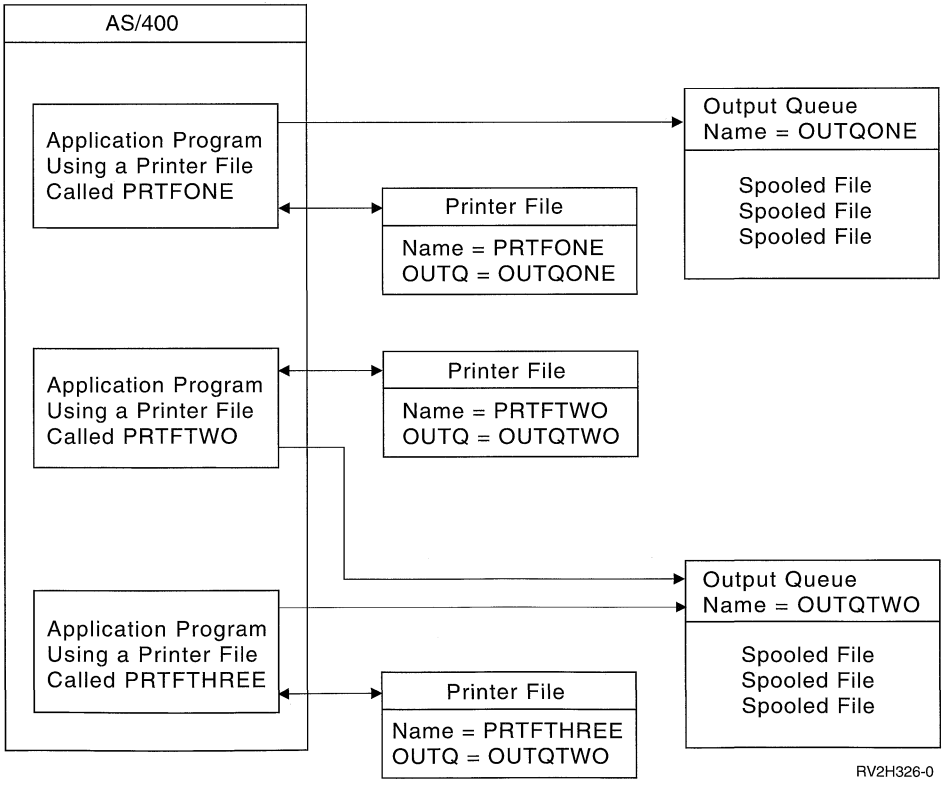
Spooling is a system function that saves data in a database file for later processing or printing. This data, which is saved and eventually printed, is called a ***spooled file***.

When spooling is used, files (called spooled files) are created from the application program, a system program, or the pressing of the Print key. These files are put on disk in places called ***output queues***.

The diagram below shows an AS/400 system with three application programs. When these application programs are run, they take information from a ***printer file***.

Information in the printer file determines if the output should be spooled, and which output queue the spooled file is sent to.

A key concept to remember is that you can create and use multiple printer files and multiple output queues to accomplish your printing needs. Also, two different application programs can send spooled files to the same output queue. This is shown in the bottom portion of the diagram.



Spooling and Application Programs

Almost all application programs that generate printed output make use of the spooling support provided with the AS/400 system. Whether spooling support is requested is determined by specifying SPOOL = *YES or SPOOL = *NO on the SPOOL parameter of a printer file.

By creating and using your own printer file instead of using a system-supplied printer file, you can specify the printing control instructions that your application program receives.

You can use the Create Printer File (CRTPRTF) command to create your own printer file.

For more detailed information and examples about printer files, see Chapter 2, "Printer File Support."

Spooling and the Print Key

Using the Print key to capture an image of a screen almost always results in a spooled file being created (SPOOL = *YES must be specified in the printer file named in the workstation device description). Unless the value has been changed, the default value for the SPOOL attribute in the QSYSPRT printer file is *YES. When the Print key is pressed, the system looks at the OUTQ parameter in the QSYSPRT printer file to determine which output queue to send the spooled file to.

Why Use Spooling to Manage Your Printing Workload?

Spooling (SPOOL = *YES) has several advantages over direct output (SPOOL = *NO in the printer file):

- The user's display station remains available for work.
- Other users can request printing work without having to wait for the printer to become available.
- If special forms are required, you can have the spooled files sent to a special output queue and printed at a time when the printer is not busy.
- Since disk operations are much faster than printers, the system is used efficiently.

Learning about Output Queues (CRTOUTQ)

Output queues are objects, defined to the system, that provide a place for spooled files to wait until they are printed.

Output queues are created in two ways:

- By the user
- By the system

User-Created Output Queues

As a user, you can create an output queue by using the Create Output Queue (CRTOUTQ) command. You can create as many output queues as you want.

The following is an example of the display that appears when you type the CL command CRTOUTQ and press F4 (Prompt). A **prompt** is a reminder or a displayed request for information or user action. On the prompt display, you choose the name for the output queue you create. See the *Output queue* prompt on the display below, where xxxxxxxxx is the name you assign to the output queue. The output will be in the library identified by the library prompt.

```
                        Create Output Queue (CRTOUTQ)
 Type choices, press Enter.
Output queue  . . . . . .   xxxxxxxxx     Name
   Library  . . . . . . .     *CURLIB     Name, *CURLIB
 Order of files on queue  . . . .  *FIFO   *FIFO, *JOBNBR
 Text 'description' . . . . . .    *BLANK
                       Additional Parameters
 Display any file . . . . . .      *NO     *NO, *YES, *OWNER
 Job separators . . . . . .        0       0-9, *MSG
 Operator controlled  . . . . .    *YES    *YES, *NO
 Data Queue . . . . . .            NAME    NAME, *NONE
   Library  . . . . . . .                  NAME, *LIBL, *CURLIB
 Authority to check . . . . . .    *OWNER  *OWNER, *DTAAUT
 Authority  . . . . . . . . . .    *USE    Name, *USE, *ALL, *CHANGE. . .
```

System-Created Output Queues

When a printer is configured to the system, either manually or through automatic configuration, the system creates an output queue for that printer.

System-created output queues are commonly called device output queues and have the same name as the printer device.

For example: when you configure a printer using the Create Device Description (Printer) (CRTDEVPRT) command, if you assign the printer name PRT01 in the DEVD parameter, the system creates an output queue named PRT01.

How to Determine Your Output Queue

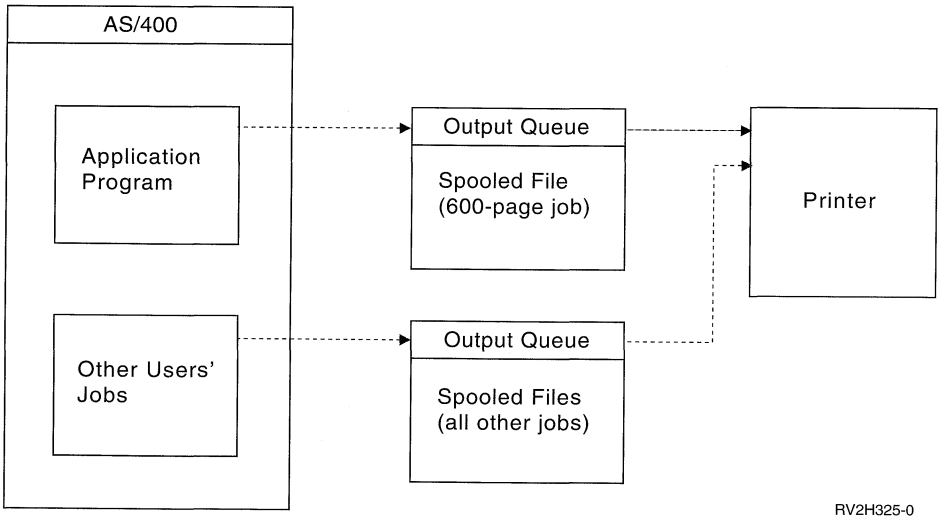
If none of the IBM-supplied default values for the system have been changed, you can identify your output queue by displaying the system value QPRTDEV. Your output queue has the same name as the value shown for the system printer.

Why Use Multiple Output Queues?

Spooled files are created when application programs are run. If you do not want the spooled files to print right away, you can have them sent to an output queue that currently does not have a printer assigned to it.

For example: let us assume that you have only one printer available. One of your application programs creates a job that has 600 pages of printed output. Since all users are using the same printer, you do not want to print the 600-page job until everyone has finished working for the day.

One solution is to create two separate output queues. One output queue receives the spooled files from the application program that creates the 600 pages of printed output. The other output queue receives the spooled files from the jobs run by other users, as shown in the diagram below.



The program that creates the 600-page job sends the spooled file to a specific output queue. That output queue does not have a printer assigned to it. Therefore, the 600-page spooled file has to wait until a printer is assigned; meanwhile, the spooled files that are in the other output queue can be printed.

Controlling Print Activity

In the first part of this chapter you read about **spooled files** and **output queues**. These elements are identified by 1 in the diagram below.

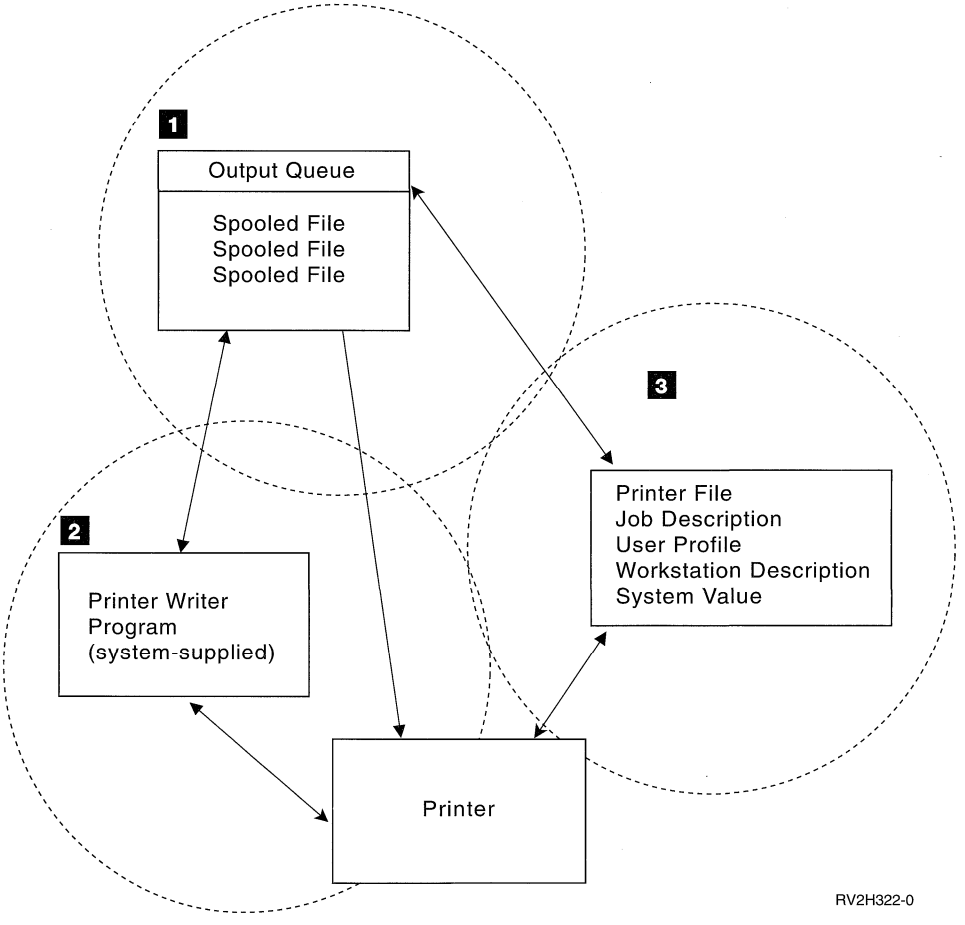
The remainder of this chapter discusses the elements that control or direct the printing activity.

- The printer writer program.

  This element is identified by 2 in the diagram below.

- Printer files, job descriptions, user profiles, workstation descriptions, and system values.

  These elements are identified by 3 in the diagram below.



This diagram is designed to show you, by use of the joined circles, that the elements that control printing are interrelated; to produce printed output, the attributes that are common to all the elements must be correctly matched.

These important attributes, common to the elements that control printing, are:

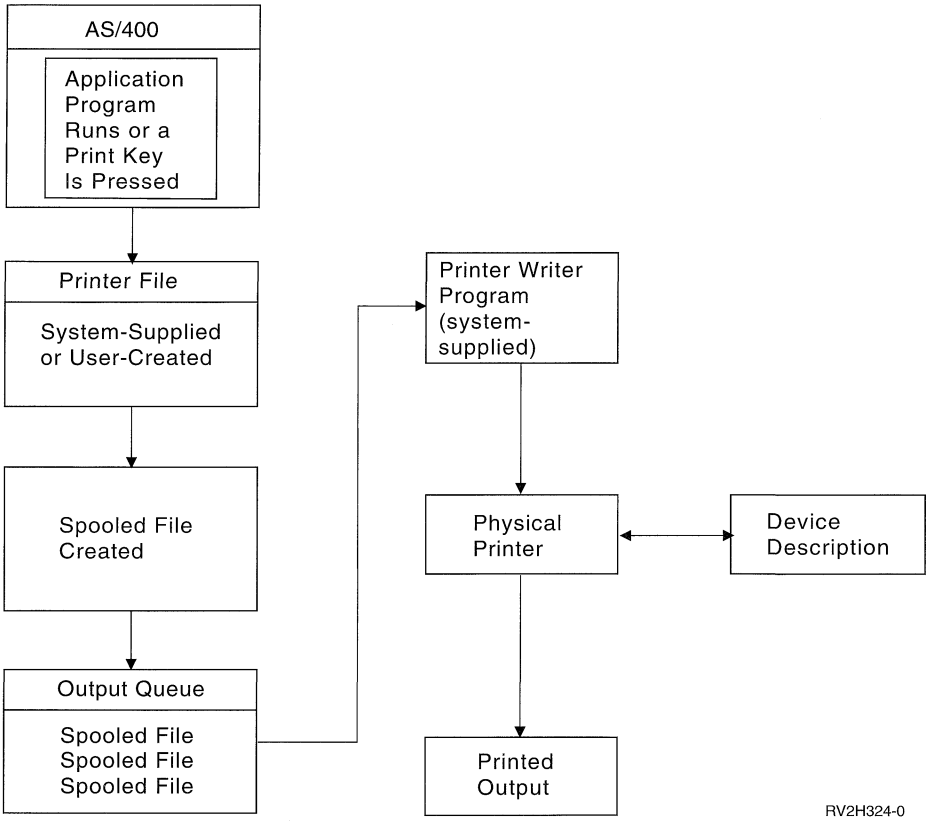
- Output queues
- Printer devices

Learning about the Printer Writer Program

The printer writer program is a system-supplied program that enables the user to work with the printers attached to the AS/400 system.

Note: Do not confuse the printer writer program with an actual printer device or a printer file. The printer device is a physical printer and the printer writer is the program that allows you to assign an actual printer device to an output queue and select spooled files from the output queue to be printed.

The diagram below illustrates how the **printer writer program** interacts with the output queue and the physical printer to take spooled files from an output queue and send them to a printer.



Printer device descriptions have to be created for each printer attached to the system. If you use automatic configuration, this is done for you by the system, with the exception of printers attached to an ASCII work station controller. Or you can use the Create Device Description (Printer) (CRTDEVPRT) command to assign a name to each printer.

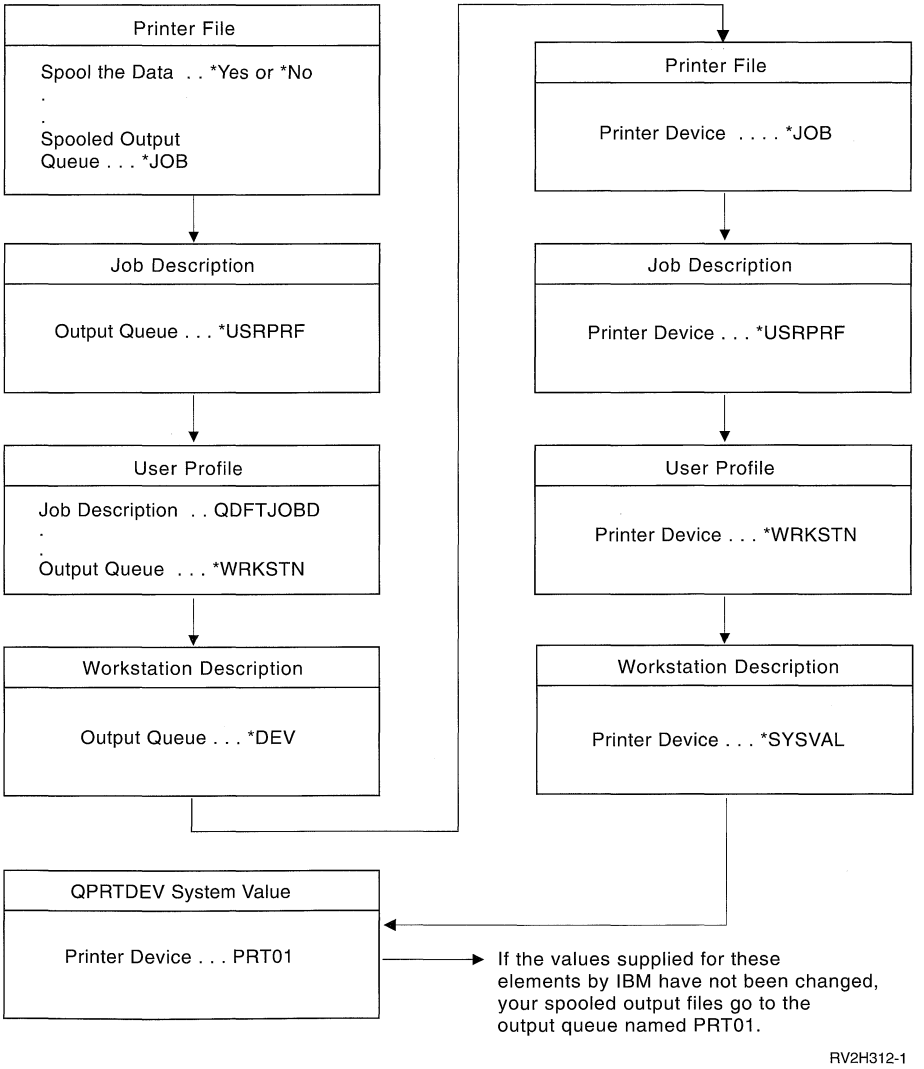
The Start Printer Writer (STRPRTWTR) command and the Work with Writers (WRKWTR) command provide you with the ability to assign any configured printer to any output queue.

Notes:

1. Even though the name of the command (Work with Writers) indicates you are working with printer writers, you are actually using the printer writer program to make a match between an output queue and a physical printer.
2. If your printer stops for any reason (out of paper, for example), the AS/400 system does not automatically assign a different printer to continue printing the jobs in the output queue that your printer was assigned to. You have to manually assign another printer to that output queue.

Understanding the Hierarchy of the Printing Elements

The elements that control printing have a defined hierarchy. The following diagram shows that hierarchy. The system looks first for the output queue and print device in the printer file. In the diagram you can see that the system looks at these elements in this order: printer file, job description, user profile, workstation description, and system values.



Note: If the printer identified in the system value does not exist on your AS/400 system, the output goes to output queue QPRINT.

Understanding Printer Files

Notes:

1. The information in this chapter on printer files is quite brief and intended only to introduce the printer file concept to you. For more detailed information on printer file support go to Chapter 2, "Printer File Support" on page 2-1.
2. Also, for this discussion, assume that the printer file parameter SPOOL is set to *YES. This means that spooled files will be sent to an output queue (OUTQ).

As you learned earlier in this chapter, printer files contain many parameters that describe how the system is to operate on the data as it passes between your application program and the printer. One of these parameters, the output queue (OUTQ) parameter, tells the system which output queue to send your spooled files to.

On the following page is a diagram of the system-supplied printer file called QSYSPRT. Locate the spooled output queue parameter (**1**) on that diagram.

You might expect that the location of your printed output can be determined by knowing the name of the spooled output queue specified in your printer file. However, in the default printer file QSYSPRT, the value specified is *JOB.

This means that the QSYSPRT printer file tells the system to look in your ***job description*** to determine the name of the output queue (OUTQ).

Go to "Understanding the Job Description" on page 1-16.

```
  Processor . . . . . : IBM AS/400 Display File Description Processor
File . : PJL          Library . : LAWSON      Type of file . : Printer  Auxiliary Storage Pool ID . : 01
                                Device File Attributes
  Externally described file . . . . . :           No
  File level identifier . . . . . :           0920325141052
  Creation date . . . . . :           03/25/92
  Text 'description'  . . . . . : TEXT
  Spool the data  . . . . . : SPOOL      *YES
  Maximum devices . . . . . :             1
  User specified DBCS data  . . . . . : IGCDTA     *NO
  Maximum file wait time  . . . . . : WAITFILE   *IMMED
  Share open data path  . . . . . : SHARE      *NO
  Record format level check . . . . . : LVLCHK     *NO
  Number of record formats  . . . . . :               1
  User buffer length  . . . . . :               0
  Number of devices . . . . . :             1
  Separate indicator area . . . . . : INDARA     No
Printer Attributes
  Device  . . . . . : DEV        *JOB
  Printer device type . . . . . : DEVTYPE    *AFPDS
  Page size                       PAGESIZE
    Length  . . . . . :           66
    Width . . . . . :           132
    Measurement Method  . . . . . :           *ROWCOL
  Lines per inch  . . . . . : LPI        6
  Characters per inch . . . . . : CPI        10
  Front margin  . . . . . : FRONTMGN   *DEVD
  Back margin . . . . . : BACKMGN    *FRONTMGN
  Overflow line number  . . . . . : OVRFLW      60
  Fold records  . . . . . : FOLD       *NO
  Degree of page rotation . . . . . : PAGRTT     *AUTO
  Hardware justification  . . . . . : JUSTIFY      0
  Print on both sides . . . . . : DUPLEX     *NO
  Defer Write . . . . . : DFRWRT     *YES
  Unprintable character action    RPLUNPRT
    Replace character . . . . . :           *YES
    Replacement character . . . . . :           ' '   X'40'
  Print text  . . . . . : PRTTXT     *JOB
  Align page  . . . . . : ALIGN      *NO
  Control character . . . . . : CTLCHAR    *NONE
  Channel values  . . . . . : CHLVAL     *NORMAL
  Fidelity . . . . . : FIDELITY   *CONTENT
                                Device File Attributes
  Printer quality . . . . . : PRTQLTY    *STD
  Form feed . . . . . : FORMFEED   *DEVD
  Source drawer . . . . . : DRAWER     1
  Font                            FONT
    Identifier  . . . . . :           *CPI
    Point size  . . . . . :           *NONE
  Character identifier  . . . . . : CHRID      *DEVD
  Font character set  . . . . . : FNTCHRSET  *FONT
  Coded font . . . . . : CDEFNT     *FNTCHRSET
  Form type . . . . . : FORMTYPE   *STD
  Pages per side  . . . . . : MULTIUP    1
  Unit of measure . . . . . : UOM        *INCH
  Front side overlay  . . . . . : FRONTOVL   *NONE
  Back side overlay . . . . . : BACKOVL    *FRONTOVL
  DBCS extension characters . . . . . : IGCEXNCHR  *YES
  DBCS character rotation . . . . . : IGCCHRRTT  *NO
  DBCS characters per inch  . . . . . : IGCCPI     *CPI
  DBCS SO/SI spacing  . . . . . : IGCSOSI    *YES
  DBCS Coded font . . . . . : IGCCDEFNT  *SYSVAL
                                Spooling Description
*******************************************************************************
1   Spooled output queue  . . .     : OUTQ       *JOB
*******************************************************************************
  Max spooled output records  . . . . . : MAXRCDS        100000
  Spooled output schedule . . . . . : SCHEDULE   *FILEEND
  Copies  . . . . . : COPIES       1
  Page range to print             PAGERANGE
    Starting page . . . . . :                     1
    Ending page . . . . . :           *END
  File separators . . . . . : FILESEP      0
  Hold spooled file . . . . . : HOLD       *NO
  Save spooled file . . . . . : SAVE       *NO
  Output priority (on OUTQ) . . . . . : OUTPTY     *JOB
  User data . . . . . : USRDTA     *SOURCE
  Maximum file wait time. . . . . :           *IMMED
  Share open data path. . . . . :           *NO
  Record format level check . . . . . :           *YES
  Authority . . . . . :           *LIBCRTAUT
  Replace file. . . . . :           *YES
```

Understanding the Job Description

A job description is a set of characteristics that define how the system handles a job.

The IBM-supplied default job description is QDFTJOBD.

QDFTJOBD is shown in the diagram on the following page. To see the parameters of QDFTJOBD on your display, type DSPJOBD QDFTJOBD and press the Enter key.

Every time you sign on to the system a job is started for you. From a printing standpoint, the parameters (on the following page) labeled **1** Printer device and **2** Output queue are very important.

The printer device parameter determines which printer your output is printed on if you specified *NO as the value for the SPOOL parameter. However, in our example we have specified SPOOL = *YES.

The output queue parameter determines which output queue your spooled files are stored in before they are printed.

You might expect that the location of your printed output can be determined by knowing which output queue is specified in your job description. However, in the default job description, the value specified is *USRPRF.

This means that the job description tells the system to look at your ***user profile*** to determine what output queue (OUTQ) your spooled files should be sent to.

Go to "Understanding the User Profile" on page 1-18.

```
Job description . . . . . :   QDFTJOBD
Library  . . . . :   QGPL
User profile . . . . . :   *RQD
CL syntax check  . . . . . :   *NOCHK
Hold on job queue  . . . . . :   *NO
End severity . . . . . :   30
Job date . . . . . :   *SYSVAL
Job switches . . . . . :   00000000
Inquiry message reply  . . . . . :   *RQD
Job priority (on job queue)  . . . . . :   5
Job queue  . . . . . :   QBATCH
  Library  . . . . . :     QGPL
Output priority (on output queue). . . . . :   5
*****************************************************************
1  Printer device . . . . . :   *USRPRF
2  Output queue . . . . . :   *USRPRF
*****************************************************************
  Library  . . . . . :
Message logging
  Level  . . . . . :   4
  Severity . . . . . :   0
  Text . . . . . :   *NOLIST
Log CL program commands  . . . . . :   *NO
Accounting code  . . . . . :   *USRPRF
Print text . . . . . :   *SYSVAL
Routing data . . . . . :   QCMDI
Request data . . . . . :   *NONE
Device recovery action . . . . . :   *SYSVAL
Time slice end pool  . . . . . :   *SYSVAL
Text description . . . . . :   Default job description
Initial library list . . . . . :
  *SYSVAL
```

Understanding the User Profile

On the following page is an example of a **user profile** with the attribute values set to the system-supplied defaults.

To become a user of the system you must have a user profile. In most cases, someone having security officer authority adds new users to the system. A **user profile** is created for each new user added to the system. The user profile has three parameters (highlighted on the following page) that provide information to determine where the user's printed output will go.

1. Job Description
2. Output Queue
3. Printer Device

Job Description: In the example user profile, this parameter and its value of QDFTJOBD (item 1 in the following example) mean that when the user requests a printing job, the system scans the QDFTJOBD job description to determine which output queue (OUTQ) and printer device (PRTDEV or DEV) it should use. If the job description has the value of *USRPRF specified for these parameters, the system comes back to the user profile and continues to look for the printer and the output queue to use.

The system looks, in the user profile, at the parameters of output queue and printer device.

Output Queue: In the example user profile, you can see the output queue value (item 2) specified is *WRKSTN. This tells the system to use the value specified in the output queue (OUTQ) parameter of the ***workstation description*** as the output queue name.

Go to "Understanding the Workstation Description" on page 1-20.

```
Display User Profile - *BASIC
 User profile  . . . . . :     LAWSON
 Previous sign-on  . . . . . :     04/15/91  13:47:07
 Sign-on attempts not valid  . . . . . :     0
 Date password last changed  . . . . . :     04/09/91
 Password expiration interval  . . . . . :     *SYSVAL
   Date password expires . . . . . :     05/09/91
 Set password to expired . . . . . :     *NO
 User class  . . . . . :     *PGMR
 Special authority . . . . . :     *ALLOBJ
                                     *JOBCTL
                                     *SAVSYS
                                     *SECADM
                                     *SPLCTL
 Group profile . . . . . :     *NONE
 Owner . . . . . :     *USRPRF
 Group authority . . . . . :     *NONE
 Assistance level. . . . . :     *INTERMED
 Current library . . . . . :     *CRTDFT
 Initial menu  . . . . . :     MAIN
   Library . . . . . :       *LIBL
 Initial program . . . . . :     *NONE
   Library . . . . . :
 Limit capabilities  . . . . . :     *NO
 Text  . . . . . :
 pat lawson   534/030-2    3-6051
 Display sign-on information . . . . . :     *SYSVAL
 Limit device sessions . . . . . :     *SYSVAL
 Keyboard buffering. . . . . :     *SYSVAL
 Maximum storage allowed . . . . . :     *NOMAX
 Storage used  . . . . . :     519
 Highest scheduling priority . . . . . :     3
*******************************************************************************
 1 Job description . . . . . :     QDFTJOBD
*******************************************************************************
   Library . . . . . :     QGPL
 Accounting code . . . . . :
 Message queue . . . . . :     LAWSON
   Library . . . . . :     QUSRSYS
 Message queue delivery  . . . . . :     *NOTIFY
 Message queue severity  . . . . . :     0
*******************************************************************************
 2 Output queue  . . . . . :     *WRKSTN
   Library . . . . . :
*******************************************************************************
 3 Printer device  . . . . . :     *WRKSTN
*******************************************************************************
 Special Environment . . . . . :     *SYSVAL
 Attention program . . . . . :     *NONE
   Library . . . . . :
 User options  . . . . . :     *NONE
```

Understanding the Workstation Description

On the following page is an example of a **workstation description** with the values set to the system-supplied defaults.

Each user signs on to the system at a display station. Many display stations can be attached to an AS/400 system. Each display station that is attached to the system has a **workstation description**.

The workstation description, for a display station, is a collection of information that tells the system how the display station is to be used.

From a printing standpoint, the parameters labeled 1 Printer device and 2 Output queue are very important.

When you sign on to the system, if no defaults or system values have been changed, your output will be sent to the output queue and the printer device specified in the workstation description of the display station where you are signed on.

Note: Any batch job submitted from the interactive job would use the same printer device or output queue that is currently specified in the workstation description.

Output Queue: In the example workstation description, you can see the output queue value (item 2) specified is *DEV. This tells the system to use the value specified in the printer device parameter of the printer file as the output queue name.

In our example, the value in the DEV parameter of the printer file is *JOB, which tells the system to look at the PRTDEV parameter in the job description. The value in that parameter is *USRPRF, which tells the system to look at the PRTDEV parameter in the user profile. The value in that parameter is *WRKSTN, which tells the system to look at the PRTDEV parameter in the workstation description.

Printer Device: In the example workstation description, you can see the printer device value (item 1) specified is *SYSVAL. This tells the system to look at the system value QPRTDEV. This IBM-supplied system value has a printer assigned to it. For example: PRT01 could be the value assigned to the system value QPRTDEV.

To find out what printer is assigned to QPRTDEV, see "Understanding System Values" on page 1-22.

```
                          Display Device Description                MSP38360

 Device description . . . . . :   DSP10
 Option . . . . . :   *BASIC
 Category of device . . . . . :   *DSP
 Device class . . . . . :   *LCL

 Device type  . . . . . :   5291
 Device model . . . . . :   2
 Port number  . . . . . :   6
 Switch setting . . . . . :   6
 Online at IPL  . . . . . :   *YES
 Attached controller  . . . . . :   CTL02
 Keyboard language type . . . . . :   USB
 Character identifier . . . . . :   *KBDTYPE
 Allow blinking cursor  . . . . . :   *YES
********************************************************************************
 1  Printer device  . . . . . :     *SYSVAL
 2  Output queue  . . . . . :     *DEV
   Library . . . . . :
********************************************************************************
 Printer file . . . . . :   QSYSPRT
   Library  . . . . . :     *LIBL
 Text . . . . . :   CREATED BY AUTO-CONFIGURATION
```

Understanding System Values

System values are objects supplied by IBM and shipped with the system. System values control such things as system date, system time, system console (display station), system printer, and so on. The system value most important to printing is the system printer.

The name of the system value that specifies the name of the default system printer is **QPRTDEV**. The value supplied by IBM for the system value QPRTDEV is PRT01.

Displaying the QPRTDEV System Value: As a user of the system, you can display any of the IBM-supplied system values.

To display the QPRTDEV system value, type DSPSYSVAL QPRTDEV and press the Enter key. The following is displayed:

```
                          Display System Value

System value . . . . . :   QPRTDEV
Text . . . . . . . . . :   Printer device description

Printer device . . . . :   PRT01          Name
```

If the value supplied by IBM has not been changed, the name of the system printer is PRT01.

Where Did the Output Go?

Since the printer file in the example specified SPOOL = *YES, the application program sent a spooled file to an output queue. The system looked at the printing elements in the order shown in "Understanding the Hierarchy of the Printing Elements" on page 1-13. In this example, the spooled file was sent to the output queue with the same name as the system printer, PRT01.

How the Printing Elements Control Print Activity

This chapter has discussed the many elements that control where your requests for printed output go.

If you are a programmer or system operator, the flexibility of creating additional output queues can help you manage and balance your printing work load.

If you are the person responsible for adding new users to the system, much confusion and detailed explanations to those new users can be avoided by specifying the print device values you want in the user's ***user profile***.

Go to "Examples of Where Your Printing Would Go" on page 1-23 for some examples that show how the printing elements work with each other.

Examples of Where Your Printing Would Go

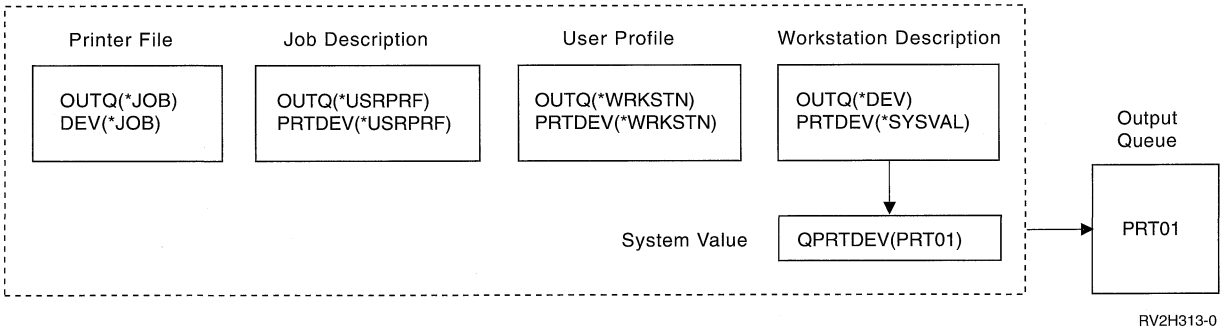
The following examples show where your printed output would go based on certain values being assigned to the various printing elements.

Example 1: Determine Your Output Queue

In the printer file, assume that:

- Output queue value is *JOB
- Printer device value is *JOB
- SPOOL = *YES

  Because SPOOL = *YES, the output must go to an output queue.



The system looks at the OUTQ parameter in the printer file for the output queue name. That value, *JOB, tells the system to look at the OUTQ parameter in the job description. In the job description, that value is *USRPRF. This tells the system to look at the OUTQ parameter in the user profile. In this example, that value is *WRKSTN. This tells the system to look at the OUTQ parameter in the workstation description. In the workstation description, the OUTQ parameter value is *DEV. This tells the system to look at the DEV parameter in the printer file.

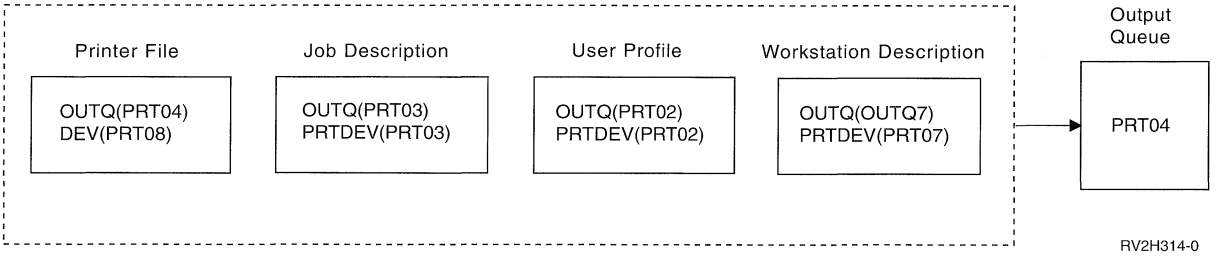
The value in the DEV parameter of the printer file is *JOB. That value tells the system to look at the PRTDEV parameter in the job description. In the job description, that value is *USRPRF. This tells the system to look at the PRTDEV parameter in the user profile. In this example, that value is *WRKSTN. This tells the system to look at the PRTDEV parameter in the workstation description. In the workstation description, the PRTDEV parameter value is *SYSVAL. This tells the system to look at the system value QPRTDEV and to use the output queue on the system that has the same name as the system printer named in the system value QPRTDEV. In this example, that is PRT01.

If no user has changed the IBM-supplied value for QPRTDEV, the printer device name is PRT01 and the output queue name is PRT01.

Example 2: Determine Your Output Queue

In the printer file, assume that:

- Output queue value is PRT04
- Printer device value is PRT08
- SPOOL = *YES

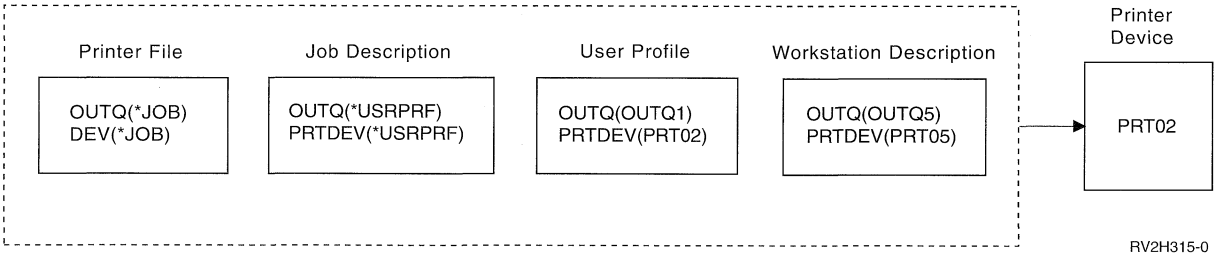


In this example, the output queue would be PRT04. This is because the system looked first into the printer file and found a value in the output queue parameter other than one that would point it to your job description (*JOB), your user profile (*USRPRF), or your workstation description (*WRKSTN).

Example 3: Determine Your Printer Name

In the printer file, assume that:

- Output queue value is *JOB
- Printer device value is *JOB
- SPOOL = *NO



In this example, your printer device would be PRT02. This is because the system looked first into the printer file and found the DEV parameter value to be *JOB.

In the job description, the PRTDEV parameter value is *USRPRF, which tells the system to look into the user profile.

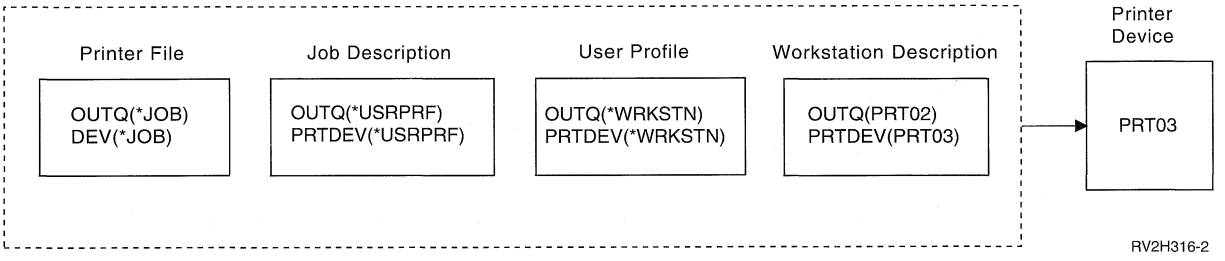
In the user profile, the PRTDEV parameter value is PRT02.

In this example, the printer file specified SPOOL = *NO. Your output would go directly to PRT02 for printing and no output queue would be used.

Example 4: Determine Your Printer Name

In the printer file, assume that:

- Output queue value is *JOB
- Printer device value is *JOB
- SPOOL = *NO.



In this example, your printer device name would be PRT03. This is because the system looked first into the printer file and found the DEV parameter value to be *JOB, which tells the system to look next in the job description, where the PRTDEV parameter value is *USRPRF.

This tells the system to look at the PRTDEV parameter value in the user profile. In this example, that value is *WRKSTN.

This tells the system to look at the PRTDEV parameter value in the workstation description. In this example, that value is PRT03.

In this example, the printer file specified SPOOL = *NO. Your output would go directly to PRT03 for printing and no output queue would be used.

REMEMBER

You must know the value (*YES or *NO) of the SPOOL parameter in the printer file to determine if your output goes to an output queue or to a printer. If SPOOL = *YES, a spooled file goes to an output queue. If SPOOL = *NO, the output goes directly to a printer.

Printing in a Batch Environment

When a user signs on to the AS/400 system, an output queue (OUTQ) and a printer device (PRTDEV) are established for that job.

The names for the output queue and printer device are resolved when the system searches through the user profile, job description, workstation description, and system values.

How Output is Routed in a Batch Job

A similar process occurs when batch jobs are started on the system, with two differences:

- The output queue and printer device values are passed to the batch job from the job that started it. This means that no resolution of the output queue and printer device needs to be done.

- The value *WRKSTN has no real meaning because batch jobs do not have an associated workstation. If *WRKSTN is encountered in the resolution of output queue and printer device, *WRKSTN is replaced with *DEV if output queue is being resolved and *SYSVAL if printer device is being resolved.

Following are examples that illustrate where output goes from a job that runs in batch.

Example 1

Assume:

- The user's output queue (OUTQ) is OUTQ1 and the printer device (PRTDEV) is PRT1.
- The Submit Job (SBMJOB) command is used to submit the job to batch.
- The output queue parameter on the SBMJOB command is specified as *CURRENT.
- The printer device parameter on the SBMJOB command is specified as *CURRENT.

When the job runs in batch, the resulting spooled file is sent to OUTQ1 and that spooled file prints on the printer assigned to OUTQ1.

If no spooling was used when printing, the output would go to printer device PRT1.

The reason OUTQ1 and PRT1 are used is that *CURRENT is the value passed to the batch job by the user.

Example 2

Assume:

- The user's output queue (OUTQ) is OUTQ1 and the printer device (PRTDEV) is PRT1.
- The Submit Job (SBMJOB) command is used to submit the job to batch.
- The output queue parameter on the SBMJOB command is specified as *USRPRF.
- The user profile has *WRKSTN as the value for the output queue parameter.
- The printer device parameter on the SBMJOB command is specified as PRT99.

When the job runs in batch, the resulting spooled file is sent to the output queue named PRT99 and the spooled file prints on PRT99. The *WRKSTN value for output queue is interpreted as *DEV and an output queue having the same name as the printer device is selected.

If no spooling was used when printing, the output would go to printer device PRT99.

Example 3

Assume:

- The user's output queue (OUTQ) is OUTQ1 and the printer device (PRTDEV) is PRT1.
- The Submit Job (SBMJOB) command is used to submit the job to batch.
- The output queue parameter on the SBMJOB command is specified as *USRPRF.
- The user profile has *WRKSTN as the value for the output queue parameter.
- The printer device parameter on the SBMJOB command is specified as *WRKSTN.

When the job runs in batch, the resulting spooled file is sent to the system printer. This is because the *WRKSTN value for output queue is interpreted as *DEV and the printer device value of *WRKSTN is interpreted as *SYSVAL.

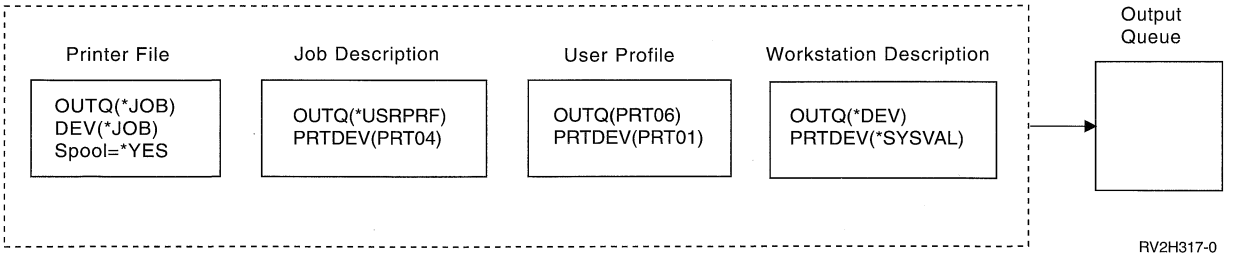
If no spooling was used when printing, the output would go to the printer defined as the system printer. This is the printer name assigned to the system value QPRTDEV.

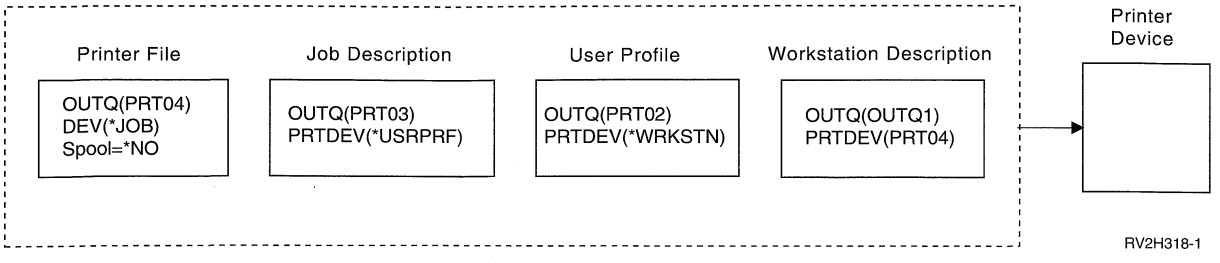
Self-Test on Determining Output Queue and Printer Device

Below are diagrams similar to the ones in the examples on the preceding pages. Read the information in the diagrams. Using the information you have acquired about the hierarchy of printing elements, determine what the output queue and printer device names would be.

Record the names of the output queue and the printer device in the empty blocks to the right of the diagram. The completed diagrams with the correct names for the output queues and printer devices are available on the next page.

Note: Keep in mind the SPOOL parameter value when deciding on your answer.

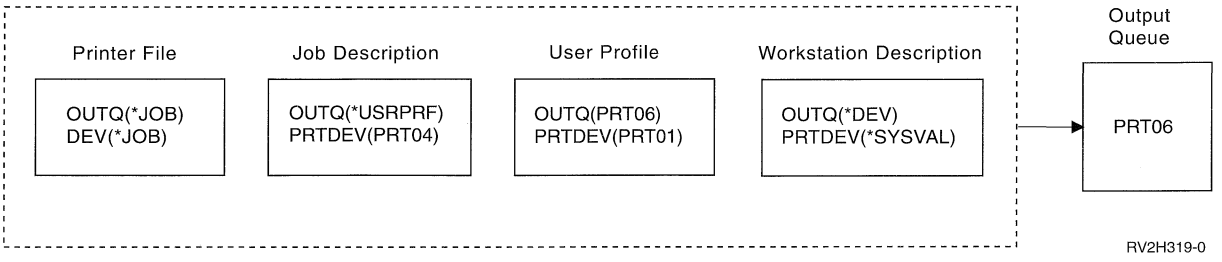




Self-Test Answers

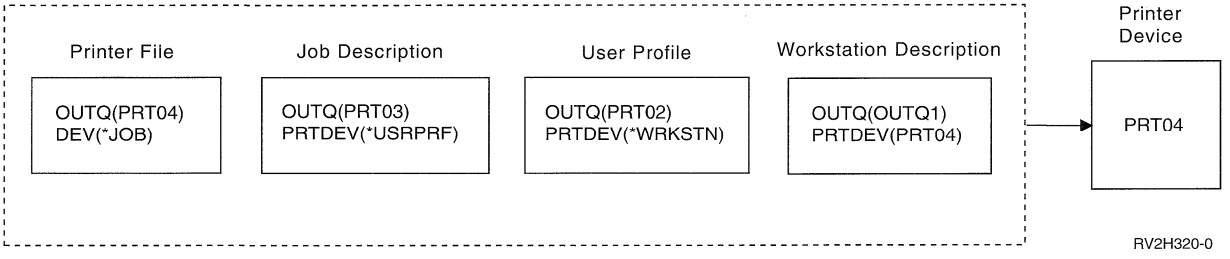
Below are the diagrams from the preceding page, with the correct output queue and printer device parameter values filled in.

For the first diagram, the output queue name is PRT06.



The system looked first at the printer file and found SPOOL = *YES. Next it looked at the output queue value in the printer file, which is *JOB. It then looked at the output queue value in the job description, which is *USRPRF. Finally, the system looked at the user profile and found the output queue value PRT06.

For the second diagram, the printer device value is PRT04.



Again, the system looked first at the printer file, but this time it found SPOOL = *NO. Next, it looked at the device value in the printer file, which is *JOB. It then looked at the device value in the job description, which is *USRPRF.

The user profile PRTDEV parameter has a value of *WRKSTN, which tells the system to look in the workstation description. Finally, it looked at the workstation description and found the PRTDEV parameter value of PRT04.

If you had difficulty identifying the correct output queue and printer device you should go to "Controlling Print Activity" on page 1-11 and read the information again on controlling printing activity.

Where to Find More Examples

If you would like to experiment with some printing element examples, you can find them in Appendix A, "Examples of Working with Printing Elements."

- Creating output queues
- Displaying and changing your user profile
- Displaying system values (QPRTDEV)
- Changing a printer file

- Displaying a printer file
- Using the printer writer program
  - Starting a printer
  - Assigning a printer to a particular output queue
  - Stopping a printer
- Working with spooled files
  - Moving spooled files from one output queue to a different output queue
  - Holding spooled files

Part 2. Printer File and Spooling Support

Chapter 2. Printer File Support

This chapter contains general-use programming interface and associated guidance information.

After reading this chapter you will:

- Understand what a printer file is.
- Understand how to create a printer file.
- Understand how to work with printer file overrides.
- Understand how to change printer files.
- Understand how a printer file interacts with an application program.

  An **application program** is used to perform a particular data processing task, such as inventory control, mailing labels, or payroll.

What is a Printer File?

Printer files describe how the system is to operate on data as it passes between your application program and a printer. The printer file to be used is specified in your application program.

Different Types of Printer Files

There are two different types of printer files:

- Program-described printer files

  Program-described printer files rely on the high-level language program to define records and fields to be printed.

- Externally described printer files

  Externally described printer files use data description specifications (DDS) rather than the high-level language to define records and fields to be printed. If you use DDS, you specify the name of your DDS source file in the SRCFILE parameter of the Create Printer File (CRTPRTF) command. DDS gives the application programmer much more control over how the printed output is formatted and printed.

What Parameters Make Up a Printer File?

Like other CL commands, the Create Printer File (CRTPRTF) command is made up of a group of parameters. These parameters, and the different values you can assign to each parameter, are designed to give you great flexibility in choosing how you want your printed output to look.

The following table provides a list of all the parameters of the CRTPRTF command. It also indicates if those parameters can be changed or temporarily overridden through the Override Printer File (OVRPRTF) command or through a program written in a high-level language (HLL) such as RPG, COBOL, PL/I, C, or BASIC.

Table 2-1 (Page 1 of 3). Printer Support Parameters

CL Parameter Name	Description	Specified on CRTPRTF and CHGPRTF Command	Specified on OVRPRTF Command	Specified in HLL Program
FILE	Printer file name	Qualified file name	*PRTF or file name	RPG/400, COBOL/400, PL/I, C/400*, and BASIC
TOFILE	Overriding file		*FILE or qualified name	
SRCFILE	Source file	*NONE or qualified name		
SRCMBR	Source member	*FILE or name		
GENLVL	Generation severity level	0, 10, 20, or 30		
OPTION	Type of output list	*SRC, *SOURCE, *NOSRC, *NOSOURCE, *LIST or *NOLIST, *SECLVL or *NOSECLVL		
DEV	Device name	*JOB, *SYSVAL, or device name	*JOB, *SYSVAL, or device name	
DEVTYPE	Device type	*SCS, *IPDS, *USERASCII, or *AFPDS	*SCS, *IPDS, *USERASCII, or *AFPDS	
PAGESIZE	Page length, width, and measurement method	Page length, width, and measurement method	Page length, width, and measurement method	RPG/400 and BASIC
LPI	Lines per inch	3, 4, 6, 7.5, 8, 9, or 12	3, 4, 6, 7.5, 8, 9, or 12	
CPI	Characters per inch	5, 10, 12, 13.3, 15, 16.7, 18 or 20	5, 10, 12, 13.3, 15, 16.7, 18 or 20	
FRONTMGN	Front margin	0 or any positive number	0 or any positive number	
BACKMGN	Back margin	*FRONTMGN, 0, or any positive number	*FRONTMGN, 0, or any positive number	
OVRFLW	Overflow line number	Line number	Line number	RPG/400 and BASIC
FOLD	Fold records	*NO, or *YES	*NO, or *YES	
RPLUNPRT	Replace unprintable characters	*YES and replacement character, or *NO	*YES and replacement character, or *NO	
ALIGN	Align forms	*NO, or *YES	*NO, or *YES	RPG/400
CTLCHAR	Control character	*NONE or *FCFC	*NONE or *FCFC	PL/I and C/400
CHLVAL	Channel value	*NORMAL or channel value and line number	*NORMAL or channel value and line number	
FIDELITY	Fidelity	*CONTENT or *ABSOLUTE	*CONTENT or *ABSOLUTE	
PRTQLTY	Print quality	*STD, *DRAFT, *NLQ, *DEVD, or *FASTDRAFT	*STD, *DRAFT, *NLQ, *DEVD, or *FASTDRAFT	
FORMFEED	Form feed mode	*DEVD, *CONT, *CUT, or *AUTOCUT	*DEVD, *CONT, *CUT, or *AUTOCUT	COBOL/400
DRAWER	Paper source	1, 2, 3 or *E1	1, 2, 3 or *E1	
FONT	Font identifier and point size	*CPI, *DEVD, font identifier name and point size of font if a point size is valid	*CPI, *DEVD, font identifier name and point size of font if a point size is valid	

Table 2-1 (Page 2 of 3). Printer Support Parameters

CL Parameter Name	Description	Specified on CRTPRTF and CHGPRTF Command	Specified on OVRPRTF Command	Specified in HLL Program
CHRID	Character set code page	*DEVD, *SYSVAL, *JOBCCSID, or graphic character set and code page	*DEVD, *SYSVAL, *JOBCCSID, or graphic character set and code page	
FNTCHRSET	Font character set	*FONT, or font character set and code page	*FONT, or font character set and code page	
CDEFNT	Coded font	*FNTCHRSET or coded font name	*FNTCHRSET or coded font name	
PAGRTT	Page rotate	*AUTO, *DEVD, *COR, 0, 90, 180, or 270	*AUTO, *DEVD, *COR, 0, 90, 180, or 270	
MULTIUP	Pages per side	1, 2, or 4	1, 2, or 4	
PRTTXT	Print text	*JOB, *SYSVAL, *BLANK, or print text	*JOB, *SYSVAL, *BLANK, or print text	
JUSTIFY	Justify	0, 50, or 100	0, 50, or 100	
DUPLEX	Output printed on one or both sides of the paper	*NO, *YES, or *TUMBLE	*NO, *YES, or *TUMBLE	
UOM	Unit of measure	*INCH or *CM	*INCH or *CM	
FRONTOVL	Front side overlay	*NONE, qualified overlay name and library, offsets	*NONE, qualified overlay name and library, offsets	
BACKOVL	Back side overlay	*FRONTOVL, *NONE, qualified overlay name and library, offsets	*FRONTOVL, *NONE, qualified overlay name and library, offsets	
DFRWRT	Defer write	*YES or *NO	*YES or *NO	
SPOOL	Spool data	*YES, or *NO	*YES, or *NO	
OUTQ	Output queue	*JOB, *DEV, or qualified name	*JOB, *DEV, or qualified name	
FORMTYPE	Form type	*STD or form type	*STD or form type	RPG/400
COPIES	Number of copies	Number of copies	Number of copies	
PAGERANGE	Starting and ending pages	Starting and ending pages	Starting and ending pages	
MAXRCDS	Maximum records	*NOMAX, or maximum records	*NOMAX, or maximum records	
FILESEP	Separator pages	Number of file separators	Number of file separators	
SCHEDULE	Schedule	*FILEEND, *JOBEND, or *IMMED	*FILEEND, *JOBEND, or *IMMED	
HOLD	Hold	*NO or *YES	*NO or *YES	
SAVE	Save	*NO or *YES	*NO or *YES	
OUTPTY	Output priority	*JOB or output priority	*JOB or output priority	
USRDTA	User data	*SOURCE or user data	*SOURCE or user data	
SPLFNAME	Spool file name		*FILE	
IGCDTA	Double-byte data	*NO or *YES	*NO or *YES	
IGCEXNCHR	Double-byte extension characters	*YES, or *NO	*YES, or *NO	

Table 2-1 (Page 3 of 3). Printer Support Parameters

CL Parameter Name	Description	Specified on CRTPRTF and CHGPRTF Command	Specified on OVRPRTF Command	Specified in HLL Program
IGCCHRRTT	Rotate double-byte characters	*NO, or *YES	*NO, or *YES	
IGCCPI	Double-byte characters per inch	*CPI, 5, 6, 10, or *CONDENSED	*CPI, 5, 6, 10, or *CONDENSED	
IGCSOSI	Shift control characters	*YES, *NO, or *RIGHT	*YES, *NO, or *RIGHT	
IGCCDEFNT	Double-byte coded font	*SYSVAL or coded font name	*SYSVAL or coded font name	
WAITFILE	File wait time	*IMMED, *CLS or number of seconds	*IMMED, *CLS or number of seconds	RPG/400 and PL/I
SECURE	Secure from other overrides		*YES or *NO	
SHARE	Shared file	*NO or *YES	*NO or *YES	PL/I
LVLCHK	Level check	*YES or *NO	*YES or *NO	RPG/400, COBOL/400, PL/I, C/400, and BASIC
AUT	Authority	*CHANGE, *ALL, *USE, *EXCLUDE or authorization list name		
REPLACE	Replace	*YES or *NO		
TEXT	Text	*SRCMBRTXT, *BLANK, or text description		
	Record length			RPG/400, COBOL/400, PL/I, C/400, and BASIC
	End-of-page indicator			RPG/400, PL/I and BASIC
	Skip before	Line number		RPG/400
	Skip after	Line number		RPG/400
	Space before	Number of lines		RPG/400, COBOL/400
	Space after	Number of lines		RPG/400, COBOL/400

Creating a Printer File

Printer files can be created by the user or the user could choose to use the printer files supplied by IBM.

IBM-Supplied Printer Files

The following list contains the IBM-supplied printer files:

- QSYSPRT: a program-described printer file in library QSYS.
- QPRINT: Default spooled output printer file for normal print.
- QPRINTS: Default spooled output printer file for special forms.
- QPRINT2: Default spooled output printer file for two copy output.
- QPSPLPRT: Default spooled output printer file for the spooling subsystem.

User-Created Printer Files

You use the Create Printer File (CRTPRTF) command to begin the process of creating a printer file tailored specifically to your needs.

If, at this time, you want to become familiar with this command, type CRTPRTF and press F4 (Prompt). Or you can go to "What Parameters Make Up a Printer File?" on page 2-1 and view a chart that lists all the printer file parameters.

The next section of this chapter contains examples where an application program calls (uses) a user-created printer file. The examples focus on a program-described printer file and an externally described printer file.

Why is the concept of externally described or program-described printer files important?

The reason the terms *externally described* or *program-described* are important is that by specifying *NONE on the SRCFILE parameter of the CRTPRTF command, the user is telling the system that the high-level language the application program is written in will control how the printed output appears on a printed page.

If the user specifies a source file name and member (made up of data description specifications) on the SRCFILE parameter, then the application program will use information that is specified in the member to control how the printed output appears on a printed page.

To show you how printer files interact with application programs there is an example of a printer file using program-described files and one using externally described files (DDS).

Do you want to read through the example of the program described printer file or through the example of the externally described printer file?

Program Described	**Externally Described**
↓	Go to "Using an Externally-Described Printer File with an Application Program" on page 2-15.

Go to "Using a Program-Described Printer File with an Application Program" on page 2-6.

Using a Program-Described Printer File with an Application Program

This example shows how an application program calls and uses a program-described printer file to control how your printed output will look.

This example consists of:

- An RPG-coded application program that produces mailing labels.
- A printer file that is opened by the application program when the application program runs.
- A detailed listing of which parameters from the printer file are used by the application program and at what point during the processing of the application program they are used.

This is the RPG-coded application program. The reverse-image numbers within the program correspond to the list on the following pages. That list explains how this program works and specifically how the program opens and uses the printer file.

- Part 1 opens the printer file
- Part 2 sends the output to the designated output queue
- Part 3 closes the opened files
- Part 4 processes the data
- Part 5 provides the code to control how the printed output will look

```
*************************************************************************
                FADDRESS IF  E           K        DISK
1     FLABELPRTO   F     132     OF      PRINTER
*************************************************************************

                       CTAR       20  1
                       CSAR       30  1
                       STAR        2  1
                       ZPAR        8  1

                        READ ADDRESS                 10

                *IN10   DOWEQ'0'

                ADD2    IFEQ *BLANKS
                        MOVE '1'       *IN55
                        ELSE
                        MOVE '0'       *IN55
                        END

                        EXSR CKCITY

*************************************************************************
2                EXCPTPRINT
*************************************************************************
                        READ ADDRESS                 10

                        END

*************************************************************************
3                MOVE '1'       *INLR
*************************************************************************
     .
     .          CKCITY  BEGSR
     .
     .                  MOVEA*BLANKS   CTAR
     .                  MOVEA*BLANKS   STAR
     .                  MOVEA*BLANKS   ZPAR
     .                  MOVEA*BLANKS   CSAR
     .
     .                  MOVEACITY      CTAR
     .                  MOVEAST        STAR
     .                  MOVEAZIP       ZPAR
     .
     .                  Z-ADD1         X       20
     .                  Z-ADD1         Y       20
     .
     .                  EXSR LOOKBL                  1ST WORD
```

```
     .
     .                  ADD  1         X
     .          CTAR,X  IFGT *BLANKS                2ND WORD
     .                  MOVE ' '       CSAR,Y
     .                  ADD  1         Y
     .                  EXSR LOOKBL
4                ADD  1         X
     .          CTAR,X  IFGT *BLANKS                3RD WORD
     .                  MOVE ' '       CSAR,Y
     .                  ADD  1         Y
     .                  EXSR LOOKBL
     .                  END
     .                  END
     .                  MOVE ','       CSAR,Y
     .                  ADD  1         Y
     .                  MOVE ' '       CSAR,Y
     .                  ADD  1         Y
     .                  MOVE STAR,1    CSAR,Y
     .                  ADD  1         Y

     .                  MOVE STAR,2    CSAR,Y
     .                  ADD  1         Y
     .                  MOVE ' '       CSAR,Y
     .                  ADD  1         Y
     .                  MOVE ' '       CSAR,Y
     .                  ADD  1         Y
                        Z-ADD1         X
                X       DOWLT9
                        MOVE ZPAR,X    CSAR,Y
     .                  ADD  1         Y
     .                  ADD  1         X
     .                  END
     .                  MOVEACSAR      CTSTZP 30
     .                  ENDSR
     .
     .                  LOOKBL         BEGSR
     .                  CTAR,X         DOWGT*BLANKS
     .                  MOVE CTAR,X    CSAR,Y
     .                  ADD  1         X
     .                  ADD  1         Y
     .                  END
     .                  ENDSR
*************************************************************************
     .                  RTE    1 2         PRINT
     .                  NAME   25
     .                  E  1               PRINT
     .                  ADD1   25
5                E  1   N55         PRINT
     .                  ADD2      25
     .                  E  1               PRINT
     .                  CTSTZP 30
     .                  E  1   55          PRINT
*************************************************************************
```

Open Processing

Part 1 of the application program opens files that are called by the application program.

When a program opens files, an object of type *FILE is connected to the program for processing. Among the files opened in this example, and of particular interest at this point, is the printer file whose name is LABELPRT. You can find the printer file name LABELPRT next to the 1 in the program listing.

A printer file is opened to prepare the system so that the application can put data into a spooled file or print it out directly to a printer. Information from the high-level language application program, the printer file, and any printer file overrides is combined.

The printer file open operation is controlled by parameters specified in the printer file, the high-level language program, and in printer file overrides (through the OVRPRTF command). See "Overriding Printer Files" on page 2-31 for more information on overrides.

As an example, if the printer file specified lines per inch (LPI) of 8, and an OVRPRTF command specified an LPI of 6, the LPI of 6 would be used since the override value specified by the OVRPRTF command takes precedence over the LPI value specified in the printer file.

Printer File Parameters

The following list contains parameters from the printer file LABELPRT. These are the parameters that the application program accesses or looks at when it opens the printer file. They are the majority of the parameters in the printer file, but not all of them. When the application looks at each parameter, it finds a value specified for each parameter.

Some of the values are discussed in more detail than others, because some of the parameters have many more possible values than others.

FILE
Specifies the qualified name by which the printer file being called is known.

DEV
Specifies the name of a printer device description. The device description is an object that contains information describing a particular device (printer in this case) or logical unit that is attached to the system. For nonspooled output, this identifies the printer device used with the printer file to produce the printed output. For spooled output, if OUTQ(*DEV) is also specified, the default output queue for the specified printer is used for the spooled file.

DEVTYPE
Specifies the type of data stream created for a printer file. This parameter indicates whether the resulting data stream should be an intelligent printer data stream (IPDS), an SNA character stream (SCS), an ASCII data stream (*USERASCII), or an Advanced Function Printing data stream (*AFPDS). For more information on the DEVTYPE parameter, go to "Using the Device Type (DEVTYPE) Parameter" on page 2-37.

PAGESIZE

Specifies the length and width of the printer forms used by this printer file.

Go to Appendix D, "Working with Fonts, Font Character Sets, Code Pages, CHRIDs, and Coded Fonts" on page D-1 to view tables that show:

- Range of values for lines per page for each printer type and for each value of lines per inch (LPI) valid for the printer.
- Range of values for characters per line for each printer type and for each value of characters per inch (CPI) for the printer.

Notes:

1. For IPDS printers configured with AFP(*NO) on the Create Device Description (Printer) (CRTDEVPRT) or Change Device Description (Printer) (CHGDEVPRT) CL commands, the printer file parameters are used to override the forms size set on the printer. For printers configured with AFP(*YES), the forms size set on the printer is used to determine the actual size of the forms loaded in the printer.
2. If *ROWCOL is specified as the method of measure on the PAGESIZE parameter, and either a coded font or font character set is specified on the printer file, the page width is calculated using 10 characters per inch.
3. If the PAGESIZE parameter value is *UOM, the page size length and width is converted to *ROWCOL (number of rows and columns per page) when spooled files are created.

   If the DEVTYPE is *IPDS, the pitch of the font specified by the FONT parameter is used to calculate the number of columns allowed per page. For example, assume:

   Form size is 8.5 x 11 inches
   The UOM parameter value is *INCH
   The CPI parameter value is 10 (the default)
   The FONT parameter value is 86

   The number of columns available for printing is 102 (8.5 inches x 12 characters per inch), because FONT 86 is a 12-pitch font. The CPI parameter is ignored.

   If the DEVTYPE is *SCS, the CPI parameter is used for the conversion. The CPI value should match the pitch of the specified FONT, or the FONT parameter should be *CPI. Let's use the same values as in the previous example but have the DEVTYPE be *SCS and the FONT value be *CPI. Now, because the CPI parameter is 10, the printed output will be truncated at 85 columns (8.5 inches x 10 characters per inch).

LPI

Specifies the line spacing setting on the printer, in lines per inch, used by this printer file.

UOM

Specifies the unit of measure to be used for various measurements used in printing. Possible values are:

- *INCH (Use inches as the unit of measure.)
- *CM (Use centimeters as the unit of measure.)

CPI

Specifies the printer character density, in characters per inch (CPI), used by this printer file.

For more information on CPI, go to "Printer Font Support" on page 2-60.

OVRFLW

Specifies the line number where an overflow message is issued.

RPLUNPRT

Specifies (1) whether unprintable characters are replaced and (2) which substitution character (if any) is used. An unprintable character is a character the printer is unable to print. For more information on replacing unprintable characters, go to "Replacing Unprintable Characters" on page 2-64.

FIDELITY

Specifies whether the spooled file should continue printing if errors are encountered.

***CONTENT** If errors are encountered, the spooled file continues to print.

***ABSOLUTE** If errors are encountered, the spooled file does not print.

For more information on FIDELITY, go to "Using the Fidelity (FIDELITY) Parameter" on page 2-48.

CTLCHAR

Specifies whether the printer file supports input with print control characters. Incorrect control characters encountered are ignored, and single spacing is assumed. Control characters (such as carriage return, font change, or end of transmission) are contained in the data stream that is being prepared for printing.

PRTQLTY

Specifies, for the 4214, 4224, 4230, 4234, and 5219 Printers, the quality of print produced.

FORMFEED

Specifies, for the 4028, 4214, 4224, 4230, 5219, and 5553 Printers, the form feed attachment used by this printer file.

DRAWER

Specifies the source drawer used when automatic cut sheet feed mode is used (specified by FORMFEED(*AUTOCUT)).

FONT

Specifies, for the 3812, 3816, 3820, 3825, 3827, 3829, 3831, 3835, 3900, 4028, 4224, 4230, 4234, and 5219 Printers (including ASCII printers emulating the 3812 or 5219 Printer), the font identifier and the point size (if the font supports multiple point sizes) of the font used with this printer.

Notes:

1. For a list of fonts supported, see Appendix D, "Working with Fonts, Font Character Sets, Code Pages, CHRIDs, and Coded Fonts" on page D-1.
2. For more information on fonts and how they work with the above printers, go to "Printer Font Support" on page 2-60.

CHRID

Specifies the character identifier (graphic character set and code page) for fields identified with the CHRID DDS keyword.

Notes:

1. If the CHRID parameter value is *JOBCCSID, the character set and code page are determined by the CCSID value of that job.

   *JOBCCSID indicates that all data being printed should be printed using the CCSID value for the current job. With externally-described printer files, constants specified in DDS are translated from the CCSID of the DDS source file to the CCSID of the current job. In addition, the CHRID DDS keyword is ignored.

2. For a list of character IDs supported, see Appendix D, "Working with Fonts, Font Character Sets, Code Pages, CHRIDs, and Coded Fonts" on page D-1.

3. For more information on multinational environments and alternative character sets and code pages, go to "Using Alternative Character Sets and Code Pages for Printer Output" on page 2-65.

FNTCHRSET

Specifies the font character set and the code page to be used at printing time.

The font character set identifier provides the size and style of the character.

The code page identifies which characters in a font are available for printing. For more information about font character sets and code pages, go to "Using the Font Character Set (FNTCHRSET) Parameter" on page 2-57.

CDEFNT

Specifies the coded font to be used at printing time.

A coded font is an AFP* resource that is made up of a font character set name and a code page name.

For more information about coded fonts and their relationship to font character sets, code pages, and font global identifiers (FGIDs), go to "Using the Coded Font (CDEFNT) Parameter" on page 2-57.

PAGRTT

Specifies the degree of text rotation for the 3812, 3816, 3820, 3825, 3827, 3828, 3829, 3831, 3835, 3900, and 4028 Printers. This parameter allows the user to specify the degree of rotation of the text on the page with respect to the way the form is loaded into the printer.

Note: Overlays and page segments are not rotated with the rest of the page.

PRTTXT

Specifies the printing of a line of text at the bottom of each page. For more information about printing information on the bottom of your printed page, go to "Print Text" on page 2-67.

JUSTIFY

For the 5219 and 3812 SCS only, specifies the printing positions of the characters on a page so the right-hand margin of printing is regular.

DUPLEX
Specifies whether the output is printed on only one or on two sides of the paper.

SPOOL
Specifies whether the output data for the printer file is spooled. If SPOOL(*NO) is specified, the following parameters in the printer file command are ignored: OUTQ, COPIES, MAXRCDS, FILESEP, SCHEDULE, HOLD, SAVE, OUTPTY, and USRDTA.

SCHEDULE
Specifies, for spooled files only, when the spooled file is made available to the printer writer program.

For more information on how the SCHEDULE parameter is used to control when the spooled file is made available to a printer writer to produce a printed document, go to "Using the SCHEDULE Parameter" on page 2-38.

USRDTA
Specifies, only if the output is spooled, some user specified data that identifies the file on the output queue.

IGCDTA
Specifies, for program-described printer files, whether the printer file processes double-byte character set data. For externally described printer files, specifies double-byte character set attributes of the printer file.

IGCEXNCR
Specifies whether the system processes double-byte character extension characters.

IGCCHRTT
Specifies whether the printer should rotate double-byte characters 90 degrees counterclockwise when printing.

IGCCPI
Specifies the printer character density of double-byte characters, in characters per inch.

IGCSOSI
Specifies how the system prints shift control characters.

IGCCDEFNT
Specifies the font that the system uses to print DBCS data to an IPDS printer. The printer must be configured AFP(*YES). For more information on DBCS coded fonts, go to "Using the DBCS Coded Font (IGCCDEFNT) Parameter" on page 2-56.

WAITFILE
Specifies the number of seconds the program waits for allocation of the file resources when the file is opened.

SHARE
Specifies whether the open data path (ODP) for the printer file can be shared with other programs in the same routing step.

LVLCHK
Specifies whether the level identifiers of the record formats in this printer file are checked when the file is opened by the program. For more information on

how this parameter works to redirect files, go to "Effect of Changing Fields in a File Description" on page 2-68.

AUT
Specifies the authority granted to users who do not have specific authority to the file, who are not on the authorization list, and whose users' group has no specific authority to the file.

TEXT
Specifies text that briefly describes the printer file.

Output Processing

Part **2** of the application program performs the operations of reading, compiling, and sending the output to the output queue specified in the OUTQ parameter of the CRTPRTF command or to the printer specified in the DEV parameter of the CRTPRTF command. In this example, the SPOOL parameter has a value of (*YES). This means the output will become a spooled file in the designated output queue.

The following printer file parameters from the CRTPRTF command are the parameters looked at by the system program and application program during the output processing portion of the application program.

SRCFILE
Specifies the qualified name of the source file and member, if one exists, that contains the data description specifications (DDS).

This example does not use a DDS source file. Thus, when the application program calls the printer file LABELPRT and looks at the SRCFILE parameter, the value will be *NONE.

Since no DDS will be used, the high-level language must provide the programming to control how the printed output will look. This example contains the high-level language code in part **5** of the example program listing.

SRCMBR
Specifies the name of the member in the source file that contains the DDS for this printer file.

FOLD
Specifies whether all positions in a record are printed when the record length exceeds the page width (specified by the PAGESIZE parameter).

ALIGN
Specifies whether the page alignment must be verified by the operator before printing is started. For more information about the align parameter and its relationship to the Start Printer Writer (STRPRTWTR) command, go to "Using the Align (ALIGN) Parameter" on page 2-39.

CHLVAL
Specifies a list of channel numbers with their assigned line numbers. Use this parameter only if CTLCHAR(*FCFC) has been specified. For more information on first-character forms-control data, go to "First-Character Forms-Control Data" on page 2-58.

PRTTXT

Specifies the printing of a line of text at the bottom of each page. For more information about printing information on the bottom of your printed page, go to "Print Text" on page 2-67.

MULTIUP

Specifies how many logical pages of output can be printed on one physical page of paper. The values are 1, 2, or 4 with 1 being the default value.

For example: if you select 4 as the parameter value and you are printing on both sides of the paper, you actually print 8 pages of output on 1 piece of paper.

For more information on the MULTIUP parameter, go to "Using the Pages per Side (MULTIUP) Parameter" on page 2-43.

FRONTMGN

Specifies the margin to be used on the front side of a piece of paper.

For more information on front margins, go to "Using the Margin (FRONTMGN and BACKMGN) Parameters" on page 2-54.

BACKMGN

Specifies the margin to be used on the back side of a piece of paper.

For more information on back margins, go to "Using the Margin (FRONTMGN and BACKMGN) Parameters" on page 2-54.

FRONTOVL

Specifies the overlay to be used on the front side of a piece of paper. Possible values are:

- *NONE (No overlay is used.)
- qualified overlay-name (The name of the overlay to be used and the library the overlay is in.)

Front side overlays are valid only for printers configured for Advanced Function Printing*. For more information on overlays, go to "Using the Overlay (FRONTOVL and BACKOVL) Parameters" on page 2-48.

BACKOVL

Specifies the overlay to be used on the back side of a piece of paper. Possible values are:

- *NONE (No overlay is used.)
- qualified overlay-name (The name of the overlay to be used and the library the overlay is in.)
- *FRONTOVL (Use the overlay specified for the FRONTOVL parameter.)

Back side overlays are valid only for printers configured for advanced function printing. For more information on overlays, go to "Using the Overlay (FRONTOVL and BACKOVL) Parameters" on page 2-48.

MAXRCDS

Specifies, for spooled output only, the maximum number of records in the spooled file for spooled jobs using this printer file.

DFRWRT

DFRWRT(*YES) means the system controls the amount of output held in the buffer before being sent to the printer.

For spooled files, DFRWRT(*NO) means spooled data is sent to the printer when a page of output is available or when the system buffer is full. (Buffers are usually 512 bytes.) DFRWRT(*NO) has effect on spooled files only if SCHEDULE(*IMMED) is specified.

For direct output, DFRWRT(*NO) means data is sent to the printer each time the application program performs a write operation.

Close Processing

Part **3** of the application program performs the close operations of the application program.

When the application program has finished the output processing part of the application program, it performs a close operation on all the files it opened during the open processing portion of the application program.

The following printer file parameters from the CRTPRTF command are the parameters looked at by the system program and the application program during the close portion of the application program.

SCHEDULE

Specifies, for spooled files only, when the spooled file is made available to the printer writer program.

For more information on how the SCHEDULE parameter is used to control when the spooled file is made available to a printer writer to produce a printed document, go to "Using the SCHEDULE Parameter" on page 2-38.

Using an Externally-Described Printer File with an Application Program

This example shows how an application program calls and uses an externally described printer file to control how your printed output will look.

This example will consist of:

- An RPG-coded application program that produces mailing labels.
- A printer file that is opened by the application program when the application program runs.
- A detailed listing of which parameters from the printer file are used by the application program and at what point during the processing of the application program they are used.
- A detailed listing of the DDS keywords and an explanation of which DDS keywords are used by the mailing label application program.

This is the RPG-coded application program. The reverse-image numbers within the program correspond to the list on the following pages. That list explains how this program works and specifically how the program opens and uses the printer file.

- Part **1** opens the printer file
- Part **2** sends the output to the designated output queue
- Part **3** closes the opened files

- Part 4 processes the data

```
*****************************************************************************
             FADDRESS IF  E           K        DISK
1    FLABELPR3O   E                   PRINTER
*****************************************************************************

                      CTAR       20  1
                      CSAR       30  1
                      STAR        2  1
                      ZPAR        8  1

                       READ ADDRESS                 10              4
*****************************************************************************
     .                 WRITEHEADNG
     .
     .          *IN10  DOWEQ'0'
     .
     .                 EXSR CKCITY
     .
2     WRITEDETAIL1
     .
     .          ADD2   IFNE *BLANKS
     .                 WRITEDETAIL3
     .                 END
     .
     .                 WRITEDETAIL4
     .                 READ ADDRESS                 10
     .
     .                 END
*****************************************************************************

*****************************************************************************
3      MOVE '1'       *INLR
*****************************************************************************
     .
     .          CKCITY BEGSR
     .
     .                 MOVEA*BLANKS   CTAR
     .                 MOVEA*BLANKS   STAR
     .                 MOVEA*BLANKS   ZPAR
     .                 MOVEA*BLANKS   CSAR
     .
     .                 MOVEACITY      CTAR
     .                 MOVEAST        STAR
     .                 MOVEAZIP       ZPAR
     .
     .                 Z-ADD1         X       20
     .                 Z-ADD1         Y       20
     .
     .                 EXSR LOOKBL                  1ST WORD
     .
     .                 ADD  1         X
     .          CTAR,X IFGT *BLANKS                 2ND WORD
     .                 MOVE ' '       CSAR,Y
     .                 ADD  1         Y
     .                 EXSR LOOKBL
     .                 ADD  1         X
     .          CTAR,X IFGT *BLANKS                 3RD WORD
     .                 MOVE ' '       CSAR,Y
     .                 ADD  1         Y
     .           EXSR LOOKBL
     .                 END
     .                 END
     .                 MOVE ','       CSAR,Y
     .                 ADD  1         Y
     .                 MOVE ' '       CSAR,Y
     .                 ADD  1         Y
     .                 MOVE STAR,1    CSAR,Y
     .                 ADD  1         Y
     .                 MOVE STAR,2    CSAR,Y
     .                 ADD  1         Y
     .                 MOVE ' '       CSAR,Y
     .                 ADD  1         Y
     .                 MOVE ' '       CSAR,Y
     .                 ADD  1         Y
     .                 Z-ADD1         X
     .          X      DOWLT9
     .                 MOVE ZPAR,X    CSAR,Y
     .                 ADD  1         Y
     .                 ADD  1         X
     .                 END
     .                 MOVEACSAR      CTSTZP 30
     .                 MOVEACSAR      CTSTZ2 30
     .                 ENDSR
     .
     .          LOOKBL BEGSR
     .          CTAR,X DOWGT*BLANKS
     .                 MOVE CTAR,X    CSAR,Y
     .                 ADD  1         X
     .                 ADD  1         Y
     .                 END
     .                 ENDSR
     .
*****************************************************************************
```

Open Processing

Part 1 of the application program opens files that are called by the application program. Among those, and of particular interest at this point, is the printer file whose name is LABELPR3. You can locate LABELPR3 next to 1 in the program listing.

A printer file is opened to prepare the system so that the application can put data into a spooled file or print it out directly to a printer. Information from the high-level language application program, the printer file, and any printer file overrides is combined.

The printer file open operation is controlled by parameters specified in the printer file, the high-level language program, and in printer file overrides (through the OVRPRTF command). See "Overriding Printer Files" on page 2-31 for more information on overrides.

As an example, if the printer file specified lines per inch (LPI) of 8, and an OVRPRTF command specified an LPI of 6, the LPI of 6 would be used since the override value specified by the OVRPRTF command takes precedence over the LPI value specified in the printer file.

Printer File Parameters

The following list contains parameters from the printer file LABELPR3. These are the parameters that the application program looks at when it opens the printer file. They are the majority of the parameters in the printer file, but not all of them. When the application looks at each parameter it finds a value specified for each parameter.

Some of the values are discussed in more detail than others, because some of the parameters have many more possible values than others.

FILE

Specifies the qualified name by which the printer file being called is known.

DEV

Specifies the name of a printer device description. For nonspooled output, this identifies the printer device used with the printer file to produce the printed output. For spooled output, if OUTQ(*DEV) is also specified, the default output queue for the specified printer is used for the spooled file.

DEVTYPE

Specifies the type of data stream created for a printer file. This parameter indicates whether the resulting data stream should be an intelligent printer data stream (IPDS), an SNA character stream (SCS), an ASCII data stream (*USERASCII), or an Advanced Function Printing data stream (*AFPDS). For more information on the DEVTYPE parameter, go to "Using the Device Type (DEVTYPE) Parameter" on page 2-37.

PAGESIZE

Specifies the length and width of the printer forms used by this printer file.

Go to Appendix D, "Working with Fonts, Font Character Sets, Code Pages, CHRIDs, and Coded Fonts" on page D-1 to view tables that show:

- Range of values for lines per page for each printer type and for each value of lines per inch (LPI) valid for the printer.

- Range of values for characters per line for each printer type and for each value of characters per inch (CPI) for the printer.

Notes:

1. For IPDS printers configured with AFP(*NO) on the Create Device Description (Printer) (CRTDEVPRT) or Change Device Description (Printer) (CHGDEVPRT) CL commands, the printer file parameters are used to override the forms size set on the printer. For printers configured with AFP(*YES), the forms size set on the printer is used to determine the actual size of the forms loaded in the printer.
2. If *ROWCOL is specified as the method of measure on the PAGESIZE parameter, and either a coded font or font character set is specified on the printer file, the page width is calculated using 10 characters per inch.
3. If the PAGESIZE parameter value is *UOM, the page size length and width is converted to *ROWCOL (number of rows and columns per page) when spooled files are created.

   If the DEVTYPE is *IPDS, the pitch of the font specified by the FONT parameter is used to calculate the number of columns allowed per page. For example, assume:

   Form size is 8.5 x 11 inches
   The UOM parameter value is *INCH
   The CPI parameter value is 10 (the default)
   The FONT parameter value is 86

   The number of columns available for printing is 102 (8.5 inches x 12 characters per inch), because FONT 86 is a 12-pitch font. The CPI parameter is ignored.

   If the DEVTYPE is *SCS, the CPI parameter is used for the conversion. The CPI value should match the pitch of the specified FONT, or the FONT parameter should be *CPI. Let's use the same values as in the previous example but have the DEVTYPE be *SCS and the FONT value be *CPI. Now, because the CPI parameter is 10, the printed output will be truncated at 85 columns (8.5 inches x 10 characters per inch).

LPI
Specifies the line spacing setting on the printer, in lines per inch, used by this printer file.

UOM
Specifies the unit of measure to be used for various measurements used in printing. Possible values are:

- *INCH (Use inches as the unit of measure.)
- *CM (Use centimeters as the unit of measure.)

CPI
Specifies the printer character density, in characters per inch (CPI), used by this printer file.

For more information on CPI, go to "Printer Font Support" on page 2-60.

OVRFLW
Specifies the line number where an overflow message is issued.

RPLUNPRT

Specifies (1) whether unprintable characters are replaced and (2) which substitution character (if any) is used. An unprintable character is a character the printer is unable to print. For more information on replacing unprintable characters, go to "Replacing Unprintable Characters" on page 2-64.

FIDELITY

Specifies whether the spooled file should continue printing if errors are encountered.

***CONTENT** If errors are encountered, the spooled file continues to print.

***ABSOLUTE** If errors are encountered, the spooled file does not print.

For more information on FIDELITY, go to "Using the Fidelity (FIDELITY) Parameter" on page 2-48.

CTLCHAR

Specifies whether the printer file supports input with print control characters. Incorrect control characters encountered are ignored, and single spacing is assumed.

PRTQLTY

Specifies, for the 4214, 4224, 4230, 4234, and 5219 Printers, the quality of print produced.

FORMFEED

Specifies, for the 4028, 4214, 4224, 4230, 5219, and 5553 Printers, the form feed attachment used by this printer file.

DRAWER

Specifies the source drawer used when automatic cut sheet feed mode is used (specified by FORMFEED(*AUTOCUT)).

FONT

Specifies, for the 3812, 3816, 3820, 3825, 3827, 3829, 3831, 3835, 3900, 4028, 4224, 4230, 4234, and 5219 Printers (including ASCII printers emulating the 3812 or 5219 Printer), the font identifier and the point size (if the font supports multiple point sizes) of the font used with this printer.

Notes:

1. For a list of fonts supported, see Appendix D, "Working with Fonts, Font Character Sets, Code Pages, CHRIDs, and Coded Fonts" on page D-1.
2. For more information on fonts and how they work with the above printers, go to "Printer Font Support" on page 2-60.

CHRID

Specifies the character identifier (graphic character set and code page) for fields identified with the CHRID DDS keyword.

Notes:

1. If the CHRID parameter value is *JOBCCSID, the character set and code page are determined by the CCSID value of that job.

   *JOBCCSID indicates that all data being printed should be printed using the CCSID value for the current job. With externally-described printer files, constants specified in DDS are translated from the CCSID of the DDS

source file to the CCSID of the current job. In addition, the CHRID DDS keyword is ignored.

2. For a list of character IDs supported, see Appendix D, "Working with Fonts, Font Character Sets, Code Pages, CHRIDs, and Coded Fonts" on page D-1.
3. For more information on multinational environments, alternative character sets, and code pages, go to "Using Alternative Character Sets and Code Pages for Printer Output" on page 2-65.

FNTCHRSET

Specifies the font character set and the code page to be used at printing time.

The font character set identifier provides the size and style of the character.

The code page identifies which characters in a font are available for printing. For more information about font character sets and code pages, go to "Using the Font Character Set (FNTCHRSET) Parameter" on page 2-57.

CDEFNT

Specifies the coded font to be used at printing time.

A coded font is an AFP resource that is made up of a font character set name and a code page name.

For more information about coded fonts and their relationship to font character sets, code pages, and font global identifiers (FGIDs), go to "Using the Coded Font (CDEFNT) Parameter" on page 2-57.

PAGRTT

Specifies the degree of text rotation for the 3812, 3816, 3820, 3825, 3827, 3828, 3829, 3831, 3835, 3900, and 4028 Printers. This parameter allows the user to specify the degree of rotation of the text on the page with respect to the way the form is loaded into the printer.

Note: Overlays and page segments are not rotated with the rest of the page.

PRTTXT

Specifies the printing of a line of text at the bottom of each page. For more information about printing information on the bottom of your printed page, go to "Print Text" on page 2-67.

JUSTIFY

For the 5219 and 3812 SCS only, specifies the printing positions of the characters on a page so the right-hand margin of printing is regular.

DUPLEX

Specifies whether the output is printed on only one or on two sides of the paper.

SPOOL

Specifies whether the output data for the printer file is spooled. If SPOOL(*NO) is specified, the following parameters in the printer file command are ignored: OUTQ, COPIES, MAXRCDS, FILESEP, SCHEDULE, HOLD, SAVE, OUTPTY, and USRDTA.

SCHEDULE

Specifies, for spooled files only, when the spooled file is made available to the printer writer program.

For more information on how the SCHEDULE parameter is used to control when the spooled file is made available to a printer writer to produce a printed document, go to "Using the SCHEDULE Parameter" on page 2-38.

IGCDTA
Specifies, for program-described printer files, whether the printer file processes double-byte character set data. For externally described printer files, specifies double-byte character set attributes of the printer file.

IGCEXNCR
Specifies whether the system processes double-byte character extension characters.

IGCCHRTT
Specifies whether the printer should rotate double-byte characters 90 degrees counterclockwise when printing.

IGCCPI
Specifies the printer character density of double-byte characters, in characters per inch.

IGCSOSI
Specifies how the system prints shift control characters.

IGCCDEFNT
Specifies the font that the system uses to print DBCS data to an IPDS printer. The printer must be configured AFP(*YES). For more information on DBCS coded fonts, go to "Using the DBCS Coded Font (IGCCDEFNT) Parameter" on page 2-56.

WAITFILE
Specifies the number of seconds the program waits for allocation of the file resources when the file is opened.

SHARE
Specifies whether the open data path (ODP) for the printer file can be shared with other programs in the same routing step.

LVLCHK
Specifies whether the level identifiers of the record formats in this printer file are checked when the file is opened by the program. For more information on how this parameter works to redirect files, go to "Redirecting Output" on page 2-69.

AUT
Specifies the authority granted to users who do not have specific authority to the file, who are not on the authorization list, and whose users' group has no specific authority to the file.

TEXT
Specifies text that briefly describes the printer file.

Output Processing

Part **2** of the application program performs the operations of reading, compiling, and sending the output to the output queue specified in the OUTQ parameter of the CRTPRTF command, or to the printer specified in the DEV parameter of the CRTPRTF command. In this example, the SPOOL parameter has a value of (*YES) which means the output will become a spooled file in the designated output queue.

The following printer file parameters from the CRTPRTF command are the parameters looked at by the application program during the output processing portion of the application program.

SRCFILE
Specifies the qualified name of the source file and member, if one exists, that contains the data description specifications (DDS).

Since this example uses DDS, look at **1** in the program listing and see that the name of the printer file is LABELPR3. LABELPR3 was compiled using the source from the member and file listed here. See "Data Description Specifications" on page 2-24 for the example of the compiled DDS and a list of DDS keywords.

Note: The DDS is compiled before the application program runs. The application program never looks at the DDS file and member, only at the compiled results.

Option
Specifies the type of printout produced when the printer file is created.

GENLVL
Specifies the severity level of DDS messages that cause file creation to fail.

FOLD
Specifies whether all positions in a record are printed when the record length exceeds the page width (specified by the PAGESIZE parameter).

ALIGN
Specifies whether the page alignment must be verified by the operator before printing is started. For more information about the align parameter and its relationship to the Start Printer Writer (STRPRTWTR) command, go to "Using the Align (ALIGN) Parameter" on page 2-39.

CHLVAL
Specifies a list of channel numbers with their assigned line numbers. Use this parameter only if CTLCHAR(*FCFC) has been specified. For more information on first-character forms-control data, go to "First-Character Forms-Control Data" on page 2-58.

PRTTXT
Specifies the printing of a line of text at the bottom of each page. For more information about printing information on the bottom of your printed page, go to "Print Text" on page 2-67.

MULTIUP
Specifies how many logical pages of output can be printed on one physical page of paper. The values are 1, 2, or 4 with 1 being the default value.

For example: if you select 4 as the parameter value and you are printing on both sides of the paper, you actually print 8 pages of output on 1 piece of paper.

For more information on the MULTIUP parameter, go to "Using the Pages per Side (MULTIUP) Parameter" on page 2-43.

FRONTMGN

Specifies the margin to be used on the front side of a piece of paper.

For more information on margins, go to "Using the Margin (FRONTMGN and BACKMGN) Parameters" on page 2-54.

BACKMGN

Specifies the margin to be used on the back side of a piece of paper.

For more information on margins, go to "Using the Margin (FRONTMGN and BACKMGN) Parameters" on page 2-54.

FRONTOVL

Specifies the overlay to be used on the front side of a piece of paper. Possible values are:

- *NONE (No overlay is used.)
- qualified overlay-name (The name of the overlay to be used and the library it is in.)

Front side overlays are valid only for printers configured for advanced function printing. For more information on overlays, go to "Using the Overlay (FRONTOVL and BACKOVL) Parameters" on page 2-48.

BACKOVL

Specifies the overlay to be used on the back side of a piece of paper. Possible values are:

- *FRONTOVL (Use the overlay specified for the FRONTOVL parameter.)
- *NONE (No overlay is used.)
- qualified overlay-name (The name of the overlay to be used and the library it is in.)

Back side overlays are valid only for printers configured for advanced function printing. For more information on overlays, go to "Using the Overlay (FRONTOVL and BACKOVL) Parameters" on page 2-48.

MAXRCDS

Specifies, for spooled output only, the maximum number of records in the spooled file for spooled jobs using this printer file.

DFRWRT

DFRWRT(*YES) means the system controls the amount of output held in the buffer before being sent to the printer.

For spooled files, DFRWRT(*NO) means spooled data is sent to the printer when a page of output is available or when the system buffer is full. (Buffers are usually 512 bytes.) DFRWRT(*NO) has no effect on spooled files if SCHEDULE(*IMMED) is not specified.

For direct output, DFRWRT(*NO) means data is sent to the printer each time the application program performs a write operation.

Data Description Specifications

Below is the example of the compiled DDS used by the RPG program. You can update the DDS; however, you must then re-compile it.

```
000100900115                R HEADNG
000200900115                                        3  2'MAILING LABELS'
000300900115
000400900115                R DETAIL1
000500900115                  NAME          25      2  2UNDERLINE
000600900115                  ADD1          25      3  2
000700900115                R DETAIL3
000800900115                  ADD2          25         2SPACEB(1)
000900900115                R DETAIL4
001000900115                  CTSTZP        30         2HIGHLIGHT SPACEB(1)
```

This example uses three DDS keywords: SPACEB, UNDERLINE, and HIGHLIGHT.

DDS Keywords: Below is a listing of all available DDS keywords associated with printer files.

Remember

DDS and its associated keywords can only be used if the SRCFILE parameter contains the name of the file and the SRCMBR parameter contains the name of the member that the DDS source resides in.

The following list contains all the DDS keywords that you can use to help you control how your printed output will look. Remember, some DDS keywords can only be used if the target printer supports them. For example: COLOR can only be specified if the target printer is a 4224.

For more detailed information on how to create and code DDS source files and to find out which printers support which DDS keywords, see the *DDS Reference* manual.

ALIAS

Alternative Name. Use this field-level keyword to specify an alternative name for a field. When the program is compiled, the alternative name is brought into the program instead of the DDS field name. The high-level language compiler in use determines if the alternative name is used. Refer to the appropriate high-level language reference manual for information about ALIAS support for that language.

BARCODE

Bar Code. Use this field-level keyword to print a field as a user-specified bar code. BARCODE is valid for IPDS printers. (A **bar code** is a pattern of bars of various widths containing data to be interpreted by a scanning device.)

BLKFOLD

Blank Fold. Use this field-level keyword for named fields that overflow onto subsequent print lines, to cause folding to occur at a blank rather than at the end of a line. If the blank fold keyword is not specified, the line folds at the end of the physical print line.

BOX

Box. Use this record-level keyword to specify the position where a box will be drawn on a page. You can specify the corners of the box and the weight (thickness) of the lines in the box. For more information on the DDS box keyword, go to "Using the Box (BOX) DDS Keyword" on page 2-78.

CDEFNT

Coded Font. Use this record- or field-level keyword to specify the coded font for printing a named or constant field or fields within a record. For more information on the DDS coded font keyword, go to "Using the Coded Font (CDEFNT) DDS Keyword" on page 2-80.

CHRID

Character identifier. Use this field-level keyword to specify that a graphic character set and code page other than the device default can be used for this field. This can be important when extended alphabetics (characters such as u with an umlaut or c with a cedilla) are to be printed.

CHRSIZ

Character Size. Use this record- or field-level keyword to expand the width and height of a record or field. This applies to SCS double-byte characters, and IPDS and AFPDS single-byte characters.

COLOR

Color. Use this field-level keyword to specify the color for a field, if it is supported by the printer device. The COLOR keyword is used only by the 4224 printer. If you do not specify COLOR, or if the keyword is not valid for a printer device, black (the default value) is used.

CPI

Characters per Inch. This record- or field-level keyword specifies the horizontal printing density for the record format or field you are defining. Use CPI to:

- Darken logos and other printed graphics that you create using the DFNCHR keyword.
- Place more data in less space on printed forms.
- Fit the appearance of a form to your needs.

CVTDTA

Convert Data. This field-level keyword converts character data to hexadecimal data when the field is passed to the printer. You can use the CVTDTA keyword to define:

- Logos or emblems for a letterhead on your forms
- Alternative character sets or symbols (such as a copyright symbol)
- The appearance of a physical form (by adding vertical and horizontal lines that act as boundaries on the form or between positions on an invoice)
- IPDS bar code commands

DATE

Date. Use this field-level keyword to display the current job date.

DFNCHR

Define Character. The DFNCHR keyword allows you to define characters of your own design at the file or record level for the 5224 Printer and 5225 Printer. With this keyword you can specify DFNCHR more than once at the file or record level, or as many as 50 characters each time you specify DFNCHR.

DFT

Default. Use the DFT keyword to specify a constant value for constant (unnamed) fields.

DLTEDT

Delete Edit. Use this field-level keyword to specify that the OS/400 program is to ignore any edit code or edit word keywords specified for the referenced field. If a field description is referred to from a database file, DLTEDT prevents certain information from being referenced.

DRAWER

Drawer. Use this record-level keyword to specify the drawer from which non-continuous forms will be selected.

EDTCDE

Edit Code. Use this keyword to edit output-capable numeric fields.

An edit code is a letter or number indicating that editing should be done according to a defined pattern before a field is displayed or printed.

EDTWRD

Edit Word. If you cannot accomplish the desired editing by using the EDTCDE keyword, specify an edit word instead.

An edit word is a user-defined word that specifies the form in which the field values are to print and clarifies the data by inserting characters, such as decimal points, commas, floating- and fixed-currency symbols, and credit balance indicators. Also use it to suppress leading zeros and to provide asterisk fill protection.

ENDPAGE

End Page. Use this record-level keyword to specify that the page should eject. Page ejection occurs after the record format is processed.

FLTFIXDEC

Floating-Point to Fixed Decimal. Use this field-level keyword to print a number in a floating point field in fixed decimal notation.

FLTPCN

Floating-Point Precision. Use this keyword to specify the precision of a floating-point field.

FNTCHRSET

Font Character Set. Use this record- or field-level keyword to specify the font for printing a named or constant field or fields within a record. For more information on the DDS font character set keyword, go to "Using the Font Character Set (FNTCHRSET) DDS Keyword" on page 2-82.

FONT

Font. Use the FONT keyword to specify the font ID for printing a named or constant field or fields within a record.

The optional point size parameter can be used to further define a numeric font specifying a point size. It is specified as an expression of the form (*POINTSIZE *value*). The valid values for the parameter are 0.1 through 999.9.

GDF

Graphics Data Format File. Use this record-level keyword to specify the inclusion of a graphic data file at a specific location on a page. For more informa-

tion on the DDS graphics data format file keyword, go to "Using the Graphics Data Format File (GDF) DDS Keyword" on page 2-83.

HIGHLIGHT
Highlight. Use this record- or field-level keyword to indicate that a field should be printed in bold letters.

IGCCDEFNT
DBCS Coded Font. Use this record- or field-level keyword to print DBCS data contained in the AFPDS. For more information on the DDS DBCS coded font keyword, go to "Using the DBCS Coded Font (IGCCDEFNT) DDS Keyword" on page 2-81.

INDARA
Indicator Area. Use this keyword to remove option indicators from the buffer (also called the record area) and place them in a 99-byte separate indicator area.

INDTXT
Indicator Text. Use this file-, record-, or field-level keyword to associate descriptive text (indicating intent or use) with a specific indicator. You can specify INDTXT once for each indicator.

LINE
Line. Use this record-level keyword to position where a line will be drawn on a page. You can specify the weight (thickness) of lines. Only horizontal and vertical lines can be drawn. For more information on the DDS line keyword, go to "Using the Line (LINE) DDS Keyword" on page 2-85.

LPI
Lines Per Inch. Use this keyword to change lines per inch within a file. If you do not specify LPI for a record, the LPI value is set from the LPI value on the CRTPRTF, CHGPRTF, or OVRPRTF command.

MSGCON
Message Constant. Use this field-level keyword to indicate that the text for a constant field is contained in a message description. If the message description does not exist at DDS compile time, the file is not created. If you change the message description, you must create the file again.

OVERLAY
Overlay. Use this record-level keyword to specify the inclusion of an overlay to be printed at a specific location on a page. For more information on the DDS overlay keyword, go to "Using the Overlay (OVERLAY) DDS Keyword" on page 2-86.

PAGNBR
Page Number. Use this field-level keyword to specify the location of an unnamed, four-digit, zoned decimal field to contain the page number.

PAGRTT
Page Rotation. Use this record-level keyword to specify the degree of rotation of the text with respect to the way the page is loaded into the printer. The PAGRTT keyword is valid only for the 3812, 3816, 3820, 3825, 3827, 3829, 3831, 3835, 3900 and 4028 Printers. If you do not specify a PAGRTT keyword for a record, the page rotation is set from the value specified on the Create Printer File (CRTPRTF), Change Printer File (CHGPRTF), or Override Printer File (OVRPRTF) commands.

Note: Overlays and page segments are not rotated with the rest of the page.

PAGSEG
Page Segment. Use this record-level keyword to specify the inclusion of a page segment to be printed at a specific location on a page. For more information on the DDS page segment keyword, go to "Using the Page Segment (PAGSEG) DDS Keyword" on page 2-88.

POSITION
Position. Use this field-level keyword to specify the position of a field using the units specified on the unit of measure (UOM) printer file parameter. For more information on the DDS position keyword, go to "Using the Position (POSITION) DDS Keyword" on page 2-90.

PRTQLTY
Print Quality. Use this record- or field-level keyword to vary the print quality within the file.

The PRTQLTY keyword is allowed only on records or fields for which a CHRSIZ or BARCODE keyword applies.

REF
Reference. Use this file-level keyword to specify the name of a file from which field descriptions are to be retrieved.

REFFLD
Referenced Field. Use this field-level keyword when referring to a field under one of these three conditions:

- The name of the referenced field is different from the name in positions 19 through 28.
- The name of the referenced field is the same as the name in positions 19 through 28, but the record format, file, or library of the referenced field is different from that specified with the REF keyword.
- The referenced field occurs in the same DDS source file as the referencing field.

SKIPA
Skip After. Use this file-, record-, or field-level keyword to specify that the printer device is to skip to a specific line number after it prints one or more lines.

SKIPB
Skip Before. Use this file-, record-, or field-level keyword to specify that the printer device is to skip to a specific line number before it prints the next line(s).

SPACEA
Use this record- or field-level keyword to specify that the printer device is to space some number of lines after it prints one or more lines.

SPACEB
Space Before. Use this record- or field-level keyword to specify that the printer device is to space some number of lines before it prints the next line or lines.

TEXT
Text. Use this record- or field-level keyword to supply a text description (or comment) for the record format or field.

TIME
Time. This field-level keyword prints the current system time.

TRNSPY
Transparency. This field-level keyword prevents code points you have redefined (using the DFNCHR keyword) from being interpreted as SCS printer control commands when your program sends an output operation that prints the field you are defining.

TXTRTT
Text Rotation. Use this field-level keyword to specify the rotation of the text on a page. For more information on the DDS text rotation keyword, go to "Using the Text Rotation (TXTRTT) DDS Keyword" on page 2-91.

UNDERLINE
Underline. Use this field-level keyword to specify that the OS/400 program is to underline the field when it is printed.

Close Processing

Part **3** of the application program performs the close operations of the application program.

When the application program has finished the output processing part of the application program, it performs a close operation on all the files it opened during the open processing of the application program.

The SCHEDULE parameter from the CRTPRTF command is looked at by the application program during the close portion of the application program.

SCHEDULE
Specifies, for spooled files only, when the spooled file is made available to the printer writer program.

For more information on how the SCHEDULE parameter is used to control when the spooled file is made available to a printer writer to produce a printed document, go to "Using the SCHEDULE Parameter" on page 2-38.

Output from the Example Application Programs

Following are examples of the output from the mailing label application program. Notice that the first example has no underlining or boldface text. Example 1 is produced using a program-described printer file and example 2 (with the underlining and highlighting) is produced using an externally-described printer file (DDS).

Using a Program-Described Printer File

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Box 123
RR 1
Chatfield, IA 55924

Cindy Olson
502 9th Ave.
RR2
St. George Cove, IN 46043

Lynn Smith
808 5th St.
Peru, IN 46234

Michael Jones
Box 215
Preston, MN 55923

Pat Edwards
123 River Road
St. Charles, MN 55945

Using an Externally Described Printer File (Using DDS):

Bonnie Fohrman
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Chatfield, IA 55924

Cindy Olson
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St. George Cove, IN 46043

Lynn Smith
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Overriding Printer Files

Note to Readers

Overriding files (printer files, display files, diskette files, database files, and tape files) can be done by commands, from CL programs, or from HLL programs. Overrides can be called from different levels (programs calling another program).

This guide discusses overriding printer files.

If you want to read about overriding one file type with another, programs calling overrides from other programs (multiple call levels), and file redirection, go to the *Data Management Guide*, SC41-9658.

Overrides are used to temporarily specify a different printer file or temporarily change some of the attributes of a file. An override is only active for the current sign-on session. As soon as you end your session or use the Delete Override (DLTOVR) command, the override is no longer active.

Override commands may be entered interactively from a display station or as part of a batch job. They may be included in a control language (CL) program, or they may be issued from other programs via a call to the program QCMDEXC. Regardless of how they are issued, overrides remain in effect only for the job, program, or sign-on session in which they are issued. Overrides have no effect on other jobs that may be running at the same time.

Overrides are particularly useful for making minor changes to the way a program functions or for selecting the data on which it operates, without having to recompile the program. Their principal value is in allowing you to use general purpose programs in a wider variety of circumstances. Examples of items where overrides may be used are:

- Changing the name of the file to be processed
- Indicating whether output is to be spooled
- Changing printer characteristics such as lines per inch and number of copies

It is also possible to use overrides to direct data input or output to a device of a different type; for example, to send data that was intended for a diskette to a printer instead. This use of overrides requires somewhat more foresight than the override applications listed above, because the program must be able to accommodate the different characteristics of the two devices involved. The special considerations required for overrides that change the file type or redirect files are discussed in the *Data Management Guide*.

Files are associated with an application program by the file names specified in the program when it is created. You can override these file names or attributes of a specified file when you compile a program or run a program. The system supplies three override functions: applying overrides, deleting overrides, and displaying overrides. You can process override functions for files using the following CL commands:

OVRPRTF Override with Printer File: Overrides (replaces) the printer file named in the program, overrides certain parameters of a printer file that is used by the program, or overrides the file and certain parameters of the file to be processed.

DLTOVR Delete Override: Deletes one or more file overrides that were previously specified in a call level.

DSPOVR Display Override: Displays file overrides at any active call level for a job.

Overrides may be used to change most, but not all, of the file attributes that are specified when the file is created. In some cases, attributes may be specified in overrides that are not part of the original file definition. Refer to the command descriptions in the *CL Reference* for details.

Overriding a file is different from changing a file in that an override does not permanently change the attributes of a file. For example, if you override the number of copies specified in a printer file by requesting six copies instead of two, the file description for the printer file still specifies two copies, but six copies are printed. The override command tells the system which file to open and what its file attributes are.

Applying Overrides

There are three different types of file overrides. These are:

- Overriding file attributes

  For example, you could temporarily change the number of copies you want printed from one to three by overriding the value specified on the COPIES parameter.

- Overriding file names or types

  For example, you could temporarily change which printer file the program uses.

- Overriding file names and file attributes of the new file

  For example, you could temporarily change the printer file used and also temporarily change some of the values specified in the new printer file.

Overriding File Attributes

The simplest form of overriding a file is to override some attributes of the file.

For example, assume that you create a printer file named OUTPUT with these attributes:

- Page size: 66 by 132
- Lines per inch: 6
- Copies of printed output: 2
- Pages for file separators: 2
- Overflow line number: 55

The Create Printer File (CRTPRTF) command used to create this file looks like this:

```
CRTPRTF FILE(QGPL/OUTPUT) SPOOL(*YES)
PAGESIZE(66 132) LPI(6)
COPIES(2)  FILESEP(2)  OVRFLW(55)
```

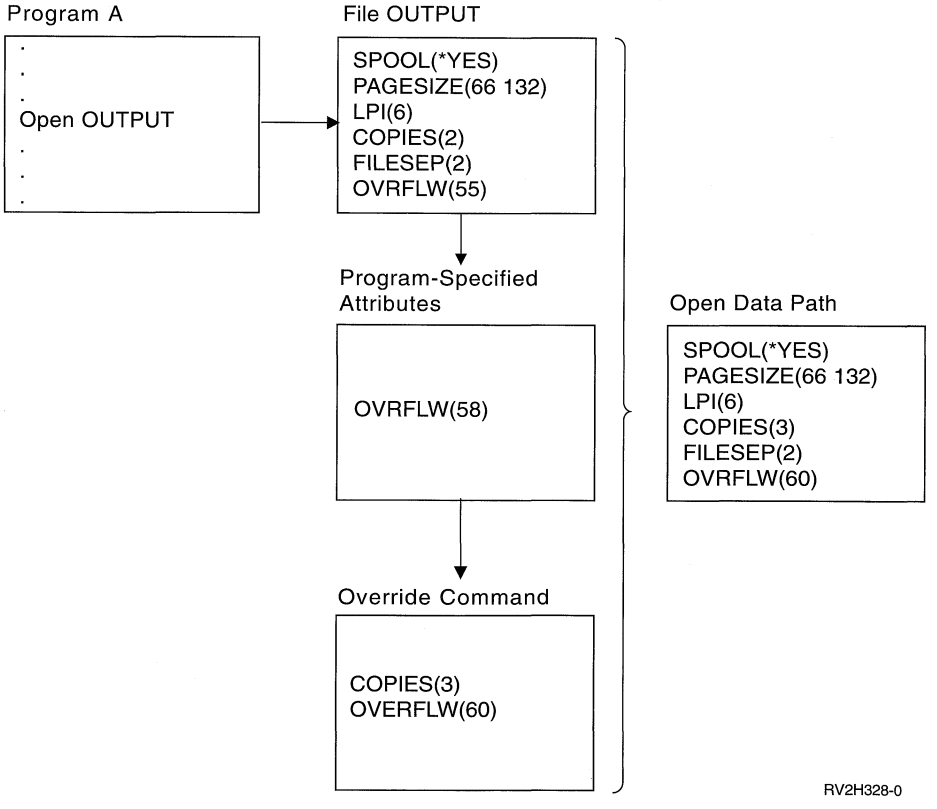
The printer file named OUTPUT is specified in your application program with an overflow line number of 58. However, before you run the application program, you want to change the number of copies of printed output to 3 and the overflow line to 60. The override command looks like this:

```
OVRPRTF  FILE(OUTPUT)  COPIES(3)  OVRFLW(60)
```

When you call the application program, three copies of the output are printed.

When the application program opens the file, the file overrides, program-specified attributes, and file attributes are merged to form the open data path (ODP) which is used to manage the file during the running of the program. File overrides have precedence over program-specified attributes. Program-specified attributes have precedence over file-specified attributes. In this example, when the file is opened and output operations are performed, spooled output will be produced with a page size of 66 by 132, six lines per inch, three copies, two file separator pages, and overflow at 60 lines.

The following chart explains this example:



Overriding File Names or Types

Another simple form of overriding a file is to change which file is used by the program. This may be useful for files that have been moved or renamed after the program has been compiled. For example, you want the output from your application program to be printed using the printer file named REPORTS instead of the printer file named OUTPUT (OUTPUT is specified in the application program). Before you run the program, enter the following:

```
OVRPRTF FILE(OUTPUT) TOFILE(REPORTS)
```

The file REPORTS must have been created (CRTPRTF command) before it can be used.

If you want to override to a different type of file, you use the override command for the new type of file. For example, if you are overriding a diskette file with a printer file, use the Override with Printer File (OVRPRTF) command.

The special considerations required for overrides that change the file type or redirect files are discussed in the *Data Management Guide*.

Overriding File Names or Types and File Attributes of the New File

This form of overriding files is simply a combination of overriding file attributes and overriding file names or types. With this form of override, you can override the file that is to be used in a program and you can also override the attributes of the overriding file. For example, you want the output from your application program to be printed using printer file REPORTS instead of printer file OUTPUT (OUTPUT is specified in the application program). In addition to having the application program use printer file REPORTS, you want to override the number of printed copies to three. Assume printer file REPORTS was created with the following command:

```
CRTPRTF FILE(REPORTS) SPOOL(*YES)
PAGESIZE (68 132) LPI(8)
OVRFLW(60) COPIES(2) FILESEP(1)
```

Before you run the program, type the following command:

```
OVRPRTF FILE(OUTPUT) TOFILE(REPORTS) COPIES(3)
```

Then call the application program, and three copies of the output are printed using the REPORTS printer file.

Note that this is not equal to the following two override commands:

```
Override 1   OVRPRTF    FILE(OUTPUT)   TOFILE(REPORTS)
Override 2   OVRPRTF    FILE(REPORTS)  COPIES(3)
```

Only one override is applied for each call level for an open of a particular file, so if you want to override the file that is used by the program and also override the attributes of the overriding file from one call level, you must use a single command. If two overrides are used, the first override will cause the output to be printed using the REPORTS printer file, but the second override will be ignored.

CL Program Overrides

If a CL program overrides a file and then calls a high-level language program, the override remains in effect for the high-level language program. However, if a high-level language program calls a CL program that overrides a file, the override is deleted automatically when control returns to the high-level language program.

High-level language program:

```
CALL  CLPGM1
```

CL program:

```
OVRPRTF  FILE(PRTF1)  TOFILE(MSTOUT)
.
.
.
ENDPGM
```

High-level language program:

```
OPEN  PRTF1
```

The file opened is PRTF1, not MSTOUT. This is because the override in the CL program is deleted when the CL program ends.

Securing Printer Files

You may want to prevent the person or program that calls your program from changing the printer file names or parameters you have specified.

You can prevent additional printer file overrides by specifying SECURE(*YES) on the printer file override command for each printer file you want to protect from overrides. Go to the *Data Management Guide* for more information on securing printer files.

Using a Generic Override for Printer Files

The OVRPRTF command allows you to have one override for all the printer files in your job with the same set of values. Without the generic override, you would have to do a separate override for each of the printer files.

By specifying *PRTF as the file name on the OVRPRTF command, you can apply one override to all printer files

The override specified on the OVRPRTF command with *PRTF is applied if there is no other override for the printer file name at the same call level. The following example shows how *PRTF works:

```
Override 1   OVRPRTF FILE(OUTPUT) COPIES(6) LPI(6)

Override 2   OVRPRTF FILE(*PRTF) COPIES(1) LPI(8)
             CALL PGM(X)
```

When program X opens the file named OUTPUT, the opened file has the following attributes:

```
COPIES(6)   From Override 1
LPI(6)      From Override 1
```

When program X opens the file named PRTOUT, the opened file has the following attributes:

```
COPIES(1)   From Override 2
```

LPI(8) From Override 2

Deleting Overrides

If you want to delete an override before the program has completed running, you can use the Delete Override (DLTOVR) command. This command deletes only overrides that are active in the call level in which the command is entered. To identify an override, use the printer file name specified on the FILE parameter of the override command.

Following is an example that shows an override of a printer file (PRTF1) with a different printer file (PRTF2). On the second line of the example is the Delete Override (DLTOVR) command that is used to delete the override. The printer file named PRTF1 will be used to process the output from the application program.

```
OVRPRTF FILE(PRTF1)  TOFILE(PRTF2)
DLTOVR FILE(PRTF1)
```

You can delete all printer file overrides at this call level by specifying *ALL for the FILE parameter.

Following is an example that shows two printer file overrides, PRTC and PRT3. The override is changing the COPIES parameter value in both cases. The third line of the example shows the Delete Override (DLTOVR) command with the FILE parameter value set to *ALL. This means the overrides to PRTC and PRT3 are deleted.

```
OVRPRTF FILE(PRTC)  COPIES(2)
OVRPRTF FILE(PRT3)  COPIES(4)
DLTOVR FILE(*ALL)
```

For more information on deleting overrides from multiple call levels and overrides to different file types, go to the *Data Management Guide*.

Displaying Overrides

You can use the Display Override (DSPOVR) command to display printer file overrides. You can display all printer file overrides or overrides for a specific printer file.

To display any overrides to the printer file PRTF1, type:

```
DSPOVR FILE(PRTF1)
```

To display all printer file overrides, type:

```
DSPOVR  FILE(*ALL)
```

However, when the FILE parameter has a value of *ALL, the system presents a display with all the active overrides to all the file types supported on the system. Using FILE(*ALL) on the DSPOVR command is an indirect way to learn what overrides are active for any printer files; a more direct way is to issue a DSPOVR command for each printer file.

Go to the *Data Management Guide* for more information on displaying printer file overrides from specific or multiple call levels.

Changing Printer Files

You can change the parameters of a printer file by using the Change Printer File (CHGPRTF) command.

Using the CHGPRTF command makes the specified changes permanent for the current active session and for all future sessions. You can still apply overrides to a printer file that has been changed. However, the override is only active for the current session.

Let's assume that you have a mailing label program that uses a printer file named LABELPR3. You now want to have two sets of mailing labels every time the mailing label program is run and you want the spooled file to go to the output queue named LABELS. The CL command would look like:

```
CHGPRTF FILE(LABELPR3) COPIES(2) OUTQ(LABELS)
```

When you enter this CHGPRTF command, it becomes effective immediately.

When any application program that uses printer file LABELPR3 is run, the spooled file will go to output queue LABELS and two copies of the mailing labels will be printed. For more information on the CHGPRTF command, see the *CL Reference*.

Using Printer File Parameters

The following sections discuss individual printer file parameters in more detail to help you better understand how to use them.

Using the Device Type (DEVTYPE) Parameter

The device type (DEVTYPE) parameter specifies the type of data stream created for a printer file. This parameter indicates whether the resulting data stream should be an intelligent printer data stream (IPDS), an SNA character stream (SCS), an ASCII data stream (*USERASCII), or an Advanced Function Printing data stream (*AFPDS).

An AFP data stream can be created from several sources:

- System/370
- PrintManager*
- AFP Utilities/400 licensed program
- Using the virtual print function with the PC Support licensed program

However, to use the functions provided by many of the printer file parameters that are supported for AFPDS, the spooled file must be created with a printer file that specifies a device type of *AFPDS. These parameters include FRONTMGN, BACKMGN, FRONTOVL, BACKOVL, FNTCHRSET, CDEFNT, and IGCCDEFNT. In cases where the AS/400 system does not actually generate the AFP data stream (the list above) either a printer file is not used or the DEVTYPE parameter for the printer file is ignored.

Throughout this manual, AFPDS output that is created on the AS/400 system with a printer file specifying DEVTYPE(*AFPDS) is referred to as *AFPDS created on the AS/400 system.

If DEVTYPE(*USERASCII) is specified, the user is responsible for the content of the entire data stream (such as PPDS for the 4019 printer). The AS/400 system will not send any formatting commands that correspond to the spooled file attributes. For example, the system sends initial formatting commands to the printer that set up the page size, lines per inch, characters per inch, and font for spooled files with DEVTYPE(*SCS) or DEVTYPE(*IPDS). These commands are not sent for spooled files with DEVTYPE(*USERASCII). Instead, the system sends the contents of the spooled file without adding any formatting commands.

This spooled file can then be sent to an ASCII printer attached to an AS/400 system. It is recommended that you not use file or job separators when you specify DEVTYPE(*USERASCII).

Note: Do not put hex 03 transparency commands in the data stream. Instead, put only ASCII commands the target printer can understand. The AS/400 system inserts the hex 03 commands with the correct lengths; thus, no EBCDIC to ASCII translation occurs.

Using the SCHEDULE Parameter

The SCHEDULE parameter can be specified with one of three values to control when the spooled file is available for a writer to produce the file.

*FILEEND Specifies that the spooled file is made available to the writer when the file is closed

*JOBEND Specifies that the spooled file is made available to the writer when the job that created the spooled file is ended

*IMMED Specifies that the spooled file is made available to the writer when the file is opened

*JOBEND Considerations

The SCHEDULE(*JOBEND) spooled files of a job are grouped together on their output queues when the job completes. All SCHEDULE(*JOBEND) spooled files of the same job that are grouped together on a queue are produced together by the writer. Another spooled file can be added to the top of the queue while the writer is producing a SCHEDULE(*JOBEND) spooled file. After a writer produces one file of a job that is SCHEDULE(*JOBEND), it checks the following file on the queue. If this file is from the same job and is also SCHEDULE(*JOBEND), the writer produces it next. However, if the file is from a different job or is not SCHEDULE(*JOBEND), the first file on the queue is produced next.

If you want your SCHEDULE(*JOBEND) spooled files grouped together on a SEQ(*FIFO) output queue, you must be careful not to separate the spooled files. File operations such as HLDSPLF, CHGSPLFA, and RLSSPLF are performed one at a time (even from a Work with Output Queue (WRKOUTQ) display). If operations to other files on the queue are done at the same time, your spooled files can be separated on a SEQ(*FIFO) queue. If your SCHEDULE(*JOBEND) spooled files separate, you can regroup them by changing their output priority with the Change Job (CHGJOB) command.

*IMMED Considerations

When a writer is producing a SCHEDULE(*IMMED) spooled file, it may catch up to the program producing the output. When this happens, the writer must wait for the program to produce more output. Because of this, you should be careful using *IMMED for the schedule option. When this happens, the writer cannot process other spooled files. Moreover, the device cannot be used for any other work.

Normally, spooled files that are created with SCHEDULE(*IMMED) specified are assigned a smaller internal buffer than spooled files that are created with SCHEDULE(*JOBEND) or SCHEDULE(*FILEEND) specified. Using SCHEDULE(*IMMED) to assign a smaller internal buffer may allow the spooled data to be produced sooner, but can also adversely affect performance because more disk operations are needed for the same amount of spooled data.

A large internal buffer is always used for spooled print files that use certain special device requirements or are created by PC Support/400. Special device requirements include:

- Defined characters
- Graphics 4214
- Graphics 4234
- Graphics 522x

Changing the SCHEDULE parameter of a spooled file with the CHGSPLFA command does not affect the internal buffers used for that file.

Using the OUTPTY Parameter

Once a spooled file is available to a writer, the OUTPTY parameter determines the order in which the files are produced. The OUTPTY parameter supports the value *JOB (use the default output priority for the job) and a range of values from 1 to 9. All available files that have an output priority of 1 are positioned at the top of the output queue and are the first files to be printed. Next are the priority 2 files and so on. By selecting the appropriate output priority for spooled files, you may ensure that the spooled files needed right away will be printed first.

The priority of a spooled file when it is created is set from the printer file. Use the Create Printer File, Change Printer File, or Override with Printer File commands to set the OUTPTY parameter to the desired value before the file is opened. After the file is opened, the output priority of the spooled file can be changed by using the CHGSPLFA command.

Using the Align (ALIGN) Parameter

The align parameter on the Start Printer Writer (STRPRTWTR) and Create Printer File (CRTPRTF) commands influences how the AS/400 system issues messages to check forms alignment in printers before they start to print.

If the value on the STRPRTWTR align parameter is *WTR, the printer writer keeps track of spooled files that are to be printed and issues a forms alignment message whenever it determines that forms alignment is needed.

The following cause the printer writer to issue a forms alignment message:

- Delete or hold spooled file command (option *IMMED) issued against a spooled file with a status of WTR

- Printer writer or spooled file restarted
- Previous spooled file was created with ASCII data (virtual print) and current spooled file was not
- Forms length of previous spooled file is different than current spooled file
- File being printed is the first file to print after a printer writer has been started
- Forms type is changed (after a G reply to a CPA3394 or CPA3395 message)
- Incorrect control characters have been detected on a work station printer in the previous file
- The Cancel key on a work station printer has been pressed while the previous file is being printed
- A C (Cancel) reply has been given to the inquiry message for unprintable characters detected on a work station printer in a previous file
- An H (Hold) reply has been given to some inquiry messages on a work station printer
- A printer writer has recovered from a communications failure on a remote work station printer

If you do not want the printer writer to control the issuing of forms alignment messages, you can specify *FILE as the value for the align parameter of the STRPRTWTR command and *YES on the align parameter of the printer file used with the application that produces the spooled file.

If the value on the STRPRTWTR align parameter is *FILE, the printer writer looks at the attributes of the spooled file created by the application program. Specifically, the printer writer looks at the align parameter value of the spooled file attributes to determine if it should send a forms alignment check.

If the align parameter value of the spooled file attributes is *YES, the printer writer sends a message to check forms alignment on the target printer.

If the align parameter value of the spooled file attributes is *NO, the printer writer does not send any messages to check forms alignment on the target printer.

If you want to avoid any forms alignment messages, you can specify *FILE for the align parameter on the Start Printer Writer (STRPRTWTR) command and *NO as the align parameter value of the printer file. With this combination of values, the AS/400 system does not send any messages to check alignment.

Using the Page Rotation (PAGRTT) Parameter

The PAGRTT parameter controls the rotation of text on the page. When *AUTO or *DEVD is specified for the PAGRTT parameter, the system determines the orientation of the printed page. For example, if the output is too wide, the page is rotated 90 degrees.

For the 3831, 3835, and 3900 printers, the system automatically senses when the output is too large to fit on the paper loaded in the printer. In the information below, for printers other than the 3831, 3835, and 3900, the expression "too large to fit on the form" refers to a page size defined in the printer file parameters where both the length and width exceed 8.5 inches, or where either the length or width is greater than 14 inches. For example, a page defined to be 13.2 inches wide and 11 inches long is too large for a form that is 8.5 inches wide and 14 inches long. This would be a candidate for computer output reduction (COR).

If PAGRTT = *AUTO

- If the output is too large to fit on the form, computer output reduction is performed automatically.
- If the page is wider than it is long, the page is rotated 90 degrees. If it is not wider than it is long, the page is not rotated.
- *AUTO is only supported for spooled files with a device type (DEVTYPE) of *SCS, *IPDS, or *AFPDS that is created on an AS/400 system. It is not supported for files with a device type of *USERASCII, *LINE, *AFPDSLINE, or *AFPDS that is not created on an AS/400 system.

If PAGRTT = *DEVD

- If the output is too large to fit on the form, computer output reduction is performed automatically.
- If the page is wider than it is long, the page is rotated 90 degrees. If it is not wider than it is long, the page is not rotated.
- For computer output reduction printing, the PRTQLTY (print quality) parameter value must be either *DRAFT or *DEVD. If the PRTQLTY parameter value is *STD or *NLQ, spooled files are printed without computer output reduction (COR) and without page rotation.
- When using the PAGRTT parameter, do not specify *DEVD for the FONT parameter value. When FONT(*DEVD) is used, the system cannot determine the exact page width; therefore, page positioning may not be as intended.

Note: When the PAGRTT parameter value is *AUTO or *DEVD, computer output reduction (COR) is not provided if the spooled file has any of the *Device Requirements* fields set to Y. Use the Work with Spooled Files (WRKSPLF) command and select option `8=Attributes` to view the device requirements for any spooled file.

If PAGRTT = 0, 90, 180, or 270 Degrees

When these values (0, 90, 180, or 270) are specified for the PAGRTT parameter, the page size (PAGESIZE) parameter values are not automatically changed. You must specify the PAGESIZE parameter values with reference to the way the data is printed on the page. For example, using forms that are 8.5 inches wide by 11 inches long and printing at 6 lines per inch with a 10-pitch font:

- Specify PAGESIZE(66 85) with PAGRTT(0) or PAGRTT(180).

  The page reads top to bottom with the 8.5-inch side at the top (portrait orientation).

- Specify PAGESIZE(51 110) with PAGRTT(90) or PAGRTT(270).

  The page reads top to bottom with the 11-inch side at the top (landscape orientation).

If PAGRTT = *COR

- Output is rotated 90 degrees.
- Page size is set to 11 by 8.5 inches.
- Font substitution occurs as follows:
  - 12-pitch fonts are replaced with 15-pitch fonts.
  - 15-pitch fonts are replaced with 20-pitch fonts.

– All other fonts are replaced with a 13.3-pitch font (with the exception of the 4028 printer, which uses a 15-pitch font).

Note: When the PAGRTT parameter value is *COR, computer output reduction is not provided if the spooled file is *AFPDS, was created on the AS/400 system, and has any of the *Device Requirements* fields set to Y.

Use the Work with Spooled Files (WRKSPLF) command and select option `8=Attributes` to view the device requirements for any spooled file. In addition, *COR is not supported for spooled files with a device type of:

– *USERASCII

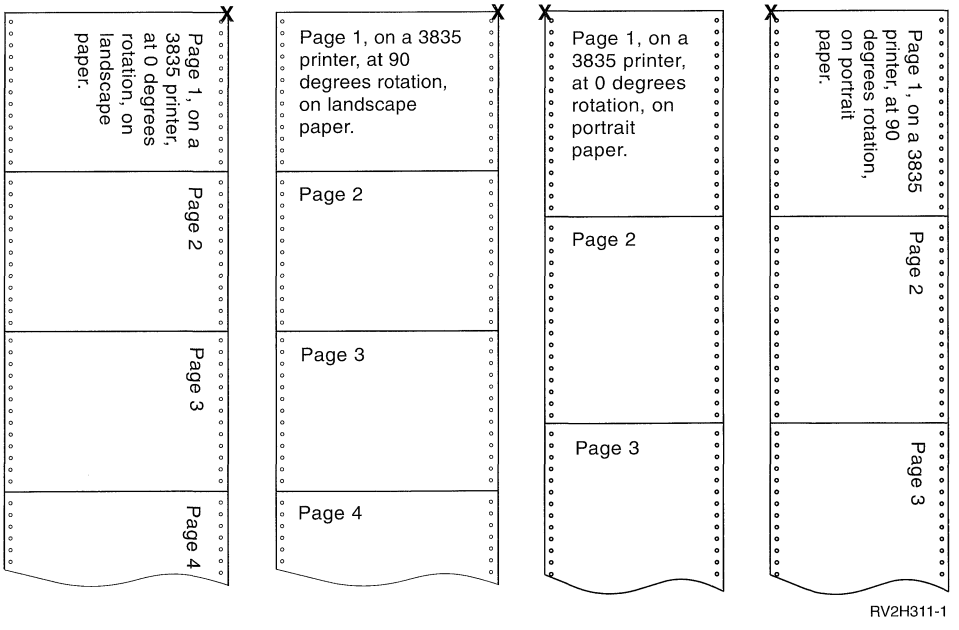
– *LINE (if the spooled file is sent to a printer configured with AFP(*YES))

– *AFPDSLINE

– *AFPDS (if the spooled file was not created on the AS/400 system)

Page Rotation on the 3831, 3835, and 3900 Printers

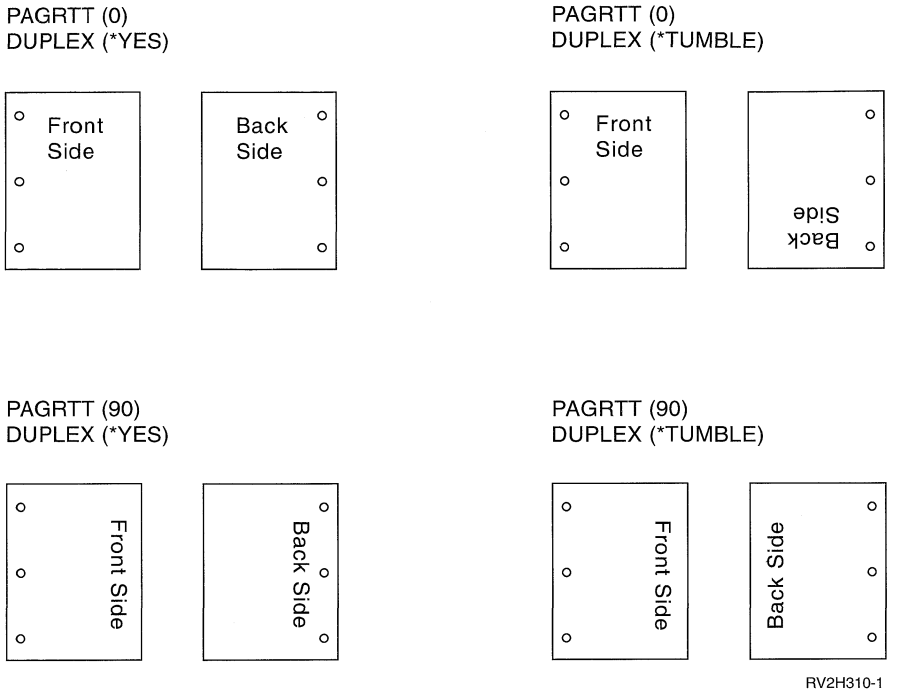
The 3831, 3835, and 3900 printers are continuous-forms printers that can accept page rotation commands. To permit output to be easily readable, output printed at 90-degree rotation on landscape paper (paper that is wider than it is long) is rotated in a counter-clockwise direction instead of the usual clockwise direction. See the diagram below for an example of how printed output appears on these printers when rotation occurs.



Note: The corner with the **X** is the paper origin. It is the left edge of the narrow side of the page.

Page Rotation and Duplex Printing

The examples below show how printed output will appear when combinations of duplex and page rotation are used. The dots on each page represent holes punched in the paper.



Note: A page segment or overlay included using the DDS PAGSEG or OVL keyword is not rotated with the rest of the printed output. This is also true of an overlay (front or back) specified on the printer file.

You must specify the degree of rotation when the page segment or overlay is created. Advanced Function Printing Utilities/400 can be used to create overlays and page segments.

Using the Pages per Side (MULTIUP) Parameter

The MULTIUP parameter allows you to print more than one logical page of data on a piece of paper. Depending on the printer that you are using, you can print from one to eight logically formatted pages on one physical piece of paper.

Using a printer that supports duplex printing, you could have four logical pages printed on each side of the physical paper, thus reducing the number of physical pages printed from eight to one.

The rotation value specified in the PAGRTT parameter of the printer file is used to determine the rotation for MULTIUP printing. When PAGRTT(*AUTO), PAGRTT(*DEVD), or PAGRTT(*COR) is specified and the MULTIUP parameter has a value of 2 or 4, the PAGRTT value used is 0.

MULTIUP Support for the 4224, 4230, and 4234 Printers

These are continuous-forms printers, and do not support rotation. MULTIUP(2) with PAGRTT(0) is the only valid combination. Below is an example of what the physical output page would look like. If the logical page width is less than or equal to 6-1/2 inches, the font is not changed. Otherwise font 223, which is 15 pitch, is used.

```
Page  1                    Page  2
Page  1                    Page  2
Page  1                    Page  2
Page  1                    Page  2
Page  1                    Page  2
Page  1                    Page  2
Page  1                    Page  2
Page  1                    Page  2
```

MULTIUP Support for the 3812, 3816, 3820, 3825, 3827, 3828, 3829, 3831, 3835, 3900, and 4028 Printers

These are IPDS printers that support page rotation (PAGRTT) and pages per side (MULTIUP).

For all the above-described printers, the following diagrams are examples of how the output will print depending on the PAGRTT and MULTIUP values.

PAGRTT(0) or PAGRTT(180) and MULTIUP(2)

```
Page  1
Page  1
Page  1
Page  1
Page  1
Page  1
Page  1


Page  2
Page  2
Page  2
Page  2
Page  2
Page  2
Page  2
```

If the logical page width is less than or equal to 8 inches and the logical page length is less than 5 inches, the font is not changed.

If the logical page width is greater than 8 inches, or the logical page length is greater than 5 inches, the font is selected based on the following table:

Table 2-2. Multiup Font Substitution for Page Rotation 0 or 180 with MULTIUP(2)

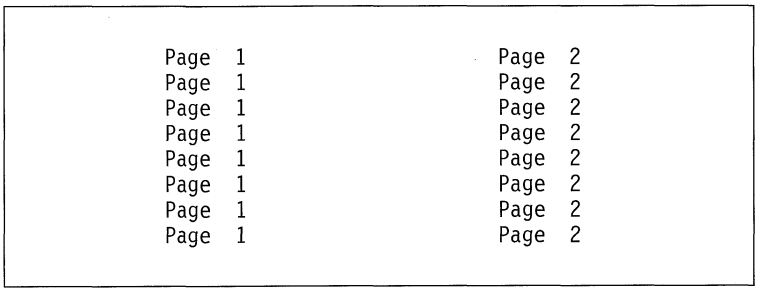
Page Width (Characters)	Page Length (Inches)	Font Used	Pitch (CPI)
1 through 123 characters	Less than or equal to 5 inches	230[1]	15
1 through 123 characters	Greater than 5 inches	254	17
124 through 139 characters	All	254	17
140 through 163 characters	All	281[2]	20[2]
Greater than or equal to 164 characters	All	290[2]	27[2]

Note:

1 Font 223 is used if your target printer is a 4028.

2 If your target printer is a 4028, font 283 (20-pitch) is used if the appropriate font card is installed. If not, font 281 (20-pitch) is used.

PAGRTT(90) or PAGRTT(270) and MULTIUP(2)



If the logical page width is less than or equal to 5 inches and the logical page length is less than 8 inches, the font is not changed.

If the logical page width is greater than 5 inches, or the logical page length is greater than 8 inches, the font is selected based on the following table:

Table 2-3. Multiup Font Substitution for Page Rotation 90 or 270 with MULTIUP(2)

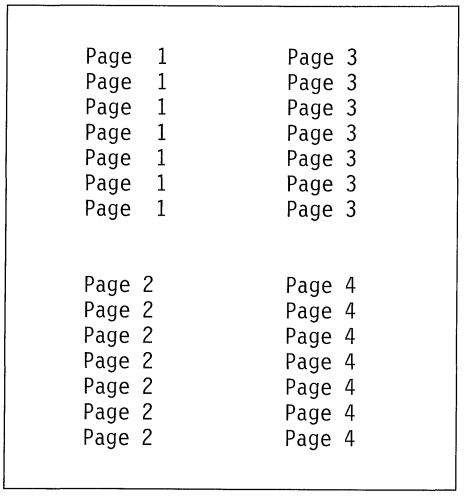
Page Width (Characters)	Page Length (Inches)	Font Used	Pitch (CPI)
1 through 73 characters	Less than or equal to 8 inches	230[1]	15
1 through 73 characters	Greater than 8 inches	254	17
74 through 83 characters	All	254	17
84 through 97 characters	All	281[2]	20[2]
Greater than or equal to 98 characters	All	290[2]	27[2]

Note:

1 Font 223 is used if your target printer is a 4028.

2 If your target printer is a 4028, font 283 (20-pitch) is used if the appropriate font card is installed. If not, font 281 (20-pitch) is used.

PAGRTT(0) or PAGRTT(180) and MULTIUP(4)



If the logical page width is less than or equal to 3.75 inches and the logical page length is less than 5 inches, the font is not changed.

If the logical page width is greater than 3.75 inches, or the logical page length is greater than 5 inches, the font is selected based on the following table:

Table 2-4. Multiup Font Substitution for Page Rotation 0 or 180 with MULTIUP(4)

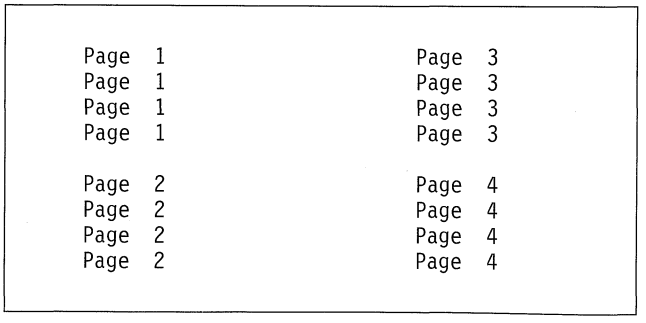
Page Width (Characters)	Page Length (Inches)	Font Used	Pitch (CPI)
1 through 54 characters	Less than or equal to 5 inches	230*	15
1 through 54 characters	Greater than 5 inches	254	17
55 through 61 characters	All	254	17
Characters 62 through 71	All	281[2]	20[2]
Greater than or equal to 72 characters	All	290[2]	27[2]

Note:

1 Font 223 is used if your target printer is a 4028.

2 If your target printer is a 4028, font 283 (20-pitch) is used if the appropriate font card is installed. If not, font 281 (20-pitch) is used.

PAGRTT(90) or PAGRTT(270) and MULTIUP(4)



If the logical page width is less than or equal to 5 inches and the logical page length is less than 3.75 inches, the font is not changed.

If the logical page width is greater than 5 inches, or the logical page length is greater than 3.75 inches, the font is selected based on the following table:

Table 2-5. Multiup Font Substitution for Page Rotation 90 or 270 with MULTIUP(4)

Page Width (Characters)	Page Length (Inches)	Font Used	Pitch (CPI)
1 through 73 characters	Less than or equal to 5 inches	230[1]	15
1 through 73 characters	Greater than 5 inches	281	20
74 through 83 characters	Less than or equal to 3.75 inches	254	17
74 through 83 characters	Greater than 3.75 inches	281	20
84 through 97 characters	All	281[2]	20[2]
Greater than or equal to 98 characters	All	290[2]	27[2]

Note:

1 Font 223 is used if your target printer is a 4028.

2 If your target printer is a 4028, font 283 (20-pitch) is used if the appropriate font card is installed. If not, font 281 (20-pitch) is used.

MULTIUP Restrictions

- MULTIUP requires an IPDS printer. It can be configured AFP(*YES) or AFP(*NO).
- MULTIUP reduces the size of any lines drawn in the printed output resulting from the use of the DDS LINE or BOX keywords. Depending on the pel resolution of the printer being used, the lines may become too narrow to print.
- MULTIUP is not supported for spooled files created with device type (DEVTYPE) of *LINE, *AFPDSLINE, or *AFPDS unless the AFPDS was created on an AS/400 system.
- MULTIUP is ignored if the spooled file contains any of the following advanced printing functions:
  - Final form text
  - Variable fonts
  - Variable lines per inch
  - Variable drawer
  - Superscript or subscript
  - Variable character ID
  - Highlighting
  - Extended 3812 fonts
  - Graphics
  - Bar codes
  - Variable page rotation
  - PC printer emulation
  - Define characters
  - Variable characters per inch

- Transparency commands
- Field outlining

Using the Fidelity (FIDELITY) Parameter

For AFP functions that are not supported, the FIDELITY parameter allows the user to determine if a spooled file with advanced printing functions should continue to print on an IPDS printer configured AFP(*YES) or stop printing when an advanced printing function is encountered that is not supported. For example, if a spooled file containing bar code commands is to be printed on a 3820 printer and the FIDELITY parameter value is:

- *ABSOLUTE, the spooled file does not print because the 3820 does not support bar codes.
- *CONTENT, the spooled file prints without the bar codes.

Note: If the device description of the printer has the value for the print while converting (PRTCVT) parameter set to *YES, the spooled file can print the pages up to the point where the bar code was encountered no matter what the fidelity parameter value is.

Fidelity and Other Printer File Parameters

If FIDELITY(*ABSOLUTE) is specified, the following list of printer file parameters must have a valid value specified for the selected printer. Otherwise, the spooled file is held.

- DRAWER
- FONT
- DUPLEX
- MULTIUP
- PAGRTT
- FRONTOVL
- BACKOVL

If FIDELITY (*CONTENT) is specified, a default value is used. For example, if DUPLEX (*YES) is requested, but the printer does not support duplex printing, the spooled file is printed on one side of the paper.

Using the Overlay (FRONTOVL and BACKOVL) Parameters

When an overlay is specified in a printer file, you can merge data from a spooled file onto the same piece of paper that the overlay is printed on. The FRONTOVL parameter specifies the overlay to be printed on the front side of the paper; the BACKOVL parameter specifies the overlay for the back side of the paper.

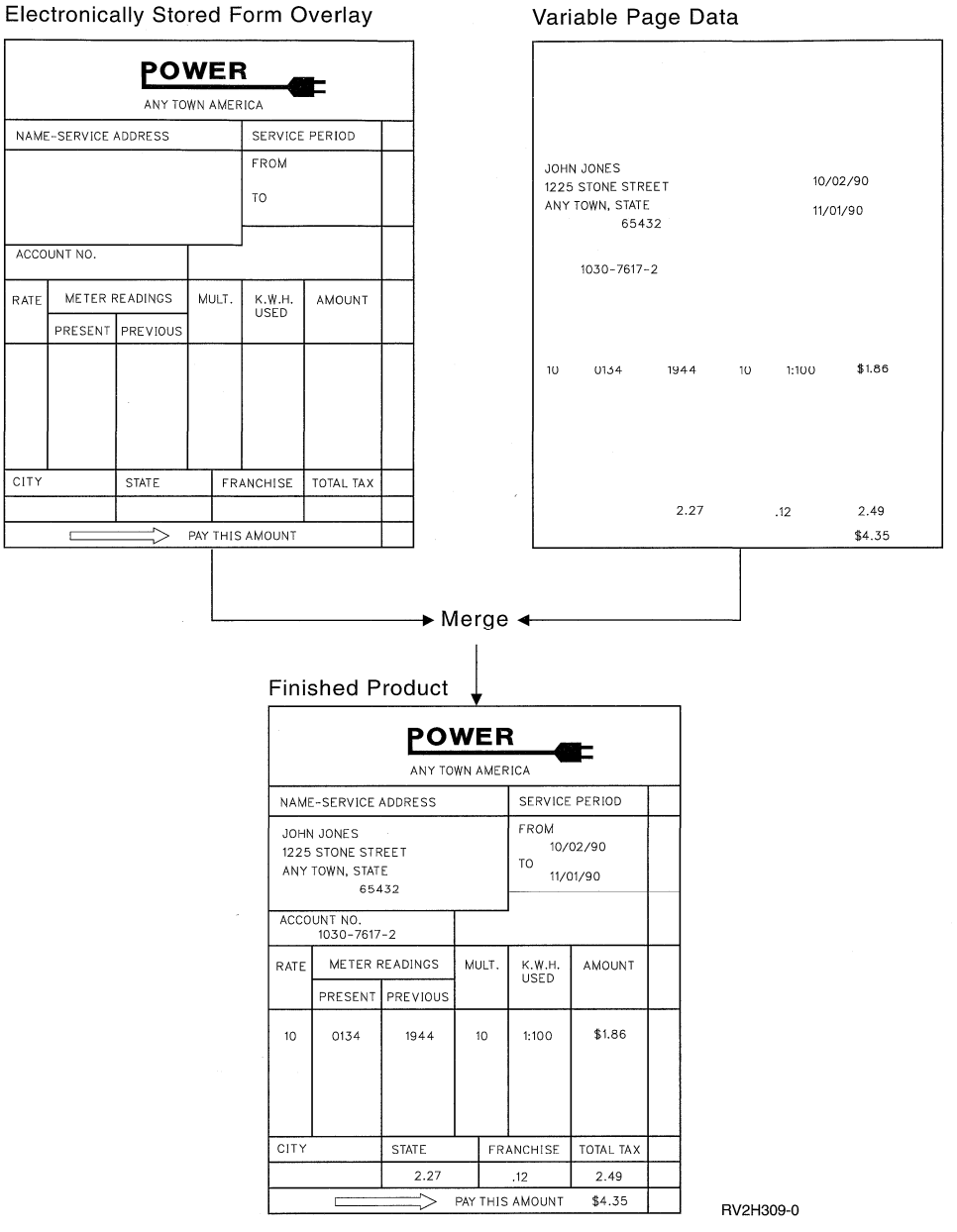
With your application program, you can use overlays that you created yourself using the Advanced Function Printing Utilities/400 licensed program, or overlays sent from System/370.

For more information about the Advanced Function Printing Utilities/400 licensed program, go to "Advanced Function Printing Utilities/400" on page 14-1.

The following diagram is an example of an overlay you can create using the AFP utilities. Additionally, the diagram shows how the merged spooled file data (Variable Page Data in the diagram) can be integrated into one document.

The merged document can be printed on any IPDS printer configured with AFP(*YES) in the printer's device description.

The overlays can only be merged with a spooled file that was created using a device type (DEVTYPE) of *SCS, *IPDS, or *AFPDS. The *AFPDS must have been created on an AS/400 system.



Using Overlays and Rotation

Rotation can occur for text and overlays. The AS/400 system treats text and overlays separately. That is, text is rotated using the page rotation (PAGRTT) parameter of the printer file. Overlay rotation must be determined at the time the overlay is created. Overlays are not rotated by the PAGRTT parameter.

To use the contents of the same overlay with different degrees of rotation (0 and 90 degrees), you create the overlay twice, once for 0 degrees and once for 90 degrees.

Assuming that you want the text and the overlay to be read in the same direction, the overlay offset values (down and across) on the printer file need to change depending on the degree of rotation of the text (PAGRTT parameter). That is, an overlay created with 90 degrees rotation is most often used with text that is rotated 90 degrees.

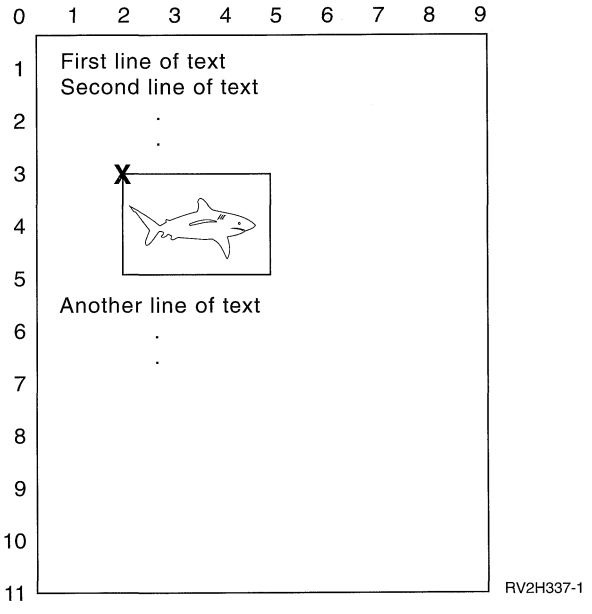
Notes:

1. Determining the overlay parameter values is made easier by focusing on a particular corner of the overlay depending on the degree of rotation specified.
2. Keep in mind that paper does not rotate as it passes through the printer.
3. The page size (PAGESIZE) values (down, across) must be viewed differently depending on the page rotation value (PAGRTT) specified. The examples show this concept by having numbers along the edge of the page.

Following are examples of how to determine the overlay parameter values when page rotation (PAGRTT) is used.

Example 1: Determining Overlay Values with Page Rotation (PAGRTT) of 0 Degrees. The following example assumes:

- Page size (PAGESIZE) parameter values are (11,9)
- Page rotation (PAGRTT) parameter value is (0)



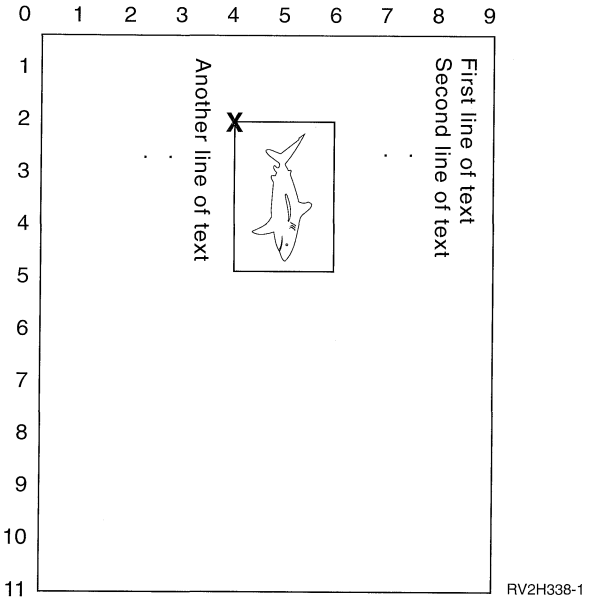
When PAGRTT is 0, the focus point for determining the overlay parameter values is the top left of the overlay (indicated by the **X** in the example).

Use the numbers beside the example page to determine the overlay down (3) and across (2) values.

Overlay parameter values are (3,2).

Example 2: Determining Overlay Values with Page Rotation (PAGRTT) of 90 Degrees. The following example assumes:

- Page size (PAGESIZE) parameter values are (9,11)
- Page rotation (PAGRTT) parameter value is (90)



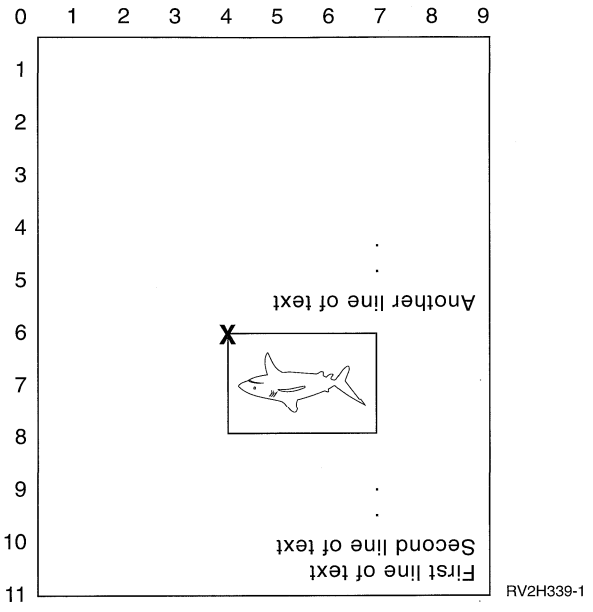
When PAGRTT is 90, the focus point for determining the overlay parameter values is the bottom left of the overlay (indicated by the **X** in the example).

Use the numbers beside the example page to determine the overlay down (2) and across (4) values.

Overlay parameter values are (2,4).

Example 3: Determining Overlay Values with Page Rotation (PAGRTT) of 180 Degrees. The following example assumes:

- Page size (PAGESIZE) parameter values are (11,9)
- Page rotation (PAGRTT) parameter value is (180)



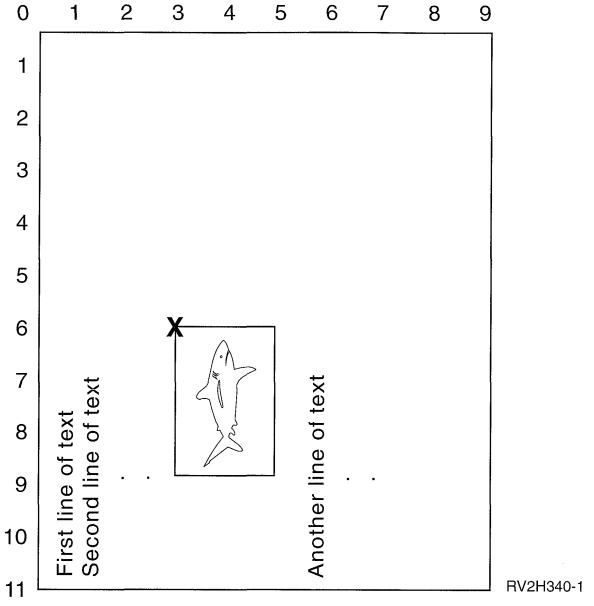
When PAGRTT is 180, the focus point for determining the overlay parameter values is the bottom right of the overlay (indicated by the **X** in the example).

Use the numbers beside the example page to determine the overlay down (6) and across (4) values.

Overlay parameter values are (6,4).

Example 4: Determining Overlay Values with Page Rotation (PAGRTT) of 270 Degrees. The following example assumes:

- Page size (PAGESIZE) parameter values are (9,11)
- Page rotation (PAGRTT) parameter value is (270)



When PAGRTT is 270, the focus point for determining the overlay parameter values is the top right of the overlay (indicated by the **X** in the example).

Use the numbers beside the example page to determine the overlay down (6) and across (3) values.

Overlay parameter values are (6,3).

Using the Margin (FRONTMGN and BACKMGN) Parameters

To use the margin parameters, the device type (DEVTYPE) parameter on the printer file must be *AFPDS. For device types other than *AFPDS, the AS/400 system calculates the margins.

Margins define the starting point of printed output on a piece of paper. The FRONTMGN parameter specifies the starting point on the front side of the paper; the BACKMGN parameter specifies the starting point on the back side of the paper.

There are two types of margins: front and back. Offset values, down and across, are used to fix the position of the margin. Across is defined as left to right. Down is defined as top to bottom.

Margins are measured in either inches or centimeters. The type of measurement is specified in the unit-of-measure (UOM) parameter on the printer file.

Using *DEVD and 0 as Margin Parameter Values

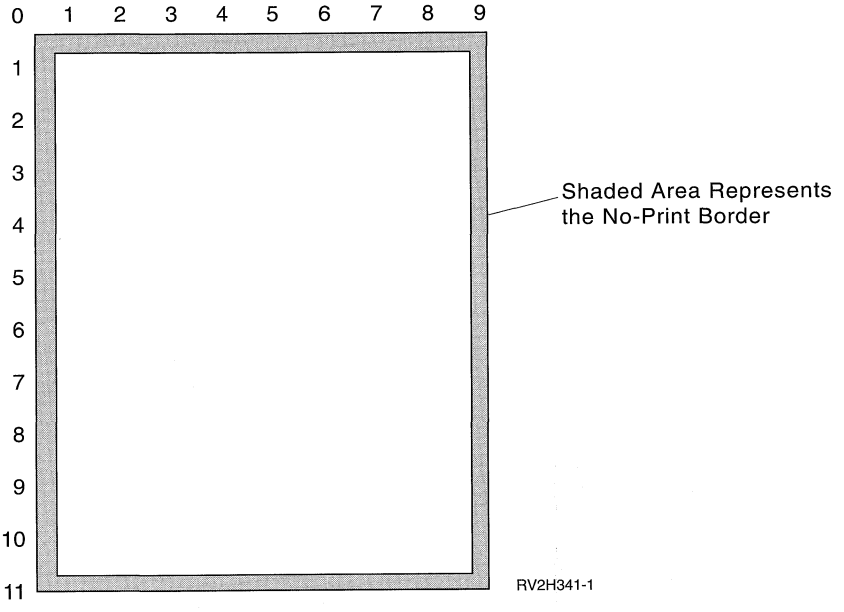
If you have existing application programs that specify how far across and how far down to start printing, you should specify 0 (zero) or *DEVD for the margin parameter offset values.

***DEVD** When *DEVD is specified, the no-print border (no-print border is a small area around the whole page where data will not print) is used to determine the starting printing point.

For printers configured as AFP(*NO), 0 is used to determine the starting point when *DEVD is specified.

0 When 0 is specified, the top left corner of the page is used to determine the starting printing point.

The following diagram shows a no-print border. The size of the no-print border can vary from printer to printer.

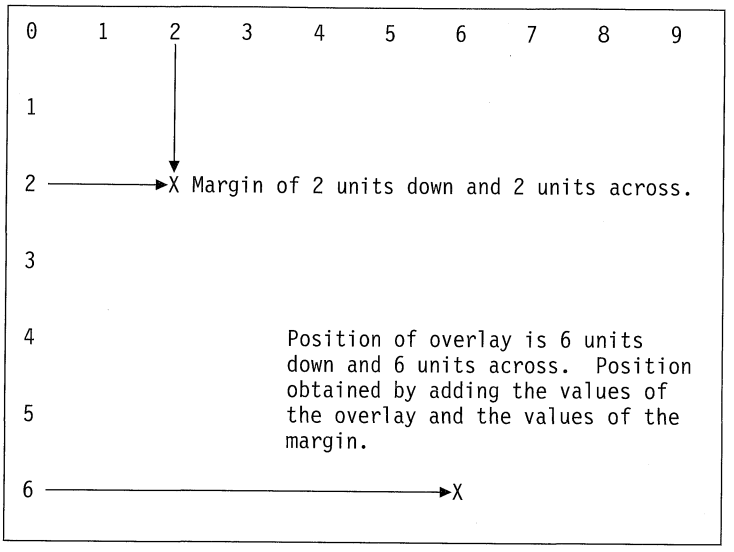


Restrictions with the Margin Parameters

The margin parameters (both front and back) are ignored for spooled files that have *COR specified as the value for the page rotation (PAGRTT) printer file parameter. This is because *COR assumes a half-inch margin. In addition, the margin parameters are ignored for spooled files that have a pages per side (MULTIUP) value of 2 or 4.

Using Margin Parameters and Overlays

Overlays specified with the back or front overlay printer file parameter are affected by the front or back margin parameters. The following diagram shows how your output would look if your front margin was defined as 2 units down and 2 units across and the placement of your overlay was 4 units down and 4 units across:



Note: If you use margins and overlays together, the offsets have the same unit of measure (UOM) specified: inches (*INCH) or centimeters (*CM), but not inches and centimeters together.

Using the DBCS Coded Font (IGCCDEFNT) Parameter

The DBCS coded font is the font that the system uses for DBCS printing on IPDS printers. This parameter is specified only for printer files with DEVTYPE (*SCS) or (*AFPDS) when printing on IPDS-capable printers configured with AFP(*YES).

Transforming SCS DBCS Data to AFPDS Data

When transforming the SCS data stream to AFPDS, the IGCCDEFNT parameter is used to print the DBCS data. When the spooled file is created as SCS, it contains SO/SI (shift out / shift in) characters to identify the double-byte data. When the printer writer is printing a spooled file, a font change to the DBCS coded font replaces the SO in the AFPDS data stream. When the SI is encountered in the data stream, a font change is placed in the data stream to change the font back to the previous SBCS font.

Generating AFPDS Data to Spool

The IGCCDEFNT parameter is used when generating AFPDS. If the data stream contains double-byte data (IGCDTA(*YES)), a font substitution to the DBCS coded font takes place.

In an externally-described file (DDS), the user can use the IGCCDEFNT DDS keyword to specify a DBCS font. This font will be used to print any DBCS data encountered in that field or record. If the user has a DBCS-graphic field specified, the printer file IGCCDEFNT parameter is used unless the IGCCDEFNT DDS keyword has been specified at the record or field level.

Using the Font Character Set (FNTCHRSET) Parameter

This parameter is specified only for printer files with DEVTYPE (*AFPDS) when printing on IPDS-capable printers configured with AFP(*YES).

When using a font character set, a character set and a code page must be specified on the font character set (FNTCHRSET) parameter of the printer file being used.

You cannot specify a coded font if you use the FNTCHRSET parameter on the printer file.

You can find out which font character sets and code pages come with the AS/400 system by using the Work with Font Resources (WRKFNTRSC) command and specifying QFNTCPL for the library and *FNTCHRSET or *CDEPAG as the object attribute.

Font character sets and code pages are downloaded from the AS/400 system to an IPDS printer when the spooled file is printed. They are supported on all IPDS printers except the 4224, 4230, and 4234. The use of font character sets provides greater consistency in the printed appearance of output from different printers.

Using the Coded Font (CDEFNT) Parameter

This parameter is specified only for printer files with DEVTYPE (*AFPDS) when printing on IPDS-capable printers configured with AFP(*YES).

A coded font is the combination of a font character set and a code page. This combination is assigned a name and called a coded font.

Note: The coded font contains only the names of the font character set and code page. It does not contain the font and code page data.

You can find out which coded fonts come with the AS/400 system by using the Work with Font Resources (WRKFNTRSC) command and specifying QFNTCPL for the library and *CDEFNT as the object attribute.

Note: If you have obtained coded fonts from other sources but have them in a different library, the WRKFNTRSC command can display the coded fonts located in that library.

You can specify a library for the coded font specified on the printer file. However, if the font character set and code page that make up the coded font are not in a library that is defined to your library list, the coded font is not found.

Special Printer File Considerations

Open Considerations

The following considerations apply to opening printer files for spooled output:

- The output queue should be created for the type of output your program produces so that system operator intervention can be kept to a minimum while a printer writer is producing output. You should consider the following when creating an output queue:
  - What form of output is being produced (printer or diskette).

  - What kind of forms the output is printed on.
  - What kind of protection you want to place on your data. (Do you want someone else to be able to display your data?)
  - How many job separators you want.

- The SCHEDULE parameter specifies when output is to be made available to a printer writer. When a printer writer processes a specific file, it is dependent on things such as:
  - When the writer is started
  - Other output files on the queue
  - If the writer or the output queue is being held
- The parameters specified to produce output are saved until they are used by the writer.

Output Considerations

The following considerations apply to output operations performed on spooled files:

Force-End-of-Data Considerations: The force-end-of-data (FEOD) operation can make part of the spooled file available to the writer unless SCHEDULE(*JOBEND) or HOLD(*YES) are specified for the file. This operation lets you write parts of a spooled file; for example, you can write one order at a time. You should not use the force-end-of-data operation for normal output. A new spooled file is started after each FEOD operation.

Close Considerations

When the schedule value is *FILEEND, the output file is made available to the printer writer. The file resources used by the program are deallocated.

If an application program is writing data when the system ends abnormally, the spooled output is shown containing 0 pages on spool displays such as the WRKOUTQ, WRKSPLFA, and WRKJOB displays. Records that were stored in internal system buffers are lost.

Spooled files that contain no records (open and close, but no output) are automatically deleted by the system when the application closes the device file. Writers will not select these files for printing unless SCHEDULE(*IMMED) is specified and the writer selects the file before it is closed.

First-Character Forms-Control Data

For program-described printer files, you can also specify the print control information in the data itself. You can do this by including an American National Standard first-character forms-control code in position 1 of each data record in the printer file. (You cannot use first-character forms control and DDS on the same file.)

To include the print control information in the data, you specify one of the following American National Standard first-character forms-control codes in the first position of each data record:

Control Code	Action before Printing a Line
' '	Space one line (blank code)
0	Space two lines

-	Space three lines
+	Suppress space
1	Skip to channel 1
2	Skip to channel 2
3	Skip to channel 3
4	Skip to channel 4
5	Skip to channel 5
6	Skip to channel 6
7	Skip to channel 7
8	Skip to channel 8
9	Skip to channel 9
A	Skip to channel 10
B	Skip to channel 11
C	Skip to channel 12

Any other character in position 1 of a record defaults to a blank (the American National Standard code for spacing one line). If this occurs, the notify message CPF4916 is sent to the high-level language program once per file.

When you use first character forms control data for a printer file, the print control information created by the high-level language compiler is ignored. The character in position 1 of the record is used as the print control character for that record.

To create a program-described printer file that uses first-character forms-control data, specify the CTLCHAR parameter and, optionally, the CHLVAL parameter on the Create Printer File (CRTPRTF) command. CTLCHAR(*FCFC) specifies that the first character in every record is an American National Standard forms-control code.

The CHLVAL parameter allows you to associate a specific skip-to line number with an American National Standard channel identifier. For example, if you specify CHLVAL(2 20), channel identifier 2 is allocated with line number 20; therefore, if you place the forms-control 2 in the first position of a record, the printer skips to line 20 before printing the line.

Note: If the printer stops at a particular line number and the next record processed has a channel value forms-control number that is the same value as the line number the printer is on, the printer advances to that value (line number) on the next page. In the example in the paragraph above, if the printer had been on line 20 already, the printer would then have advanced to line 20 of the next page.

There is one exception to this method of printer advancement.

If the printer is positioned at the top of the page (line 1) and the channel value forms-control value is line 1, the printer does not advance to a new page.

Each control identifier can be specified only once on the parameter. If no line number is defined for a channel identifier and that channel identifier is encountered in the data, the printer takes the default of spacing one line before printing.

In the following example, a file, PRTFCFC, that uses first-character forms-control data is created:

```
CRTPRTF  FILE(QGPL/PRTFCFC) OUTQ(PRINT) CTLCHAR(*FCFC) +
CHLVAL((1 1) (2 10) (12 60))
```

The printer output is spooled to the output queue PRINT. Channel identifier 1 is associated with line 1, channel identifier 2 is associated with line 10, and channel identifier 12 is associated with line 60.

Printer Font Support

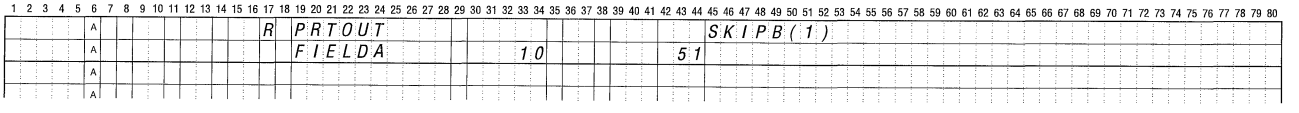
Characters Per Inch Versus Font

Most SCS printers use the CPI parameter on the CRTPRTF, CHGPRTF, or OVRPRTF command to determine the pitch (characters per inch) of the printed output. However, the 3812, 3816, 5219, and all IPDS printers use the FONT parameter to select both an implied pitch (characters per inch) and a font style. For these printers, the CPI parameter is ignored except when converting the page size (PAGESIZE) from *UOM to *ROWCOL. Conversely, the FONT parameter is ignored on printers where it is not applicable.

To provide flexibility in your print job, the pitch of the font identifier (FONT parameter) should match, where possible, the value specified on the CPI parameter. By setting the FONT parameter to FONT(*CPI), the system selects a font of the same pitch as the CPI parameter value. A print job intended for a printer that supports fonts can then be printed on another printer without significant change in the appearance of the printed output. For example, a printer file which has FONT(222), Gothic font with 15 pitch, and CPI(15) could print on a 3812, 4224, or 5219 Printer (which use the FONT parameter) or also could print on a 4214, 4230, 4234, 5224, or 5225 Printer (which support 15 characters per inch). If this print job were directed to a printer that only supports 10 characters per inch, then printer file redirection would be used.

For more information about redirecting spooled files to SCS printers, go to "Spooled File Redirected to SCS Printers" on page 2-70.

When using an SCS externally described printer file, normally the value specified in the CPI parameter is used to position fields on the printed page. For example, if a printer file has 10 characters per inch specified, and FIELDA is specified to start in column 51, then there would be 50 blanks to the left of FIELDA (50 blanks at 10 characters per inch is 5 inches).



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For the IPDS externally described printer files, the pitch implied by the FONT parameter on the CRTPRTF, CHGPRTF, and OVRPRTF commands is used instead of the CPI parameter or the value of the FONT DDS keyword to determine the starting column of fields on a printed page. In the example above, if CPI(10) and FONT(087) had been specified, and the printer specified was one that supports fonts, then FIELDA specified to start in column 51 would be 50 blanks at 12 characters per inch (implied CPI value for font 087) or 50/12 inches, which is 4.167 inches in from the left margin of the paper. The default for FONT is (*CPI). When *CPI is selected, the OS/400 program automatically selects a font of the pitch specified on the CPI parameter.

Proportionally Spaced and Typographic Fonts

All IPDS printers support proportionally spaced fonts. For proportionally spaced fonts, characters vary in width depending on the character being printed (for example, **i** is a narrow character, and **W** is a wide character). See Appendix D, "Working with Fonts, Font Character Sets, Code Pages, CHRIDs, and Coded Fonts" on page D-1 for a list of all supported fonts. The implied characters-per-inch column in this table lists the value of the width of a blank character for the font selected.

When using proportionally spaced fonts, fold and truncation (FOLD parameter) may not work as intended. This is because the system does not keep track of the width of each individual character.

The 3812, 3816, 3820, 3825, 3827, 3829, 3831, 3835, 3900, and 4028 Printers also support typographic fonts. A typographic font is specified by point size (height of font). A point measures 1/72 of an inch, so an 8-point font would be 1/9 of an inch high and a 24-point font would be 1/3 of an inch high. When using fonts that contain tall characters, double or triple spacing may be needed to avoid having lines overlap when the page is printed.

Because proportionally spaced and typographic fonts have characters of variable widths, care should be taken with the use of underlining and overstriking. The highlighting or underlining method of printing a line with a space after (SPACEA) value of 0 followed by printing another line may not work correctly.

Proportionally spaced and typographic fonts may be specified on the CRTPRTF, CHGPRTF, or OVRPRTF command when using an externally described printer file. The point size may be specified for typographic fonts. The point size is ignored for fonts that are not typographic. As noted above, the implied characters-per-inch value of the font identifier specified on the FONT parameter is used to position fields on a printed page. The same rule for positioning fields on a printed page is used with proportionally spaced and typographic fonts. The width of a blank character is used to position fields on a page. Output should be tested to see that using externally described printer files with proportionally spaced fonts produces satisfactory results because overprinting and gaps can occur in the output.

Note: The amount of printed space for a field varies depending on which characters are in a field. Enough space should be left between fields to allow for the widest characters (uppercase characters) expected in that field.

In the previous example, if CPI(10) and FONT(1351) had been specified, and the printer used was a 3812 Printer, then FIELDA specified to start in column 51 would be 50 blanks at 17.14 characters per inch (implied CPI value for font 1351) or 50/17.14 inches, which is 2.975 inches from the left margin of the paper.

In this example, FIELDA would start 2.975 inches from the left margin of the paper regardless of how many fields were defined to its left. When using an increment value (+n) instead of a column number (positions 42 through 44 in DDS specification), fields are positioned the same for proportionally spaced fonts as they are for fixed pitch fonts. That is, the field is positioned based on the width of the blank for the specified font. The following example illustrates that using either absolute column numbers or relative increment numbers (+n) will supply the same result.

```
     A*
     A* USE ABSOLUTE COLUMN NUMBER TO POSITION FIELDS
     A*
     A          R PRTOUT                    SKIPB(1)
     A            FIELDA        10        11SPACEA(1)
     A            FIELDB        15        31SPACEA(1)
     A            FIELDC        10        51SPACEA(1)
     A
     A*
     A* USE INCREMENT (+n) TO POSITION FIELDC2
     A*
     A          R PRTOUT2                   SKIPB(1)
     A            FIELDA2       10        11SPACEA(1)
     A            FIELDB2       15        31SPACEA(1)
     A            FIELDC2       10        +5SPACEA(1)
     A
     A
```

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Font Substitution

If the font identifier specified on the FONT parameter is not supported by the printer being used, printer data management selects a substitute font that is supported by the printer (if possible). A substitute font is at the same pitch or a higher pitch whenever possible to ensure that as much data as possible fits on the printed page. A complete list of fonts supported and the substitute font selected for each printer that supports the FONT parameter is shown in Appendix D, "Working with Fonts, Font Character Sets, Code Pages, CHRIDs, and Coded Fonts" on page D-1.

If a substitute font cannot be used, spool redirection is done. An inquiry message is sent to the message queue associated with the device or printer writer. The inquiry message gives you the option of holding or printing the file. If the print option is used, then the spooled output file is reformatted with the print attributes of file QPSPLPRT. Output may not look as intended. Refer to the printer's reference manual for information on what conditions cause the substitute font to not be used.

For the SCS 3812, 3816 and 5219 Printers, font substitution can be made only at the file level. For font changes made in the document, font substitution is not done. In this case, spool redirection (described previously) is used.

IPDS Printer FONT Parameter Considerations

When a printer has AFP(*YES) specified in the printer device description and the DEVTYPE specified for the printer file being used is *AFPDS, the FNTCHRSET, CDEPGE, and CDEFNT printer file parameters may be used to select a font resource to be downloaded to the printer. This applies to all IPDS printers except the 4224, 4230, and 4234. If these parameters are not used, then the value specified in the FONT printer file parameter is used.

When FONT(*DEVD) is specified on the CRTPRTF, CHGPRTF, and OVRPRTF commands, the following limitations are imposed:

- Bar codes are positioned on the page assuming a 10-pitch font is specified in the device description.
- When using a combination of bar code (BARCODE), page rotate from a printer file or DDS (PAGRTT), and character size (CHRSIZ) parameters in an externally described printer file, unpredictable results may occur. This is because the printer device FONT parameter value is not known when the spooled file is created.

- The data stream created may be longer than if a specific font were selected. This means the spooled file may take more storage in the output queue. Fields are positioned with spaces (hex 40) between them instead of using commands to specify the location where a field is to be placed.
- If a proportionally spaced font is used with a field in the file, any following fields may not be positioned in the column used if a specific font were specified at the file level. This is caused by the variable width of the characters in the proportionally spaced font, which are followed by spaces (hex 40) to position the next field.
- If the value of the FONT parameter on the printer device description is *DEVD or 0, font 011 is selected.

The maximum number of fonts that can be sent to a printer file is 48. When more than 48 fonts are requested, an error message is sent.

A slight adjustment is sometimes made to the first or last line of a page when the lines per inch (LPI) parameter value is greater than 6. This adjustment prevents IPDS printers from reporting position check errors due to part of a character printing off the top or bottom of the page. For the first line on a page, a slight downward adjustment is made. For the last line on a page, a slight upward adjustment is made. This adjustment is about 1/72 of an inch. No other lines on the page are adjusted. This adjustment is made only for spooled files with DEVTYPE of *SCS or *IPDS when printed on IPDS-capable printers. It is recommended that the first line on a page not be used for printing if the lines per inch (LPI) parameter on the printer file is 8 or greater.

Note: If an optical character recognition (OCR) font is specified with a non-OCR code page, the code page is changed to an OCR code page. If a non-OCR font is specified with an OCR code page, the font is changed to an OCR font.

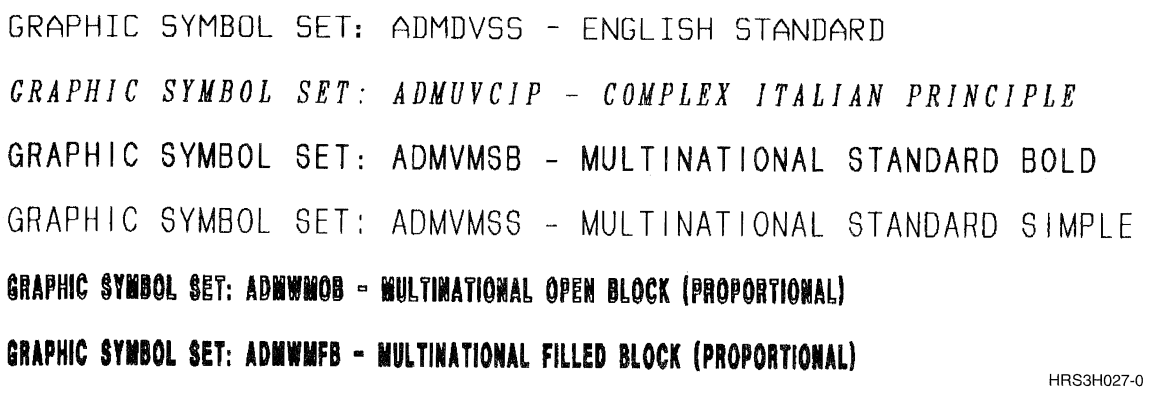
Using Graphic Symbol Sets

IPDS printers allow the selection of graphic symbol sets as fonts when using the DDS font keyword.

To find which graphic symbol sets are available on your system, enter the CL command:

```
DSPOBJD OBJTYPE(*GSS) OBJ(QGDDM/*ALL)
```

Following are some examples of the different graphic fonts available for use with AS/400 system.



Replacing Unprintable Characters

You can replace unprintable characters in your data before the data is written to the printer or to a spooled file by specifying RPLUNPRT(*YES) on the CRTPRTF, CHGPRTF, or OVRPRTF commands. The replacement of an unprintable character depends on the printer being used and the hexadecimal value of the unprintable character.

The RPLUNPRT value must be selected before the spooled file is created. Once a spooled file is in an output queue, changing the RPLUNPRT value has no effect on that particular spooled file.

- When RPLUNPRT(*YES) is specified, any characters in the range hex 00 through hex 3F, and hex FF, are replaced. The default replacement character is a blank. The character which a printer cannot print varies depending on the type of printer.
- When RPLUNPRT(*NO) is specified, no translation of the data stream is made. Any characters in the range hex 00 through hex 3F, or hex FF, may cause undesirable results. These characters are in the range used by printer control characters.

  For most characters in this range, the printer signals an unrecoverable error and the spooled file either is held in the output queue or is not processed. Some characters in this range control forms action and character representation on the printer and, as a result, additional skipping or spacing may occur. If control characters are placed in the data, system functions such as displaying or copying spooled output files and restarting or backing up a printer may produce results that cannot be predicted.

  If the hexadecimal value of the unprintable character is hex 40 through hex FE, a message is sent to the message queue associated with the printer. The message gives you the option to end the writer, hold the spooled file, ignore the error and continue printing, or select a page number where printing should be restarted. If the ignore option is taken, then unprintable characters continue to be reported. If the option to start again (specify page number) is taken, all unprintable characters are replaced with blanks and you receive no more notification for unprintable characters.

Considerations for the 4245, 5262, 6252, and 6262 Printers

The printer translates lowercase characters to uppercase characters when using a print band that does not contain lowercase characters. If your print job contains other characters that are not on the print band, they can be translated to blanks by specifying RPLUNPRT(*YES) for the printer file.

CL commands that you can use to do this are: CRTPRTF, CHGPRTF, and OVRPRTF.

A print band is selected by switches on the 5262 operator's panel. The operator must select both a language ID and a band image using these switches.

The 4245, 6252, and 6262 Printers detect the print band the printer is using.

When a print band changes for a print job, no inquiry message is sent to the message queue associated with the printer writer. You can specify a different form type for that job, such as blank payroll forms or blank invoices. A message to change the form type is sent to the printer writer message queue to notify the operator of the change to the print band.

Using Alternative Character Sets and Code Pages for Printer Output

Character sets are used with code pages to determine how each character will appear in the printed output. Code pages consist of hexadecimal identifiers (code points) assigned to character identifiers. For example, in code page 037 (EBCDIC), the letter e is assigned a code point of hex 85.

In multinational environments, data in one national graphics character set may need to be printed on devices that support another national character set. This is particularly true of characters with accents and other characters with diacritical marks (such as ç, ñ, and ü). In this section, these characters are called **extended alphabetics**.

For example, assume that a physical file on the system contains data in the Basic French character set, and includes the character é. In the code page used with the Basic French character set, this character is hex C0. The data could have been entered on a display device that can handle the character or could have been sent to the system from another system over a communications line. When hex C0 is sent to a printer that is set up for the United States Basic character set, the hex C0 is printed as {. Depending on the printer and the hexadecimal value sent, the hexadecimal value could be an unprintable character. The way the printer handles a specific hex code point (for example, hex C0) depends on the current value of the CHRID parameter in the printer file. You can specify three parameter values for the CHRID parameter:

- With an explicit value specified for the CHRID parameter, the printer interprets the data as if the data were in the character set and code page specified.
- With CHRID(*SYSVAL) specified, the printer file takes the value specified in the QCHRID system value when the output is created.
- With CHRID(*DEVD) specified, the printer uses the CHRID that was set with the device control panel or that was specified when the printer device description was created.
- With CHRID(*JOBCCSID) specified, the printer interprets the data as if the data were in the character set and code page associated with the CCSID for

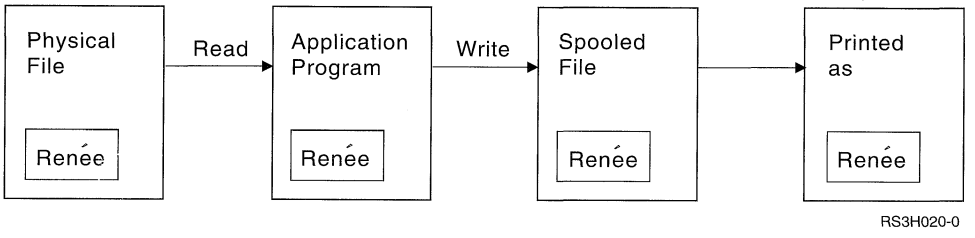
the current job. For more information, see the *National Language Support Planning Guide*.

Not all printers can handle all CHRID parameter values. If a CHRID is specified for a printer on which that CHRID is not supported, a message is sent to the operator. Go to Appendix D, "Working with Fonts, Font Character Sets, Code Pages, CHRIDs, and Coded Fonts" on page D-1 for a description of which printers support which extensions.

For program-described printer files, the value of the CHRID parameter determines the code page and character set used to print the data. However, for externally described printer files, the CHRID parameter is used only for fields that also have the CHRID DDS keyword specified. Fields that do not have the CHRID DDS keyword use the code page and character as if CHRID(*DEVD) had been specified for the CHRID parameter on the printer file.

For printers with AFP(*YES) in the device description, the printer file CDEPAG and FNTCHRSET parameters can be used to select a code page when the printer file DEVTYPE parameter is *AFPDS. This applies to all IPDS printers except 4224, 4230, and 4234.

The following shows how extended alphabetics are handled in printer output:



Assume that a record in a physical file contains a field with the value Renée. An application program reads the record from the physical file, and writes a record containing the data to the spooled file. The output field in the printer file that describes how Renée is to be printed has the CHRID DDS keyword specified, indicating that the printer is to interpret extended alphabetics. (The graphic character set 288 and code page 297 are specified for the interpretation in either the printer file or the QCHRID system value. Code page 297 is used for French language.)

When printing the data, the printer interprets hex C0 as specified in character set 288 and code page 297. If character set 101 and code page 037 had been selected, hex C0 (é) would have been printed as {.

One of the following CHRID values (graphic character set and code page) must be specified to print fonts OCR-A and OCR-B on the IPDS printers:

580 340
590 340
697 892
697 893

Print Text

You can specify on the printer file a line of text that is to be printed at the bottom of every page. This line of text is called the print text and is set by using the PRTTXT parameter on the CRTPRTF, CHGPRTF, or OVRPRTF commands. Up to 30 characters are allowed in the line of print text. The 30 characters are centered at the bottom of the page, 2 lines below the overflow line. If the user already has data to print on the line that the print text goes on, the print text is bumped down to the next blank line on the page. If no lines are blank, the print text is printed on the last line of the page.

Notes:

1. For externally described printer files with DEVTYPE(*AFPDS) using the DDS POSITION keyword, the print text is positioned by ignoring the location of any data placed on the page by records using the POSITION keyword. If all the data on the page is positioned using the DDS POSITION keyword, the print text is located on the overflow line.
2. If a host resident font is specified on the printer file, 10 characters per inch is used to calculate the location of the text specified on the PRTTXT parameter.

A system value, QPRTTXT, can be used to specify the print text so that the same text can appear on all files printed on the system. Also, the print text can be taken from the job description, so that all files created from a particular job can have the same print text.

Print text is useful for printing a security classification on each page. It can also be used to print a company name or slogan on each page.

Editing Output Fields

The system provides editing support that makes fields more readable when they are printed. With the system editing support, you can do the following:

- Suppress leading zeros
- Punctuate a field with commas and periods to show decimal column and to group digits by threes
- Print negative values with a minus sign or CR to the right
- Print zero values as zeros or blanks
- Print asterisks to the left of significant digits to provide asterisk protection
- Print a currency symbol corresponding to the system value QCURSYM

The system provides this editing support with edit codes and edit words. Edit codes are a defined set of editing patterns. You identify these by name, and the system edits a field according to the pattern defined by the named edit code. Edit words are edit patterns that you define to produce the desired results. Edit codes cover most commonly used editing requirements. You need to use the edit word support only for those editing needs not covered by edit codes.

There are two methods of using edit codes and edit words. Which one you use depends on how you define the printer file and how it is used in an application program. If your application is using program-described data, your high-level language may allow you to identify edit codes or create your own edit words. If your application is using externally described data, the edit code (EDTCDE) DDS keyword allows you to identify an edit code; the edit word (EDTWRD) DDS keyword allows you to define your own editing pattern.

The system provides several edit codes:

- 1 through 4
- A through D
- J through M
- X through Z

The editing patterns defined by these codes are described in the *DDS Reference* manual.

User-Defined Edit Codes

You can also define five edit codes to provide more editing function than is available with the OS/400 edit codes, and to handle common editing functions that would otherwise require the use of an edit word. These are called user-defined edit codes. For example, you may need to edit numbers that include hyphens (like some telephone numbers), or more than one decimal point. You can use user-defined edit codes for these functions. These edit codes are named QEDIT5, QEDIT6, QEDIT7, QEDIT8, and QEDIT9 and can be referred to in DDS or a high-level language program by number (5, 6, 7, 8, or 9).

These edit codes are created by using the Create Edit Description (CRTEDTD) command. Edit descriptions are always placed in library QSYS. They cannot be moved or renamed; only one occurrence of each is allowed. Edit descriptions have an object type of *EDTD.

IBM supplies a version of each of the QEDIT edit codes. You can use these edit descriptions as they are, or you can delete them and create your own. See the *DDS Reference* for more information about using these edit descriptions.

Before using any of the user-defined edit codes, you should check its contents on your system, since it may have been changed from the IBM-supplied version. The Display Edit Description (DSPEDTD) command can be used to display the contents of a user-defined edit code.

Changing a user-defined edit code description does not affect any application or printer file that has already been created using that edit description. If you want your application to use the changed edit description, you must either create the high-level language program again (if the edit code is used in the program) or create the file again (if the application is using an externally described file that contains EDTCDE keywords).

Effect of Changing Fields in a File Description

When a program using externally described printer files is compiled, the compiler extracts the file descriptions for the files referred to in the program and makes these file descriptions part of the compiled program. When you run the program, you can verify that the record formats with which the program was compiled are the current record formats. To do this, you use the LVLCHK parameter on the create file command when the file is created.

The system assigns a unique level identifier for each record format when the file it is associated with is created. The system uses the information in the record format description to determine the level identifier. This information includes the name of the record format, the names, attributes, and order of the fields in the format, the indicators used, and the names and the order of the indicators in the record format.

If you use the INDARA keyword to remove the indicator from the output buffer, the indicators used are not included in the level identifier information.

When the file is opened, if level checking is specified (LVLCHK parameter), the system does a format-by-format comparison of the level-checking values specified in the program to the level-checking values specified in the printer file. If any of the formats specified in the program do not exist in the file, or if any of the level checking values are different, an error occurs. Formats can be added to or removed from a printer file without affecting existing application programs that do not use the added or deleted formats.

You should display the file description to determine if the changes affect your program. You can use the Display File Field Description (DSPFFD) command to display the file description or, if you have the source entry utility (SEU), you can display the source file. Not every change in a file necessarily affects your program. You may not have to recompile your program. If you do not have to recompile your program, you should specify LVLCHK(*NO) for the file (CHGPRTF or OVRPRTF command).

You can add a field to the end of a printer file record format without having to recompile your program as long as you do not want to use the field in your program. If you delete a field from the end of the record format, you do not have to recompile your program if you are not using the field. However, if you add a field to or delete a field from a record format anywhere other than at the end, you must recompile your program. Otherwise, the field offsets in the record passed to and from the program are wrong for processing.

In general, anything that changes the length or position of any fields in the record format used by the program will require that the program be recompiled.

Redirecting Output

Spooled or nonspooled output intended for a printer can be redirected to another printer. However, each file is checked to ensure that the file attributes (device type, number of lines per inch, number of characters per inch, page length, and page width) and any advanced functions used by the file (such as variable LPI, variable font, or defined characters) are valid on the new printer.

Nonspooled Output

When a nonspooled file is redirected, and the printer file attributes do not match the new printer, one of the following occurs:

- If the printer file specifies a characters-per-inch value not supported by the device being used, a diagnostic message (CPF4057) is sent to the program message queue and the data is printed at 10 characters per inch. If the page width is greater than 132 characters, the records are folded.

  Notes:

  Folding is not supported on IPDS printers.

  1. If the printer file specifies a lines-per-inch value not supported by the device being used, a diagnostic message (CPF4056) is sent to the program message queue, and the data is printed at 8 lines per inch.
  2. If the page length is greater than the maximum length allowed for the printer being used, the printing ends with an escape message (CPF4138).

3. If the printer file specifies special device requirements (such as use of certain DDS keywords) that are not supported by the device being used, then a diagnostic message is sent to the program message queue and the special function is ignored.

Spooled Files

When a spooled file is redirected to another printer, the spooled file cannot be printed without change if any of the spooled output file attributes are not supported by the printer device. For example, some printer device attributes that might not be supported are:

- Page size
- Output drawers
- Print quality
- Lines per inch
- Characters per inch

Spooled File Redirected to SCS Printers

The following section describes the actions taken when a spooled file is redirected to an SCS printer and cannot be printed without change (SCS printers include the 3812, 3816, 4214, 4234, 4245, 5219, 5224, 5225, 5256, 5262, 6252, and 6262 Printers):

- An inquiry message is sent to the message queue of the writer if any of the following is true:
  - The spooled file uses the IPDS data stream (DEVTYPE(*IPDS))
  - The spooled file attributes are not supported by the printer
  - The special device requirements used by the spooled file are not supported by the printer

  The inquiry message allows these options:
  - End the writer
  - Print the spooled file with lines folded when the lines are longer than the width of IBM-supplied printer file QPSPLPRT
  - Print the spooled file with lines truncated when the lines are longer than the width of IBM-supplied printer file QPSPLPRT
  - Hold the spooled file and process the next file on the output queue

  If the spooled file is printed, results may be unpredictable because the file is printed using the printer attributes specified in the IBM-supplied printer file QPSPLPRT, and all advanced functions used by the spooled file are removed. Functions removed include:

  DDS keywords:

CHRID	Graphic character set and code page
CHRSIZ	Character size (width and height)
CPI	Characters per inch
DFNCHR	Define character
DRAWER	Paper drawer selection
FONT	Font selection
LPI	Lines per inch

PAGRTT	Page rotation
PRTQLTY	Print quality
TRNSPY	Transparency

Other print functions:

Drawer change in document

Font change in document

Lines-per-inch change in document

Page rotation in document

Subscript and superscript

- If the spooled file specifies a characters-per-inch value not supported by the printer, an inquiry message is sent to the message queue of the writer with the option to:
  - End the writer
  - Print the spooled file at 10 characters per inch with lines folded when the lines are longer than the width of IBM-supplied printer file QPSPLPRT
  - Hold the spooled file and process the next file on the output queue
- The 5219 Printer is an exception to the above cases if the only mismatch between the spooled file and printer is the HIGHLIGHT special device requirement that the file contains. When this occurs, an inquiry message is sent to the message queue of the writer with the option to:
  - End the writer.
  - Print the spooled file without highlighting but keep all other advanced functions used by the file.
  - Attempt to print the spooled file without changing. (If this is not successful, the file will be held on the output queue.)
  - Hold the spooled file and process the next file on the output queue.

  If the spooled file is printed, the resulting output closely resembles how the file was intended to look. This is because the attributes specified by the spooled file were used and advanced functions were kept.
- Documents created on other systems may contain print controls that are not supported by the 5219 or 3812 Printers. These controls may include variable form size, output drawer, print quality, lines per inch, characters per inch, character identifier, or justification. If this occurs, an inquiry message is sent to the message queue of the writer with the options to:
  - End the writer.
  - Print the spooled file with unsupported values changed to values which are supported by the printer.
  - Attempt to print the spooled file without changing. (If this is not successful, the file will be held on the output queue).
  - Hold the spooled file and process the next file on the output queue.

  If the spooled file is printed, the file attributes from the spooled file are used and all advanced functions that are valid for the device are kept. The resulting output should closely resemble what the file was intended to look like, though it still may not print exactly as intended because of the unsupported values.

Spooled Files Redirected to IPDS Printers

The following describes the actions taken when a spooled file is redirected to an IPDS printer (3812, 3816, 3820, 3825, 3827, 3829, 3831, 3835, 3900, 4028, 4224, 4230, or 4234) and cannot be printed without changing:

- If the spooled file uses the SCS data stream (DEVTYPE(*SCS)) and contains DBCS (double-byte character set) data or has a page length greater than that supported by the printer (for both SCS and IPDS files), an inquiry message is sent to the message queue of the writer with the option to:
  - End the writer
  - Print the spooled file with lines truncated when the lines are longer than the width of IBM-supplied printer file QPSPLPRT
  - Hold the spooled file and process the next file on the output queue

  If the spooled file is printed, results may be unpredictable because the file is printed using the printer attributes specified in the IBM-supplied printer file QPSPLPRT, and all advanced functions used by the spooled file are removed. Functions removed include:

  DDS keywords:

CHRSIZ	Character size (width and height)
CPI	Characters per inch
DFNCHR	Define character
DRAWER	Paper drawer selection
PAGRTT	Page rotation
TRNSPY	Transparency

  Other print functions:

  Drawer change in document

  Font change in document

  Lines-per-inch change in document

  Page rotation in document

  Subscript and superscript

- If the spooled file uses the SCS data stream (DEVTYPE(*SCS)), does not contain DBCS data, and uses special device requirements (graphics, defined characters, transparencies, variable font, or enhanced 3812 fonts) or uses a proportionally spaced font for the FONT parameter of the file, an inquiry message is sent to the message queue of the writer with the option to:
  - End the writer
  - Transform the spooled file to IPDS format and print
  - Hold the spooled file and process the next file on the output queue

  If the spooled file is printed, the attributes from the spooled file are used and most advanced functions are kept. Advanced functions not kept are graphics, defined characters, justification, and transparencies. The transformation to IPDS format should substantially keep the integrity of the text data. However, the file may still not print exactly as intended because unsupported font pitches, font spacings, and character identifiers are changed to the closest approximation valid on the printer.

- If the spooled file uses DEVTYPE(*SCS), does not contain DBCS data, does not use defined characters, graphics, transparency, variable fonts, or enhanced 3812 fonts, and does not use a proportionally spaced font for the FONT parameter of the printer file, the writer automatically transforms the file to an IPDS file and prints it. The spooled file may not print exactly as intended because unsupported font pitches, font spacings, and character identifiers are changed to the closest approximation available on the printer.
- If the spooled file uses the IPDS data stream (DEVTYPE(*IPDS)) but uses advanced functions not supported by the printer, an inquiry message is sent to the message queue of the writer with the option to:
  - End the writer
  - Print the spooled file with unsupported advanced functions dropped from the file
  - Hold the spooled file and process the next file on the output queue

3812 and 3816 SCS Printer Considerations

When automatic configuration is run for 3812 and 3816 printers, the printers reports as a 5219 Printer. The first time the printer is used, the AS/400 system sends some commands to the printer that allow the system to distinguish between a 5219 Printer and a 3812 or 3816 SCS printer.

However, this happens after the open processing has been done for the first output to print. The first output to print can be direct output or a spooled file. This means, for the first output printed, the system treats the printer as a 5219 Printer. For example, this means there is no page rotation for that first printed output.

In order for the system to recognize a 3812 or 3816 SCS printer, the printer writer must complete processing. After the first output has been printed, and a new printer writer is started, the system recognizes the printer as a 3812 or 3816 SCS printer.

Once the system recognizes a printer as a 3812 or 3816 SCS, it remembers the true printer type until the printer device description is deleted.

3835 Printer Considerations

The 3835 Model 1 printer has a no-print border. In this area, about 1/6 inch from all edges of the page, data will not print.

The AS/400 system adjusts the positioning of the printed text on the page to compensate for the no-print border. For example, if your application program prints text in the top 1/6 inch or left 1/6 inch, all the text will print. The AS/400 system adjusts the starting printing position to 1/6 inch from the top and left of the page causing all printed data on the page to be shifted to the right and down by 1/6 inch. If your application relies on printing data at a certain point on the paper, you may have to change your application to compensate for this adjustment or use the margin values of 0 on the printer file.

Note: The 3835 Model 2 does not have a no-print border. The AS/400 system does not adjust the position of printed text for this printer. When directing output from printing on a 3835 Model 1 to a Model 2, the difference in how the no-print border is used must be considered.

4028 Printer Considerations

The 4028 printer has a no-print border. In this area, about 1/6 inch from all edges of the page, data will not print.

If the 4028 is configured AFP(*NO), you may have to adjust your application programs. For example, if your application program prints text in the top 1/6 inch or left 1/6 inch, that text will not appear on the page.

If the 4028 is configured AFP(*YES), the AS/400 system adjusts the positioning of the printed text on the page to compensate for the no-print border. For example, if your application program prints text in the top 1/6 inch or left 1/6 inch, all the text will print. The AS/400 system adjusts the starting printing position to 1/6 inch from the top and left of the page causing all printed data on the page to be shifted to the right and down by 1/6 inch. If your application relies on printing data at a certain point on the paper, you may have to change your application to compensate for this adjustment.

To print as close to the edge of the page as possible:

- Use PAGRTT (*COR)
- Use MULTIUP(2) or (4)
- Configure the printer with AFP(*YES)

This positions the starting origin of the page to the edge of the printable area.

Printing a Graphic along with Other Output

The command word #$@INCLGRPH allows a user to include a graph anywhere in the data printed by high-level languages.

To include graphics with other program output, a special control record is used. The format for this control record is:

```
#$@INCLGRPH filename,x,y,w,l
```

Notes:

1. There must be only one space between the command word and the parameters.
2. All five parameters must be specified. A default value (the default values are included in the list below) for parameters x, y, w, and l can be obtained by omitting any value. For example, a valid control record with defaults for parameters x, y, and l would look like:

   ```
   #$@INCLGRPH filename,,,9.5,
   ```

3. The #$@INCLGRPH control record should be in a print record by itself, because any other data along with it may be considered as parameters.
4. Parameters should immediately follow one another, separated by commas, using no blanks.
5. The characters INCLGRPH must be all uppercase.
6. The #$@INCLGRPH control record must begin in the first column.
7. The #$@INCLGRPH control word is used with characters from code page 500. For example, in code page 500, # is hex '7B', $ is hex '5B', and @ is hex '7C'.

Other code pages may use other characters in the #$@INCLGRPH control record. You will need to change the characters depending on the code page being used.

The parameters are defined below. Parameters x, y, w, and l define the area on the page where the graphics file will be printed. Parameters x and y define the upper left corner of the graphics area, and parameters w and l define the size of the graphics area.

filename The name of the graph object file to be included. If the file has more than one member, the last member is used. The library containing the file must be in your library list.

x The distance, in inches, from the left edge of the page to the left edge of the graphics area on the page. The default is 0.

y The distance, in inches, from the top of the page to the top edge of the graphics area on the page. The default is 0.

w The width of the graphics area, in inches. The default is the width of the current page you are using.

l The length of the graphics area, in inches. The default is the length of the current page you are using.

Parameters x, y, w, and l can be specified in decimal form in any combination of xx.xx, where x is any number from 0 through 9. The specified value cannot be more than 45.50 and, if a 0 value is specified, the result is the default value for that parameter.

If there are any errors found in the control record or an error occurs while processing the graphics file, the control record is printed as normal text data. The graphics file to be used must be in a format acceptable to the printer. For IPDS devices, this format is level DR/2 of the Graphic Object Content Architecture (GOCA). See the manual *Graphic Object Content Architecture*, SC31-6804, for more information about GOCA.

Special Printer File Considerations for AFPDS

If the device type (DEVTYPE) parameter for the printer file is *AFPDS, certain considerations apply to some printer file parameters and to the sending of spooled files to other systems.

Considerations for Printer File Parameters

- Overflow (OVRFLW) parameter

  Overflow is not signalled for externally described printer files (DDS) for record formats that use absolute positioning. In addition, overflow is determined by using the margin offset down value. For example, if the margin offset down value is .5 inches, the overflow line is line 60, and the lines per inch value is 6, overflow is signalled when line 60 is printed on the page. This is 10.5 inches down the page.

- Character Identifier (CHRID) parameter

  The CHRID parameter of the printer file is ignored if a font character set (FNTCHRSET) or coded font (CDEFNT) parameter is specified.

- Page Rotation (PAGRTT) parameter

  Overlays and page segments are not automatically rotated based on the PAGRTT parameter of the printer file.

- Page Size (PAGESIZE) parameter

  If the unit of measure is *ROWCOL, and either a coded font or font character set is specified on the printer file, the page width is calculated using 10 characters-per-inch.

Considerations for Sending an AFPDS Spooled File to Another System

Because the actual printer device is not known when a spooled file is created, some parameters specified on the printer file cause a default setting to be used in the created spooled file. This is done to provide values in the data stream of the spooled file in the event it is sent to another system.

On the system the spooled file was created on, the correct values (as determined for the printer you want the spooled file printed on) are substituted before the spooled file is printed.

The following parameters cause a default setting to be used:

- If CHRID(*DEVD) or an externally described printer file is used, the CHRID system value (QCHRID) is substituted.
- If FONT(*DEVD) is used, font 11 is substituted.
- If FORMFEED(*DEVD) is used, drawer 1 is substituted.
- If PAGRTT(*DEVD), PAGRTT(*AUTO), or PAGRTT(*COR) is used, page rotation of 0 is substituted.

Note: On the AS/400 system, offset stacking of printed output is used. As the job finishes, the paper tray moves, offsetting the stack of paper to make it easier to distinguish between finished jobs. Because of this, the data stream that is created on the AS/400 system contains the control to indicate that offset stacking should be used. If the spooled file is sent to a system that does not support offset stacking, an error message may be issued.

Special DDS Considerations for AFPDS

Following is a list of DDS keywords that are valid for printer files that have the printer device type (DEVTYPE) parameter value specified as *AFPDS. Restrictions on DDS keywords are contained in this list as well.

- ALIAS
- BARCODE
- BOX
- CDEFNT
- CHRID (Only applies to output printed using a printer resident font. If a coded font (CDEFNT) or a font character set and code page combination (FNTCHRSET) is specified, the CHRID keyword is ignored and a message issued.)
- CHRSIZ
- COLOR (Color is ignored if your printer does not support color printing.)
- CVTDTA
- DATE

- DFT
- DLTEDT
- DRAWER
- EDTCDE
- EDTWORD
- ENDPAGE
- FLTFIXDEC
- FLTPCN
- FONT
- FNTCHRSET
- GDF
- HIGHLIGHT (Only applies to output printed using a printer resident font. If a coded font (CDEFNT) or a font character set and code page combination (FNTCHRSET) is specified, the HIGHLIGHT keyword is ignored and a message issued.)
- IGCCDEFNT
- INDARA
- INDTXT
- LINE
- MSGCON
- OVERLAY
- PAGNBR
- PAGRTT
- PAGSEG
- POSITION
- PRTQLTY
- REF
- REFFLD
- SKIPA (Not allowed at the file level in a spooled file with printer device type *AFPDS.)
- SKIPB (Not allowed at the file level in a spooled file with printer device type *AFPDS.)
- TEXT
- TIME
- TXTRTT
- UNDERLINE (When creating an AFPDS spooled file to be distributed to a System/370, the DDS underline keyword should not be used because it will not print correctly.)

The following information about DDS keywords contains:

- Description of the DDS keyword
- Format of the DDS keyword
- Considerations when using the DDS keywords
- Examples of how to code the DDS keyword
- Examples of what your output will look like using DDS keywords

Advancing Pages Using Positioning Keywords

The order in which records are printed is important when the record contains positioning keywords such as SKIPA, SKIPB, or POSITION. You need to make sure the positioning keywords are used at the correct place in the application program to get the results you want. This is most important when using data in conjunction with BOX, OVERLAY, PAGSEG, LINE, and GDF DDS keywords. As an example, let's use an overlay that will have data printed in it. Your program:

1. Prints the overlay first
2. Prints data for the overlay
3. Prints another overlay
4. Prints data for the overlay
5. Repeats steps 3 and 4 until all the records are processed.

If the record that prints the data does not request to advance to the next page (ENDPAGE keyword or a SKIP keyword), the overlay and data for all the records will keep printing on the same page.

Possible solutions to the mismatching of your overlay and data are:

- Have your program print the overlay after the data has been printed on the page.
- If the overlay prints first followed by the data, use the SKIPA keyword instead of the SKIPB keyword. This advances the printer to the next page if the skip-to line number is located above the current location. For example, if the printer is currently on line 40 and the SKIPA value is 10, the printer advances to line 10 of the next page.
- Use the ENDPAGE keyword with the overlay after the data is printed.

Note: BOX, GDF, LINE, OVERLAY, and PAGSEG are all AFPDS DDS keywords that can be affected by the order in which the high-level language (HLL) program processes records.

Using the Program-to-System Fields (P-Fields)

On some DDS keywords, program-to-system fields (P-fields) can be used to pass information such as object names or position values from the application program to the AS/400 system at run time. P-fields are not printed; instead, the system uses the information contained in a P-field as a parameter value for the DDS keyword.

Thus, using P-fields can eliminate declaring a specific value in the DDS.

On the OVERLAY, PAGSEG, and GDF DDS keywords, you can use P-fields to pass the object name and/or library name from the application program.

On the LINE and POSITION DDS keywords, you can use P-fields to pass the position values from the application program.

Using the Box (BOX) DDS Keyword

Use this record-level keyword to print a rectangle.

The format of the BOX keyword is:

```
BOX(first-corner-down first-corner-across diagonal-corner-down
    diagonal-corner-across line-width)
```

Following is a list of things to consider when using the BOX keyword:

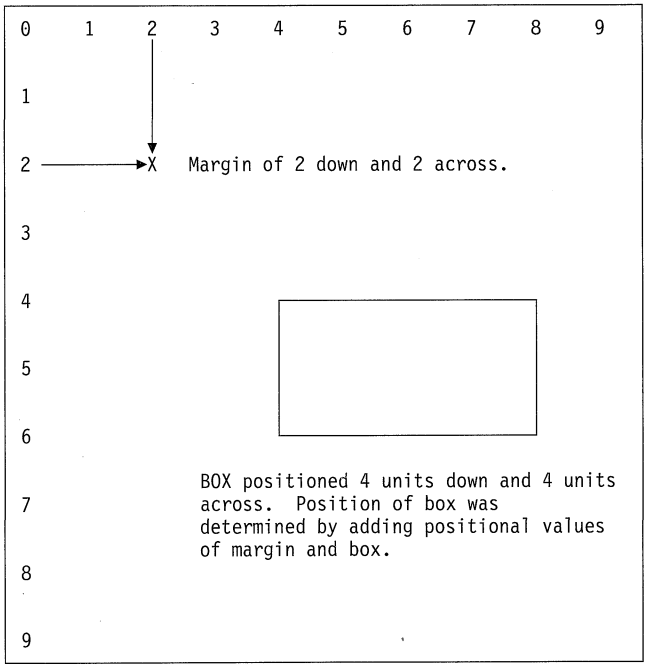
- The numeric values you specify for positioning of the box are calculated in either inches or centimeters. Three decimal places can be specified. The posi-

tional values you can specify for the location of the box range from 0 through 22.750 inches or 0 through 57.790 centimeters

- The UOM parameter on the printer file determines the unit of measure (inches or centimeters) used for the placement of the box.
- The position of the box on a piece of paper is in addition to the margins specified with the FRONTMGN and BACKMGN parameters on the printer file being used.

  For example, assume the margins have a value of 2 down and 2 across. Assume the BOX keyword has the first corner of the box defined as 2,2 (first corner of the box is at a coordinate of 2 units down and 2 units across) and the other corner of the box is at a coordinate of 4,4 (diagonal, down and across).

  The box starts printing at a position of 4 units down from the top of the paper and 4 units in from the left edge of the paper (margin position values plus the first BOX position value) as shown in the diagram below.



- The DEVTYPE parameter on the printer file must be *AFPDS when using the BOX keyword.

  At print time, if the DEVTYPE is anything other than *AFPDS, the record format containing the BOX keyword is ignored and a message is issued.
- Option indicators are valid for this keyword.
- You can specify the BOX keyword multiple times on a record format.
- Within a record, you cannot mix the row/column and absolute positioning methods of specifying where objects are placed. Because the BOX keyword uses absolute positioning, all fields in the record must be positioned by use of the DDS POSITION keyword and you cannot use any of the row/column positioning keywords such as:

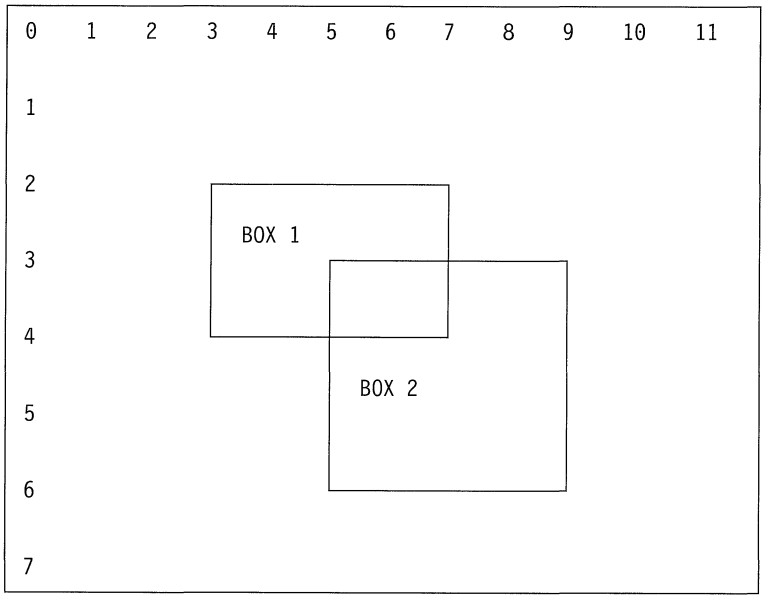
  SPACEA
  SPACEB
  SKIPA

SKIPB

The following example shows how to specify the BOX keyword.

```
0         1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
     *
               R BOX1                    BOX(2 3 4 7 0.2)
     *
               R BOX2                    BOX(3 5 6 9 0.2)
     *
     *
```

The example below illustrates the location of the boxes using the DDS code above.



Using the Coded Font (CDEFNT) DDS Keyword

Use this field- or record-level keyword to specify the coded font for printing a named or constant field or fields within a record.

The format of the keyword is:

```
CDEFNT({library-name/}coded-font-name)
```

A coded font is a combination of names of a font character set and a code page. This combination is stored in a library under a name selected by you. IBM also supplies coded fonts. To view the IBM-supplied coded font names, you can use the Work with Font Resources (WRKFNTRSC) command and specify coded fonts.

Following is a list of things to consider when using the CDEFNT keyword:

- The DEVTYPE parameter on the printer file must be *AFPDS when using the CDEFNT keyword.

  At print time, if the DEVTYPE is anything other than *AFPDS, the record format containing the CDEFNT keyword is ignored and a message is issued.

- If you do not specify a library name, the coded font must exist in a library that is defined to your library list (*LIBL) when the job runs. Otherwise the coded font cannot be found and an error message is issued.
- The IBM-supplied coded font names all start with the characters X0.
- You cannot use the following DDS keywords in conjunction with the CDEFNT keyword for the same field or record format:

  FONT
  FNTCHRSET

The following example shows how to specify the CDEFNT keyword.

```
0       1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
     *
              R REC1
                FLD1          8A     10 13CDEFNT(QFNTCPL/X0BRTR)
     *
```

When the spooled file prints, all the text in field 1 appears in the type style indicated by coded font X0BRTR in library QFNTCPL.

Using the DBCS Coded Font (IGCCDEFNT) DDS Keyword

Use this record- or field-level keyword to specify the DBCS coded font for printing a named or constant field or fields.

The format of the keyword is:

```
IGCCDEFNT(coded-font)
```

A DBCS coded font is a combination of names of a font character set and code page. This combination is stored in a library under a name selected by you. IBM also supplies DBCS coded fonts. To view the IBM-supplied DBCS coded font names, you can use the Work with Font Resources (WRKFNTRSC) command and specify DBCS coded fonts.

Following is a list of things to consider when using the IGCCDEFNT keyword:

- The DEVTYPE parameter on the printer file must be *AFPDS when using the IGCCDEFNT keyword.

  At print time, if the DEVTYPE is anything other than *AFPDS, the record format containing the IGCCDEFNT keyword is ignored and a message is issued.
- If you do not specify a library name, the DBCS coded font must exist in a library that is defined to your library list (*LIBL) when the job runs. Otherwise the DBCS coded font cannot be found and an error message is issued.
- The IBM-supplied DBCS coded font names all start with the characters X0.

The following example shows how to specify the IGCCDEFNT keyword.

```
0       1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
     *
              R REC1
                FLD1          80     10 13CDEFNT(QFNTCPL/X0BRTR)
     *                                   IGCCDEFNT(FONT/IGC1A)
```

When the spooled file prints, all the SBCS text in FLD1 prints in the type style defined by X0BRTR. All the DBCS text in FLD1 prints in the type style defined by IGC1A.

Using the Endpage (ENDPAGE) DDS Keyword

Use this record-level keyword to eject the current page after the record format is printed.

This keyword has no parameters.

Following is a list of things to consider when using the ENDPAGE keyword:

- The DEVTYPE parameter on the printer file must be *AFPDS when using the ENDPAGE keyword.

  At print time, if the DEVTYPE is anything other than *AFPDS, the record format containing the ENDPAGE keyword is ignored and a message is issued.
- Option indicators are valid for this keyword.
- Within a record, you cannot mix the row/column and absolute positioning methods of specifying where objects are placed. Because the ENDPAGE keyword uses absolute positioning, all fields in the record must be positioned by use of the DDS POSITION keyword and you cannot use any of the row/column positioning keywords such as:

  SPACEA
  SPACEB
  SKIPA
  SKIPB

The following example shows how to specify the ENDPAGE keyword.

```
0       1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
     *
               R REC1                      ENDPAGE
                 FLD1           5A    66 10POSITION(8.5 10.2)
     *
               R REC2
       01                                  ENDPAGE
                 FLD1           5A    66 10POSITION(8.5 10.2)
```

A page eject occurs after REC1 is printed.

If indicator 01 is on when the application writes REC2, a page eject occurs after REC2 is printed. If indicator 01 is off, no page eject occurs.

Using the Font Character Set (FNTCHRSET) DDS Keyword

Use this field- or record-level keyword to specify the font for printing a named or constant field or fields within a record.

The format of the keyword is:

```
FNTCHRSET({library-name/}font-character-set {library-name/}code-page)
```

A font character set requires a specific font character set name and a code page name. Each of these objects is stored in a library under a name selected by you. IBM also supplies font character sets and code pages. To view the IBM-supplied font character set names or code page names, you can use the Work with Font

Resources (WRKFNTRSC) command and specify font character sets or code pages.

Following is a list of things to consider when using the FNTCHRSET keyword:

- The DEVTYPE parameter on the printer file must be *AFPDS when using the FNTCHRSET keyword.

  At print time, if the DEVTYPE is anything other than *AFPDS, the record format containing the FNTCHRSET keyword is ignored and a message is issued.
- If you do not specify a library name, the font character set and code page names must exist in a library that is defined to your library list (*LIBL) when the job runs. Otherwise the font character set and code page cannot be found and an error message is issued.
- The IBM-supplied font character set names all start with the characters C0 and the IBM-supplied code page names all start with T1.
- Option indicators are valid for this keyword.
- You cannot use the following DDS keywords in conjunction with the FNTCHRSET keyword:

  FONT
  CDEFNT

The following example shows how to specify the FNTCHRSET keyword.

```
0         1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
      *
               R REC1
                 FLD1A          14A     3  8FNTCHRSET(C0S0CE12 +
                                             T1L0PCHN)
      *
```

The data in FLD1A prints using font character set C0S0CE12 and code page T1L0PCHN. Since no library was specified, the application's library list (*LIBL) is used to search for both font character set C0S0CE12 and code page T1L0PCHN.

Using the Graphics Data Format File (GDF) DDS Keyword

Use this record-level keyword to print a graphics data format file.

The format of the keyword is:

```
GDF({library-name/}graph-file graph-member position-down
position-across graph-depth graph-width graph-rotation)
```

Graphics data format files can be created using the Business Graphics Utility (BGU) licensed program or the Graphical Data Display Manager (GDDM*), which is a function of the OS/400 system. Once the objects exist, they can be printed using the DDS graphics data format file (GDF) keyword to determine the location (library), identity (file and member name), position (down and across with a possibility of three decimal positions, for example, 1.001), size (width and depth), and rotation of the object.

The Display Graphics Data File (DSPGDF) command can be used to view the objects on a display station. Viewing the object before using the DDS GDF

keyword to print it could help with selecting the position values required on the GDF keyword.

Following is a list of things to consider when using the GDF keyword:

- The DEVTYPE parameter on the printer file must be *AFPDS when using the GDF keyword.

  At print time, if the DEVTYPE is anything other than *AFPDS, the record format containing the GDF keyword is ignored and a message is issued.
- You can specify the GDF keyword multiple times on a record.
- Option indicators are valid for this keyword.
- Within a record, you cannot mix the row/column and absolute positioning methods of specifying where objects are placed. Because the GDF keyword uses absolute positioning, all fields in the record must be positioned by use of the DDS POSITION keyword and you cannot use any of the row/column positioning keywords such as:

  SPACEA
  SPACEB
  SKIPA
  SKIPB

The first coding example shows how to specify the GDF keyword using DDS.

In the example, the library name is GRAPHLIB, the file name is GRFILE, and the member name is BARCHART.

```
0       1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
      *
               R REC1                     GDF(GRAPHLIB/GRFILE BARCHART  +
                                          2.0 2.0 3.0 2.0 90)



     *
```

The second coding example uses DDS and P-fields. In the P-field coding example, the program passes the name of the library (GRAPHLIB), the name of the file (GRFILE), and the name of the graphic object (BARCHART) to the system in fields LIBFLD, FILEFLD, and CHARTFLD respectively.

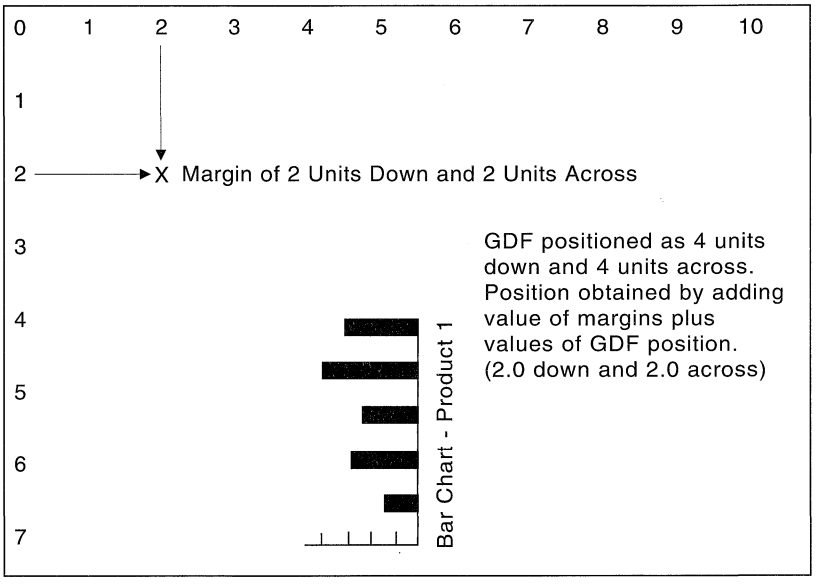
```
0       1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
      *
               R REC1                     GDF(&LIBFLD/&FILEFLD &CHARTFLD  +
                                          2.0 2.0 3.0 2.0 90)

                 LIBFLD        10A  P
                 FILEFLD       10A  P
                 CHARTFLD      10A  P
```

The following diagram shows:

- The location of the margins (2 units down and 2 units across) as specified on the printer file being used.
- The starting position (2.0 units down and 2.0 units across from the location of the margins) of the member BARCHART.

- The depth (3.0 units) and the width (2.0 units) of the member called BARCHART.
- The rotation (90 degrees) of the member BARCHART.



Using the Line (LINE) DDS Keyword

Use this record-level keyword to print a horizontal or vertical line.

The format of the keyword is:

```
LINE(position-down position-across line-length line-direction
line-width {line-pad})
```

Following is a list of things to consider when using the LINE keyword:

- The DEVTYPE parameter on the printer file must be *AFPDS when using the LINE keyword.

  At print time, if the DEVTYPE is anything other than *AFPDS, the record format containing the LINE keyword is ignored and a message is issued.
- The numeric values you specify for positioning of the line are calculated in either inches or centimeters. Three decimal places can be specified. The positional values you can specify for the location of the line range from 0 through 22.750 inches or 0 through 57.790 centimeters
- The UOM parameter on the printer file determines the unit of measure (inches or centimeters) used for the placement of the line.
- You can specify the LINE keyword multiple times on a record.
- Within a record, you cannot mix the row/column and absolute positioning methods of specifying where objects are placed. Because the LINE keyword uses absolute positioning, all fields in the record must be positioned by use of the DDS POSITION keyword and you cannot use any of the row/column positioning keywords such as:

  SPACEA

SPACEB
SKIPA
SKIPB

The following examples show how to specify the LINE keyword.

The first coding example uses DDS.

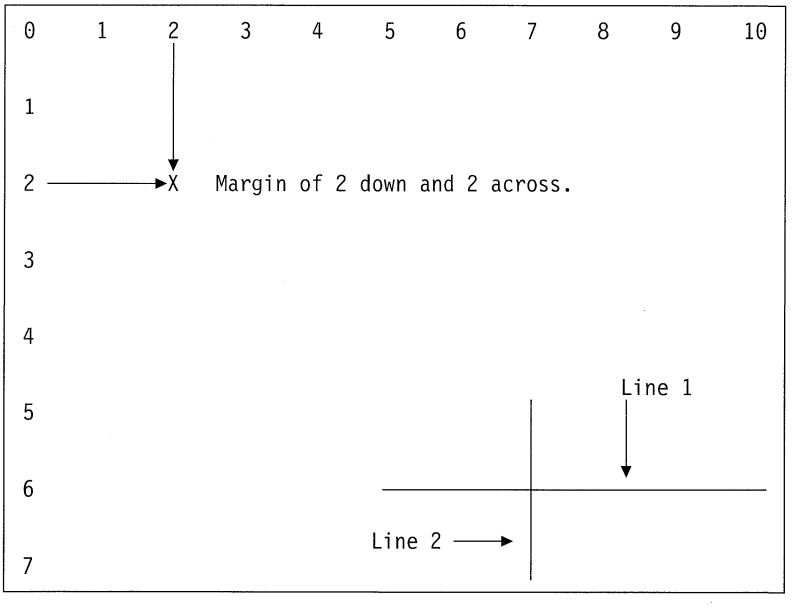
```
0       1         2         3         4         5         6         7         8
1234567890123456789012345678901234567890123456789012345678901234567890123456789
      *
               R REC1                     LINE(4 3 5 *HRZ  .01)
                                          LINE(3 5 2 *VRT .015 *RIGHT)
      *
      *
```

The second coding example uses DDS and P-fields.

```
0       1         2         3         4         5         6         7         8
1234567890123456789012345678901234567890123456789012345678901234567890123456789
      *
               R REC1                     LINE(4 3 5 *HRZ  .01)
                                          LINE(&FLD1 &FLD2 3 5 2 *VRT .015 *RIGHT)

                 FLD1          5S 3P
                 FLD1          5S 3P
```

The example below illustrates the location of the lines using the DDS code above.



Line 1 starts at 4 down and 3 across and its horizontal length is 5.

Line 2 starts at 3 down and 5 across and its vertical length is 2.

Using the Overlay (OVERLAY) DDS Keyword

Use this record-level keyword to print an overlay.

The format of the keyword is:

```
OVERLAY({library-name/}overlay-name position-down position-across)
```

Following is a list of things to consider when using the OVERLAY keyword:

- If you do not specify a library name, the overlay must exist in a library that is defined to your library list (*LIBL) when the job runs. Otherwise the overlay cannot be found and an error message is issued.
- You can specify the OVERLAY keyword multiple times on a record.
- The numeric values you specify for positioning of the overlay is calculated in either inches or centimeters. Three decimal places can be specified. The positional values you can specify for the location of the overlay range from 0 through 22.750 inches or 0 through 57.790 centimeters
- The UOM parameter on the printer file determines the unit of measure (inches or centimeters) used for the placement of the overlay.
- The position of the overlay on a piece of paper is in addition to the margins specified with the MARGIN parameters of the printer file.

  For example, if the margin parameter has a value of (2,2), and the DDS OVERLAY keyword specifies 2 units down and 2 units across, the overlay would start printing at a point 4 units down from the top and 4 units from the left side of the paper.
- Overlays are not automatically rotated based on any value specified with the PAGRTT keyword. The overlay needs the degree of rotation specified when it is created.
- The DEVTYPE parameter on the printer file must be *AFPDS when using the OVERLAY keyword.

  At print time, if the DEVTYPE is anything other than *AFPDS, the record format containing the OVERLAY keyword is ignored and a message is issued. Any objects or records that require AFPDS are ignored.
- Within a record, you cannot mix the row/column and absolute positioning methods of specifying where objects are placed. Because the OVERLAY keyword uses absolute positioning, all fields in the record must be positioned by use of the DDS POSITION keyword and you cannot use any of the row/column positioning keywords such as:

  SPACEA
  SPACEB
  SKIPA
  SKIPB

The following examples show how to specify the OVERLAY keyword.

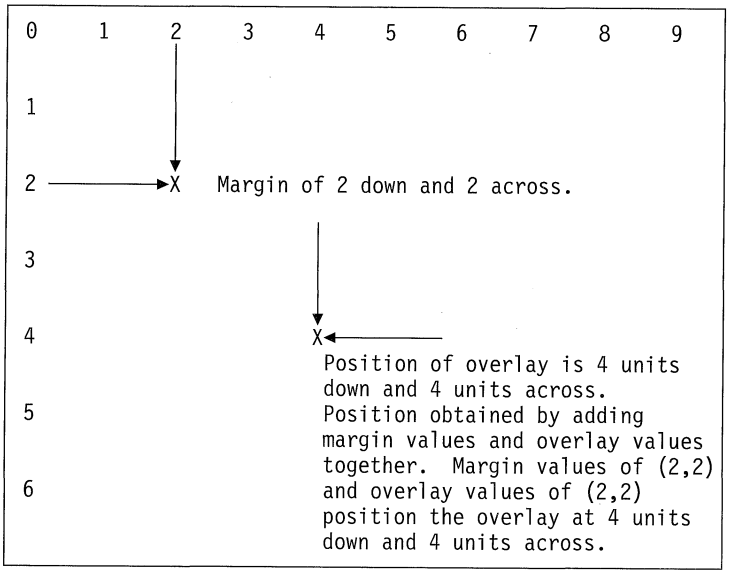
The first coding example uses DDS.

```
0         1         2         3         4         5         6         7         8
1234567890123456789012345678901234567890123456789012345678901234567890123456789
     *
               R REC1                    OVERLAY(MYLIB/MYOVL +
                                         4 4)
     *
```

The second coding example uses DDS and P-fields.

```
0        1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
     *
               R REC1                        OVERLAY(&MYLIB/&MYOVL +
                                             4 4)
     *
                 MYLIB          10A  P
                 MYOVL           8A  P
```

The example below illustrates the location of the overlay using the DDS code above.



Using the Page Segment (PAGSEG) DDS Keyword

Use this record-level keyword to print a page segment.

The format of the keyword is:

```
PAGSEG({library-name/}page-segment-name position-down position-across)
```

Following is a list of things to consider when using the PAGSEG keyword:

- Page segments are not automatically rotated based on any value specified with the PAGRTT keyword. The data or image to appear in the page segment must be created to match the rotation you want to use with the text.

  Note: Position values of the page segment vary depending on the rotation used. For examples that show how to determine the position values, go to "Using Overlays and Rotation" on page 2-50.

- If you do not specify a library name, the page segment must exist in a library that is defined to your library list (*LIBL) when the job runs. Otherwise the page segment cannot be found and an error message is issued.
- The UOM parameter on the printer file determines the unit of measure (inches or centimeters) used for the placement of the page segment.
- The numeric values you specify for positioning of the page segment are calculated in either inches or centimeters. Three decimal places can be specified. The positional values you can specify for the location of the page segment range from 0 through 22.750 inches or 0 through 57.790 centimeters

- The position values specified for the DDS PAGSEG keyword are in addition to the values on the front and back margin parameters of the printer file.

  For example, if the margin parameters value is (2,2), and the DDS PAGSEG keyword specifies 2 units down and 2 units across, the page segment would start printing at a point 4 units down from the top and 4 units from the left side of the paper.

- You can specify the PAGSEG keyword multiple times on a record.
- The DEVTYPE parameter on the printer file must be *AFPDS when using the PAGSEG keyword.

  At print time, if the DEVTYPE is anything other than *AFPDS, the record format containing the PAGSEG keyword is ignored and a message is issued. Any objects or records that require AFPDS are ignored.

- Within a record, you cannot mix the row/column and absolute positioning methods of specifying where objects are placed. Because the PAGSEG keyword uses absolute positioning, all fields in the record must be positioned by use of the DDS POSITION keyword and you cannot use any of the row/column positioning keywords such as:

  SPACEA
  SPACEB
  SKIPA
  SKIPB

The following examples show how to specify the PAGSEG keyword.

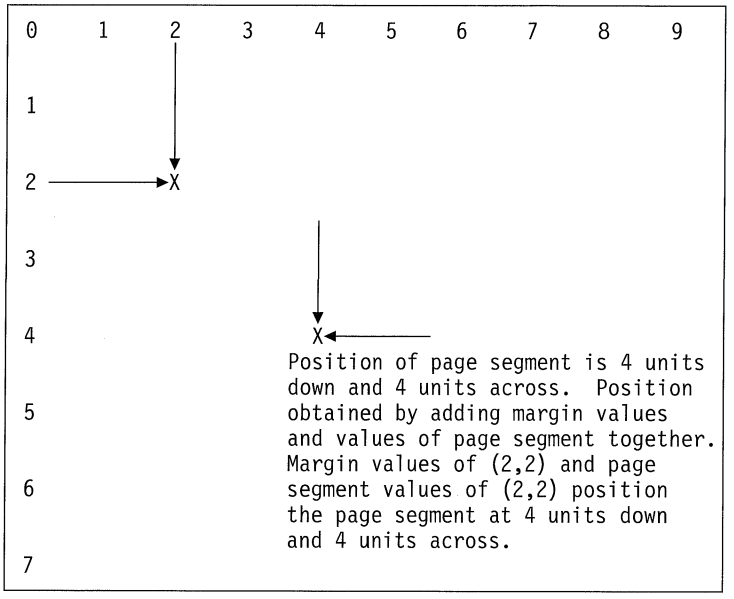
The first coding example uses DDS.

```
0         1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
     *
               R REC1                      PAGSEG(MYLIB/PAGSEG5  +
     *                                     4 4)
```

The second coding example uses DDS and P-fields.

```
0         1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
     *
               R REC1                      PAGSEG(&MYLIB/&PAGSEG   +
                                           4 4)
     *
                 MYLIB          10A  P
                 PAGSEG          8A  P
```

The following example illustrates the location of the page segment using the DDS code above.



Using the Position (POSITION) DDS Keyword

Use this field-level keyword to define the location of a named field on the page. When the POSITION keyword is specified you cannot specify a location in positions 39-44.

The format of the keyword is:

```
POSITION(position-down position-across)
```

Following is a list of things to consider when using the POSITION keyword:

- The UOM parameter on the printer file determines the unit of measure (inches or centimeters) used for the POSITION keyword.
- The position values specified are in addition to the values on the front and back margin parameters of the printer file.

  For example, if the front or back margin parameter has a value of (2,2), and the POSITION keyword specifies 2 units down and 2 units across, the object you wanted to position would start printing 4 units down from the top and 4 units from the left side of the paper.
- The DEVTYPE parameter on the printer file must be *AFPDS when using the POSITION keyword.

  At print time, if the DEVTYPE is anything other than *AFPDS, the record format containing the POSITION keyword is ignored and a message is issued. Any objects or records that require AFPDS are ignored.
- Within a record, you cannot mix the row/column and absolute positioning methods of specifying where objects are placed. Therefore, if the POSITION keyword is used on one field, all fields in the record must use the POSITION keyword and you cannot use any of the row/column positioning keywords such as:

  SPACEA
  SPACEB
  SKIPA

SKIPB

The following example shows how to specify the POSITION keyword.

The first coding example uses DDS.

```
0       1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
     *
               R REC1
                 FLD1           6S 2       POSITION(2.0 1.5)
     *
     *
```

In the above coding example, REC1, FLD1 is printed 2.0 units down and 1.5 units across from the margins specified on the FRONTMGN or BACKMGN parameter of the printer file.

The second coding example uses DDS and P-fields.

```
0       1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
     *
               R REC1
                 FLD1           6S 2       POSITION(&POSD &POSA)
                 POSD           5S 3P
                 POSA           5S 3P
```

In the above coding example using P-fields, the application assigns a numeric value to POSD and POSA. These values are then used to position FLD1 on the page.

Using the Text Rotation (TXTRTT) DDS Keyword

Use this field-level keyword to rotate the field.

The format of the keyword is:

```
TXTRTT(field-rotation)
```

Field-rotation is a required parameter and controls the rotation of the field. Valid values are 0, 90, 180, and 270 degrees.

Following is a list of things to consider when using the TXTRTT keyword:

- The DEVTYPE parameter on the printer file must be *AFPDS when using the TXTRTT keyword.

  At print time, if the DEVTYPE is anything other than *AFPDS, the record format containing the TXTRTT keyword is ignored and a message is issued. Any objects or records that require AFPDS are ignored.

The following example shows how to specify the TXTRTT keyword.

Record 1 (REC1) field 5 (FLD05), shows the coding using the row/column method of positioning.

Record 2 (REC2) field 6 (FLD06), shows the coding using the absolute method of positioning.

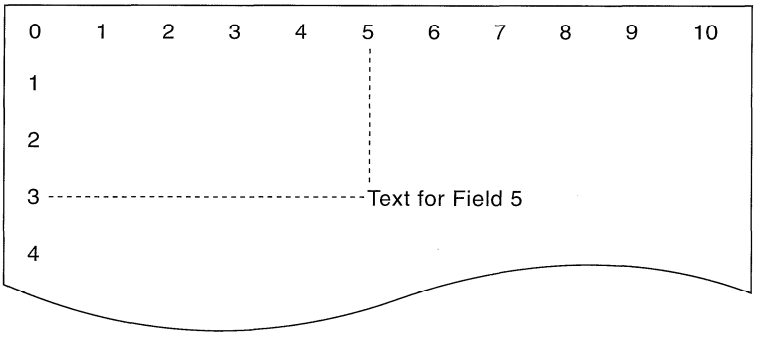
```
0        1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
     *
               R REC1
                 FLD05          16     3  5TXTRTT(0)
     *
               R REC2
                 FLD06          16          TXTRTT(270)
                                            POSITION(6 7)
```

The diagram below shows:

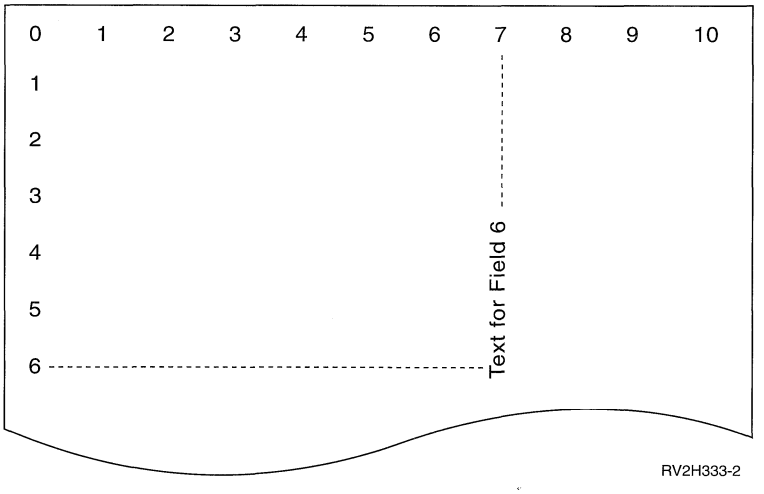
- The position of FLD05 in REC1 with the row/column method of positioning. Rotation is 0 degrees.
- The position of FLD06 in REC2 with the absolute method of positioning. Rotation is 270 degrees.

Scale and position should not be considered in this diagram.

Row/Column Method of Positioning



Absolute Positioning Method



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Performance Considerations

- For externally described printer files, the fewer the number of fields in a record, the faster the processing of that record. Also, by putting several lines of text within a record instead of each line as a separate record, system overhead involved with the processing of each record is reduced.
- When coding the DDS for externally described printer files, define the fields in sequential order. The output is not changed if fields are not defined in sequential order, but the extra travel time of the printer head may be noticeable.
- For externally described printer files, specify a specific font or FONT(*CPI) on the CRTPRTF, CHGPRTF, or OVRPRTF command instead of FONT(*DEVD). This helps keep the data stream as small as possible.
- If a spooled file is intended to be printed on an IPDS printer configured AFP(*NO), specify DEVTYPE(*IPDS) on the CRTPRTF, CHGPRTF, or OVRPRTF command to avoid the extra system processing required to transform the data stream from SCS to IPDS.
- If a spooled file is intended to be printed on an IPDS printer configured AFP(*YES), specify DEVTYPE(*AFPDS) on the CRTPRTF, CHGPRTF, or OVRPRTF command.
- When printing on an IPDS printer configured AFP(*YES), large spooled files begin to print sooner if the print while convert (PRTCVT) parameter on the printer device description is set to *YES. However, some printing may occur before the syntax of the entire spooled file is checked. A data stream error may be found after printing has started. This causes printing to end. If you want all data stream syntax checking to complete before the spooled file starts printing, set the print while convert (PRTCVT) parameter of the printer device description to *NO.

Chapter 3. Spool Support

Spooling functions help system users to manage their printing operations more efficiently. This chapter discusses:

- Spooling: an overview
- The elements you need to make spooling work
- Managing spooled files
  - Using the Work with Spooled Files (WRKSPLF) command
  - Restarting and controlling printing
  - Spooled file security
  - Controlling the number of spooled files in your system
  - Redirecting spooled files
  - Copying spooled files
  - Sample commands for additional spooling support

Why Spooling Is Important: An Overview

Spooling functions are performed by the system without requiring any special operations by the program that creates the output.

When a program opens a printer file, the operating system, by looking at the printer file SPOOL parameter, determines whether the output is to be spooled.

When a printer file specifying spooling is opened, the spooled file containing the output of the program (data to be printed) is placed on the appropriate output queue in the system. A spooled file can be made available for printing when the printer file is opened, when the printer file is closed, or at the end of the job. This is done by specifying a particular value on the schedule parameter. *IMMED makes the spooled file available to the writer as soon as the program is opened. *FILEEND makes the spooled file available to the writer as soon as the file is closed. *JOBEND makes the spooled file available to the writer as soon as the job is complete.

This process of spooling prevents a potential job limitation imposed by the availability or speed of the printer devices. That is, the system can process application programs that generate printed output much faster than printers can print the output.

By spooling (that is, sending the output to output queues to await printing), the system does not have to wait until the printing for that application program is complete before it can start processing the next application program.

Spooling is especially important in a multiple-user environment where the number of jobs running often exceeds the number of available printer devices. Using spooling, output can be easily redirected from one output queue to another or from one printer to another.

Spooling Elements

Following is a list of spooling elements and a diagram showing their working relationship. All of these elements must work together to produce, route, and print spooled files. Following the list is information about each of these elements.

Application program — A high-level language program that creates a spooled file using a printer file with the SPOOL parameter value set to *YES

Printer file — A description of the format of the output, and a list of attributes that describe how the system should process the spooled file

Device description — A description of the printer

Output queue — An object that contains an ordered list of spooled files to be printed

Printer writer — A program that takes spooled files from an output queue and sends them to a printer

Spooled file — A file containing spooled output records that are to be printed

Figure 3-1 shows the relationship of these spooling elements.

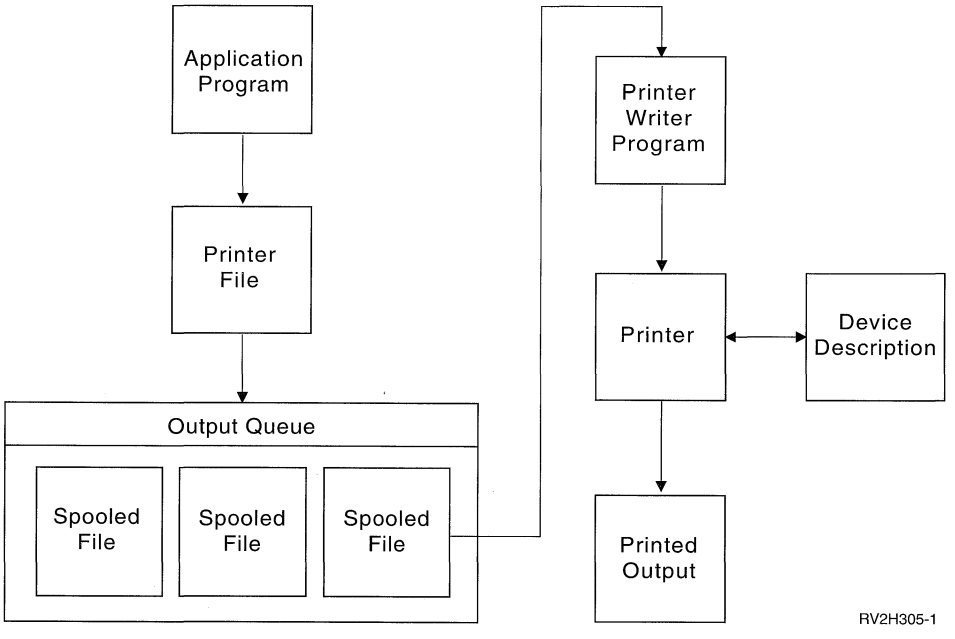


Figure 3-1. Relationship of Spooling Elements

Application Program

Application programs are the primary objects that produce spooled files on the AS/400 system. All HLL (high-level languages) that can be used on the AS/400 system can make use of the spooling support by specifying SPOOL(*YES) in whichever printer file the application uses.

Pressing the Print key runs a program that uses the QSYSPRT printer file to create a spooled file that captures the image that was on the screen when the Print key was pressed.

Printer File

Many attributes of the printer file used by the application program apply to the spooled file and how the spooled file is processed by the system when the application program ends. These attributes can be specified on the following commands:

CHGPRTF	Change Printer File
CRTPRTF	Create Printer File
OVRPRTF	Override with Printer File

After a spooled file is created, its attributes can be displayed using the WRKSPLFA command. Some attributes can be changed using the CHGSPLFA command

Printer Device Descriptions

Printer descriptions must be created for each printer that is or will be attached to the system. Printer device descriptions are created using the Create Device Description (Printer) (CRTDEVPRT) command or they can also be created automatically by the system if automatic configuration is being used.

Note: Automatic configuration cannot be used for ASCII devices attached to the ASCII workstation controller.

The printer file that an application program uses will require some of the information that is contained in the printer device description. For example: the printer file PRINTER parameter requires the same value as assigned to the printer device description DEVD parameter.

See the *Device Configuration Guide* for more information about specifying device descriptions for printers.

Output Queues

Batch and interactive job processing may result in spooled files that are to be sent to a printer. These spooled files contain output records waiting to be printed. There may be many spooled files for a single job.

When a spooled file is created, the file is placed on an output queue. Each output queue contains an ordered list of spooled files. A job can have spooled files on one or more output queues. All spooled files on a particular output queue should have a common set of output attributes, such as printer device, form type, and lines per inch. Using common attributes on an output queue reduces the amount of intervention required and increases the printer throughput.

Output Queue Security

Output queues are created with a level of security determined by the value of the AUT parameter on the Create Output Queue (CRTOUTQ) command. To work with the spooled files on that output queue, you must have the appropriate authority for that output queue (as specified in the AUT parameter). For example, reading the contents of a spooled file might require one level of authority, while changing the contents of that spooled file might require a higher level of authority.

For more information on spooled file security, see "Spooled File Security" on page 3-25.

For more information on output queue security, see the *Security Reference*.

Output Queue Parameters

The following lists the parameters on the Create Output Queue (CRTOUTQ) command and what they specify:

DSPDTA	Whether users without any special authority, but with *USE authority to the output queue, can display, copy, or send the contents of spooled files other than their own.
JOBSEP	How many, if any, job separator pages are to be placed between the output of each job and the output of the next job when the output is printed.
OPRCTL	Whether a user having job control authority can control the output queue (for example, if the user can hold the output queue).
DTAQ	The name of the data queue associated with an output queue. See "Data Queue Support on Output Queues" on page 3-6 for more information.
LIB	The name of the library in which the data queue resides.
SEQ	Controls the order in which files are sorted on the output queue. See "Order of Spooled Files on an Output Queue" on page 3-5 for more information.
AUTCHK	Specifies what type of authority to the output queue is required for a user to control the output queue (for example, to hold the output queue).
AUT	Public authority.
TEXT	Text description.

Summary of Output Queue Commands

The following commands may be used to create and control output queues. For detailed descriptions of the commands, see the *CL Reference*.

CHGOUTQ	Change Output Queue: Allows you to change certain attributes of an output queue, such as the sequence of the spooled files on the output queue.
CLROUTQ	Clear Output Queue: Removes all spooled files from an output queue.
CRTOUTQ	Create Output Queue: Allows you to create a new output queue.
DLTOUTQ	Delete Output Queue: Deletes an output queue from the system.
HLDOUTQ	Hold Output Queue: Prevents all spooled files from being processed by the printer writer.
RLSOUTQ	Release Output Queue: Releases a previously held output queue for processing by the printer writer.

WRKOUTQ	Work with Output Queue: Shows the overall status of all output queues, or the detailed status of a specific output queue.
WRKOUTQD	Work with Output Queue Description: Shows descriptive information for an output queue.

Default Output Queues for Printers

When a printer is configured to the system, the system automatically creates the printer's default output queue in library QUSRSYS. The output queue is given a text description of `'Default output queue for printer xxxxxxxxxx'`, where `xxxxxxxxxx` is the name assigned to the printer during configuration. The printer name is specified in the device description (DEVD) parameter.

The AUT parameter for the output queue is assigned the same value as that specified by the AUT parameter for the printer device description. All other parameters are assigned their default values. Use the Change Command Default (CHGCMDDFT) command to change the default values used when creating output queues with the CRTOUTQ command.

The default output queue for a printer is owned by the user who created the printer device description. In the case of automatic configuration, both the printer and the output queue are owned by the system profile QPGMR.

Default Output Queues for System Printer

The system is shipped with the defaults on commands to use the default output queue for the system printer as the default output queue for all spooled output. The system printer is defined by the QPRTDEV system value.

When a spooled file is created by opening a printer file and the output queue specified for the file cannot be found, the system attempts to place the spooled file on output queue QPRINT in library QGPL. If for any reason the spooled file cannot be placed on output queue QPRINT, an error message is sent and the output is not spooled.

The following output queues are supplied with the system:

QPRINT	Default printer output queue
QPRINTS	Printer output queue for special forms
QPRINT2	Printer output queue for 2-part paper

Creating Your Own Output Queues

You can create output queues for each user of the system. For example:

```
CRTOUTQ OUTQ(QGPL/JONES) TEXT('Output queue for Mike Jones')
```

Order of Spooled Files on an Output Queue

The order of spooled files on an output queue is mainly determined by the status of the spooled file. A spooled file that is being processed by a writer may have a status of printing (PRT status), writer (WTR status), or pending to be printed (PND status). Spooled files with a status of PRT, WTR, or PND are placed at the top of the output queue. A spooled file being processed by the writer may have a held (HLD) status if a user has held the spooled file but the writer is not yet finished processing the file. All other spooled files with a status of RDY are listed on the output queue after the file being processed by a writer, followed by spooled files with a status other than RDY.

Each group of spooled files (RDY and non-RDY files) is further sorted by:

1. The output priority of the spooled file.
2. A date and time field (time stamp).
3. The SCHEDULE parameter value of the spooled file. Files with SCHEDULE(*JOBEND) specified are grouped together and placed after other spooled files of the same job that have SCHEDULE(*IMMED) or SCHEDULE(*FILEEND) specified.
4. The spool number of the spooled file.

For output queues with SEQ(*JOBNBR) specified, the date and time field is the date and time that the job that created the spooled file entered the system. (A sequential job number and time of day value are also assigned to the job when it enters the system.) That is how the spooled files are sorted on the queue.

For first-in-first-out (*FIFO) output queues, the date and time change to the current system date and time when:

- A spooled file is created by opening a device file.
- The output priority of the job that created the spooled file is changed.
- The status of the spooled file changes from non-RDY to RDY.

  Note: The date and time do not change when the reason the status changes from RDY to WTR or from WTR to RDY is because the writer was canceled.

- A spooled file is moved to another output queue that has SEQ(*FIFO) specified.

Because of the automatic sorting of spooled files, different results occur when SEQ(*JOBNBR) is specified for an output queue than when SEQ(*FIFO) is specified. For example, when a spooled file is held and then immediately released on an output queue with SEQ(*JOBNBR) specified, the spooled file will end up where it started; but if the same spooled file were held and then immediately released on an output queue with SEQ(*FIFO) specified, the spooled file would be placed at the end of the spooled files that have the same priority and a status of RDY.

Data Queue Support on Output Queues

Support is available to optionally associate a data queue with an output queue using the Create Output Queue (CRTOUTQ) or Change Output Queue (CHGOUTQ) command. Entries are logged in the data queue when spooled files are in ready (RDY) status on the output queue. A user program can determine when a spooled file is available on an output queue using the Receive Data Queue API (QRCVDTAQ) to receive information from a data queue. See the *Programming: Control Language Programmer's Guide*, SC41-8077, for more information about data queues and the QRCVDTAQ API.

Each time a spooled file on the output queue reaches RDY status an entry is sent to the data queue. A spooled file can have several changes in status (for example, ready (RDY) to held (HLD) to release (RLS) to ready (RDY) again) before it is taken off the output queue. These status changes result in entries in the data queue for a spooled file each time the spooled file goes to RDY status.

A spooled file can reach RDY status:

- When initially spooled on the output queue.
- When the spooled file is opened and the schedule parameter value is *IMMED.
- When a job completes and the spooled file schedule parameter value is *JOBEND.
- When the spooled file is released.
- When a spooled file is moved to this output queue from another output queue.
- When a writer is ended immediately while printing a spooled file (the spooled file status is reset from WTR to RDY).

Creating Data Queues

The Create Data Queue (CRTDTAQ) command is used to create the data queue. The maximum message length (MAXLEN) parameter value should be specified as at least 128. The sequence (SEQ) parameter value should be *FIFO or *LIFO.

Specifying Data Queues on the CRTOUTQ and CHGOUTQ Commands

The CRTOUTQ and CHGOUTQ commands have a data queue (DTAQ) parameter, which is used to specify the data queue name. An error occurs when using these commands if the specified data queue does not exist or if the user creating or changing the output queue does not have use authority to the data queue.

After a data queue is associated with an output queue, any spooled file that is placed on the output queue in ready status causes an entry to be placed on the data queue. The data queue entry is added regardless of the authority the user generating the spooled file has to the data queue.

Working with Data Queues When Errors Occur

If the AS/400 system tries to add entries to a data queue that does not exist or has an invalid length, the system continues with its processing but sends an informational message to the QSYSOPR message queue. This message indicates that there is a problem with the data queue and specifies the data queue name. This message is sent the first time a specific problem occurs with the data queue of an output queue. The message is sent once every 24 hours.

For example, if message X is received at 10:00 AM, it is logged in the QSYSOPR message queue. If message X is received again at 10:30 AM, 11:00 AM, 1:00 PM, or 1:30 PM, it will not be logged. As you can see, the message will not be logged until after 10:00 AM the next day, even if it continues to be received all day.

If after message X is logged at 10:00 AM, message Y is received at 2:00 PM, message Y is logged. If message X is received again at 2:30 PM, message X will be logged again even though it was logged earlier in the day.

The intent is not to log the same recurring message all day, but to inform the user of each change of error messages associated with the data queue of a particular output queue.

Managing Data Queue Entries

Changing the data queue of an output queue is allowed regardless of whether there are spooled files on the output queue. However, only spooled files that reach RDY status after the change will have entries on the data queue. Spooled files already having a status of ready on the output queue will not have entries on the new data queue.

It is the user's responsibility to manage the data queues. These responsibilities include creating, clearing, and deleting data queues.

When clearing all output queues during IPL, any associated data queues are not cleared. If a damaged system output queue is found, it is re-created without any associated data queue name. Damaged data queues are not re-created.

Sample Data Queue Entry

Following is the format of an entry sent to the data queue for a spooled file that is in ready status on an output queue.

Table 3-1. Format of Data Queue Entry for a Spooled File

Decimal Offset	Hex Offset	Type	Description
0	0	CHAR(10)	Function Identifies the function that created the data queue entry. The value for a spooled file is *SPOOL.
10	A	CHAR(2)	Record type Identifies the record type within the function. Valid values are: **01** A spooled file that is in READY status has been placed on the output queue.
12	C	CHAR(26)	Qualified job name Identifies the qualified job name of the job that created the spooled file placed on the output queue. CHAR(10) Job name CHAR(10) User name CHAR(6) Job number
38	26	CHAR(10)	Spooled file name Identifies the name of the spooled file placed on the output queue.
48	30	BINARY(4)	Spooled file number Identifies the unique number of the spooled file placed on the output queue.
52	34	CHAR(20)	Qualified output queue name Identifies the qualified name of the output queue on which the spooled file was placed. CHAR(10) Output queue name CHAR(10) Library of the output queue
72	48	CHAR(56)	Reserved

Using Multiple Output Queues

You may want to create multiple output queues for:

- Special forms printing
- Output to be printed after normal working hours
- Output that is not printed

  An output queue can be created to handle spooled files that need only to be displayed or copied to a database file. Care should be taken to remove unneeded spooled files.
- Special uses

  For example, each programmer could be given a separate output queue.
- Output of special IBM files

  You may want to consider separate queues for the following IBM-supplied files:

- QPJOBLOG: You may want all job logs sent to a separate queue.
- QPPGMDMP: You may want all program dumps sent to a separate queue so you can review and print them if needed or clear them daily.
- QPSRVDMP: You may want all service dumps sent to a separate queue so the service representative can review them if needed.

Controlling Multiple Output Queues

Controlling multiple output queues requires both finding where your output is and determining how to print it if a writer is not started to the queue.

The Work with Spooled Files (WRKSPLF) command can be used to display all the spooled files that you have created. This is an easy way to find your output if you do not know the name of the output queue where it has been placed. The spooled files are listed in the same order as they would be on a SEQ(*FIFO) output queue. (See "Order of Spooled Files on an Output Queue" on page 3-5 for more information.)

If you know the name of the output queue that contains the spooled file, the Work with Output Queue (WRKOUTQ) command can be used to display the queue to determine the position of the spooled files on that output queue.

The WRKOUTQ command also provides the option to display all the output queues that exist on your system.

If a writer is not started to the output queue that contains the spooled file you wish to print, you have several options in order to print the file:

- Use the Work with All Spooled Files (WRKSPLF) command and type 9 (Work with printing status) next to your spooled file to find out why it is not printing.
- Use the Change Spooled File Attributes (CHGSPLFA) command to move the spooled file to an output queue that has a writer started to it.
- Select a printer that is not being used and use the Start Printer Writer (STRPRTWTR) command to start a printer that will print the spooled files from your output queue.
- Select a printer that is started to a different output queue and use the Change Writer (CHGWTR) command to change the printer to print the spooled files from your output queue.

The Work with Writers (WRKWTR) command can be used to find a list of printers attached to your system and to determine if the printer is active (started).

Output Queue Recovery

If a job that has produced spooled files is running when the job or system stops abnormally, the files remain on the output queue. Some number of records written by active programs may still be in main storage when the job ends and will be lost. You should check these spooled files to ensure that they are complete before you decide to continue using the files.

You can use the SPLFILE parameter on the End Job (ENDJOB) command to specify if all spooled files (except QPJOBLOG) created by the job are to be kept for normal processing by the printer writer, or if these files are to be deleted.

If an abnormal end occurs, the spooled file QPJOBLOG will be written at the next IPL of the system.

If a printer writer fails while a spooled file is being printed, the spooled file remains on the output queue intact.

Recovery of User-Created Output Queues: If an output queue becomes damaged in such a way that it cannot be used, you are notified by a message sent to the system operator message queue. The message comes from a system function when a printer writer or a job tries to put or take spooled files from the damaged queue.

A damaged output queue can be deleted using the Delete Output Queue (DLTOUTQ) command, or it will be deleted by the system during the next IPL.

After a damaged output queue is deleted, all spooled files on the damaged output queue are moved to output queue QSPRCLOUTQ in library QRCL. The move is performed by the QSPLMAINT system job, which issues a completion message to the QSYSOPR message queue when all spooled files have been moved.

After the damaged output queue is deleted, it can be created again by entering the Create Output Queue (CRTOUTQ) command. Then, spooled files on output queue QSPRCLOUTQ can be moved to the newly created output queue using the Change Spooled File Attributes (CHGSPLFA) command.

Recovery of System-Created Output Queues: If the output queue that was damaged was the default output queue associated with a printer, the system automatically re-creates the output queue when it is deleted.

This system-created output queue has the same public authority as specified for the device and default values for the other parameters. After the system re-creates the output queue, you should verify its attributes are correct or change them, if necessary, using the Change Output Queue (CHGOUTQ) command.

When a damaged output queue associated with a printer is deleted and created again, all spooled files on the damaged queue are moved to the re-created output queue. This is done by the QSPLMAINT system job, which issues a completion message to the QSYSOPR message queue when all spooled files have been moved.

Spooled File Cleanup after an Abnormal IPL

System spool cleanup starts immediately following an abnormal IPL. Spool cleanup is done under the system job QSPLMAINT.

Spooled files on destroyed user-created output queues are moved to output queue QSPRCLOUTQ in library QRCL. Spooled files on destroyed system-created output queues are moved to the re-created output queues.

Cleanup also deletes spooled files that have data in a damaged database file in library QSPL.

Printer Writer Program

A printer writer is an OS/400 program that takes spooled files from an output queue and sends them to a printer. The spooled files on a particular output queue remain stored in the system until the printer writer program assigns a printer to the output queue.

The printer writer program takes spooled files, one at a time, from the output queue, based on their priority. The printer writer program prints a spooled file only if its entry on the output queue indicates that it has a ready (RDY) status. You can display the status of a particular spooled file using the Work with Output Queue (WRKOUTQ) command.

If the spooled output file has a ready status, the printer writer program takes the entry from the output queue and prints the specified job and/or file separators, followed by the output data in the file. If the spooled file does not have a ready status, the printer writer program leaves the entry on the output queue and goes on to the next entry. In most cases the printer writer program continues to print spooled files (preceded by job and file separators) until all spooled files with a ready status have been taken from the output queue.

Note: The printer writer program uses the printer file QPSPLPRT. This printer file is shipped with the system. It is set up for the printer writer program and should not be changed or used for other applications.

The AUTOEND parameter on the Start Printer Writer command determines whether the printer writer program continues to wait for new spooled files to become available to be printed, ends after printing one file, or ends after all spooled files with ready status have been taken from the output queue.

The SEPDRAWER parameter on the Start Printer Writer (STRPRTWTR) and Change Writer (CHGWTR) commands allows the job separators and file separators to be printed on paper selected from a different drawer. Typically this is used to print the separators on colored paper.

The FORMTYPE parameter on the STRPRTWTR command allows several values for the message option:

***INQMSG** This is the default value.

An inquiry message is issued if the spooled file has a form type that is different from what is in the printer.

***INFOMSG** An informational message is issued when no spooled files of the specified form type remain on the output queue.

***MSG** Both the inquiry and informational messages are issued.

***NOMSG** No messages are issued.

These values are also supported on the Change Writer (CHGWTR) command.

Summary of Printer Writer Commands

The following commands may be used to work with the printer writer program. For detailed descriptions of the commands, see the *CL Reference*.

STRPRTWTR	Start Printer Writer: Starts the printer writer program to assign an active printer to an output queue. Spooled files on that output queue will be printed on the assigned printer. This command also allows you to specify the message queue for printer writer messages, which form types should be printed, number of file separator pages, and the drawer for separator pages.
CHGWTR	Change Writer: Allows you to change some printer writer program attributes, such as form type, drawer for separator pages, number of file separator pages, or output queue.
HLDWTR	Hold Writer: Temporarily stops a printer writer program at the end of a record, at the end of a file, or at the end of a page.
RLSWTR	Release Writer: The printer writer program continues from the point at which it was previously held.
ENDWTR	End Writer: Ends a printer writer program and makes the associated printer device available to the system.

Using a Printer for Both Spooled Files and Direct Print Jobs

The allow direct print function provides the capability of sharing a printer between the printer writer and direct print jobs.

A printer writer sends spooled files to the printer from the output queue assigned to that printer. When the SPOOL parameter value on the printer file is *YES, output data is written to a spooled file and placed on an output queue.

When the SPOOL parameter value on the printer file is *NO, output data is written directly to the printer. This is a direct print job.

Enabling the Allow Direct Print Function

To allow direct print jobs as well as spooled files for a printer, specify *YES as the value on the allow direct print (ALWDRTPRT) parameter on the Start Printer Writer (STRPRTWTR) command.

When *YES is specified, the printer writer releases the printer for direct print jobs when either of the following conditions is true:

- The printer writer is held (STATUS(*HLD)).
- The output queue associated with the printer contains no spooled files waiting to print.

The allow direct print function uses the maximum file-wait time specified in the WAITFILE parameter in the printer file.

The default value for the WAITFILE parameter is *IMMED. However, the allow direct print function requires some time to obtain access to the printer. Therefore, it is recommended that 2 or 3 minutes be allowed for access to the printer.

Note: The WAITFILE parameter value must be calculated in seconds. For example, a parameter value of 120 would allow a wait time of 2 minutes.

When choosing the value for the maximum file-wait time (WAITFILE) parameter in the printer file, consider how busy is the printer that you want to use for your direct print jobs?

If the value for the WAITFILE parameter is too small, a message is returned indicating the specified printer could not be obtained. If you still need the job printed, the job must be run again.

If the value for the WAITFILE parameter is too large, your sign-on session is utilized waiting for the job to obtain the printer. You cannot use System Request to end the direct print job. The job must be ended using the End Job (ENDJOB) command. Using this command ends your sign-on session.

Modifying the Start Printer Writer (STRPRTWTR) Command

The STRPRTWTR command can be modified to allow all printers being started to accept direct print jobs. Use the Change Command Default (CHGCMDDFT) command and set the value for the allow direct print (ALWDRTPRT) parameter on the STRPRTWTR command to *YES. Thereafter, when the STRPRTWTR command is used, the allow direct print function is enabled.

Restrictions When Using the Allow Direct Print Function

The Change Writer (CHGWTR) command cannot be used to enable the allow direct print function.

The allow direct print function is not supported on printers configured for advanced function printing. This means the advanced function printing (AFP) parameter on the printer device description must be *NO.

Managing Spooled Files

When jobs that produce spooled files are running, they use specified printer files to determine where the spooled files will go and what they will look like.

The spool support on the AS/400 system allows you to change the destination of spooled files and to alter the appearance of a spooled file before actual printing occurs. The Work with Spooled Files (WRKSPLF) command is the primary command used for managing your spooled files.

Using the Work with Spooled Files (WRKSPLF) Command

By typing WRKSPLF on a command line you can display a list of your spooled files similar to the example below.

The Work with All Spooled Files display shows you, in the *Device or Queue* column, the name of the queue that the spooled file is currently in.

At the top of the display is a list of actions that can be performed on any spooled file.

All of these actions (with the exception of Messages and Work with printing status) can be performed using CL commands. The Work with All Spooled Files display

provides a convenient way for you to run these commands. When you use this display, you do not have to remember the exact CL command name and the spooled file attributes such as: name, number, and position in a particular output queue.

Using the WRKSPLF command, you can manage your spooled files by selecting one of the available options.

```
                          Work with All Spooled Files

Type options, press Enter.
  1=Send   2=Change   3=Hold   4=Delete   5=Display   6=Release   7=Messages
  8=Attributes        9=Work with printing status

                              Device or                       Total     Cur
Opt  File        User         Queue        User Data   Sts    Pages    Page  Copy
     QPJOBLOG    STANGLER     STANGLER     STANGLERS1  RDY       38            1









                                                                          Bottom
Parameters for options 1, 2, 3 or command
===>
F3=Exit   F10=View 3   F11=View 2   F12=Cancel   F22=Printers   F24=More keys
```

Following is a list of these options (with the associated CL commands), and an explanation of each option.

- Send — Send Network Spooled File (SNDNETSPLF) command

  This option allows you to send the spooled file to another user on your system or to a user in your network. Go to "Using the Send Option" on page 3-17 for more information on using this option.

- Change — Change Spooled File Attributes (CHGSPLFA) command

  This option allows you to change attributes of a spooled file. Go to "Using the Change Option" on page 3-19 for information on what attributes can be changed.

- Hold — Hold Spooled File (HLDSPLF) command

  This option allows you to stop the processing of a spooled file by a printer writer.

- Delete — Delete Spooled File (DLTSPLF) command

  This option allows you to remove the spooled file from the system.

- Display — Display Spooled File (DSPSPLF) command

  This option allows you to display the contents of a spooled file.

- Release — Release Spooled File (RLSSPLF) command

  This option allows the printer writer to process a previously held or saved spooled file.

- Messages — No associated CL command

  This option displays any messages associated with the spooled file.

- Attributes — Work with Spooled File Attributes (WRKSPLFA) command

  This option allows you to change attributes that control how a spooled file will look when it is printed. Go to "Using the Attributes Option" on page 3-20 for examples of changing these attributes.

- Work with printing status — Work with Printing Status (WRKPRTSTS) command

  This option allows you to view the conditions that are preventing the spooled file from printing. For examples on how to use this option, go to "Using the Work with Printing Status Option" on page 3-23.

Using the Send Option

Selecting option 1 (Send) from the Work with All Spooled Files display allows you to send a spooled file to another user on the system or to a user in a communications network that your AS/400 system is linked to.

Notes:

1. The users to whom you want to send the spooled file must be in the system directory. Also, if the user to whom you want to send the spooled file is a user on another system, the name of that system must be in the system directory. Use the Display Directory (DSPDIR) command to view the list of users and systems in your communications network.
2. In most cases you will want to specify *ALLDATA as the value for the *Data format* prompt. This will ensure that all the attributes of the spooled file are sent with the file.
3. See the *CL Reference* for more information on the SNDNETSPLF command.

```
                  Send Network Spooled File (SNDNETSPLF)

Type choices, press Enter.

Spooled file . . . . . > QPJOBLOG      Name
User identifier:
  User ID  . . . . . .                 Character value
  Address  . . . . . .                 Character value
             + for more values
Job name . . . . . > STANGLERS1    Name, *
  User . . . . . >   STANGLER      Name
  Number . . . . . >   000796      000000-999999
Spooled file number  . . . . . > 11          1-9999, *ONLY, *LAST
Data format  . . . . . .   *RCDDATA      *RCDDATA, *ALLDATA

                                                                  Bottom
F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
F24=More keys
```

By choosing option 1 from the WRKSPLF display, the only information you have to type to send the spooled file is the user ID and address.

Note: If your system is in a TCP/IP network, you can send and print spooled files using the send TCP/IP Spooled File (SNDTCPSPLF) command. For more information, see "Sending and Printing Files with TCP/IP" on page 14-13.

Using the Messages Option

Selecting option 7 (Messages) from the Work with All Spooled Files display allows you to view any system messages concerning a particular spooled file.

```
                         Work with All Spooled Files

 Type options, press Enter.
   1=Send   2=Change   3=Hold   4=Delete   5=Display   6=Release   7=Messages
   8=Attributes        9=Work with printing status

                               Device or                    Total     Cur
 Opt  File        User         Queue       User Data  Sts
Pages     Page  Copy
  7   QPJOBLOG    TGC          KLEPELS3    CLEMENS    MSGW      1       0      1
  _   QPSRVDMP    TGC          TGC                    RDY      94              1
  _   QPJOBLOG    TGC          QEZJOBLOG   CLEMENS    RDY       1              1
  _   QPJOBLOG    TGC          QEZJOBLOG   CLEMENS    RDY       1              1
  _   QPJOBLOG    TGC          QEZJOBLOG   CLEMENS    RDY       1              1
  _   QPJOBLOG    TGC          QEZJOBLOG   CLEMENS    RDY       1              1
  _   QPJOBLOG    TGC          QEZJOBLOG   CLEMENS    RDY       1              1
  _   QPJOBLOG    TGC          QEZJOBLOG   CLEMENS    RDY       1              1
  _   QPJOBLOG    TGC          QEZJOBLOG   CLEMENSS1  RDY       6              1
  _   QPRTSPLF    TGC          TGC                    RDY       1              1
                                                                         More...
 Parameters for options 1, 2, 3 or command
 ===> ____________________________________________________________________________
 F3=Exit   F10=View 3   F11=View 2   F12=Cancel   F22=Printers   F24=More keys
```

When a spooled file does not start to print or finish printing, the reason could be that a message was not replied to. Often it is a check to make sure the forms being used are aligned or positioned correctly in the printer. Answering these messages allows the job to start or continue printing.

In the example shown here, answering the message with a **G** would tell the printer to start printing. Before you type **G** and press the Enter key, you need to make sure the form type you need is loaded on the printer.

```
                        Additional Message Information

 Message ID . . . . . . :   CPA3394        Severity . . . . . . :   99
 Message type . . . . . :   INQUIRY
 Job . . :   KLEPELS3      User . . :   QSPLJOB       Number . . :   008906
 Date sent . . . . . . :   11/06/90       Time sent . . . . . :   14:37:09
 From program . . . . . :   QSPPRTWT       Instruction . . . . :   0000

 Message . . . . :   Load form type '*STD' device KLEPELS3 writer KLEPELS3.   (H
   C G I R)
 Cause . . . . . :   The file on output queue KLEPELS3 in library QUSRSYS
   requires form type '*STD' to be loaded on device KLEPELS3. The form type for
   the file was all blanks when '' appears as the form type.
 Recovery . . . :   Do one of the following:
      -- Type H to hold the file and print the next file on the output queue.
      -- Type C to cancel the writer.
      -- Type G after the form type is loaded to begin printing the current
   file.
                                                                         More...
 Type reply, press Enter.
   Reply . . .   G___________________________________________________________

 F3=Exit            F12=Cancel
```

Using the Change Option

Selecting option 2 (Change) from the Work with All Spooled Files display allows you to change certain attributes of a spooled file. Below is a list that indicates which of the spooled file attributes you can change using option 2.

Notes:

1. To find out the possible values you could specify for any of these attributes, move the cursor under any of the attributes and press the Help key.
2. If the spooled file is already printing (status is WTR), only a subset of this list of attributes can be changed.

   The attributes included in the subset vary depending on the device type (*IPDS, *SCS, *AFPDSLINE, *LINE, and *AFPDS).

```
Printer
Print sequence
Form type
Copies
Restart printing
Output queue
  Library
File separators
Page range to print:
  Starting page
  Ending page
File becomes available
Save file
Output priority
User data
Align page
Print quality
Form feed
Print fidelity
Print on both sides
Pages per side
Front side overlay:
  Overlay
    Library
  Offset down
  Offset across
Back side overlay:
  Overlay
    Library
  Offset down
  Offset across
```

For example, to change the specified printer: Use option 2 from the Work with All Spooled Files display by typing 2 next to the spooled file you want to work with.

The Change Spooled File Attributes display appears.

Type the name of the printer you want to specify for this spooled file.

Press the Enter key and you are returned to the Work with All Spooled Files display.

You have now changed the specified printer for that spooled file.

Restrictions to changing spooled file attributes: Some attributes of a spooled file cannot be changed based on the device type (DEVTYPE) of the spooled file.

The pages per side (MULTIUP), front overlay (FRONTOVL), and back overlay (BACKOVL) attributes can only be changed if the DEVTYPE is *SCS or *IPDS.

The above attributes plus form feed (FORMFEED), print quality (PRTQLTY), and print on both sides (DUPLEX) cannot be changed on spooled files created on the AS/400 system with printer device type *AFPDS.

Using the Attributes Option

Selecting option 8 (Attributes) from the Work with All Spooled Files display allows you to view a list of all the attributes of the specified spooled file.

You can also use the Work with Spooled File Attributes (WRKSPLFA) command to change the attributes of a spooled file.

```
                          Work with All Spooled Files

Type options, press Enter.
  1=Send   2=Change   3=Hold   4=Delete   5=Display   6=Release   7=Messages
  8=Attributes        9=Work with printing status

                              Device or                       Total     Cur
Opt  File        User         Queue        User Data   Sts    Pages    Page  Copy
 8   QPJOBLOG    STANGLER     STANGLER     STANGLERS1  RDY       38             1









                                                                          Bottom
Parameters for options 1, 2, 3 or command
===>
F3=Exit   F10=View 3   F11=View 2   F12=Cancel   F22=Printers   F24=More keys
```

Initially, the attributes assigned to this spooled file were obtained from the printer file that the application program used.

Not all attributes shown can be changed. To view the attributes that can be changed, press F13.

Following is a list of attributes that can be changed by pressing F13.

Note: The attributes included in the subset vary depending on the device type (*IPDS, *SCS, *USERASCII, *AFPDSLINE, *LINE, and *AFPDS).

```
Printer
Print sequence
Form type
Copies
Restart printing
Output queue
  Library
File separators
Page range to print:
  Starting page
  Ending page
File becomes available
Save file
Output priority
User data
Align page
Print quality
Form feed
Print fidelity
Print on both sides
Pages per side
Front side overlay:
  Overlay
    Library
  Offset down
  Offset across
Back side overlay:
  Overlay
    Library
  Offset down
  Offset across
```

Device Requirements

When you work with spooled file attributes, the device requirements shown in the following table are displayed. The table shows the device requirements supported on each printer.

Table 3-2. Supported Device Requirements

	Printer											
Device Requirement	**3287 4245 5256 5262 6262**	**5252**	**4214**	**5224 5225**	**4234-2**	**5219**	**3812 3816 SCS**	**5553[1]**	**3812 3816 4028 IPDS**	**4230 4224 4234-8 4234-12**	**5583**	**3820[1] 3825[1] 3827[1] 3829[1] 3831[1] 3835[1] 3900[1]**
Final Form Text			X			X	X	X	X	X		X
Variable Font						X	X	X	X	X		X
Variable LPI			X		X	X	X	X	X	X	X	X
Variable Drawer			X			X	X	X	X	X	X	X
Super/Subscript						X	X	X	X	X		X
Variable Character ID			X	X	X	X	X	X	X	X		X
Highlight							X	X	X	X		X
Extended 3812 Fonts							X	X	X	X		X
Graphics 522X				X	X			X				X
Graphics 4214			X					X				X
Graphics 4234					X			X				X
Graphics								X	X	X		X
Barcodes								X	X	X		X
Variable Page Rotation							X	X	X			X
PC Printer Emulation	X	X	X	X	X	X	X	X			X	
Defined Characters			X	X	X			X			X	X
Variable CPI		X	X	X	X	X		X			X	X
Transparency			X	X	X			X			X	X
IPDS Transparent Data								X	X	X		X
Field Outlining								X			X	X
AFP Resources									X	X		X
Rotated DBCS Characters								X			X	X
Double-wide Characters								X			X	X

[1] System does not check device attributes for these printers, so all attributes are permitted. This does not guarantee the spooled file will print correctly.

Using the Work with Printing Status Option

Selecting option 9 (Work with printing status) from the Work with All Spooled Files display helps you find the reason why a spooled file is not printing.

Type a 9 (Work with printing status) next to the spooled file that is not printing.

```
                          Work with All Spooled Files

Type options, press Enter.
  1=Send   2=Change   3=Hold   4=Delete   5=Display   6=Release   7=Messages
  8=Attributes        9=Work with printing status

                              Device or                        Total     Cur
Opt  File        User         Queue       User Data   Sts     Pages    Page  Copy
 9   REPORTS1    STANGLER     STANGLER    STANGLERS1  RDY        38            1









                                                                          Bottom
Parameters for options 1, 2, 3 or command
===>
F3=Exit   F10=View 3   F11=View 2   F12=Cancel   F22=Printers   F24=More keys
```

The conditions that may be preventing the spooled file from printing are displayed.

```
                          Work with Printing Status

Job  . . . . . :   STANGLERS1      File . . . . . :   REPORTS1
  User . . . . . :     STANGLER       Number . . . . . :     11
  Number . . . . . :   000796        User data  . . . . . :   STANGLERS1

Type options, press Enter.
  2=Change status   5=Display detailed description

Opt     Status Description
 2      This file is not associated with a started printer.









                                                                          Bottom
Command
===>
F3=Exit   F4=Prompt   F5=Refresh   F9=Retrieve   F12=Cancel
```

Type a 2 (Change status) next to the condition you want to eliminate. With the information shown in the Change Status window, you can take corrective action to make the spooled file print. All of the conditions listed must be eliminated before the spooled file will print.

If you need more information to eliminate the conditions, select option 5 (Display detailed description) for an explanation of each of the conditions preventing the spooled file from printing.

In the example shown, you would type a 2 (Change status) next to `This file is not associated with a started printer`. When the Change Status window appears, type the name of a printer that you know is active. Or, if you want to view a list of all printers configured to the system to determine which one to select, press F4. From this list you can select a printer that is active. The spooled file will then print on the selected printer.

Restarting and Controlling Printing

In some cases, you may want to restart printing or control a spooled file while it is being printed. For example:

- The system ended while a spooled file was being printed, or you want to print only selected portions of a large spooled file.

  You can use the Work with Spooled Files (WRKSPLF) command, the Work with Output Queue (WRKOUTQ) command, or the Work with Job (WRKJOB) command to see a list of spooled files. Type 2 (Change) next to the spooled output file you want to work with and press the Enter key. The Change Spooled File Attributes display appears.

  Locate the *Restart printing* parameter and type *STRPAGE. Locate the *Page range to print* parameter. This parameter has two parts: *Starting page* and *Ending page*. Type the page number that you want the spooled file to start or resume printing on and type the page number that you want that spooled file to stop printing on.

- A spooled file needs to be printed immediately, but another file is currently printing.

  For example, assume spooled file A is currently printing. While A is printing, you receive a request to have spooled file B printed immediately.

  Use the Work with Spooled Files (WRKSPLF) command or Work with Output Queue (WRKOUTQ) command to locate spooled files A and B.

  Next to B, type 2 (Change) and press the Enter key. The Change Spooled File Attributes display appears. Locate the *Print sequence* parameter. Change the value of the *Print sequence* parameter to *NEXT and press the Enter key. This moves B to the top of the output queue.

  Next to spooled file A (currently printing and having a status of WTR), type 3 (Hold), move the cursor to the command line, and type OPTION(*PAGEEND). Press the Enter key and A stops printing at the end of the current page.

  This allows spooled file B to start printing.

  When you are ready to finish printing spooled file A, type 2 (Change) next to A and press the Enter key.

  The Change Spooled File Attributes display appears. Locate the *Print sequence* parameter. Change the value of the *Print sequence* parameter to *NEXT. Locate the *Restart printing* parameter and change the value to *NEXT. File A is released and will be the next spooled file to print, and the system will resume printing with the page following the last page printed.

- You want to be notified when a spooled file completes printing or is held by the printer writer program.

  You can specify *PRTMSG for the user option in your user profile to tell the system to notify you when your spooled file is being held by the printer writer or when printing is complete. Use the Create User Profile (CRTUSRPRF) command, the Change User Profile (CHGUSRPRF) command, or the Change Profile (CHGPRF) command, and look for the *User option* prompt (USROPT parameter). See the *CL Reference* for more information about these commands and the *PRTMSG value of the USROPT parameter.

Spooled File Security

Spooled security is primarily controlled through the output queue that contains the spooled files. In general, there are four ways that a user can become authorized to control a spooled file (for example, hold or release the spooled file):

- User is assigned spool control authority (SPCAUT(*SPLCTL)) in the user profile.

  This authority gives a user control of all spooled files on the system and should only be granted to appropriate users.

- User is assigned job control authority (SPCAUT(*JOBCTL)) in the user profile and the output queue is operator-controlled (OPRCTL(*YES)).

- User has the required object authority for the output queue. The required object authority is specified by the AUTCHK parameter on the CRTOUTQ command. A value of *OWNER indicates that only the owner of the output queue is authorized to control all the spooled files on the output queue. A value of *DTAAUT indicates that users with *CHANGE authority to the output queue are authorized to control all the spooled files on the output queue.

  Note: The specific authorities required for *DTAAUT are *READ, *ADD, and *DLT data authorities.

- A user is always allowed to control the spooled files created by that user.

For the Copy Spooled File (CPYSPLF), Display Spooled File (DSPSPLF), and Send Network Spooled File (SNDNETSPLF) commands, in addition to the four ways already listed, there is an additional way a user can be authorized.

If DSPDTA(*YES) was specified when the output queue was created, any user with *USE authority to the output queue is allowed to copy, display, send, or move spooled files. The specific authority required is *READ data authority.

If the user is authorized to control the file by one of the four ways already listed above, using DSPDTA(*NO) when creating the output queue will not restrict the user from displaying, copying, or sending the file. DSPDTA authority is only checked if the user is not otherwise authorized to the file.

DSPDTA(*OWNER) is more restrictive than DSPDTA(*NO). If the output queue is created with DSPDTA(*OWNER), only the owner of the spooled file (the person who created it) or a user with SPCAUT(*SPLCTL) may display, copy, or send a file on that queue. Even users with SPCAUT(*JOBCTL) on an operator-controlled (OPRCTL(*YES)) output queue cannot display, copy, move, or send spooled files they do not own.

See the *Security Reference* for details about the authority requirements for individual commands.

To place a spooled file on an output queue, one of the following authorities is required:

- Spool control authority (SPCAUT(*SPLCTL)) in the user profile.

  This authority gives a user control of all spooled files on the system and should only be granted to appropriate users. If you have spool control authority you can delete, move, hold, and release any spooled files on the system. You can also change the attributes of any spooled file.

- Job control authority (SPCAUT(*JOBCTL)) in the user profile and the output queue is operator-controlled (OPRCTL(*YES)).
- *READ authority to the output queue. This authority can be given to the public by specifying AUT(*USE) on the CRTOUTQ command.

Controlling the Number of Spooled Files in Your System

The number of spooled files in your system should be limited. When a job is completed, spooled files and internal job control information are kept until the spooled files are printed or canceled. The number of jobs on the system and the number of spooled files known to the system increase the amount of time needed to perform initial program load (IPL) and internal searches, and increase the amount of temporary storage required.

The number of jobs known to the system can be displayed using the Work with System Status (WRKSYSSTS) command.

You can use the Work with Spooled Files (WRKSPLF) command to identify spooled files that are no longer needed. By periodically entering the command:

```
WRKSPLF SELECT(*ALL)
```

you can determine which spooled files are older than 6 or 7 days, and then delete the spooled files or contact the users who created them.

For detailed information on minimizing the number of job logs (for example, by using LOG(4 0 *NOLIST)), see the *CL Programmer's Guide*. For information regarding the use of system values to control the amount of storage associated with jobs and spooled files, see the *Work Management Guide*.

Reclaiming Empty Spooled File Members

When a spooled file has been deleted, all of the spooled file data has been erased. However, an empty spooled file member is still residing in auxiliary storage waiting to be reused.

Having some empty spooled file members available for creating new spooled files increases system performance. However, a large number of empty spooled files can use large amounts of storage and decrease system performance.

You can determine the balance you want to maintain between spool performance and auxiliary storage use by setting the system value Reclaim Spool Storage (QRCLSPLSTG) to a certain number of days. The default value for QRCLSPLSTG is 8 days.

As an alternative, you can run the Reclaim Spool Storage (RCLSPLSTG) command with the DAYS parameter set to *NONE to immediately reclaim all empty spooled file members.

You can reclaim empty spooled file members by:

- Adjusting the value assigned to the Reclaim Spool Storage (QRCLSPLSTG) system value.
- Using the Reclaim Spool Storage (RCLSPLSTG) command.

See the *Data Management Guide* for more information on reclaiming spool storage.

Example 1: Adjusting the QRCLSPLSTG System Value

Let's assume that one of your application programs had an error and it produced hundreds of spooled files that were of no value to you. When this happened those spooled files used lots of storage space on your system.

Change the QRCLSPLSTG system value to 1.

Delete all the unwanted spooled files that the application program created. Note the time of day you deleted all the unwanted spooled files.

After 24 hours, provided the empty spooled file members are not reused, the system reclaims the auxiliary storage that was being used by the empty spooled files.

Example 2: Using the Reclaim Spool Storage (RCLSPLSTG) Command

Let's assume that one of your application programs had an error and it produced hundreds of spooled files that were of no value to you. When this happened those spooled files used lots of storage space on your system.

Delete all the unwanted spooled files that the application program created.

Run the RCLSPLSTG command with the DAYS parameter set to *NONE.

The system immediately reclaims all auxiliary spool storage that was being used by the unwanted spooled files.

Spooled File Names

When spooled files are created, the spooled file name is usually the same as the name of the printer file that was used to create it. For example, if the Print key is pressed the spooled file would be called QSYSPRT, because QSYSPRT is the printer file used by the Print key operation.

There are several ways in which the spooled file could have a different name:

- The Override with Printer File (OVRPRTF) command was used and a name was specified in the SPLFNAME parameter. For example, typing the following command:

  ```
  OVRPRTF QSYSPRT SPLFNAME(REPORT1)
  ```

  causes the name of the spooled file to be REPORT1 instead of QSYSPRT.

- The OVRPRTF command was used and a different printer file is specified in the TOFILE parameter. For example, typing the following command:

  ```
  OVRPRTF QSYSPRT TOFILE(PRTF2)
  ```

  causes the spooled file to be called PRTF2 (the name of the printer file specified in the TOFILE parameter of the OVRPRTF command).

- Some IBM applications may create spooled files that have names different from the printer files used to create them. Users have no control over spooled file names in this situation.

Redirecting Spooled Files

You may want to move some of your spooled files to an output queue that has no spooled files currently in it so that they will print sooner. To do this, enter the WRKSPLF command and type a 2 (Change) next to each spooled file you want to move. Press the Enter key and, in the OUTQ parameter, type the name of the output queue you want each spooled file to go to.

File redirection occurs when a spooled file is sent to an output device other than the one for which it was originally intended. File redirection may involve devices that process different media (such as printer output sent to a diskette device) or devices that process the same type of media but are of different device types (such as 5219 Printer output sent to a 4224 Printer).

Depending on the new output device for the spooled file, the file may be printed just as it would have been on the originally specified device. However, differences in devices often cause the output to be formatted differently. In these cases, the system sends an inquiry message to the message queue of the printer writer program to inform you of the situation and allow you to specify whether you want printing to continue.

Spooled files created by printing an OfficeVision/400 document should not be redirected to a different output device than was originally specified in the Print Options of the document. The document will not print correctly.

For more information about spooled file redirection, see "Redirecting Output" on page 2-69.

Copying Spooled Files

You can use the Copy Spooled File (CPYSPLF) command to copy a spooled file to a physical file.

Note: If the data stream type is AFPDS (determined by the DEVTYPE parameter on the printer file) you cannot copy or display the spooled file.

The original spooled file is not affected by the copy operation and can still be printed by the printer writer program. You may want to copy a spooled file to a database file for the following reasons:

- You may want to copy the spooled file to a physical file because there are no commands to save spooled files on tape or diskette. However, if the system fails, physical files are backed up and you can recover the data. You can use the spool APIs to create your own save and restore operations for spooled files. See the *System Programmer's Interface Reference*, SC41-8223, for information on these APIs.

- You can save paper by having reports produced on microfiche instead of printed.
- You can copy a report to a database file to be sent over communications lines for printing at another location.
- You have collected information in a spooled file by running one of the system display commands with OUTPUT(*PRINT) specified. The spooled file created by this operation can be copied to a database file so that it can be read and processed by the application program using it.

  Note: If you use this method of gathering information, remember that the system displays that you are spooling may change when new functions are added to the system.
- You can copy the file to a spooled file so you can direct the same output to a different output queue.

  When copying spooled files to a database file, many device requirement attributes of the spooled file cannot be copied. Most OfficeVision/400 documents have device requirements such as variable lines per inch (LPI) and characters per inch (CPI) that are not copied to a database file. If the database file is copied back to the spooled file, the spooled file will not print the same as the original file.

  For more information, refer to "Duplicate Spooled File (DUPSPLF) Sample Command" on page 3-33.

Selecting the Control Character (CTLCHAR Parameter)

The CTLCHAR parameter determines which control code is produced by the Copy Spooled File (CPYSPLF) command. You can select one of the following control codes:

- *NONE: No print control characters are created. You can use this code, for example, when printed displays (produced with the OUTPUT(*PRINT) parameter) are to be read by an application program.
- *FCFC: The first character of every record contains one of the following American National Standard control codes:

Code	Action before Printing a Line
' '	Space one line (blank code)
0	Space two lines
-	Space three lines
+	Suppress space
1	Skip to next channel 1
2	Skip to next channel 2
3	Skip to next channel 3
4	Skip to next channel 4
5	Skip to next channel 5
6	Skip to next channel 6
7	Skip to next channel 7
8	Skip to next channel 8
9	Skip to next channel 9
A	Skip to next channel 10
B	Skip to next channel 11
C	Skip to next channel 12

You can use the first-character forms-control code to create microfiche with the database file or print the spooled file with the Copy File (CPYF) command (which allows spooled files to be printed using a first-character forms-control printer file).

- *PRTCTL: The first 4 characters of every record contain skip-before and space-before values. This code can be viewed as `sssl` where `sss` is the skip-before line value (001 to 255) and `l` is the space-before value (`0`, `1`, `2`, or `3`). When one part of the code is created by the CPYSPLF command, the other part is blank. In the following examples, `b` represents a blank:

  `'005b'` Skip to line 5 before printing

  `'099b'` Skip to line 99 before printing

  `'bbb1'` Space 1 line before printing

  `'bbb0'` Do not space (or skip) before printing

  You can use this control code when printing with an RPG/400 program if the page size is not more than 99 lines long. To do this, move the control characters into the RPG/400 program's PRTCTL data structure space before and skip before fields and then print line.

  Note: Any skip to line values of 3 or less will actually be generated as space 1 line(s) to get to the correct line. For example; skip to line 2 would generate a space 1 line to get to line 2.

- *S36FMT: Specifies that the format of the records copied to a database file is the same as created by $UASF on System/36 for COPYPRT. Only spooled print files can be copied when *S36FMT is specified. You can use this option when you plan to send the spooled file to a System/36. You should copy to a database file that has a record length of 150, 215, or 248. These are the valid record lengths for a System/36 file.

  The first record placed in the database file for each spooled file to be copied is a heading record. Columns that are not defined are blank.

Table 3-3 and 3-4 describe the formats of the header and data records.

Table 3-3. Header Record Format

Beginning Column	Field Length	Description
1	1	The letter H (to indicate the heading record).
4	6	The spool ID of the entry. Valid spool IDs range from SP0000 to SP9999, and from A00000 to J99999.
12	8	The procedure name. This is blank if the file was not created by a procedure.
22	8	The job name. (The last 2 characters of the name are truncated.)
32	8	The user ID of the spooled file creator. (The last 2 characters of the ID are truncated.)
42	8	The printer device file name. (The last 2 characters of the name are truncated.)
52	2	The System/36 printer ID that corresponds to the device the file is printed on. The printer ID shown is the ID for the System/36 operating environment that copies the file, not the environment that created the spooled file.
56	4	The forms identification. (This is the first 4 characters of the form type of the spooled file.)
61	2	The number of copies (in binary).
65	2	The number of pages (in binary).
69	4	The number of records (in binary). This is the number of data records that follow this heading record.
74	2	The number of lines per page (in binary).
78	1	The letter I if this entry contains print records with double-byte character set data.
81	1	The letter M if this entry contains print records with a length greater than 132.
84	1	Lines per inch (in binary).
85	1	Characters per inch (in binary).
86	1	Font ID (in binary). The AS/400 printer file FONT parameter is converted to a binary 1 field. The maximum font ID on System/36 OCL is 255; the AS/400 system supports font IDs above 255. Any time an AS/400 font ID above 255 is used, this field is set to X'0B' for Courier 11 font. If you specify FONT(*CPI), the field contains X'00'.
87	1	Justify. Valid values are X'00' (0%), X'32' (50%), and X'64' (100%).
88	1	Align. (Y means to align forms, N means not to align forms.)
89	2	The maximum length of the print lines in the spooled file that was copied.
92	10	The nontruncated user ID of the spooled file creator.
102	10	The nontruncated printer file name.
112	10	The nontruncated form type.
113	7	(Used internally by the system.)

The data records placed in the disk file for each copied spooled file have the following format:

Table 3-4. Data Record Format

Beginning Column	Field Length	Description
1	2	The page number (in binary).
3	2	The line number (in binary).
5	4	The record number (in binary).
9	1	The letter `I` if this print record contains double-byte character set data.
10	1	A double-byte character set shift-out character (hex 0E) if this print record starts with double-byte character set data.
11	nnn	The data to be printed. (The field length is the file record length minus 10. If the print data is longer than the field length, it is truncated; and if it is shorter than the field length, it is padded with blanks at the end.) The format of data may not exactly match the format that would be produced on System/36 when multiple prints are used to construct a single print line.

The 2-byte binary numbers are unsigned, which means that a page number of 65 535 is the largest page number in a heading record or data record. When the actual number is larger, it will wrap beyond 65 535 to 0, then 1, 2, 3, and so on.

Selecting the Channel Value (CHLVAL Parameter)

You can use the CHLVAL parameter on the CPYSPLF command to assign line numbers for the different channels described above. This can only be specified if *FCFC is specified for the CTLCHAR parameter. The same channel values that were specified when the file was originally spooled should be specified when using the CPYSPLF command.

Example of Using Control Codes

To copy a spooled file named ORDERS in job NEWORDERS to database file PRTORDERS so that you can use the CPYF command to print the database file, type:

```
CPYSPLF   FILE(ORDERS) JOB(NEWORDERS) TOFILE(PRTORDERS) CTLCHAR(*FCFC)
```

To print the data from the physical file, type:

```
OVRPRTF   FILE(QSYSPRT) CTLCHAR(*FCFC) CHLVAL(*NORMAL)
CPYF      FROMFILE(PRTORDERS) TOFILE(QSYSPRT)
DLTOVR    FILE(QSYSPRT)
```

Sample Commands for Additional Spooling Support

You can define some functions to provide additional spooling support. Example source and documentation for the commands, files, and programs for these functions are part of library QUSRTOOL, which is an optionally installed part of the OS/400 program.

Documentation about these commands can be found in library QUSRTOOL, file QATTINFO, and the following members:

Member Name	Name of Command
DUPSPLF	Duplicate Spooled File command
CVTOUTQ	Convert Output Queue command
MOVSPLF	Move Spooled File command
TSRINFO	Save Spooled File command
TSRINFO	Restore Spooled File command

Descriptions of spooling commands in QUSRTOOL are:

Duplicate Spooled File (DUPSPLF) Sample Command: The DUPSPLF command can be created to duplicate a spooled file and place the duplicate output in a different output queue. You can do this when you want the same spooled file to be printed on multiple printers and each printer normally works with a specific output queue.

Convert Output Queue (CVTOUTQ) Sample Command: In some environments, you may want a function to place the information displayed by the WRKOUTQ command into a database file for processing. Each database record will contain some of the attributes of a spooled file and can be manipulated with other processing techniques, such as assigning a different output queue to all the spooled files.

Move Spooled File (MOVSPLF) Sample Command: A typical use of the previously described CVTOUTQ sample command is to move all spooled files from one queue to another. The Move Spooled File (MOVSPLF) sample command also performs this function.

Save Spooled File (ZSAVSPLF) Sample Command: This command allows you to save a spooled file or a group of spooled files into a library and optionally save the library to a device.

Restore Spooled File (ZRSTSPLF) Sample Command: This command allows you to restore spooled files from a library and optionally restore the library list from a device. The ZRSTSPLF command works only with spooled files saved using the ZSAVSPLF command.

Working with Job and File Separators

Separator pages are pages that separate one print job or spooled file from another. Separator pages for print jobs (job separators) are specified on the output queue. For each job having spooled files on the output queue, the specified number of separator pages will print at the beginning of the printed output for each job. Separator pages for spooled files (file separators) are specified on the printer file or

printer writer. The specified number of separator pages will print before each spooled file.

To print customized separator pages, for example, a banner separator page, specify a user exit program on the separator exit program (SEPPGM) parameter of the printer device description. The exit program has an API-like interface and is described in the *System Programmer's Interface Reference* manual.

A sample exit program (in C and RPG) is in the QUSRTOOL library. See member TBSINFO in file QATTINFO in library QUSRTOOL for information about this sample exit program.

Using Application Program Interfaces (APIs)

There are several APIs that provide access to spooled files. Using these APIs, a program can copy a spooled file to a database without any loss of information. See the *System Programmer's Interface Reference*, SC41-8223, for additional information about spool APIs.

Working with a QPRTJOB

A QPRTJOB job is a job that spooled files are associated with when the current job's user name is not the same as the user profile currently running. System jobs can change to run under a user's profile in order for a user to obtain ownership of the spooled file instead of the system job. For example, if you send a spooled file using the SNDNETSPLF command to user TINA on a different AS/400 system, the file is spooled for job 999999/TINA/QPRTJOB. Spooling the file for this user's job instead of the system job makes sure that user TINA owns the spooled file. Then, when she runs the WRKSPLF command, the spooled file sent to her is shown.

QPRTJOB jobs are created automatically by the system. There is only one QPRTJOB per user on a system. For example, a separate QPRTJOB is created for each user that receives spooled files sent by the SNDNETSPLF command. If users TINA and KEVIN were sent spooled files using the SNDNETSPLF command, there would be jobs named 999999/KEVIN/QPRTJOB and 999999/TINA/QPRTJOB on the receiving system.

QPRTJOB jobs are created and used by a variety of system functions. For example:

- Using the SNDTCPSPLF or SNDNETSPLF commands to send a spooled file to another user on a different AS/400 system.
- Sending a spooled file from VM or MVS through a VM/MVS bridge to an AS/400 system.
- Receiving a spooled file using TCP/IP or the line printer daemon (LPD) process.
- Using the QSPCRTSP Spool API to create a spooled file for another user.
- Using the QWTSETP Security API to set the user profile to a different user and then create a new spooled file.

  Other applications that are running can use the QSPCRTSP and QWTSETP APIs resulting in additional QPRTJOB jobs on the system.

Cleanup of QPRTJOB Jobs

QPRTJOB jobs continue to be reused until they have been inactive more than 24 hours. Inactive means all spooled files for the job have been deleted and no new ones have been received for that user in more than 24 hours. The cleanup is done by the system job QSPLMAINT.

Ending QPRTJOB Jobs

To end a QPRTJOB job before it is cleaned up, the End Job (ENDJOB) command must be used specifying SPLFILE(*YES). This action ends the job and deletes all spooled files for that job.

You should not specify SPLFILE(*NO) on the ENDJOB command to end a QPRTJOB job. If you end the job without deleting the job's spooled files, the job is left in an unusable state. For example, a user cannot receive spooled files if the QPRTJOB is left in an unusable state. The job status indicates it has ended, but the job continues to stay active. Any spooled files sent to a user arrive with a status *FIN. *FIN indicates they were already deleted. You must end the job specifying SPLFILE(*YES) to correct this problem.

Part 3. Advanced Function Printing (AFP)

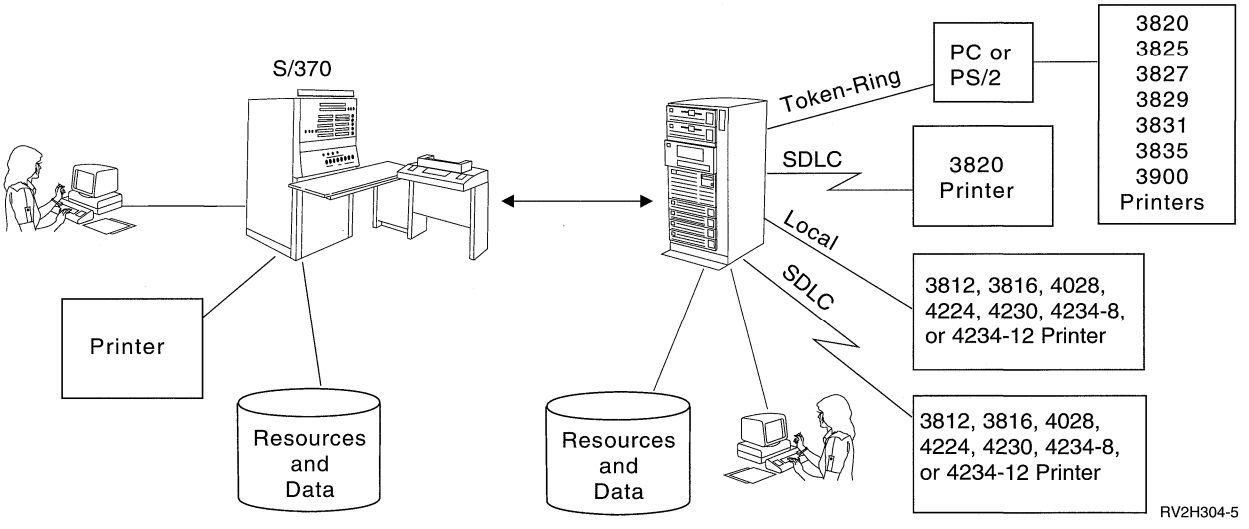
Chapter 4. What Is Advanced Function Printing (AFP)?

Advanced function printing is the ability of programs to use the all-points-addressable concept to print text and images on a printer.

Attention: You must have Version 1 Release 2.0 or higher level of Licensed Internal Code installed on your AS/400 system to use advanced function printing (AFP).

You must have Version 2 Release 1.0 or higher level of Licensed Internal Code installed to use AFP with the 4028, 4224, 4230, 4234-8, and 4234-12 printers.

The diagram below shows you the physical connections you could use to implement AFP.



From an AS/400 system perspective, advanced function printing (hereafter called AFP) means having the capability to print advanced function printer data stream (AFPDS) files.

Advanced Function Printing Data Stream (AFPDS)

AFPDS files can be generated on the AS/400 system as well as on a System/370*. The ability of both systems to generate the AFPDS data stream means that they can send AFPDS files to each other for printing on AFP-configured printers.

On the AS/400 system, AFPDS is generated by selecting *AFPDS as the value on the DEVTYPE parameter of the printer file being used.

What This Part of the Manual Will Do for You

Depending on your AFP environment, tasks to be completed could be: install hardware, configure printers, configure personal computer systems, and create configuration descriptions on the AS/400 system using the following manuals:

- The AS/400 system library manuals
- IBM personal computer manuals
- IBM token-ring manuals

- IBM 38xx printer manuals
- IBM System/370 to PC manuals
- The *IBM Remote PrintManager User's Guide and Installation Guide*

This part of the guide organizes all of these tasks and directs you, when necessary, to the correct manual required to complete a task.

Frequently Used Terms

Before using this part of the manual, familiarize yourself with these terms, which are used throughout the manual.

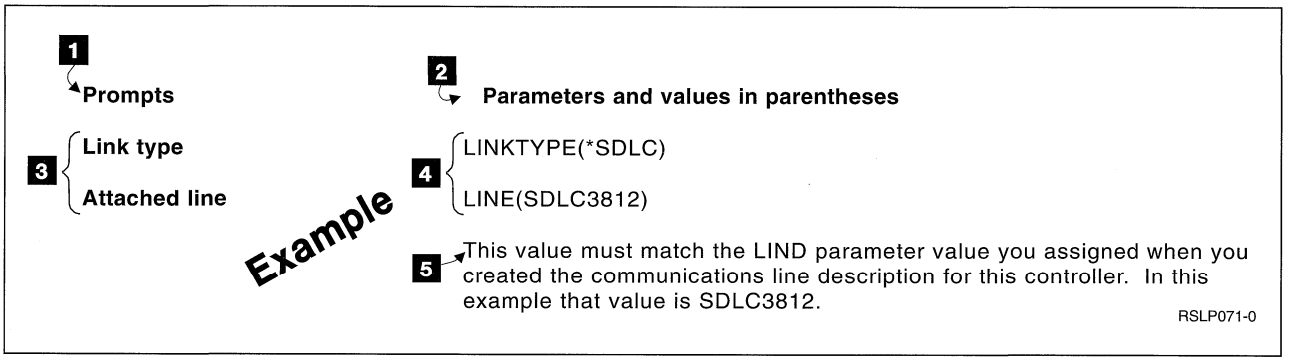
Term	Definition of Term
AFP	Advanced function printing (AFP) The ability of programs to use the all-points-addressable concept to print text and images on a printer.
APA	all-points-addressable In AFP support, pertaining to the capability to address, refer to, and position text, overlays, and images at any defined point on the printable area of the paper.
AFPDS	Advanced function printing data stream (AFPDS) In AFP support, the printer data stream used for printing advanced function printing data. The AFPDS includes composed text, page segments, electronic overlays, form definitions, page definitions, and fonts that are downloaded from the AS/400 system to the printer.
APPC/PC	Advanced Program-to-Program Communications/Personal Computer Program (APPC/PC) A licensed program, installed on a personal computer system, that performs APPC functions for a transaction program running on the personal computer system.
RPM	Remote PrintManager (RPM). In AFP support, a personal computer product that allows selected font data, overlays, and page segments that are present in advanced function printing data streams to be available to an attached IBM page printer.
PSF/2	Print Services Facility/2 (PSF/2) PSF/2 is a PS/2*-based print server that provides distributed printing in a network environment. Systems can be a host system (S/390*) or several AS/400 systems.
DPF	Distributed print function DPF is a part of PSF/2. It permits host and AS/400 systems to send IPDS spooled files to PSF/2.

Using the Configuration Examples

Configuration is the task of telling the system the physical and logical arrangement of the devices and programs that are put together to complete a computer system or a part of the computer system.

Configuration examples are provided in this manual for your use. Commands, parameters for those commands, and values for the parameters in a command are presented.

Commands used in the examples do not include every parameter associated with each command. In the examples, if the IBM-supplied default (a value that is automatically supplied or assumed by the system or program) was the parameter value used in the example, it will not be shown except to note an exception or to make a point. When creating your configuration descriptions, simply use the default parameter value. Immediately below is a diagram and explanation of how the configuration examples are presented in this manual.



1. This is a column heading over a list of prompts.
2. This is a column heading over a list of parameters and their selected values.
3. This is the descriptive wording you see for parameters when you press F4 after entering a command.
4. This is a parameter and its selected value enclosed in parentheses.
5. This is informational text, used only in this manual, to show a relationship between this parameter and some other parameter. Usually it will be a parameter for another AS/400 system command, a 38xx printer parameter, or a parameter required for RPM.

Choosing Your AFP Environment

Several IBM printers perform advanced function printing (AFP) with the AS/400 system. These printers can be used in the following environments. Read the list to determine which environment you want to establish, and then go to the page indicated.

Chapter 5. AFP and Locally Attached 3812, 3816, 4028, 4224, 4230, 4234-8, and 4234-12 Printers

In a local environment, the AS/400 system supports printing advanced function printing data stream (AFPDS) files on the following AFP-capable printers:

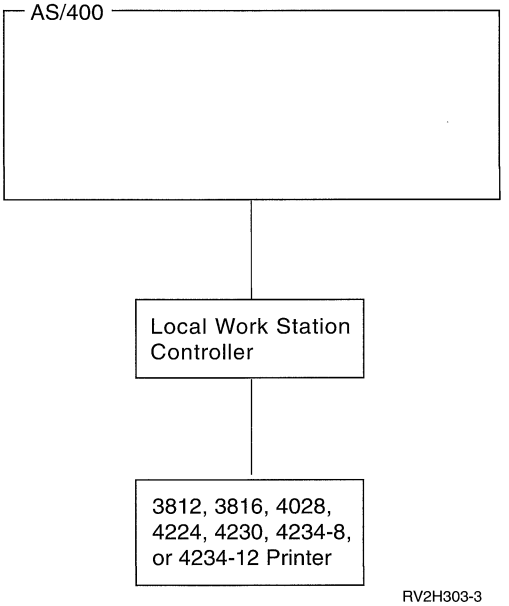
- 3812
- 3816
- 4028
- 4224
- 4230-102
- 4234-8, 4234-12

Notes:

1. For the 4224, AFP support is for all models with serial numbers of AA001 or higher.
2. For the 4234, AFP support is for Models 8 and 12 only.
3. For the 4230, AFP support is for Model 102 only.

   The 4230 printer must be configured for 4224 emulation. This is done from the operator panel of the 4230 printer.

Below is a diagram of the physical attachment necessary to print AFPDS files on those locally attached printers.



Getting the 3812, 3816, 4028, 4224, 4230, 4234-8, and 4234-12 Printers Ready

To print AFPDS files on these printers, follow the setup instructions that come with the printer. Make sure that you install the most recent version of the intelligent printer data stream (IPDS) diskette in the 3812 or 3816 printer.

4028 and 4224 Operating Considerations

4028

Item 1: If the 4028 printer display panel shows a code of 75, type the following command from an AS/400 display station:

```
ENDWTR printer-device-name *IMMED
```

A code of 75 indicates that the printer received a document that is too complex for processing and cannot continue processing.

Item 2: If the 4028 printer is running and a font card is added or changed in the 4028 printer, it is recommended that you end the printer writer program to the 4028 printer. Otherwise the first spooled file sent to the printer, after the font card change, may not substitute fonts correctly. Use the following command to end the printer writer:

```
ENDWTR printer-device-name *IMMED
```

4224, 4230 If you change the paper feed mechanism after the printer writer has been started, you need to power the 4224 off and back on. This notifies the printer writer of the type of paper feed mechanism being used with the printer.

Creating the AS/400 System Configuration Descriptions

The configuration descriptions for the 3812, 3816, 4028, 4224, 4230, and 4234 printers must be completed manually. Automatic configuration defaults to *NO for AFP and is not recommended for these printers in an environment where they will be used to perform AFP.

Use the CRTCTLLWS (Create Controller Description (Local Work Station)) and CRTDEVPRT (Create Device Description (Printer)) commands to create the configuration descriptions to enable AFP on locally attached AFP-capable printers.

Notes:

1. If you already have any of these printers locally attached and the configuration descriptions were created using automatic configuration, you can use the CHGDEVPRT (Change Device Description (Printer)) command to change the values of the parameters necessary to perform AFP.
2. Changing those parameters to enable AFP will not prevent the printing of any other data.

Sample Configuration Descriptions for Locally Attached 3812, 3816, 4028, 4224, 4230, and 4234 Printers

Following are the commands, the parameters associated with those commands, and the specified values of those parameters needed to create descriptions for these locally attached printers. The values are in parentheses, beside the parameter, and are examples only. The values you decide to use in creating your descriptions may be different.

In the configuration examples presented here, information located under a parameter can pertain to:

- Another AS/400 system configuration parameter
- A printer configuration parameter

For a more detailed discussion of each parameter and value, go to the *Device Configuration Guide*.

Note: If, during configuration, you have a question about a parameter or value, press the Help key for additional information.

CRTCTLLWS (Create Controller Local Work Station) Command

This is the command that you use to create the local work station controller description.

Prompts	Parameters and Values in Parentheses
Controller description	CTLD(CTL01)
Controller type	TYPE(6040) The TYPE parameter value used here is 6040 and is from an AS/400 system model–9406. If you are configuring a 9404 the value to use would be 6140.
Controller model	MODEL(1)
Resource name	RSRCNAME(CTL01) Specifies the physical position or port number on the AS/400 system that the local work station controller attaches to. If you do not know the resource name or port number, you can use the WRKHDWRSC (Work with Hardware Resources) command to view the resource names of the local work station controller cards.
Text 'description'	TEXT('local controller for AFP printer')

CRTDEVPRT (Create Device Description Printer) Command

This is the command that you use to create the printer device description.

Prompts	Parameters and Values in Parentheses
Device description	DEVD(AFPPRINT)
Device class	DEVCLS(*LCL)
Device type	TYPE(*IPDS)
Device model	MODEL(0)
Advanced function printing	AFP(*YES) The default for this parameter is *NO; however, for AFP this parameter must be *YES.
AFP attachment	AFPATTACH(*WSC) To perform AFP on a locally attached AFP-capable printer, *WSC must be the specified value. In this example, *WSC is the default; however, it is shown here because it is necessary to perform AFP.
Port number	PORT(3) Specifies the port number that this device is attached to.
Switch setting	SWTSET(1) Specifies the switch setting for local twinaxial devices.
Attached controller	CTL(CTL01) Specifies the name of the controller description to which this device is attached. This value must be the same as the CTLD (Controller Description) parameter in the controller description you just created. In this example that value is CTL01.
Font identifier	FONT(011)
Form feed	FORMFEED(*CONT) The value you specify for the FORMFEED parameter depends on which AFP-capable printer you are configuring. ***CONT** Use the *CONT value when configuring a 4224, 4230, or 4234 printer. *CONT means that the printer supports continuous forms and moves them automatically through the printer path. ***AUTOCUT** Use the *AUTOCUT value when configuring a 3812, 3816, 3820, or 4028 printer. *AUTOCUT means that the printer supports automatic insertion of cut sheets. Movement of the cut sheets through the printer path is automatic. ***CUT** Use the *CUT value when configuring a 4224 printer. *CUT means that the printer supports manual insertion of cut sheets. Movement of the cut sheets through the printer path is automatic.

Printing while converting	PRTCVT(*YES) The default value of *YES causes the printer writer to overlap the conversion and printing processes. That is, some of the spooled file data starts to print before the printer writer has converted the whole spooled file. A value of *NO causes the printer writer to completely convert the spooled file before sending the spooled file to a printer.
Text 'description'	TEXT('Printer description for AFP printer')

Enabling the Printer

After creating the controller and printer descriptions, you must vary them on. Varying on the controller and printer puts them in an active state. Use the VRYCFG (Vary Configuration) command to vary them on.

What to do next

Do you have other printers to configure for AFP?

No **Yes**

↓ Return to "Choosing Your AFP Environment" on page 4-3.

Go to Chapter 10, "Resources Needed to Perform Advanced Function Printing (AFP)" on page 10-1.

Chapter 6. AFP and Remotely Attached 3812, 3816, 4028, 4224, 4230, 4234-8, and 4234-12 Printers Using SDLC

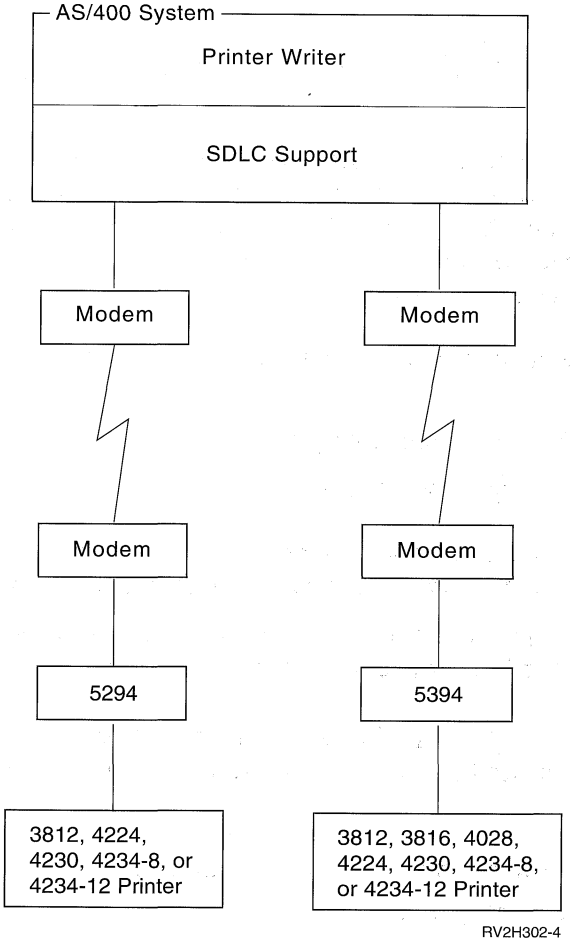
In a remote environment, using a 5294 or 5394 Remote Work Station Controller, the AS/400 system supports printing advanced function printing data stream (AFPDS) files on the following AFP-capable printers:

- 3812
- 3816
- 4028
- 4224
- 4230-102
- 4234-8, 4234-12

Note: For the 4230, AFP support is for Model 102 only.

The 4230 printer must be configured for 4224 emulation. This is done from the operator panel of the 4230 printer.

Below is a diagram of the physical attachment necessary to print AFPDS files on a remotely attached AFP-capable printer.



Getting the AFP-Capable Printers Ready to Print AFPDS Files

To print AFPDS files on a remotely attached AFP-capable printer, follow the setup instructions that come with the printer and make sure that you install the most recent version of the intelligent printer data stream (IPDS) diskette.

Creating the AS/400 System Configuration Descriptions

The configuration descriptions for AFP-capable printers attached to a 5294 (for 3812 only) or 5394 Remote Work Station controller will require you to use the CRTLINSDLC (Create Line Description (SDLC)), CRTCTLRWS (Create Controller Description (Remote Work Station)), and CRTDEVPRT (Create Device Description (Printer)) configuration commands.

Notes:

1. If you already have AFP-capable printers remotely attached and the configuration descriptions already exist, you can use the CHGDEVPRT (Change Device Description (Printer)) command to change the values of the parameters necessary to perform AFP.
2. Changing those parameters to enable AFP will not prevent the printing of any other data.

Sample Configuration Descriptions for a Remotely Attached AFP-Capable Printer

Following are the commands, the parameters associated with those commands, and the specified values of those parameters needed to create descriptions for a remotely attached AFP-capable printer. The values are in parentheses, beside the parameter, and are examples only. The values you decide to use in creating your descriptions can be different.

In the configuration examples presented here, information located under a parameter can pertain to:

- Another AS/400 system configuration parameter
- A printer configuration parameter

If you do not understand some of the commands, parameters, or values, go to the *OS/400* Communications Configuration Reference* for a more detailed discussion.

Note: If, during configuration, you have a question about a parameter or value press the Help key for additional information.

CRTLINSDLC (Create Line SDLC) Command

This is the command that you use to create the SDLC communications line description.

Prompts	Parameters and Values in Parentheses
Line description	LIND(SDLCAFP)

Resource name	RSRCNAME(LIN101) Specifies the physical location or port on the AS/400 system that the communications cable attaches to. If you do not know the resource name of the port, you can use the WRKHDWRSC (Work with Hardware Resources) command to view the resource names of the communications adapter cards.
Connection type	CNN(*NONSWTPP)
Text 'description'	TEXT('SDLC line to 5394 for AFP')

CRTCTLRWS (Create Controller Remote Work Station) Command

This is the command that you use to create the remote work station controller description.

Prompts	**Parameters and Values in Parentheses**
Controller description	CTLD(CTLAFP)
Controller type	TYPE(5394)
Controller model	MODEL(1)
Link type	LINKTYPE(*SDLC) This value corresponds to a value of 0 for field AA of the 5394 controller.
Switched connection	SWITCHED(*NO)
Attached nonswitched line	LINE(SDLCAFP) This value is the name of the line description with which this controller is associated. In this example, that value is SDLCAFP.
Exchange identifier	EXCHID(05F00001) 05F is the required block identifier for the 5394. The next 5 digits are the controller identifier. The first 3 of these digits must be 000. The last 2 digits equal the setting of the controller station address switches. In this example the controller identifier is 00001.
Station address	STNADR(01) This value must match Field 2 of the 5394 controller. In this example that value is 01.
Text 'description'	TEXT('5394 ctlr to AFP Printer')

CRTDEVPRT (Create Device Description Printer) Command

This is the command that you use to create the printer device description.

Prompts	**Parameters and Values in Parentheses**
Device description	DEVD(PRTAFP)
Device class	DEVCLS(*RMT)
Device type	TYPE(*IPDS)
Device model	MODEL(0)

Advanced function printing	AFP(*YES) The default for this parameter is *NO; however, for AFP this parameter must be *YES.
AFP attachment	AFPATTACH(*WSC) To perform AFP on a remotely attached AFP-capable printer, *WSC must be the specified value. In this example, *WSC is the default; however, it is shown here because it is necessary to perform AFP.
Local location address	LOCADR(02) This value identifies, physically, where the device is attached on the 5394 controller. In this case the printer would be connected to port 0 and have an address of 2 (value 02).
Attached controller	CTL(CTLAFP)
Font identifier	FONT(011)
Form feed	FORMFEED(*CONT) The value you specify for the FORMFEED parameter depends on which AFP-capable printer you are configuring. ***CONT** Use the *CONT value when configuring a 4224, 4230, or 4234 printer. *CONT means that the printer supports continuous forms and moves them automatically through the printer path. ***AUTOCUT** Use the *AUTOCUT value when configuring a 3812, 3816, 3820, or 4028 printer. *AUTOCUT means that the printer supports automatic insertion of cut sheets. Movement of the cut sheets through the printer path is automatic. ***CUT** Use the *CUT value when configuring a 4224 printer. *CUT means that the printer supports manual insertion of cut sheets. Movement of the cut sheets through the printer path is automatic.
Printing while converting	PRTCVT(*YES) The default value of *YES causes the printer writer to overlap the conversion and printing processes. That is, some of the spooled file data starts to print before the printer writer has converted the whole spooled file. A value of *NO causes the printer writer to completely convert the spooled file before sending the spooled file to a printer.
Text 'description'	TEXT('Printer device for SDLC line & 5394 ctl')

Enabling the Printer

After creating the line, controller, and printer descriptions, you must vary them on. Varying on the line, controller, and printer puts them in an active state. Use the VRYCFG (Vary Configuration) command to vary them on.

What to do next

Do you have other printers to configure for AFP?

No **Yes**

↓ Return to "Choosing Your AFP Environment" on page 4-3.

Go to Chapter 10, "Resources Needed to Perform Advanced Function Printing (AFP)" on page 10-1.

Chapter 7. AFP and a Remotely Attached 3820 Printer Using SDLC and APPC/APPN

In a remote environment, the AS/400 system supports printing AFPDS files on a 3820 Printer.

In this chapter you:

- Create the AS/400 system configuration descriptions and, if APPN = *YES, update the Remote Location Name list.

  Parameters that have to match 3820 printer parameters are identified in this chapter.

- Prepare and install the 3820 printer.
- Configure the 3820 printer.

  The 3820 printer configuration parameters that require information from an AS/400 system parameter are identified in the AS/400 system configuration descriptions you create in this chapter.

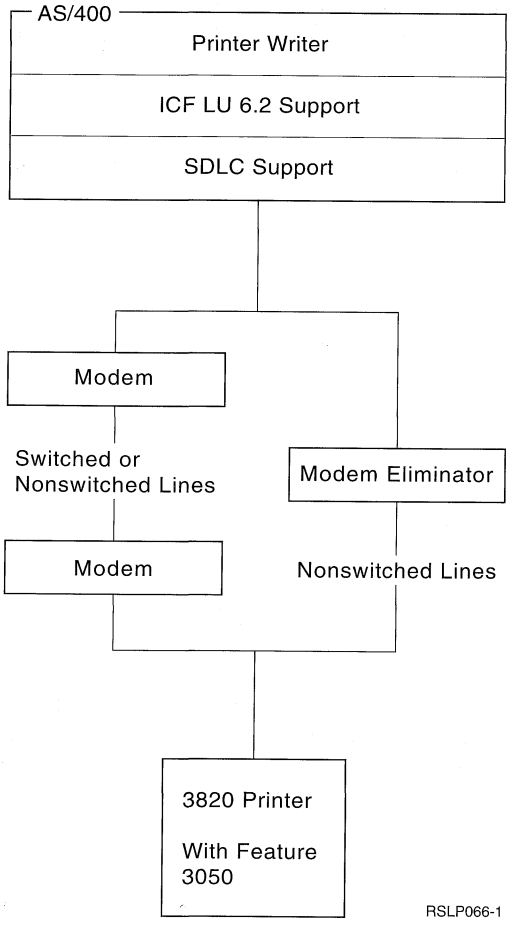
You can use the examples in this manual to create your own AS/400 system configuration descriptions. However, these are examples only and your actual descriptions may be different.

Required IBM Manual

Before you go any further, you must have available the *IBM 3820 Page Printer Operator's Guide*, S544-3080-01 or higher.

After the AS/400 system configuration descriptions are created, you will use this manual to configure the 3820 printer.

The following diagram shows the physical attachment necessary to print AFPDS files on a 3820 printer attached with an SDLC line and an APPC/APPN logical communications controller.



Getting the 3820 Printer Ready to Print AFPDS Files

To print AFPDS files on a remotely attached 3820 printer, follow the setup instructions that come with the printer.

Creating the AS/400 System Configuration Descriptions

The configuration descriptions for a 3820 printer attached to an APPC communications controller require you to use the CRTLINSDLC (Create Line SDLC), CRTCTLAPPC (Create Controller APPC), and CRTDEVPRT (Create Device Description Printer) configuration commands.

Note to Readers

If the character identifier (CHRID) value in your printer device description is 101 037, you will not be able to use font IDs 204, 252, 281, or 290. Also, if the CHRID value in your printer device description is *SYSVAL, and the QCHRID system value is set to 101 037, you will not be able to use these fonts.

Because these fonts may be needed for computer output reduction (*COR) or for MULTIUP processing, it is recommended that you change the CHRID value in your printer device description to 500 2063. You can use the Change Device Description (Printer) (CHGDEVPRT) command to do this.

Sample Configuration Descriptions for an SDLC-Attached Remote 3820 Printer

Following are the commands, the parameters associated with those commands, and the specified values of those parameters needed to create descriptions for a remotely attached 3820 printer. The values are in parentheses, beside the parameter, and are examples only. The values you decide to use in creating your descriptions can be different.

In the configuration examples presented here, information located under a parameter can pertain to:

- Another AS/400 system configuration parameter
- A printer configuration parameter
- An APPN remote location list entry
- A 3820 configuration parameter

If you do not understand some of the parameters or values, go to the *OS/400* Communications Configuration Reference* for a more detailed discussion of each parameter and value.

APPN Considerations

Advanced peer-to-peer networking (APPN) is data communications support that routes data in a network between two or more APPC systems that do not need to be adjacent.

Use of APPN can cause unnecessary overhead if configured when there is no performance gain. Following are some guidelines to consider when deciding whether to use APPN.

Use APPN When Remote PrintManager (RPM) is not attached to the same AS/400 system the printer writer program resides on.

Do not use APPN When RPM is attached to the AS/400 system the printer writer program resides on. To do so causes the system unnecessary overhead.

Will you use APPN support?

Yes **No**

↓ Go to "Configuration Descriptions without APPN Support" on page 7-8.

Go to "Configuration Descriptions with APPN Support."

Configuration Descriptions with APPN Support

The following line, controller, and device configuration descriptions use APPN support.

CRTLINSDLC (Create Line Description (SDLC)) Command

This is the command that you use to create the SDLC communications line description.

Prompts	Parameters and Values in Parentheses
Line description	LIND(LINE3820)
Resource name	RSRCNAME(LIN012) Specifies the physical position or port on the AS/400 system that the communications cable attaches to. If you do not know the resource name of the port, you can use the WRKHDWRSC (Work with Hardware Resources) command to view the resource names of the communications adapter cards.
Connection type	CNN(*NONSWTPP) This parameter corresponds to the SWITCHED parameter of the CRTCTLAPPC command. The 3820 printer configuration item 204 (Communication Line) must be 0 because this AS/400 line parameter, CNN, is set to *NONSWTPP.
NRZI data encoding	NRZI(*YES) The 3820 printer configuration item 251 (Encoding) must be 1 because this line parameter, NRZI, is set to *YES.
Maximum frame size	MAXFRAME(521) You must use the default value (521) for this parameter when the SDLC line is attached to a 3820 configured for AFP. The 3820 printer configuration item 426 (Request Unit Buffer Size) must be 256.
Text 'description'	TEXT('SDLC line to APPC ctl to 3820 printer')

CRTCTLAPPC (Create Controller Description (APPC)) Command

This is the command that you use to create the remote logical communications controller description.

Prompts	Parameters and Values in Parentheses
Controller description	CTLD(CTL3820)
Link type	LINKTYPE(*SDLC) The 3820 printer configuration item 201 (Communication Interface) must be 0 because this AS/400 controller parameter, LINKTYPE, is set to *SDLC.

Switched line	SWITCHED(*NO) This parameter corresponds to the CNN parameter of the CRTLINSDLC command. The 3820 printer configuration item 204 (Communication Line) must be 0 because this AS/400 controller parameter, SWITCHED, is set to *NO.
APPN-capable	APPN(*YES)
Attached nonswitched line	LINE(LINE3820) This value must match the LIND parameter in the AS/400 line description. In this example, the value is LINE3820.
Maximum frame size	MAXFRAME(*LINKTYPE) The 3820 printer configuration item 426 (Request Unit Buffer Size) must be 256.
Remote network identifier	RMTNETID(*NETATR) The value *NETATR allows the AS/400 system to look at the defined network attributes and use the value assigned to the ***local network id*** attribute as the value for this parameter. The 3820 printer configuration item 411 (Network Identification) must match this AS/400 system controller parameter value. To obtain the correct AS/400 value to use with the 3820 printer configuration item 411 (Network Identification), you can use the DSPNETA (Display Network Attributes) command from any command line on the AS/400 system. The value for the ***local network id*** attribute, which is displayed when you run the DSPNETA command, is the value you must assign to the 3820 printer's 411 (Network Identification) configuration item. The 3820 printer configuration item 411 (Network Identification) is **not** related to the RMTNETID parameter in the printer device description or the Remote Network ID in the APPN Remote Location List.
Remote control point name	RMTCPNAME(RLN3820) This parameter value must match the following: • Remote Location Name in the APPN Remote Location List. • RMTLOCNAME parameter in the CRTDEVPRT command. • The 3820 printer's configuration item 410, Network Addressable Unit Name. In this example, the value is RLN3820. This value must be unique within a *network*.
Exchange identifier	EXCHID(042D5BEE) The first three digits of the EXCHID, 042, are a block id and are required for a 3820 printer. The 3820 printer configuration item 332 (ID Number) must be the last 5 digits of this AS/400 controller parameter value (D5BEE in this case).
Station address	STNADR(01) The 3820 printer configuration item 330 (Station Address) must be the same as the AS/400 controller parameter value (01 in this case).

APPN node type	NODETYPE(*LENNODE)
System Services Control Point Identifier	SSCPID (050000000000) The 3820 printer will send alerts to the AS/400 system only when this value is specified. The first two digits must be 05. The remaining 10 digits are installation dependent. Use the Change Network Attributes (CHGNETA) command to enable alerts on the AS/400 system. If the problem management focal point in your network is not an AS/400 system, refer to the appropriate documentation for information on enabling alerts.
Text 'description'	TEXT('APPC controller to 3820 printer')

CRTDEVPRT (Create Device Description (Printer)) Command

This is the command that you use to create the printer device description.

Prompts	Parameters and Values in Parentheses
Device description	DEVD(DEVICE3820)
Device class	DEVCLS(*RMT)
Device type	TYPE(*IPDS)
Device model	MODEL(0)
Advanced function printing	AFP(*YES) The default for this parameter is *NO; however, for AFP this parameter must be *YES.
AFP attachment	AFPATTACH(*APPC)
Font identifier	FONT(011)
Form feed	FORMFEED(*AUTOCUT)
Remote location name	RMTLOCNAME(RLN3820) This parameter value must match the following: • The RMTCPNAME parameter value in the CRTCTLAPPC command. • The Remote Location Name in the APPN Remote Location List. • The 3820 printer's configuration item 410, Network Addressable Unit Name. In this example, the value is RLN3820. *This value must be unique within a network.*
Remote network identifier	RMTNETID(*NONE) This value must be *NONE to ensure a connection with a 3820. When configuring for a 3820, this parameter is not related to either the controller's RMTNETID parameter or the 3820's Network Identification parameter.
Mode	MODE(QSPWTR) QSPWTR is an IBM-supplied mode. You can use the CRTMODD command if you want to create your own mode description. If you do

that, the name you assign to that mode must be the value selected for this parameter.

In this example, APPN creates the APPC device description for you. You can, if you choose, create your own APPC device description using the CRTDEVAPPC command. Regardless of how the APPC device description is created, the mode value assigned here overrides the mode value assigned in the CRTDEVAPPC command.

Printing while converting — PRTCVT(*YES)

The default value of *YES causes the printer writer to overlap the conversion and printing processes. That is, some of the spooled file data starts to print before the printer writer has converted the whole spooled file. A value of *NO causes the printer writer to completely convert the spooled file before sending the spooled file to a printer.

Text 'description' — TEXT('SDLC to APPC to 3820 printer device description')

Updating the APPN Remote Location List

The APPN location lists, which are only used for APPN configurations (that is, when APPN(*YES) is specified in the controller description), define special characteristics of remote locations.

The Create Configuration List (CRTCFGL) command is used to define a list of remote locations for APPN.

1. If you do not yet have a remote location list, type CRTCFGL (Create Configuration List). If you have a remote location list, type CHGCFGL (Change Configuration List).
2. Press PF4 to get prompts.
3. Type *APPNRMT for the configuration list and press the Enter key twice.

Remote Location Name–RLN3820
This value must match the following:

- RMTCPNAME in the controller description
- RMTLOCNAME in the printer device description
- 3820's configuration item 410 (Network Addressable Unit Name)

This value must be unique within a network.

Remote Network Identifier–blank
This value must be blank to ensure a connection with a 3820. When configuring for a 3820, this parameter is not related to either the controller's RMTNETID parameter or the 3820's Network Identification parameter.

Local Location Name–*NETATR
The local location name is the name defined in the network attributes. This value must match the LCLLOCNAME defined in the printer device description.

Control Point Name–blank
This value must be blank.

Control Point Network Identifier–blank
This value must be blank.

Single Session–*YES
This value is required in order to attach to a 3820.

Number of Conversations–1
This value is required in order to attach to a 3820.

Locally Controlled Session–*YES
This value is required in order to attach to a 3820.

Pre-established Session–*NO
This value is required in order to attach to a 3820.

Note: Use the DSPCFGL (display configuration list) command to view these parameters and their assigned values.

What to do next

Go to "Installing the 3820 Printer" on page 7-11.

Configuration Descriptions without APPN Support

The following line, controller, and device configuration descriptions do not use APPN support.

CRTLINSDLC (Create Line Description (SDLC)) Command

This is the command that you use to create the SDLC communications line description.

Prompts	Parameters and Values in Parentheses
Line description	LIND(LINE3820)
Resource name	RSRCNAME(LIN012) Specifies the physical position or port on the AS/400 system that the communications cable attaches to. If you do not know the resource name of the port, you can use the WRKHDWRSC (Work with Hardware Resources) command to view the resource names of the communications adapter cards.
Connection type	CNN(*NONSWTPP) This parameter corresponds to the SWITCHED parameter of the CRTCTLAPPC command. The 3820 printer configuration item 204 (Communication Line) must be 0 because this AS/400 line parameter, CNN, is set to *NONSWTPP.
NRZI data encoding	NRZI(*YES) The 3820 printer configuration item 251 (Encoding) must be 1 because this AS/400 line parameter, NRZI, is set to *YES.
Maximum frame size	MAXFRAME(521) You must use the default value (521) for this parameter when the SDLC line is attached to a 3820 configured for AFP. The 3820 printer configuration item 426 (Request Unit Buffer Size) must be 256.
Text 'description'	TEXT('SDLC line to APPC ctl to 3820 printer')

CRTCTLAPPC (Create Controller Description (APPC)) Command

This is the command that you use to create the communications controller description.

Prompts	Parameters and Values in Parentheses
Controller description	CTLD(CTL3820)
Link type	LINKTYPE(*SDLC) The 3820 printer configuration item 201 (Communication Interface) must be 0 because this AS/400 controller parameter, LINKTYPE, is set to *SDLC.
Switched line	SWITCHED(*NO) This parameter corresponds to the CNN parameter of the CRTLINSDLC command. The 3820 printer configuration item 204 (Communication Line) must be 0 because this AS/400 controller parameter, SWITCHED, is set to *NO.
APPN-capable	APPN(*NO)
Attached nonswitched line	LINE(LINE3820) This value must match the LIND parameter in the AS/400 line description. In this example, the value is LINE3820.
Maximum frame size	MAXFRAME(*LINKTYPE) The 3820 printer configuration item 426 (Request Unit Buffer Size) must be 256.
Remote network identifier	RMTNETID(*NONE) Because you are not using APPN support, the value you specify for this parameter must be *NONE as shown in this example. That also means that the value specified on the 3820 printer configuration item 411 (Network Identification) must also match this AS/400 controller parameter value. So, on the 3820 printer, when a value is entered for the 3820 printer configuration item 411 (Network Identification), it must be blank or empty. The 3820 printer configuration item 411 (Network Identification) is not related to the RMTNETID parameter in the printer device description or the RMTNETID parameter in the APPC device description.
Exchange identifier	EXCHID(042D5BEE) The first three digits of the EXCHID, 042, are a block id and are required for a 3820 printer. The 3820 printer configuration item 332 (ID Number) must be the last 5 digits of this AS/400 controller parameter value (D5BEE in this case).
Station address	STNADR(01) The 3820 printer configuration item 330 (Station Address) must be the same as this AS/400 controller parameter value (01 in this case).
System Services Control Point Identifier	SSCPID (050000000000) The 3820 printer will send alerts to the AS/400 system only when this

	value is specified. The first two digits must be 05. The remaining 10 digits are installation dependent. Use the Change Network Attributes (CHGNETA) command to enable alerts on the AS/400 system. If the problem management focal point in your network is not an AS/400 system, refer to the appropriate documentation for information on enabling alerts.
Text 'description'	TEXT('APPC controller to 3820 printer')

CRTDEVAPPC (Create Device Description (APPC)) Command

This is the command that you use to create the APPC device description.

Prompts	**Parameters and Values in Parentheses**
Device description	DEVD(APPC3820)
Remote location name	RMTLOCNAME(RCP3820) This value must match the Remote Location Name (RMTLOCNAME) parameter in the CRTDEVPRT (Create Device Description Printer) command description and the 3820 printer's configuration item 410, Network Addressable Unit Name. In this example, that value is RCP3820. This value must be unique within a *network*.
Remote network identifier	RMTNETID(*NONE) This value must be *NONE to ensure a connection with a 3820 Printer.
Attached controller	CTL(CTL3820) The value specified here must match the Controller Description (CTLD) parameter specified in the CRTCTLAPPC (Create Controller APPC) command. That value is CTL3820, as shown in this example.
Mode	MODE(QSPWTR) QSPWTR is an IBM-supplied mode. You can use the CRTMODD (Create mode description) command if you want to create your own mode description. If you do that, the name you assign to that mode must be the value selected for this parameter and must match the MODE parameter value in the CRTDEVPRT command.
APPN-capable	APPN(*NO)
Single session	SNGSSN(*YES 1)
Locally Controlled session	LCLCTLSSN(*YES)
Text 'description'	TEXT('APPC device for APPN=*NO')

CRTDEVPRT (Create Device Description (Printer)) Command

This is the command that you use to create the printer device description.

Prompts	**Parameters and Values in Parentheses**
Device description	DEVD(DEV3820)
Device class	DEVCLS(*RMT)
Device type	TYPE(*IPDS)

Device model	MODEL(0)
Advanced function printing	AFP(*YES) The default for this parameter is *NO; however, for AFP this parameter must be *YES.
AFP attachment	AFPATTACH(*APPC)
Font identifier	FONT(011)
Form feed	FORMFEED(*AUTOCUT)
Remote location name	RMTLOCNAME(RCP3820) The 3820 printer configuration item 410 (Network Addressable Unit Name) must match this AS/400 printer device parameter value and the RMTLOCNAME parameter value in the CRTDEVAPPC command. In this example, the value is RCP3820. This value must be unique within a *network*.
Remote network identifier	RMTNETID(*NONE) This value must be *NONE to ensure a connection with a 3820 Printer.
Mode	MODE(QSPWTR) QSPWTR is an IBM-supplied mode. You can use the CRTMODD (Create Mode Description) command if you want to create your own mode description. If you do that, the name you assign to that mode must be the value selected for this parameter and must match the MODE parameter in the CRTDEVAPPC command.
Printing while converting	PRTCVT(*YES) The default value of *YES causes the printer writer to overlap the conversion and printing processes. That is, some of the spooled file data starts to print before the printer writer has converted the whole spooled file. A value of *NO causes the printer writer to completely convert the spooled file before sending the spooled file to a printer.
Text 'description'	TEXT('SDLC LINE/APPC CTL/APPC DEV/3820 PRT')

What to do next

Go to "Installing the 3820 Printer."

Installing the 3820 Printer

It is the responsibility of the IBM customer engineer (CE) and you (the customer) to install and configure the 3820 printer.

Performing the 3820 Printer Configuration

The *3820 Page Printer Operator's Guide*, S544-3080-1 has the necessary instructions for configuring the printer.

During 3820 printer configuration, the printer will display configuration parameters. You will need to choose a certain value for each parameter.

To help you choose the correct values you will need to know some things about the line, controller, and device configuration descriptions on the AS/400 system. Use the configuration descriptions you just created to find out those values.

Using the *3820 Page Printer Operator's Guide*, begin the configuration. When the 3820 printer configuration is complete, return here.

Enabling the Printer

After creating the line, controller, and printer descriptions, you must vary them on. Varying on the line, controller, APPC device description, and printer puts them in an active state. Use the VRYCFG (Vary Configuration) command to vary them on. After varying them on, you are ready to print data.

What to do next

Do you have other printers to configure for AFP?

No **Yes**

↓ Return to "Choosing Your AFP Environment" on page 4-3.

Go to Chapter 10, "Resources Needed to Perform Advanced Function Printing (AFP)" on page 10-1.

Chapter 8. AFP and Token-Ring Attached 3820, 3825, 3827, 3829, 3831, 3835, and 3900 Printers Using RPM

The 3820, 3825, 3827, 3829, 3831, 3835, and 3900 printers, attached by token-ring to an AS/400 system, can perform AFP. Several pieces of hardware and programs must be installed and configured to use AFP in a token-ring network.

A token-ring network is a local area network that sends data in one direction throughout a specified number of locations by using the symbol of authority for control of the transmission line, called a token, to allow any sending station in the network (ring) to send data when the token arrives at that location.

In this chapter you will:

- Create the AS/400 system configuration descriptions and, if APPN(*YES) is specified, update the remote location name list.
- Install your printer.
- Install and configure Remote PrintManager (RPM).

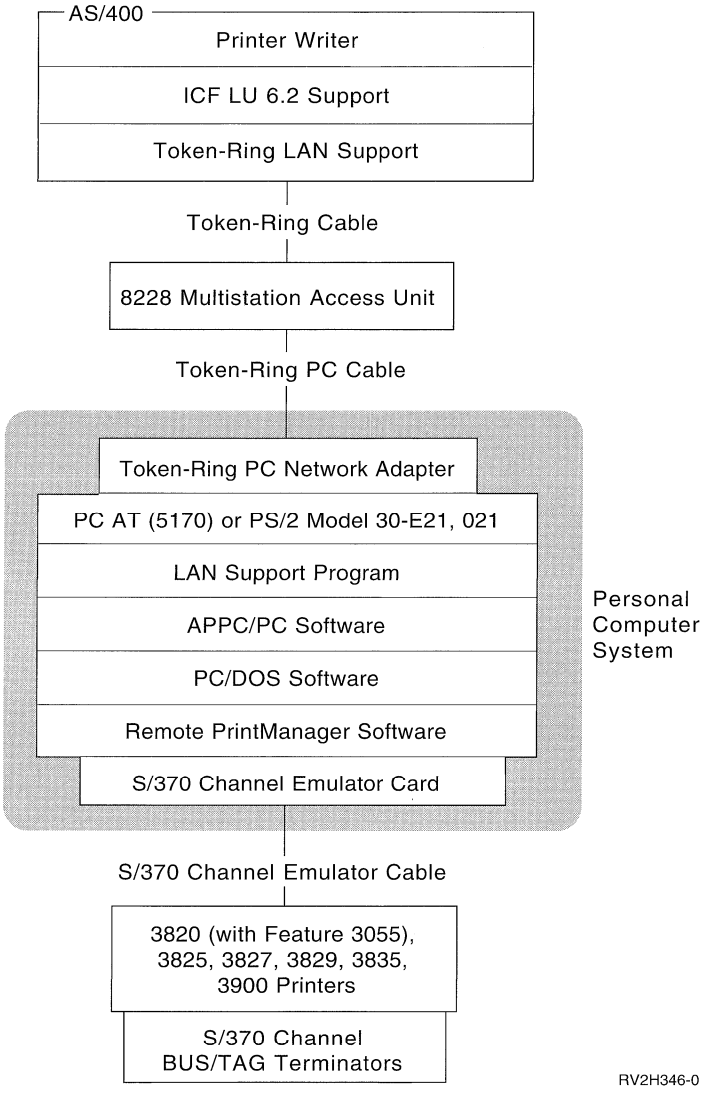
  RPM is a personal computer product that allows selected font data, overlays, and page segments that are present in AFPDS to be available to an attached IBM page printer.

Required IBM manuals

Before you go any further, you must have available the following IBM manuals:

- The operator's guide or planning and installation manuals that came with your 38xx or 39xx printer.
- The *IBM Remote PrintManager User's Guide and Installation Guide*, S544-3439-03.

The following diagram illustrates the hardware and programs needed to implement AFP in a token-ring environment.



Creating the AS/400 System Configuration Descriptions

The configuration descriptions for a 38xx or 39xx printer attached to an APPC communications controller will require you to use the following configuration commands:

- CRTLINTRN (Create Line Token-Ring)
- CRTCTLAPPC (Create Controller APPC)
- CRTDEVAPPC (Create Device APPC)

  When you choose to use APPN support (APPN = *YES), the APPC device description will be automatically created for you. Conversely, you manually create the APPC device description if you choose not to use APPN (APPN = *NO).
- CRTDEVPRT (Create Device Description Printer)

Note to Readers

If the character identifier (CHRID) value in your printer device description is 101 037, you will not be able use font IDs 204, 252, 281, or 290. Also, if the CHRID value in your printer device description is *SYSVAL, and the QCHRID system value is set to 101 037, you will not be able to use those fonts.

Because these fonts may be needed for computer output reduction (*COR) or for MULTIUP processing, it is recommended that you change the CHRID value in your printer device description to 500 2063.

You can use the Change Device Description (Printer) (CHGDEVPRT) command to do this.

Sample Configuration Descriptions for 38xx Printers Remotely Attached via Token-Ring, APPC/APPN, and RPM

Following are the commands, the parameters associated with those commands, and the specified values of those parameters needed to create descriptions for a token-ring attached 38xx printer. The values are in parentheses, beside the parameter, and are examples only. The values you decide to use in creating your descriptions can be different.

In the configuration examples presented here, information for a parameter can pertain to:

- Another AS/400 system configuration parameter
- A printer configuration parameter
- An APPN remote location list entry
- An RPM configuration parameter
- An APPC/PC configuration parameter

When information located under a parameter in the examples is presented, there will be a reference to a related parameter from the list above.

APPN Considerations

Advanced peer-to-peer networking (APPN) is data communications support that routes data in a network between two or more APPC systems that do not need to be adjacent.

Use of APPN can cause unnecessary overhead if configured when there is no performance gain. Following are some guidelines to consider when deciding whether to use APPN.

Use APPN When Remote PrintManager (RPM) is not attached to the same AS/400 system the printer writer program being used resides on.

Do not use APPN When RPM is attached to the AS/400 system the printer writer program being used resides on. To do so causes the system unnecessary overhead.

Will you use APPN support?

Yes **No**

↓ Go to "Configuration Descriptions without APPN Support" on page 8-11.

Go to "Configuration Descriptions with APPN Support."

Configuration Descriptions with APPN Support

The following line, controller, and device configuration descriptions use APPN support.

CRTLINTRN (Create Line Description (Token-Ring)) Command

This is the command that you use to create the token-ring communications line description.

Prompts	Parameters and Values in Parentheses
Line description	LIND(LINETRN)
Resource name	RSRCNAME(LIN021) Specifies the physical position or port on the AS/400 system that the communications cable attaches to. If you do not know the resource name of the port, you can use the WRKHDWRSC (Work with Hardware Resources) command to view the resource names of the communications adapter cards.
Maximum frame size	MAXFRAME(1994) The APPC/PC configuration parameter, Maximum RU Size, must be 1408. However, the MAXFRAME parameter on the AS/400 system token-ring line description must be 1994, as shown in this example.
Source service access points	SSAP(*SYSGEN) This default value is required when using APPC/PC.
Text 'description'	TEXT('TRN line to APPC ctl to 38xx or 39xx AFP printer')

CRTCTLAPPC (Create Controller Description (APPC)) Command

This is the command that you use to create the remote logical communications controller description.

Prompts	Parameters and Values in Parentheses
Controller description	CTLD(CTLRPM01)
Link type	LINKTYPE(*LAN) The RPM configuration parameter, Communication Connection Type, must be TOKENRING because this AS/400 system controller parameter, LINKTYPE, is *LAN, as shown in this example.
APPN-capable	APPN(*YES) Specifying *YES for this value means you will be using APPN support and will not have to create an APPC device description. You will have to create or update your APPN Remote Location List.
Switched line list	SWTLINLST(LINETRN) The value specified here must match the Line Description (LIND) parameter value you specified on the CRTLINTRN command. In this example, that value is LINETRN.
Maximum frame size	MAXFRAME(*LINKTYPE) The APPC/PC configuration parameter, Maximum RU Size, must be 1408. However, the MAXFRAME parameter on the AS/400 token-ring controller description must be *LINKTYPE as shown in this example.

Remote network identifier	RMTNETID(*NETATR) The value *NETATR allows the AS/400 system to look at the defined network attributes and use the value assigned to the ***local network id*** attribute as the value for this parameter. This parameter value must match the following: • The Remote Network Identifier in the APPN Remote Location List. • The RMTNETID parameter value in the CRTDEVPRT command. • The RPM configuration parameter, Network Name. To obtain the correct AS/400 value to use with the RPM configuration parameter, Network Name, you can use the Display Network Attributes (DSPNETA) command from any command line on the AS/400 system. The value for the ***local network id*** attribute, which is displayed when you run the DSPNETA command, is the value you must assign to the RPM configuration parameter, Network Name.
Remote control point name	RMTCPNAME(RLNRPM01) This parameter value must match the following: • The Remote Location Name in the APPN Remote Location List. • The RMTLOCNAME parameter in the CRTDEVPRT command. • The RPM configuration parameter, Logical Unit Name. *This value must be unique within a network.*
Exchange identifier	EXCHID(05032201) 050 is the block id required for use by RPM. The APPC/PC configuration parameter, Node ID, must match the last 5 digits of the AS/400 controller parameter value. That value is 32201, as shown in this example.
TRLAN remote adapter address	ADPTADR(400001383669) The APPC/PC configuration parameter, Local Node Address, must match the AS/400 controller parameter value. That value is 400001383669, as shown in this example.
APPN node type	NODETYPE(*LENNODE)
System Services Control Point Identifier	SSCPID (050000000000) RPM will send alerts to the AS/400 system only when this value is specified. The first two digits must be 05. The remaining 10 digits are installation dependent. Use the Change Network Attributes (CHGNETA) command to enable alerts on an AS/400 system. If the problem management focal point in your network is not an AS/400 system, refer to the appropriate documentation for information on enabling alerts.
Destination service access points	DSAP(04) This default value is required when using APPC/PC.
Source service access points	SSAP(04) This default value is required when using APPC/PC.
Text 'description'	TEXT('APPC ctl (With APPN=YES) to 38xx AFP prt')

CRTDEVPRT (Create Device Description (Printer)) Command

This is the command that you use to create the printer device description.

Prompts	Parameters and Values in Parentheses
Device description	DEVD(DEVRPM01)
Device class	DEVCLS(*RMT)
Device type	TYPE(*IPDS)
Device model	MODEL(0)
Advanced function printing	AFP(*YES) The default for this parameter is *NO; however, for AFP this parameter must be *YES.
AFP attachment	AFPATTACH(*APPC)
Font identifier	FONT(011)
Form feed	FORMFEED(*CONT) The value you specify for the FORMFEED parameter depends on which AFP-capable printer you are configuring. *CONT — *CONT means that the printer supports continuous forms and moves them automatically through the printer path. Use the *CONT value when configuring a 3831, 3835, or 3900 printer. *AUTOCUT — Use the *AUTOCUT value when configuring a 3820, 3825, 3827, or 3829 printer. *AUTOCUT means that the printer supports automatic insertion of cut sheets. Movement of the cut sheets through the printer path is automatic.
Print request timer	PRTRQSTMR(30) This parameter is required only when configuring a printer defined as FORMFEED(*CONT) and DEVCLS(*RMT). When configuring a printer that has the FORMFEED parameter value specified as *AUTOCUT or *CUT, you need not specify a value for this parameter. This parameter determines the number of seconds the printer is idle before the printer path is cleared. Clearing the printer path will update the status of spooled files currently in PRT status. For example: if you are printing only a few jobs (and on expensive forms), you would specify a high number for this value. The printer waits until the specified number of seconds has passed before it ejects the job to the stacker where it can be picked up. If no other jobs are to be printed after the specified time has passed, the printer fills the printer path with blank paper, thus wasting the forms or paper being used.
Remote location name	RMTLOCNAME(RLNRPM01) This parameter value must match the following: • The RMTCPNAME parameter in the CRTCTLAPPC command. • The Remote Location Name in the APPN Remote Location List. • The RPM configuration parameter, Logical Unit Name. *This value must be unique within a network.*

Local location name	LCLLOCNAME(*NETATR) The RPM configuration parameter, Partner (Host) Logical Unit Name, must match this AS/400 printer device parameter value and the Local Location Name in the APPN Remote Location List. That value is *NETATR, as shown in this example. To obtain the correct AS/400 value to use with the RPM configuration parameter, Partner (Host) Logical Unit Name, you can use the DSPNETA (Display Network Attributes) command from any command line on the AS/400 system. The value for the ***default local location*** attribute, which is displayed when you run the DSPNETA command, is the value you must assign to the RPM configuration parameter, Partner (Host) Logical Unit Name.
Remote network identifier	RMTNETID(*NETATR) This parameter value must match the following: • The RMTNETID parameter in the CRTCTLAPPC command. • The Remote Network Identifier in the APPN Remote Location List. • The RPM configuration parameter, Network Name. That value is *NETATR, as shown in this example. To obtain the correct AS/400 value to use with the RPM configuration parameter, Network Name, you can use the Display Network Attributes (DSPNETA) command from any command line on the AS/400 system. The value for the ***local network id*** attribute, which is displayed when you run the DSPNETA command, is the value you must assign to the RPM configuration parameter, Network Name.
Mode	MODE(QSPWTR) QSPWTR is an IBM-supplied mode. You can use the CRTMODD (Create Mode Description) command if you want to create your own mode description. If you do that, the name you assign to that mode must be the value selected for this parameter. In this example APPN creates the APPC device description for you. You can, if you choose, create your own APPC device description using the CRTDEVAPPC command. Regardless of how the APPC device description is created, the mode value assigned here will override the mode value assigned in the CRTDEVAPPC command.
Printing while converting	PRTCVT(*YES) The default value of *YES causes the printer writer to overlap the conversion and printing processes. That is, some of the spooled file data starts to print before the printer writer has converted the whole spooled file. A value of *NO causes the printer writer to completely convert the spooled file before sending the spooled file to a printer.
Text 'description'	TEXT('38xx or 39xx AFP PRT DEV DESC')

Updating the APPN Remote Location List

The APPN location lists, which are only used for APPN configurations (that is, when APPN(*YES) is specified in the controller description), define special characteristics of remote locations.

The CRTCFGL (Create Configuration List) command is used to define a list of remote locations for APPN.

1. If you do not have a remote location list, type CRTCFGL or, if you have a remote location list type, CHGCFGL (Change Configuration List).
2. Press F4 to get prompts.
3. Type *APPNRMT for the configuration list and press the Enter key twice.

Remote Location Name–(RLNRPM01)

Specifies the name that must match the following:

- RMTCPNAME in the controller description
- RMTLOCNAME in the printer device description and
- RPM's Logical Unit Name.

This value must be unique within a network.

Remote Network Identifier–(*NETATR)

Specifies the name that must match the following:

- RMTNETID in the controller description
- RMTNETID in the printer device description and
- RPM's Network Name.

Local Location Name–*NETATR

The local location name is the name defined in the network attributes. This value must match the following:

- LCLLOCNAME in the printer device description and
- RPM's Partner (Host) Logical Unit Name.

That value is *NETATR, as shown in this example.

To obtain the correct AS/400 value to use with the RPM configuration parameter, Partner (Host) Logical Unit Name, you can use the DSPNETA (Display Network Attributes) command from any command line on the AS/400 system. The value for the ***default local location*** attribute, which is displayed when you run the DSPNETA command, is the value you must assign to the RPM configuration parameter, Partner (Host) Logical Unit Name.

Control Point Name–Blank

This value must be blank or empty.

Control Point Network Identifier–Blank

This value must be blank or empty.

Single Session–(*YES)

This value is required for attaching to RPM.

Number of Conversations–1

This value is required for attaching to RPM.

Locally Controlled Session–*YES
This value is required for attaching to RPM.

Pre-established Session–*NO
This default value is required in order to attach to RPM.

Note: Use the DSPCFGL (Display Configuration List) command to view these parameters and their assigned values.

What to do next

Go to "Installing Your Printer" on page 8-16.

Configuration Descriptions without APPN Support

The following line, controller, and device configuration descriptions do not use APPN support.

CRTLINTRN (Create Line Description (Token-Ring)) Command

This is the command that you use to create the token-Ring communications line description.

Prompts	Parameters and Values in Parentheses
Line description	LIND(LINETRN)
Resource name	RSRCNAME(LIN021) Specifies the physical position or port on the AS/400 system that the communications cable attaches to. If you do not know the resource name of the port, you can use the WRKHDWRSC (Work with Hardware Resources) command to view the resource names of the communications adapter cards.
Maximum frame size	MAXFRAME(1994) The APPC/PC configuration parameter, Maximum RU Size, must be 1408. However, the MAXFRAME parameter on the AS/400 system token-ring line description must be 1994, as shown in this example.
Source service access points	SSAP(*SYSGEN) This default value is required when using APPC/PC.
Text 'description'	TEXT('TRN to APPC ctl to 38xx or 39xx AFP printer')

CRTCTLAPPC (Create Controller Description (APPC)) Command

This is the command that you use to create the communications controller description.

Prompts	Parameters and Values in Parentheses
Controller description	CTLD(CTLRPM01)
Link type	LINKTYPE(*LAN) The RPM configuration parameter, Communication Connection Type, must be TOKENRING because this AS/400 system controller parameter, LINKTYPE, is *LAN, as shown in this example.
APPN-capable	APPN(*NO) Specifying *NO for this value means you will not be using APPN support. You will have to create an APPC device description. (It is the next command you will be using.)
Switched line list	SWTLINLST(LINETRN) The value specified here must match the Line Description (LIND) parameter value you specified on the CRTLINTRN command. In this example, that value is LINETRN.

Maximum frame size	MAXFRAME(*LINKTYPE) The APPC/PC configuration parameter, Maximum RU Size, must be 1408. However, the MAXFRAME parameter on the AS/400 token-ring controller description must be *LINKTYPE as shown in this example.
Remote network identifier	RMTNETID(*NONE) Because you are not using APPN support, the value you specify for this parameter must be *NONE as shown in this example. This value must match the following: • The RMTNETID parameter in the CRTDEVAPPC command. • The RMTNETID parameter in the CRTDEVPRT command. • The RPM configuration parameter, Network Name. This value must be blank or empty.
Exchange identifier	EXCHID(05032201) The APPC/PC configuration parameter, Node ID, must match the last 5 digits of this AS/400 controller parameter value. That value is 32201, as shown in this example. The first 3 digits, 050, specify the block ID required for use by RPM.
TRLAN remote adapter address	ADPTADR(400001383669) The APPC/PC configuration parameter, Local Node Address, must match this AS/400 controller parameter value. That value is 400001383669, as shown in this example.
System Services Control Point Identifier	SSCPID (050000000000) RPM will send alerts to the AS/400 system only when this value is specified. The first two digits must be 05. The remaining 10 digits are installation dependent. Use the Change Network Attributes (CHGNETA) command to enable alerts on an AS/400 system. If the problem management focal point in your network is not an AS/400 system, refer to the appropriate documentation for information on enabling alerts.
Destination service access points	DSAP(04) This default value is required when using APPC/PC.
Source service access points	SSAP(04) This default value is required when using APPC/PC.
Text 'description'	TEXT('APPC ctl (W APPN=NO) to 38xx AFP prt')

CRTDEVAPPC (Create Device Description (APPC)) Command

This is the command that you use to create the APPC device description.

Prompts	**Parameters and Values in Parentheses**
Device description	DEVD(APPCRPM01)
Remote location name	RMTLOCNAME(RLNRPM01) This value must match the RMTLOCNAME parameter value in the CRTDEVPRT (Create Device Description Printer) command and the

	RPM configuration parameter, Logical Unit Name. In this example, that value is RLNRPM01. *This value must be unique within a network.*
Local location name	LCLLOCNAME(*NETATR) This value must match the following: • The LCLLOCNAME parameter in the CRTDEVPRT command. • The RPM configuration parameter, Partner (Host) Logical Unit Name. To obtain the correct AS/400 value to use with the RPM configuration parameter, Partner (Host) Logical Unit Name, you can use the DSPNETA (Display Network Attributes) command from any command line on the AS/400 system. The value for the ***default local location*** attribute, which is displayed when you run the DSPNETA command, is the value you must assign to the RPM configuration parameter, Partner (Host) Logical Unit Name.
Remote network identifier	RMTNETID(*NONE) This value must match the following: • The RMTNETID parameter in the CRTCTLAPPC command. • The RMTNETID parameter in the CRTDEVPRT command. • The RPM configuration parameter, Network Name. This value must be blank or empty.
Attached controller	CTL(CTLRPM01) The value specified here must match the Controller Description (CTLD) parameter specified in the CRTCTLAPPC (Create Controller APPC) command. That values is CTLRPM01, as shown in this example.
Mode	MODE(QSPWTR) The RPM configuration parameter, Mode Name, must match this AS/400 printer device description value. QSPWTR is an IBM-supplied mode. You can use the CRTMODD (Create Mode Description) command if you want to create your own mode description. If you do that, the name you assign to that mode must be the value selected for this parameter and must match the MODE parameter value in the CRTDEVPRT command.
APPN-capable	APPN(*NO)
Single session	SNGSSN(*YES 1)
Locally Controlled session	LCLCTLSSN(*YES)
Text 'description'	TEXT('APPC DEV to 38xx AFP PRINTER DEVICE')

CRTDEVPRT (Create Device Description (Printer)) Command

This is the command that you use to create the printer device description.

Prompts	**Parameters and Values in Parentheses**
Device description	DEVD(DEVRPM01)
Device class	DEVCLS(*RMT)

Device type	TYPE(*IPDS)
Device model	MODEL(0)
Advanced function printing	AFP(*YES) The default for this parameter is *NO; however, for AFP this parameter must be *YES.
AFP attachment	AFPATTACH(*APPC)
Font identifier	FONT(011)
Form feed	FORMFEED(*CONT) The value you specify for the FORMFEED parameter depends on which AFP-capable printer you are configuring. *CONT — *CONT means that the printer supports continuous forms and moves them automatically through the printer path. Use the *CONT value when configuring a 3831, 3835, or 3900 printer. *AUTOCUT — Use the *AUTOCUT value when configuring a 3820, 3825, 3827, or 3829 printer. *AUTOCUT means that the printer supports automatic insertion of cut sheets. Movement of the cut sheets through the printer path is automatic.
Print request timer	PRTRQSTMR(30) This parameter is required only when configuring a printer defined as FORMFEED(*CONT). When configuring a printer that has the FORMFEED parameter value specified as *AUTOCUT or *CUT, you need not specify a value for this parameter. This parameter determines the number of seconds the printer is idle before the printer path is cleared. Clearing the printer path will update the status of spooled files currently in PRT status. For example: if you are printing only a few jobs (and on expensive forms), you would specify a high number for this value. The printer waits until the specified number of seconds has passed before it ejects the job to the stacker where it can be picked up. If no other jobs are to be printed after the specified time has passed, the printer fills the printer path with blank paper, thus wasting the forms or paper being used.
Remote location name	RMTLOCNAME(RLNRPM01) The RPM configuration parameter, Logical Unit Name, must match this AS/400 printer device parameter value and the RMTLOCNAME parameter in the CRTDEVAPPC command. That value is RLNRPM01, as shown in this example. *This value must be unique within a network.*
Local location name	LCLLOCNAME(*NETATR) The RPM configuration parameter, Partner (Host) Logical Unit Name, must match this AS/400 printer device parameter value and the LCLLOCNAME parameter in the CRTDEVAPPC command. That value is *NETATR, as shown in this example.

To obtain the correct AS/400 value to use with the RPM configuration parameter, Partner (Host) Logical Unit Name, you can use the DSPNETA (Display Network Attributes) command from any command line on the AS/400 system. The value for the ***default local location*** attribute, which is displayed when you run the DSPNETA command, is the value you must assign to the RPM configuration parameter, Partner (Host) Logical Unit Name.

Remote network identifier

RMTNETID(*NONE)

This value must match the following:

- The RMTNETID parameter in the CRTCTLAPPC command.
- The RMTNETID parameter in the CRTDEVAPPC command.
- The RPM configuration parameter Network Name. This value must be blank or empty.

Mode

MODE(QSPWTR)

The RPM configuration parameter, Mode Name, must match the AS/400 system printer device description value and the MODE parameter in the CRTDEVAPPC command.

QSPWTR is an IBM-supplied mode. You can use the CRTMODD (Create Mode Description) command if you want to create your own mode description. If you do that, the name you assign to that mode must be the value selected for this parameter and must match the MODE parameter in the CRTDEVAPPC command and RPM's Mode Name.

Printing while converting

PRTCVT(*YES)

The default value of *YES causes the printer writer to overlap the conversion and printing processes. That is, some of the spooled file data starts to print before the printer writer has converted the whole spooled file. A value of *NO causes the printer writer to completely convert the spooled file before sending the spooled file to a printer.

| Text 'description'

TEXT('38xx or 39xx AFP prtdev desc - CTL has APPN=NO')

What to do next

Go to "Installing Your Printer" on page 8-16.

Installing Your Printer

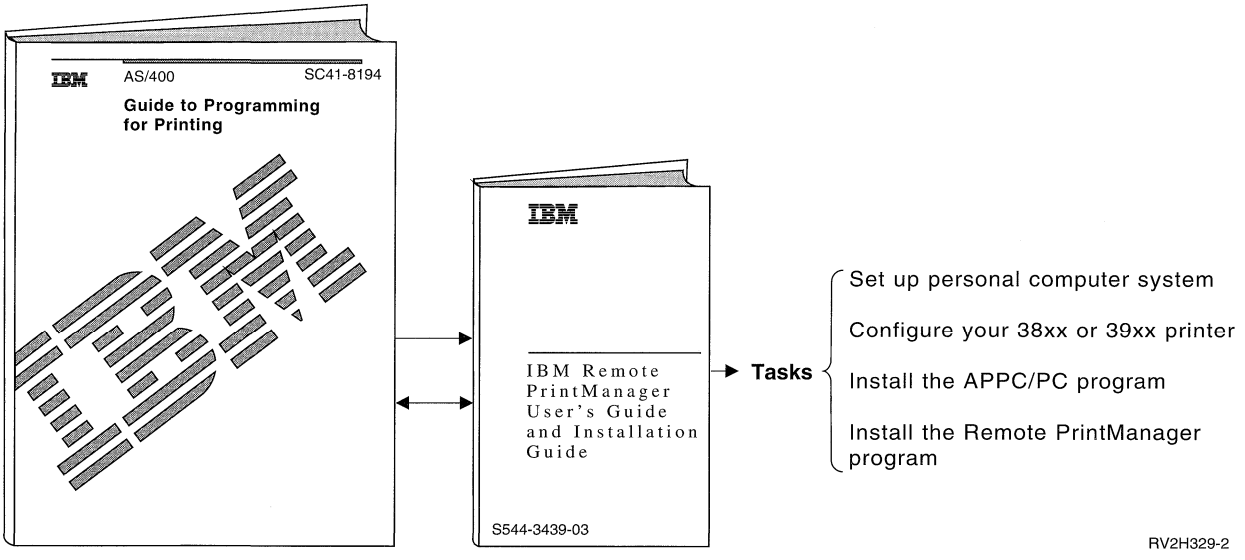
It is the responsibility of the IBM service representative and you (the customer) to install the 38xx printer you ordered.

At this time, install your printer or make arrangements with your service representative to get with you to install the printer.

Using the Remote PrintManager User's Guide and Installation Guide

To attach all the hardware and install all the programs, go to the *IBM Remote PrintManager User's Guide and Installation Guide*, S544-3439-03 or higher.

As you proceed through the *IBM Remote PrintManager User's Guide and Installation Guide*, you will be directed to perform hardware installation and loading of programs.



While using the *IBM Remote PrintManager User's Guide and Installation Guide*, you will need information about the AS/400 token-ring line description, APPC controller description, and printer device description. When you are asked for that information, you will need to look at the AS/400 configuration description(s) you just created or the examples in this chapter. Remember, the descriptions shown in this manual are examples only; your actual configuration descriptions can be different.

If, during configuration, you do not understand some of the parameters or values, press the Help key or go to the *OS/400* Communications Configuration Reference* for a more detailed discussion of each parameter and value.

Note: See the following information about the RPM inactivity timer parameter. This parameter has some special considerations you need to be aware of when configuring RPM.

RPM Inactivity Timer Parameter Considerations

The suggested value for this parameter is 9999. This means that RPM does not notify the printer writer of uncorrected intervention-required conditions at the printer (for example, end of forms). In these cases, the printer normally sounds an alarm and the RPM program displays the following message: `Operator intervention is required at the printer.`

If RPM is configured to notify the printer writer of uncorrected intervention-required conditions at the printer (the inactivity timer parameter contains a value less than 9999), then an inquiry message is issued by the printer writer to the message queue associated with the printer writer. The printer writer may not be able to accurately determine pages or spooled files that have printed. In this case, unexpected results may occur when the printer writer processes any of the following message responses:

- Cancel. The printer writer ends but may incorrectly place a printed spooled file in a status of RDY.
- Hold. The printer writer may incorrectly place a printed spooled file in a status of HLD.
- Page. The printer writer may incorrectly reprint pages or spooled files.
- 1 to 99999. The printer writer may incorrectly reprint pages or spooled files.

What to do next

Do you have other printers to configure for AFP?

No **Yes**

↓ Go to "Choosing Your AFP Environment" on page 4-3.

Go to Chapter 10, "Resources Needed to Perform Advanced Function Printing (AFP)" on page 10-1.

Chapter 9. AFP Using Print Services Facility/2

Print Services Facility/2 (PSF/2) Version 1.1 is a PS/2-based print server that provides distributed printing in a network environment. Systems can be a host system (S/390) or several AS/400 systems connected to a local area network (LAN). PSF/2 supports printing on IPDS and non-IPDS printers.

PSF/2 is supported in the following communications environments:

- Token-ring
- Ethernet
- SDLC

Note: These environments are not intended to define the only way in which a connection with PSF/2 may be configured. You may have communications connections that are not on this list.

This chapter describes:

- How to create the AS/400 system configuration descriptions and, because APPN is recommended, how to update the APPN Remote Location Configuration list.
- The relationship between parameters used with OS/2 Communications Manager and those used by the AS/400 system.

Planning Information

Exchanging information with the administrator of PSF/2 is important. Configuration descriptions, number of printers you intend to use, and type of communications line are examples of information you will need to share. The following manuals will assist you in providing this information:

- The operator's guide or planning and installation manuals that came with your printer.
- *IBM Print Services Facility/2: Getting Started*, S544-3767.
- *Print Services Facility/2: Distributed Print Function Network Configuration Guide for OS/400 Version 1.1*, S544-3823.
- *Extended Services for OS/2 Communications Manager Configuration Guide*, S04G-1002.

Multiple Printer Writers

The distributed print function (DPF) of PSF/2 permits starting multiple printer writers to host and AS/400 systems. Also, AS/400 systems in a network with other hosts, each host having one or more printers active, can send spooled files to PSF/2.

PSF/2 and AS/400 Terminology

To more closely match the terminology used in the *PSF/2 Distributed Print Function Network Configuration Guide for OS/400 Version 1.1*, S544-3823, the term **work station** in this chapter means a personal computer using the Communications Manager program in OS/2.

The term **profile** is used by the OS/2 Communications Manager program. Profiles are made up of parameters. These parameters use values that must match parameter values used in the line, controller, and device descriptions on the AS/400 system. For example, Communications Manager LAN Feature Profile has an adapter address parameter that corresponds to the adapter address (ADPTADR) parameter on the APPC controller description.

Considerations When Using PSF/2 with the AS/400 System

When preparing to use PSF/2 with an AS/400 system, you should be aware of the following:

- Font support
- Twinaxial connections
- How copies of spooled files are handled
- Error detection when printing spooled files
- MULTIUP processing
- Printer changes on the PS/2

Font Support

PSF/2 does not support printer resident fonts. You must have the required character sets in the appropriate density (240- or 300-pel) on your system and available for downloading to PSF/2.

Human readable interpretation (HRI) for barcodes is supported. This support comes through DDS or Advanced Function Printing Utilities/400 (AFP Utilities), and the default font must be used.

Twinaxial Connections

The 3812, 3816, and 4028 printers using a twinaxial attachment are not supported by PSF/2. However, the 3812 and 3816 printers using the 3270 IDS attachment and the 4028-NS1 printer are supported.

Copies of a Spooled File

When multiple copies of a spooled file are requested, each copy is transferred to the distributed print function (DPF) spool. The DPF spool is similar to an output queue on the AS/400 system. The DPF spool displays the received spooled file as only one copy. However, all copies requested on the AS/400 output queue are printed by PSF/2.

Error Detection When Printing Spooled Files

When a spooled file is transferred to PSF/2 for printing, the AS/400 system passes control of the spooled file to the DPF spool of PSF/2. Therefore, the AS/400 system cannot respond to an error that occurs when printing is in process.

MULTIUP Processing and Computer Output Reduction (COR)

MULTIUP processing provides the function to print more than one logical page of data on a single piece of paper. Computer output reduction (COR) is used with page rotation. MULTIUP processing and COR may require access to certain fonts.

If the character identifier (CHRID) value in your printer device description is 101 037, you cannot use font IDs 204, 252, 281, or 290. Also, if the CHRID value in your printer device description is *SYSVAL, and the QCHRID system value is 101 037, you will not have access to those fonts. Therefore, it is recommended that you change the CHRID value in your printer device description to 500 2063.

You can use the Change Device Description (Printer) (CHGDEVPRT) command to do this.

See "Using the Page Rotation (PAGRTT) Parameter" on page 2-40 for more information about COR and "Using the Pages per Side (MULTIUP) Parameter" on page 2-43 for more information about MULTIUP processing.

Printer Changes

Examples of changes at the printer that can occur while the printer writer is active are: media orientation, duplex availability, and input bin availability. Since PSF/2 controls the printer, an AS/400 printer writer cannot respond to changes made at the printer while the printer writer is active. Described below is an example and solution of the case where media orientation changes.

Change Printer Characteristics Scenario

You have your continuous forms printer initially configured with the wide edge of the paper feeding into the paper path. Then, while the AS/400 printer writer is active (but between spooled files), you change the forms. The change is that now the narrow edge of the paper feeds into the paper path. Unless the printer writer is ended, the new printer characteristics are sent to PSF/2, and the AS/400 printer writer is restarted, spooled files will be rotated incorrectly. Additionally, spooled files that were already sent from the AS/400 system to the DPF spool after the forms change will have to be deleted from the DPF spool and resent from the AS/400 system to get the output you expect.

Ensuring the Spooled File Prints Correctly

To ensure that spooled files requiring different form types (or orientations) print as intended:

1. At the PS/2, create a separate host receiver spool for each form type that needs to be handled. Make sure that the `Obtain Printer Characteristics` check box is not activated.
2. At the AS/400 system, create a separate printer writer for each form type that needs to be handled.
3. The first time each host receiver spool is started, make sure that the printer contains the correct forms associated with the host receiver spool.
4. You can now send spooled files requiring a specific form type to the DPF spool at any time, and get the data formatted correctly. The DPF spool must be held when the data is being received if the required form is not loaded into the printer. When you are ready to print the spooled file, load the form into the printer, then release the associated DPF spool.

Commands to Create AS/400 System Configuration Descriptions

Create the configuration descriptions for the AS/400 system first. PSF/2 requires configuration information from the AS/400 system.

To create the AS/400 configuration descriptions to connect to a PS/2 with PSF/2 running, use the following configuration commands:

- One of:
  - CRTLINTRN (Create Line Description (Token-Ring))
  - CRTLINSDLC (Create Line Description (SDLC))
  - CRTLINETH (Create Line Description (Ethernet))
- CRTCTLAPPC (Create Controller Description (APPC))
- CHGCFGL (Change Configuration List) or CRTCFGL (Create Configuration List) to work with the APPN remote location configuration list

  Note: If you will have multiple AS/400 printer writers for a single PSF/2 work station, then the following must be done at the AS/400 system for each PSF/2 host receiver you configure at the work station.

  - Create a printer device description.
  - Add an entry to the APPN remote location configuration list.

  The main difference between these printer writers is the value used for the remote location name parameter. This value is used in the printer device description and in the APPN remote location configuration list.

  A single APPC controller description is required for all printer writers attached to a single PSF/2 work station.
- CRTDEVPRT (Create Device Description (Printer))

Choosing Your PSF/2 Environment

From the following list, choose the environment in which your configuration descriptions will be used.

PSF/2 and Token-ring Go to "Sample Configuration Descriptions for PSF/2 Attached with Token-Ring" on page 9-5 to create the appropriate configuration descriptions.

PSF/2 and SDLC Go to "Sample Configuration Descriptions for PSF/2 Attached with SDLC" on page 9-11 to create the appropriate configuration descriptions.

PSF/2 and Ethernet Go to "Sample Configuration Descriptions for PSF/2 Attached with Ethernet" on page 9-17 to create the appropriate configuration descriptions.

Sample Configuration Descriptions for PSF/2 Attached with Token-Ring

Following are the commands, parameters, and values to create configuration descriptions for printers attached to a PS/2 with PSF/2 running in a token-ring environment. The values are in parentheses, beside the parameter, and are examples only. The values you decide to use in creating your descriptions can be different.

In the configuration examples presented here, information for a parameter can pertain to:

- Another AS/400 system configuration parameter
- An APPN remote location configuration list entry
- An OS/2 Communications Manager configuration parameter

When information located under a parameter in the examples is presented, there will be a reference to a related parameter from the list above.

Configuration Descriptions with APPN Support

The following line, controller, and device configuration descriptions use APPN support.

CRTLINTRN (Create Line Description (Token-Ring)) Command

This is the command that you use to create the token-ring communications line description.

Prompts	Parameters and Values in Parentheses
Line description	LIND(LINETRN)
Resource name	RSRCNAME(LIN021)
	Specifies the physical position or port on the AS/400 system that the communications cable attaches to. Use the WRKHDWRSC (Work with Hardware Resources) command to view the resource names of the communications adapter cards.
Maximum frame size	MAXFRAME(1994)
	This value must be equal to or less than the Max RU Size parameter on the work station's Token-Ring DLC profile.
Local adapter address	ADPTADR(*ADPT)
	This value must match the Dest Address parameter on the work station's Partner LU profile.
Source service access points	SSAP(*SYSGEN)
	This default value is required.
Text 'description'	TEXT('TRN line to APPC ctl to PSF/2')

CRTCTLAPPC (Create Controller Description (APPC)) Command

This is the command that you use to create the logical communications controller description.

Prompts	Parameters and Values in Parentheses
Controller description	CTLD(CTLPSF2A)
Link type	LINKTYPE(*LAN) This value is required when you are configuring for a token-ring network.
APPN-capable	APPN(*YES) Specifying *YES for this value means you will be using APPN support and will not have to create an APPC device description. You will have to create or update your APPN remote location configuration list.
Switched line list	SWTLINLST(LINETRN) The value specified here must match the line description (LIND) parameter value you specified on the CRTLINTRN command. In this example, that value is LINETRN.
Maximum frame size	MAXFRAME(*LINKTYPE) This value must be equal to or less than the Max RU size parameter on the work station's Token-Ring DLC profile.
Remote network identifier	RMTNETID(*NETATR) Specify the value *NETATR to use the value assigned to the ***local network ID*** parameter of the network attributes as the value for this parameter. This parameter value must match all of the following: • The RMTNETID parameter value in the CRTDEVPRT command. • The remote network identifier in the APPN remote location configuration list. • The Network Name parameter in the work station's SNA Base profile. • The Full PLU Name parameter on the work station's Partner LU profile. This is the leftmost field of the fully qualified partner logical unit (PLU) name. That value is *NETATR in this example. To obtain the correct AS/400 value to use with the work station configuration parameters, you can use the Display Network Attributes (DSPNETA) command from any command line on the AS/400 system. The value for the ***local network ID*** attribute, which is displayed when you run the DSPNETA command, is the value for the work station's parameters. If the work station is in a different network from the AS/400 system, RMTNETID should contain the name of that network. That value is used for the Network Name parameter on the work station's SNA Base profile. The AS/400's local network ID is used for the Full PLU Name

| | parameter on the work station's Partner LU profile. This is the leftmost field of the fully qualified partner logical unit (PLU) name.

| Remote control point name | RMTCPNAME(RCPPSF2A)

| | This parameter value must match both of the following:

| | • Remote control point in the APPN remote location configuration list.
| | • PU Name parameter in the work station's SNA Base profile.

| | *This value must be unique within a network.*

| Exchange identifier | EXCHID(05D32201)

| | 05D is the block ID required for use by PSF/2.

| | The Node ID parameter on the work station's SNA Base profile must match the last 5 digits of the EXCHID value. That value is 32201 in this example.

| System Services Control Point Identifier
| | SSCPID(050000000000)

| | The work station sends alerts to the AS/400 system only when a value is specified for the SSCPID parameter. The first two digits must be 05. Use the Change Network Attributes (CHGNETA) command to enable alerts on an AS/400 system.

| | If the problem management focal point in your network is not an AS/400 system, refer to the appropriate documentation for information on enabling alerts.

| Switched disconnect | SWTDSC(*NO)

| | This value must match the Free unused link parameter on the work station's Token-Ring DLC profile.

| LAN remote adapter address | ADPTADR(400001383669)

| | This value must match the Adapter Address parameter of the work station's LAN Feature profile. That value is 400001383669 in this example.

| Destination service access points | DSAP(04)

| | This default value is required.

| Source service access points | SSAP(04)

| | This default value is required.

| Text 'description' | TEXT('APPC ctl (With APPN=YES) to PSF/2')

CRTDEVPRT (Create Device Description (Printer)) Command

This is the command that you use to create the printer device description.

| **Prompts** | **Parameters and Values in Parentheses**

| Device description | DEVD(DEVPSF2A)

| Device class | DEVCLS(*RMT)

| Device type | TYPE(*IPDS)

| Device model | MODEL(0)

Advanced function printing	AFP(*YES) The default for this parameter is *NO; however, for AFP this parameter must be *YES.
AFP attachment	AFPATTACH(*APPC)
Font identifier	FONT(011)
Form feed	FORMFEED(*AUTOCUT) This value is recommended when using PSF/2.
Remote location name	RMTLOCNAME(RLNPSF2A) This parameter value must match both of the following: • The remote location name in the APPN remote location configuration list. • The LU Name parameter in the work station's Local APPC LU profile. In this example, the value is RLNPSF2A. *This value must be unique within a network.*
Local location name	LCLLOCNAME(*NETATR) This value must match the Full PLU Name parameter in the work station's Partner LU profile. This is the rightmost field of the work station's fully qualified partner logical unit (PLU) name. This value must also match the local location name in the APPN remote location configuration list. That value is *NETATR in this example. To obtain the correct AS/400 value to use with the work station's parameters, you can use the Display Network Attributes (DSPNETA) command from any command line on the AS/400 system. The value for the ***default local location*** attribute is displayed when you run the DSPNETA command. This is the value you must assign to the appropriate configuration parameters at the work station.
Remote network identifier	RMTNETID(*NETATR) This parameter value must match all of the following: • The RMTNETID parameter value in the CRTCTLAPPC command. • The remote network identifier in the APPN remote location configuration list. • The Network Name parameter in the work station's SNA Base profile. • The Full PLU Name parameter of the work station's Partner LU profile. This is the leftmost field of the fully qualified partner logical unit (PLU) name. That value is *NETATR in this example. To obtain the correct AS/400 value to use with the work station configuration parameters, you can use the Display Network Attributes (DSPNETA) command from any command line on the AS/400 system. The value for the ***local network id*** attribute, which is displayed when

	you run the DSPNETA command, is the value for the work station's parameters.
	If the work station is in a different network from the AS/400, RMTNETID contains the name of that network. That value should be used for the Network Name parameter on the work station's SNA Base profile. The AS/400's local network ID should be used for the Full PLU Name parameter in the work station's Partner LU profile. This is the leftmost field of the fully qualified partner logical unit (PLU) name.
Mode	MODE(QSPWTR)
	This value must match the Mode Name parameter on the work station's Mode profile. QSPWTR is an IBM-supplied mode. You can use the Create Mode Description (CRTMODD) command if you want to create your own mode description. If you do that, the name you assign to that mode must be the value selected for this parameter.
	In this example, APPN creates the APPC device description for you. You can, if you choose, create your own APPC device description using the Create Device Description (APPC) (CRTDEVAPPC) command. Regardless of how the APPC device description is created, the mode value assigned here overrides the mode value assigned in the CRTDEVAPPC command.
Printing while converting	PRTCVT(*YES)
	The default value of *YES causes the printer writer to overlap the conversion and printing processes. That is, some of the spooled file data starts to print before the printer writer has converted the whole spooled file. A value of *NO causes the printer writer to convert the spooled file completely before sending the spooled file to a printer.
Text 'description'	TEXT('PSF/2 AFP PRT DEV DESC')

Updating the APPN Remote Location Configuration List

The APPN remote location configuration list is used when APPN(*YES) is specified in the controller description. This list defines special characteristics of remote locations.

The Create Configuration List (CRTCFGL) command is used to define a list of remote locations for APPN configurations.

1. If you do not have a remote location configuration list, type CRTCFGL. If you already have a remote location configuration list, type CHGCFGL for the Change Configuration List command.
2. Press F4 (Prompt) to see the parameters for the command.
3. Type *APPNRMT for the *Configuration list type* prompt and press the Enter key twice.

Remote Location Name–RLNPSF2A

Specifies the name that must match both of the following values:

- The RMTLOCNAME parameter value in the CRTDEVPRT command.
- The LU Name parameter in the work station's Local LU profile.

This value must be unique within a network.

Remote Network Identifier–*NETATR

Specifies the name that must match all of the following:

- The RMTNETID parameter value in the CRTCTLAPPC command.
- The RMTNETID parameter value in the CRTDEVPRT command.
- The control point network identifier specified in this list (APPN remote location configuration list).
- The Network ID parameter in the work station's SNA Base profile.
- The Network Name parameter in the work station's Partner LU profile. This is the leftmost field of the fully qualified partner logical unit (PLU) name.

If the work station is in a different network from the AS/400, RMTNETID contains the name of that network. That value should be used for the work station's Network ID parameter in the SNA Base profile. The AS/400's local network ID should be used for the Network Name parameter in the work station's Partner LU profile. This is the leftmost field of the fully qualified partner logical unit (PLU) name.

Local Location Name–*NETATR

The local location name is the name defined in the network attributes. This value must match all of the following:

- The LCLLOCNAME parameter value in the CRTDEVPRT command
- The Full PLU Name parameter in the work station's Partner LU profile. This is the rightmost field of the fully qualified partner logical unit (PLU) name.

That value is *NETATR in this example.

To obtain the correct AS/400 value to use with the work station, you can use the DSPNETA (Display Network Attributes) command from any command line on the AS/400 system. The value for the ***default local location*** attribute, which is displayed when you run the DSPNETA command, is the value for the Full PLU Name parameter in the work station's Partner LU profile.

Control Point Name–RCPPSF2A

This value must match both of the following:

- The RMTCPNAME parameter value in the CRTCTLAPPC command.
- The PU Name parameter in the work station's SNA Base profile.

This value must be unique within a network.

Control Point Network Identifier–*NETATR

This value must match all of the following:

- The RMTNETID parameter value in the CRTCTLAPPC command.
- The RMTNETID parameter value in the CRTDEVPRT command.
- The remote network identifier specified in this list (the APPN remote location configuration list).
- The Network Name parameter in the work station's SNA Base profile.
- The Full PLU Name parameter in the work station's Partner LU profile. This is the leftmost field of the fully qualified partner logical unit (PLU) name.

If the work station is in a different network from the AS/400, RMTNETID contains the name of that network. That value should be used for the Network Name parameter in the work station's SNA Base profile. The AS/400's local network ID should be used for the Network Name parameter in the work station's Partner LU profile. This is the leftmost field of the fully qualified partner logical unit (PLU) name.

Note: You can use the DSPCFGL (Display Configuration List) command to view these parameters and their assigned values.

What to do next

Go to "Installing Your Printer" on page 9-23.

Sample Configuration Descriptions for PSF/2 Attached with SDLC

Following are the commands, parameters, and values to create configuration descriptions for printers attached to a PS/2 with PSF/2 running in a nonswitched SDLC environment. The values are in parentheses, beside the parameter, and are examples only. The values you decide to use in creating your descriptions can be different.

In the configuration examples presented here, information located under a parameter can pertain to:

- Another AS/400 system configuration parameter
- An APPN remote location configuration list entry
- An OS/2 Communications Manager configuration parameter

If you do not understand some of the parameters or values, go to the *OS/400* Communications Configuration Reference* for a more detailed discussion of each parameter and value.

Configuration Descriptions with APPN Support

The following line, controller, and device configuration descriptions use APPN support.

CRTLINSDLC (Create Line Description (SDLC)) Command

This is the command that you use to create the SDLC communications line description.

Prompts	Parameters and Values in Parentheses
Line description	LIND(LINESDLC)
Resource name	RSRCNAME(LIN012) Specifies the physical position or port on the AS/400 system that the communications cable attaches to. Use the WRKHDWRSC (Work with Hardware Resources) command to view the resource names of the communications adapter cards.
Connection type	CNN(*NONSWTPP) This parameter corresponds to the SWITCHED parameter on the CRTCTLAPPC command.

	This value must match the Line Type parameter on the work station's SDLC DLC profile.
NRZI data encoding	NRZI(*YES)
	This value must match the NRZI parameter on the work station's SDLC DLC profile.
Modem data rate select	MODEMRATE(*FULL)
	This value must match the Modem Rate parameter on the work station's SDLC DLC profile.
Maximum frame size	MAXFRAME(2057)
	This value must be equal to or less than the Max RU Size parameter on the work station's SDLC DLC profile.
Duplex	DUPLEX(*FULL)
	This value must match the Line Mode parameter on the work station's SDLC DLC profile.
Maximum outstanding frames	MAXOUT(7)
	This value must match the Receive Window Count parameter on the work station's SDLC DLC profile.
Text 'description'	TEXT('SDLC line to APPC ctl to PSF/2')

CRTCTLAPPC (Create Controller Description (APPC)) Command

This is the command that you use to create the logical communications controller description.

Prompts	**Parameters and Values in Parentheses**
Controller description	CTLD(CTLPSF2B)
Link type	LINKTYPE(*SDLC)
	This value is required when you are configuring for a SDLC network.
Switched line	SWITCHED(*NO)
	This parameter corresponds to the CNN parameter of the CRTLINSDLC command.
APPN-capable	APPN(*YES)
	Specifying *YES for this value means you will be using APPN support and will not have to create an APPC device description. You will have to create or update your APPN remote location configuration list.
Attached nonswitched line	LINE(LINESDLC)
	This value must match the LIND parameter in the AS/400 line description. In this example, the value is LINESDLC.
Maximum frame size	MAXFRAME(*LINKTYPE)
	This value must be equal to or less than the Max RU Size parameter on work station's SDLC DLC profile.

Remote network identifier	RMTNETID(*NETATR) Specify the value *NETATR to use the value assigned to the ***local network ID*** parameter of the network attributes as the value for this parameter. This parameter value must match all of the following: • The RMTNETID parameter value in the CRTDEVPRT command. • The remote network identifier in the APPN remote location configuration list. • The Network Name parameter in the work station's SNA Base profile. • The Full PLU Name parameter in the work station's Partner LU profile. This is the leftmost field of the fully qualified partner logical unit (PLU) name. That value is *NETATR in this example. To obtain the correct AS/400 value to use with the work station configuration parameters, you can use the Display Network Attributes (DSPNETA) command from any command line on the AS/400 system. The value for the ***local network ID*** attribute, which is displayed when you run the DSPNETA command, is the value for the work station's parameters. If the work station is in a different network from the AS/400, RMTNETID should contain the name of that network. That value is used for the Network Name parameter in the work station's SNA Base profile. The AS/400's local network ID is used for the Full PLU Name parameter in the work station's Partner LU profile. This is the leftmost field of the fully qualified partner logical unit (PLU) name.
Remote control point name	RMTCPNAME(RCPPSF2B) This parameter value must match both of the following: • Remote control point in the APPN remote location configuration list. • PU Name parameter in the work station's SNA Base profile. *This value must be unique within a network.*
Exchange identifier	EXCHID(05DD5BEE) 05D is the block ID required for use by PSF/2. The Node ID parameter on the work station's SNA Base profile must match the last 5 digits of the EXCHID parameter value. That value is D5BEE in this example.
Station address	STNADR(01) This value must match the value for the Local station address parameter on the work station's SDLC DLC profile.
System Services Control Point Identifier	SSCPID (050000000000) The work station sends alerts to the AS/400 system only when a value is specified for the SSCPID parameter. The first two digits must be 05. Use the Change Network Attributes (CHGNETA) command to enable alerts on the AS/400 system.

		If the problem management focal point in your network is not an AS/400 system, refer to the appropriate documentation for information on enabling alerts.
	Text 'description'	TEXT('APPC controller (with APPN=Yes) to PSF/2')

CRTDEVPRT (Create Device Description (Printer)) Command

This is the command that you use to create the printer device description.

	Prompts	**Parameters and Values in Parentheses**
	Device description	DEVD(DEVPSF2B)
	Device class	DEVCLS(*RMT)
	Device type	TYPE(*IPDS)
	Device model	MODEL(0)
	Advanced function printing	AFP(*YES)
		The default for this parameter is *NO; however, for AFP this parameter must be *YES.
	AFP attachment	AFPATTACH(*APPC)
	Font identifier	FONT(011)
	Form feed	FORMFEED(*AUTOCUT)
	Remote location name	RMTLOCNAME(RLNPSF2B)
		This parameter value must match both of the following: • The remote location name in the APPN remote location configuration list. • The LU Name parameter in the work station's Local APPC LU profile.
		In this example, the value is RLNPSF2B.
		This value must be unique within a network.
	Local location name	LCLLOCNAME(*NETATR)
		This value must match the Full PLU Name parameter in the work station's Partner LU profile. This is the rightmost field of the work station's fully qualified partner logical unit (PLU) name. This value must also match the local location name in the APPN remote location configuration list.
		That value is *NETATR in this example.
		To obtain the correct AS/400 value to use with the work station's parameters, you can use the Display Network Attributes (DSPNETA) command from any command line on the AS/400 system. The value for the ***default local location*** attribute is displayed when you run the DSPNETA command. This is the value you must assign to the appropriate configuration parameters at the work station.
	Remote network identifier	RMTNETID(*NETATR)
		This parameter value must match all of the following: • The RMTNETID parameter value in the CRTCTLAPPC command.

	• The remote network identifier in the APPN remote location configuration list. • The Network Name parameter in the work station's SNA Base profile. • The Full PLU Name parameter of the work station's Partner LU profile. This is the leftmost field of the fully qualified partner logical unit (PLU) name.
	That value is *NETATR in this example.
	To obtain the correct AS/400 value to use with the work station configuration parameters, you can use the Display Network Attributes (DSPNETA) command from any command line on the AS/400 system. The value for the ***local network id*** attribute, which is displayed when you run the DSPNETA command, is the value for the work station's parameters.
	If the work station is in a different network from the AS/400, RMTNETID contains the name of that network. That value should be used for the Network Name parameter on the work station's SNA Base profile. The AS/400's local network ID should be used for the Full PLU Name parameter in the work station's Partner LU profile. This is the leftmost field of the fully qualified partner logical unit (PLU) name.
Mode	MODE(QSPWTR)
	This value must match the Mode Name parameter on the work station's Mode profile. QSPWTR is an IBM-supplied mode. You can use the Create Mode Description (CRTMODD) command if you want to create your own mode description. If you do that, the name you assign to that mode must be the value selected for this parameter.
	In this example, APPN creates the APPC device description for you. You can, if you choose, create your own APPC device description using the Create Device Description (APPC) (CRTDEVAPPC) command. Regardless of how the APPC device description is created, the mode value assigned here overrides the mode value assigned in the CRTDEVAPPC command.
Printing while converting	PRTCVT(*YES)
	The default value of *YES causes the printer writer to overlap the conversion and printing processes. That is, some of the spooled file data starts to print before the printer writer has converted the whole spooled file. A value of *NO causes the printer writer to convert the spooled file completely before sending the spooled file to a printer.
Text 'description'	TEXT('SDLC to APPC to PSF/2 printer device description')

Updating the APPN remote location configuration list

The APPN remote location configuration list is used when APPN(*YES) is specified in the controller description. This list defines special characteristics of remote locations.

The Create Configuration List (CRTCFGL) command is used to define a list of remote locations for APPN configurations.

1. If you do not have a remote location configuration list, type CRTCFGL. If you already have a remote location configuration list, type CHGCFGL for the Change Configuration List command.
2. Press F4 (Prompt) to see the parameters for the command.
3. Type *APPNRMT for the *Configuration list type* prompt and press the Enter key twice.

Remote Location Name–RLNPSF2B
Specifies the name that must match both of the following values:

- The RMTLOCNAME parameter value in the CRTDEVPRT command.
- The LU Name parameter in the work station's Local LU profile.

This value must be unique within a network.

Remote Network Identifier–*NETATR
Specifies the name that must match all of the following:

- The RMTNETID parameter value in the CRTCTLAPPC command.
- The RMTNETID parameter value in the CRTDEVPRT command.
- The control point network identifier specified in this list (APPN remote location configuration list).
- The Network ID parameter in the work station's SNA Base profile.
- The Network Name parameter in the work station's Partner LU profile. This is the leftmost field of the fully qualified partner logical unit (PLU) name.

If the work station is in a different network from the AS/400, RMTNETID contains the name of that network. That value should be used for the work station's Network ID parameter in the SNA Base profile. The AS/400's local network ID should be used for the Network Name parameter in the work station's Partner LU profile. This is the leftmost field of the fully qualified partner logical unit (PLU) name.

Local Location Name–*NETATR
The local location name is the name defined in the network attributes. This value must match all of the following:

- The LCLLOCNAME parameter value in the CRTDEVPRT command
- The Full PLU Name parameter in the work station's Partner LU profile. This is the rightmost field of the fully qualified partner logical unit (PLU) name.

That value is *NETATR in this example.

To obtain the correct AS/400 value to use with the work station, you can use the DSPNETA (Display Network Attributes) command from any command line on the AS/400 system. The value for the ***default local location*** attribute, which is displayed when you run the DSPNETA command, is the value for the Full PLU Name parameter in the work station's Partner LU profile.

Control Point Name–RCPPSF2B
This value must match both of the following:

- The RMTCPNAME parameter value in the CRTCTLAPPC command.
- The PU Name parameter in the work station's SNA Base profile.

This value must be unique within a network.

Control Point Network Identifier–*NETATR
This value must match all of the following:

- The RMTNETID parameter value in the CRTCTLAPPC command.
- The RMTNETID parameter value in the CRTDEVPRT command.
- The remote network identifier specified in this list (the APPN remote location configuration list).
- The Network Name parameter in the work station's SNA Base profile.
- The Full PLU Name parameter in the work station's Partner LU profile. This is the leftmost field of the fully qualified partner logical unit (PLU) name.

If the work station is in a different network from the AS/400, RMTNETID contains the name of that network. That value should be used for the Network Name parameter in the work station's SNA Base profile. The AS/400's local network ID should be used for the Network Name parameter in the work station's Partner LU profile. This is the leftmost field of the fully qualified partner logical unit (PLU) name.

Note: You can use the DSPCFGL (Display Configuration List) command to view these parameters and their assigned values.

What to do next

Go to "Installing Your Printer" on page 9-23.

Sample Configuration Descriptions for PSF/2 Attached with Ethernet

Following are the commands, parameters, and values to create configuration descriptions for printers attached to a PS/2 with PSF/2 running in an Ethernet environment. The values are in parentheses, beside the parameter, and are examples only. The values you decide to use in creating your descriptions can be different.

In the configuration examples presented here, information for a parameter can pertain to:

- Another AS/400 system configuration parameter
- An APPN remote location configuration list entry
- An OS/2 Communications Manager configuration parameter

When information located under a parameter in the examples is presented, there will be a reference to a related parameter from the list above.

Configuration Description with APPN Support

The following line, controller, and device configuration descriptions use APPN support.

CRTLINETH (Create Line Description (Ethernet)) Command

This is the command that you use to create the Ethernet communications line description.

Prompts	Parameters and Values in Parentheses
Line description	LIND(LINEETH)
Resource name	RSRCNAME(LIN031)
	Specifies the physical position or port on the AS/400 system that the communications cable attaches to. You can use the WRKHDWRSC (Work with Hardware Resources) command to view the resource names of the communications adapter cards.
Local adapter address	ADPTADR(*ADPT)
	This value must match the Dest Address parameter on the work station's Partner LU profile.
Text 'description'	TEXT('ETH line to APPC ctl to PSF/2')

CRTCTLAPPC (Create Controller Description (APPC)) Command

This is the command that you use to create the logical communications controller description.

Prompts	Parameters and Values in Parentheses
Controller description	CTLD(CTLPSF2C)
Link type	LINKTYPE(*LAN)
	This value is required when you are configuring for an Ethernet network.
APPN-capable	APPN(*YES)
	Specifying *YES for this value means you will be using APPN support and will not have to create an APPC device description. You will have to create or update your APPN remote location configuration list.
Switched line list	SWTLINLST(LINEETH)
	The value specified here must match the line description (LIND) parameter value you specified on the CRTLINETH command. In this example, that value is LINEETH.
Maximum frame size	MAXFRAME(*LINKTYPE)
	This value must be equal to or less than the Max RU Size parameter on the work station's Token-Ring DLC profile.
Remote network identifier	RMTNETID(*NETATR)
	Specify the value *NETATR to use the value assigned to the ***local network ID*** parameter of the network attributes as the value for this parameter.
	This parameter value must match all of the following: • The RMTNETID parameter value in the CRTDEVPRT command. • The remote network identifier in the APPN remote location configuration List.

- The Network Name parameter in the work station's SNA Base profile.
- The Full PLU Name parameter on the work station's Partner LU profile. This is the leftmost field of the fully qualified partner logical unit (PLU) name.

That value is *NETATR in this example.

To obtain the correct AS/400 value to use with the work station configuration parameters, you can use the Display Network Attributes (DSPNETA) command from any command line on the AS/400 system. The value for the ***local network ID*** attribute, which is displayed when you run the DSPNETA command, is the value for the work station's parameters.

If the work station is in a different network from the AS/400 system, RMTNETID should contain the name of that network. That value is used for the Network Name parameter on the work station's SNA Base profile. The AS/400's local network ID is used for the Full PLU Name parameter on the work station's Partner LU profile. This is the leftmost field of the fully qualified partner logical unit (PLU) name.

Remote control point name

RMTCPNAME(RCPPSF2C)

This parameter value must match both of the following:

- Remote control point in the APPN remote location configuration list.
- PU Name parameter in the work station's SNA Base profile.

This value must be unique within a network.

Exchange identifier

EXCHID(05DEE0AA)

05D is the block ID required for use by PSF/2.

The Node ID parameter on the work station's SNA Base profile must match the last 5 digits of the EXCHID parameter value. That value is EE0AA in this example.

System Services Control Point Identifier

SSCPID (050000000000)

The work station sends alerts to the AS/400 system only when a value is specified for the SSCPID parameter. The first two digits must be 05. Use the Change Network Attributes (CHGNETA) command to enable alerts on an AS/400 system.

If the problem management focal point in your network is not an AS/400 system, refer to the appropriate documentation for information on enabling alerts.

Switched disconnect

SWTDSC(*NO)

This value must match the Free unused link parameter on the work station's Token-Ring DLC profile.

LAN remote adapter address

ADPTADR(400001383669)

This value must match the Adapter Address parameter of the work station's LAN Feature profile. That value is 400001383669 in this example.

Destination service access points	DSAP(04)
	This default value is required.
Source service access points	SSAP(04)
	This default value is required.
Text 'description'	TEXT('APPC ctl (With APPN=YES) to PSF/2')

CRTDEVPRT (Create Device Description (Printer)) Command

This is the command that you use to create the printer device description.

Prompts	**Parameters and Values in Parentheses**
Device description	DEVD(DEVPSF2C)
Device class	DEVCLS(*RMT)
Device type	TYPE(*IPDS)
Device model	MODEL(0)
Advanced function printing	AFP(*YES)
	The default for this parameter is *NO; however, for AFP this parameter must be *YES.
AFP attachment	AFPATTACH(*APPC)
Font identifier	FONT(011)
Form feed	FORMFEED(*AUTOCUT)
	This value is recommended when using PSF/2.
Remote location name	RMTLOCNAME(RLNPSF2C)
	This parameter value must match both of the following: • The remote location name in the APPN remote location configuration list. • The LU Name parameter in the work station's Local APPC LU profile.
	In this example, the value is RLNPSF2C.
	This value must be unique within a network.
Local location name	LCLLOCNAME(*NETATR)
	This value must match the Full PLU Name parameter in the work station's Partner LU profile. This is the rightmost field of the work station's fully qualified partner logical unit (PLU) name. This value must also match the local location name in the APPN remote location configuration list.
	That value is *NETATR in this example.
	To obtain the correct AS/400 value to use with the work station's parameters, you can use the Display Network Attributes (DSPNETA) command from any command line on the AS/400 system. The value for the ***default local location*** attribute is displayed when you run the DSPNETA command. This is the value you must assign to the appropriate configuration parameters at the work station.

Remote network identifier	RMTNETID(*NETATR) This parameter value must match all of the following: • The RMTNETID parameter value in the CRTCTLAPPC command. • The remote network identifier in the APPN remote location configuration list. • The Network Name parameter in the work station's SNA Base profile. • The Full PLU Name parameter of the work station's Partner LU profile. This is the leftmost field of the fully qualified partner logical unit (PLU) name. That value is *NETATR in this example. To obtain the correct AS/400 value to use with the work station configuration parameters, you can use the Display Network Attributes (DSPNETA) command from any command line on the AS/400 system. The value for the ***local network ID*** attribute, which is displayed when you run the DSPNETA command, is the value for the work station's parameters. If the work station is in a different network from the AS/400, RMTNETID contains the name of that network. That value should be used for the Network Name parameter in the work station's SNA Base profile. The AS/400's local network ID should be used for the Full PLU Name parameter in the work station's Partner LU profile. This is the leftmost field of the fully qualified partner logical unit (PLU) name.
Mode	MODE(QSPWTR) This value must match the Mode Name parameter on the work station's Mode profile. QSPWTR is an IBM-supplied mode. You can use the Create Mode Description (CRTMODD) command if you want to create your own mode description. If you do that, the name you assign to that mode must be the value selected for this parameter. In this example, APPN creates the APPC device description for you. You can, if you choose, create your own APPC device description using the Create Device Description (APPC) (CRTDEVAPPC) command. Regardless of how the APPC device description is created, the mode value assigned here overrides the mode value assigned in the CRTDEVAPPC command.
Printing while converting	PRTCVT(*YES) The default value of *YES causes the printer writer to overlap the conversion and printing processes. That is, some of the spooled file data starts to print before the printer writer has converted the whole spooled file. A value of *NO causes the printer writer to convert the spooled file completely before sending the spooled file to a printer.
Printing while converting	PRTCVT(*YES) The default value of *YES causes the printer writer to overlap the conversion and printing processes. That is, some of the spooled file data starts to print before the printer writer has converted the whole spooled file. A value of *NO causes the printer writer to completely convert the spooled file before sending the spooled file to a printer.

| Text 'description' TEXT('PSF/2 AFP PRT DEV DESC')

Updating the APPN Remote Location Configuration List

The APPN remote location configuration list is used when APPN(*YES) is specified in the controller description. This list defines special characteristics of remote locations.

The Create Configuration List (CRTCFGL) command is used to define a list of remote locations for APPN configurations.

1. If you do not have a remote location configuration list, type CRTCFGL. If you already have a remote location configuration list, type CHGCFGL for the Change Configuration List command.
2. Press F4 (Prompt) to see the parameters for the command.
3. Type *APPNRMT for the *Configuration list type* prompt and press the Enter key twice.

Remote Location Name–RLNPSF2C

Specifies the name that must match both of the following values:

- The RMTLOCNAME parameter in the CRTDEVPRT command.
- The LU Name parameter in the work station's Local LU profile.

This value must be unique within a network.

Remote Network Identifier–*NETATR

Specifies the name that must match all of the following:

- The RMTNETID parameter value in the CRTCTLAPPC command.
- The RMTNETID parameter value in the CRTDEVPRT command.
- The control point network identifier specified in this list (APPN remote location configuration list).
- The Network ID parameter in the work station's SNA Base profile.
- The Network Name parameter in the work station's Partner LU profile. This is the leftmost field of the fully qualified partner logical unit (PLU) name.

If the work station is in a different network from the AS/400, RMTNETID contains the name of that network. That value should be used for the work station's Network ID parameter in the SNA Base profile. The AS/400's local network ID should be used for the Network Name parameter in the work station's Partner LU profile. This is the leftmost field of the fully qualified partner logical unit (PLU) name.

Local Location Name–*NETATR

The local location name is the name defined in the network attributes. This value must match all of the following:

- The LCLLOCNAME parameter value in the CRTDEVPRT command
- The Full PLU Name parameter in the work station's Partner LU profile. This is the rightmost field of the fully qualified partner logical unit (PLU) name.

That value is *NETATR in this example.

To obtain the correct AS/400 value to use with the work station, you can use the DSPNETA (Display Network Attributes) command from any command line on the AS/400 system. The value for the ***default local location*** attribute, which is displayed when you run the DSPNETA command, is the value for the Full PLU Name parameter in the work station's Partner LU profile.

Control Point Name–RCPPSF2C
This value must match both of the following:

- The RMTCPNAME parameter value in the CRTCTLAPPC command.
- The PU Name parameter in the work station's SNA Base profile.

This value must be unique within a network.

Control Point Network Identifier–*NETATR
This value must match all of the following:

- The RMTNETID parameter value in the CRTCTLAPPC command.
- The RMTNETID parameter value in the CRTDEVPRT command.
- The remote network identifier specified in this list (the APPN remote location configuration list).
- The Network Name parameter in the work station's SNA Base profile.
- The Full PLU Name parameter in the work station's Partner LU profile. This is the leftmost field of the fully qualified partner logical unit (PLU) name.

If the work station is in a different network from the AS/400, RMTNETID contains the name of that network. That value should be used for the Network Name parameter in the work station's SNA Base profile. The AS/400's local network ID should be used for the Network Name parameter in the work station's Partner LU profile. This is the leftmost field of the fully qualified partner logical unit (PLU) name.

Note: You can use the DSPCFGL (Display Configuration List) command to view these parameters and their assigned values.

What to do next

Go to "Installing Your Printer."

Installing Your Printer

At this time, install your printer or make arrangements with your service representative to help you to install the printer.

Installing PSF/2

To attach all the hardware and install all the programs, see the following publications:

- *IBM Print Services Facility/2: Getting Started*
- *Print Services Facility/2: Distributed Print Function Network Configuration Guide for OS/400 Version 1.1*

As you proceed through the PSF/2 manuals, you will be directed to perform hardware installation and loading of programs.

When you are installing and configuring PSF/2 and working with the OS/2 Communications Manager program, you will need information about the AS/400 line, APPC controller, and printer device descriptions. When you are asked for that information, look at the AS/400 configuration descriptions you just created or the examples in this chapter. Remember, the descriptions shown in this manual are examples only; your actual configuration descriptions can be different.

If, during configuration, you do not understand some of the parameters or values, press the Help key or go to the *OS/400* Communications Configuration Reference* for a more detailed discussion of each parameter and value.

What to do next

Do you have other printers to configure for AFP?

No **Yes**

↓ Go to "Choosing Your AFP Environment" on page 4-3.

Go to Chapter 10, "Resources Needed to Perform Advanced Function Printing (AFP)" on page 10-1.

Chapter 10. Resources Needed to Perform Advanced Function Printing (AFP)

You were sent here after completing the configuration descriptions and varying on your printer.

This chapter discusses the resources used to perform advanced function printing.

Some of the resources are shipped with the system and some of them can come from a System/370. Resources from a System/370 can be downloaded or they can come inline with the data that is to be printed. Form definitions, fonts, page segments, page overlays, and page definitions are examples of resources that can come from a System/370. Additionally, you could have created page overlays and page segments yourself using the Advanced Function Printing Utilities/400 (AFP Utilities) licensed program (5738-AF1). This licensed program allows you to create resources for advanced function printing on the AS/400 system. For more information on AFP Utilities, go to "Advanced Function Printing Utilities/400" on page 14-1.

If you are certain you have all the resources needed to use AFP, you can skip this chapter and go to Chapter 11, "Printing AFPDS Data" on page 11-1. If you do not have the resources, or are unsure, read this chapter.

Resource objects contain data and control information that can be used in a printing job and that can be shared by different pages and different print data sets. Examples of resources are fonts, which define the characters used to print text, and page segments, which can include images and text.

Resources can be stored and accessed from within the operating system being used. By referring to the name of the stored resource, many data streams can share the same resources.

When you received AFPDS resource data from System/370, you transformed that data to a format that can be used on the AS/400 system. You did that by using the following commands:

- CRTFORMDF
- CRTFNTRSC
- CRTPAGSEG
- CRTOVL
- CRTPAGDFN

When the commands are run, it is important that the transformed data be placed in a **library** that is defined to your **library list** when you initially sign on the system. This ensures that System/370 resources are available when the spooled file is created and when it is printed.

A **library** is an object on disk that serves as a directory to other objects. A **library list** is a list that indicates which libraries are to be searched and the order in which they are to be searched.

When specifying an overlay, page definition, or page segment it is important to have the library they are placed in on your library list. And, if you have more than one overlay, page definition, or page segment with the same name, make sure the

one you want to use is in the first library searched. Otherwise, you could specify the correct name, but not print with the correct resources.

Working with AFP Resources and Libraries

When the spooled file is created, the system saves the libraries in your library list. Within that list are the libraries that contain the resources used to create the spooled file.

When the system searches the saved libraries for the resources needed to print the spooled file, it searches in the following order:

1. System libraries

   These libraries are identified in system value QSYSLIBL. System libraries are available to all users; they are identified in your library list with a type of SYS.

2. Current library

   The current library is identified in your user profile as the value for the current library (CURLIB) parameter. In your library list, the current library has a type of CUR.

3. User libraries

   User libraries are identified in system value QUSRLIBL or a job description. In your library list, these libraries are identified with a type of USR.

If you have a resource that you want many users to have access to (fonts, for example), you may want to put that resource in a library that everyone has access to, such as a library identified in the system value QSYSLIBL.

On the other hand, if you have a resource that you want to restrict access to (signatures, for example), you may want to put that resource in a library that is accessible only to the users that need that resource. For example, if you own the library that the resources are stored in, you can grant access to that object (the library) with the Grant Object Authority (GRTOBJAUT) command.

Form Definitions

A form definition defines the:

- Position of a page on a form.
- Modifications applied to the forms.
- Number of copies of each page and the modifications that apply to each set of copies.

The following list details the origin of AFP-related form definitions for the AS/400:

- Provided with the AS/400 system
- Downloaded from S/370
- Inline from S/370

Provided with the AS/400 System

The following form definitions are provided with the AS/400 system in library QSYS.

Name	Across (Inches)	Down (Inches)	Presentation	Direction	Bin	Duplex
F1A10110	1/6	1/6	Portrait	Across	1	No
F1A10111	1/6	1/6	Portrait	Across	1	Yes
F1A10112	1/6	1/6	Portrait	Across	1	Tumble
F1A10120	1/6	1/6	Portrait	Across	2	No
F1A10121	1/6	1/6	Portrait	Across	2	Yes
F1A10122	1/6	1/6	Portrait	Across	2	Tumble
F1C10110	1/6	1/6	Landscape	Down	1	No
F10101PA	0	1/2	Portrait	Across	1	No
F10101PD	0	1/2	Portrait	Down	1	No
F10101LA	0	1/2	Landscape	Across	1	No
F10101LD	0	1/2	Landscape	Down	1	No
F1OGL	0	0	Portrait	Across	1	No

Note: The IBM-supplied form definitions do not set the print quality for the 4224, 4230, and 4234 printers. You must set the print quality on the printer operator panel when using an IBM-supplied form definition.

Downloaded from System/370

Form definitions can also be downloaded from the System/370. These form definitions cannot be altered by the AS/400 system operator. If changes need to be made to any form definition, the System/370 site must be notified.

When these form definitions are received from System/370, you place them in a data file. In order to convert this form definition data to a format that can be used by the AS/400 system, use the **CRTFORMDF** (Create Form Definition) command.

For detailed information on the CRTFORMDF command, see the *CL Reference* manual.

Inline from System/370

Form definitions can also be part of the AFPDS file that is sent to the AS/400 system. That is, the form definition and the data all come in one large data stream. Here again, if any change is needed to the form definition, the System/370 site must be notified.

Fonts and Font Libraries

When a printer writer is started for an AFP-configured printer, the system searches for the specified font in the user's library list and then the IBM-supplied font libraries. The IBM-supplied font libraries are:

- QFNTCPL

  This library contains the OS/400 compatibility fonts. These are the fonts shipped with the AS/400 system.

- SBCS font libraries numbered QFNT01 through QFNT19 and DBCS font libraries numbered QFNT61 through QFNT69.

  These are the font libraries that support various IBM licensed programs on the AS/400 system.

Any of those libraries that are found are put in the library list of the job printing the spooled file. These font resource libraries are then available for printing spooled files even though they were not in the library list of the job (user) that originally created the spooled file. Also, if you have acquired additional font resources, you could store them in these IBM-supplied font libraries. Storing them in the IBM-supplied libraries provides widespread access based on the way the system searches for a font.

Putting the font resource in a separate library that is not one of the QFNTxx libraries listed above requires that users have that library specified in their library list when the spooled file is created.

Font Resource Objects

A font is a collection of characters of a certain size, typeface, and type style. Each character in a font is identified by a 1-byte or a 2-byte code. The internal structure of fonts depends on whether the font is for a phonetic writing system, like English, or for a nonphonetic writing system, like Kanji.

At least two resources are needed to make up a font: a font character set and a code page. A third resource, a coded font, can define a font by naming a font character set and a code page.

Font Character Set

This resource contains the raster patterns for each character in the font and associates an 8-byte character identifier with each pattern. This resource also contains descriptive information for the entire character set.

Code Page

This resource associates code points with character identifiers, each representing a character raster pattern. A code point is an 8-bit binary number representing one of 256 potential characters.

Coded Font

This resource associates one or more code pages with the appropriate font character sets.

Fonts from System/370

Fonts may be sent to the AS/400 system from the System/370. Check your licensing agreements to see if they preclude the transfer of printer resources between systems.

Font resources can be downloaded from the System/370. These font resources can not be altered by the AS/400 system operator. If changes need to be made to any font resources the System/370 site must be notified.

When these font resources are received from the System/370, you place them in a data file. In order to convert these font resources to a format that can be used by the AS/400 system, you use the **CRTFNTRSC** (Create Font Resource) command.

For detailed information on the CRTFNTRSC command, see the *CL Reference* manual.

3800 Printer Font Restrictions on the AS/400 System

You can receive data from a System/370 that was generated to print on a 3800 printer using 3800 printer font character sets.

However, the AS/400 system does not support the 3800 printer and its font character sets.

Do not receive 3800 printer font character sets on the AS/400 system.

If you have AFPDS data that calls for a 3800 font and you have the 3800 printer font character sets on the system, the system will try to use them and you will get an error when the data prints.

Instead, download the 3820 printer font character sets from the System/370. When the data generated for the 3800 printer starts to print, the AS/400 system will substitute the 3820 printer font character sets.

Note: The naming convention for 3800 printer font character sets is: C1xxxxxx. The naming convention for 3820 printer font character sets is: C0xxxxxx.

Fonts Provided by the OS/400 Program

The compatibility set is provided to allow native AS/400 system applications to print on the 3820, 3825, 3827, 3828, 3829, 3831, 3835, and 3900 Printers. The numeric font identifiers specified in the AS/400 application are translated into one of the fonts in the compatibility set.

The following font families comprise the IBM-supplied compatibility font set that is provided with the OS/400 program for advanced function printing:

- APL
- Boldface
- Courier
- Document
- Essay
- Format
- Gothic
- Orator
- Prestige
- Proprinter Emulation
- Roman
- Script
- Serif
- Symbol Set
- Text

When your operating system was loaded, you had to choose to install or not install IBM-supplied fonts. If you chose not to install the fonts at that time, and now wish to install them, use the *Licensed Programs and New Release Installation Guide* to install the fonts.

Advanced Function Printing Fonts/400 (Program 5738-FNT)

The licensed program Advanced Function Printing Fonts/400 contains all the fonts listed below. They can also be purchased individually.

- Sonoran Serif**[1]
- Sonoran Serif Headliner
- Sonoran Sans Serif**[2]
- Sonoran Sans Serif Headliner
- Sonoran Sans Serif Condensed
- Sonoran Sans Serif Expanded
- Monotype Garamond**
- Century Schoolbook**
- Pi and Specials
- ITC Souvenir**
- ITC Avant Garde Gothic**
- Mathematics and Science
- Optical Character Recognition (OCR-A and OCR-B)
- DATA1
- APL2

If you purchase any of the fonts and want to install them, you will have to use the *Licensed Programs and New Release Installation Guide* to install the fonts.

For information on font substitution go to Appendix D, "Working with Fonts, Font Character Sets, Code Pages, CHRIDs, and Coded Fonts" on page D-1.

AS/400 Core Fonts PRPQ (Program 5799-FDK)

The AS/400 Core Fonts PRPQ contains 240- and 300-pel core fonts. Also included are the 300-pel fonts for the OS/400 compatibility set.

These fonts are for use on AFP-capable, non-impact printers.

Font families for the 240- and 300-pel core fonts are:

- Times New Roman
  - Latin 1
  - Latin 2/3/5
  - Latin 4
  - Cyrillic Greek
  - Symbol
  - ITC Boutros Setting**
  - Narkissim
- Helvetica**
  - Latin 1
  - Latin 2/3/5

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1 Sonoran Serif is a functional equivalent of Monotype Times New Roman.

2 Sonoran Sans Serif is a functional equivalent of Monotype Arial.

  - Latin 4
  - Cyrillic Greek
  - Symbol
  - ITC Boutros Modern Rokaa**
  - Narkiss-Tam
- Courier
  - Latin 1
  - Latin 2/3/5
  - Latin 4
  - Cyrillic Greek
  - Symbol
  - Boutros Typing
  - Shalom
- Monthob
  - Thai

  Note: Monthob family is available in 240-pel only.

Language Groups and Complements

The Latin-1 language group includes Belgian (French and Dutch), Brazilian Portuguese, Canadian French, Catalan, Danish, Dutch, Finnish, French, German, Icelandic, Italian, Latin American Spanish, Norwegian, Portuguese, Spanish (Castillian), Swedish, Swiss (German, French, and Italian), United Kingdom English, and United States English.

The Latin-2 language group includes Croatian, Czech, German (G.D.R), Hungarian, Polish, Romanian, Slovak, and Slovenian.

The Latin-3 language group includes Esperanto, Maltese, and Turkish.

The Latin-4 language group includes Estonian, Greenlandic, Lithuanian, Lapp, and Latvian.

The Latin-5 language group includes Turkish.

Complements are combinations of language groups. The complements provided are as follows:

- Latin-1 complement consists of the Latin-1 language group.
- Latin-2/3/5 complement consists of the Latin-2, Latin-3, and Latin-5 language groups.
- Latin-4 complement consists of the Latin-4 language group.
- Cyrillic Greek complement consists of the Cyrillic and Greek language groups.

300-Pel Compatibility Fonts

The following font families comprise the 300-pel fonts that match the IBM-supplied compatibility font set that is provided with the OS/400 program for advanced function printing:

- APL
- Boldface
- Courier
- Document
- Essay
- Format
- Gothic

- Orator
- Prestige
- Proprinter Emulation
- Roman
- Script
- Serif
- Symbol Set
- Text

Advanced Function Printing DBCS Fonts/400 (Program 5738-FN1)

The licensed program Advanced Function Printing DBCS Fonts/400 contains all the fonts listed below. Each of the five features can be ordered separately.

- AS/400 Font DBCS - Japanese
- AS/400 Font DBCS - Korean
- AS/400 Font DBCS - Traditional Chinese
- AS/400 Font DBCS - Simplified Chinese
- AS/400 Font DBCS - Thai

Page Segments

Page segments are objects containing composed text and image, prepared before formatting and included during printing.

For example: you may want to repeat constant data at different positions on a page or overlay, and you may also want to repeat that data on different pages or overlays. You can do this by using a page segment. A company logo is an example of this type of data.

Using the Advanced Function Printing Utilities/400 licensed program or the AFP printer drivers provided with Microsoft** Windows or OS/2 2.0, you can create page segments on the AS/400 system. Page segments can also be downloaded from System/370. The page segments must be stored in an accessible library.

When page segment data is received from the System/370, you place it in a data file. In order to convert the page data to a format that can be used by the AS/400 system, use the **CRTPAGSEG** (Create Page Segment) command.

For detailed information on the CRTPAGSEG command, see the *CL Reference* manual.

Overlays

Overlays are a collection of predefined data (such as lines, shading, text, boxes, or logos) that can be merged with variable data on a sheet while printing is being performed.

To use overlays, specify them in the front and back overlay parameters of the printer file being used with your application: temporarily using an Override with Printer File (OVRPRTF) command, permanently using the Change Printer File (CHGPRTF) command, or before the spooled file prints using the Change Spooled File Attributes (CHGSPLFA) command.

You can also use the DDS OVERLAY keyword to include overlays with your printed output.

The licensed program Advanced Function Printing Utilities/400 (5738-AF1) or the AFP printer drivers provided with Microsoft Windows or OS/2 2.0 provide the capability to create overlays on the AS/400 system. Page overlays can also be downloaded from the System/370.

The overlays must be stored in an accessible data file.

When overlay data is received from the S/370, you place it in a data file. In order to convert the page overlay data to a format that can be used by the AS/400 system, use the **CRTOVL** (Create Overlay) command.

For detailed information on the CRTOVL command, see the *CL Reference* manual.

Page Definitions

Page definitions are resources that format and compose line data into pages. A page definition contains printing controls that specify:

- Where data from each input record is to be printed
- Page size (height and width)
- Data fields that can be suppressed
- Print positions for line-data records containing carriage-control characters
- Inline printing direction
- Number of lines per inch
- List of page segments that may be used
- List of overlays that may be used
- Record definitions
- Constant data to be printed
- List of fonts that may be used

The page definitions shown in Table 10-1 are provided with the AS/400 system in library QSYS.

Table 10-1. IBM-Supplied Page Definitions.

Name	Size of Form	Orientation on Page	Description
P1A06462	8.5 x 11.0 inches	Portrait	Letter size. 6 lines per inch (LPI). 64 lines per page
P1A08584 [1]	9.5 x 11.0 inches	Portrait	Continuous forms. 8 lines per inch (LPI). 85 lines per page.
P1A08682	8.5 x 11.0 inches	Portrait	Letter size. 8 lines per inch (LPI). 86 lines per page.
P1B08262	8.5 x 14.0 inches	Portrait	Legal size. 6 lines per inch (LPI). 82 lines per page.
P1B04963	8.5 x 14.0 inches	Portrait	Legal size. 6 lines per inch (LPI). 82 lines per page.
P1B11082	8.5 x 14.0 inches	Portrait	Legal size. 8 lines per inch (LPI). 110 lines per page.
P1B06683	14.0 x 8.5 inches	Landscape	Legal size. 8 lines per inch (LPI). 66 lines per page.
P1C09182	8.27 x 11.69 inches	Portrait	Legal size. 8 lines per inch (LPI). 91 lines per page.
P1D08462	14.33 x 10.12 inches	Landscape	B4 size forms. 6 lines per inch (LPI). 84 lines per page.
P1D08083	14.33 x 10.12 inches	Landscape	B4 Size forms. 8 lines per inch (LPI). 80 lines per page.
P1D11382	10.12 x 14.33 inches	Portrait	B4 Size forms. 8 lines per inch (LPI). 113 lines per page.
P1J04964 [1]	12.0 x 8.5 inches	Landscape	Continuous forms. 6 lines per inch (LPI). 49 lines per page.
P1J06484 [1]	12.0 x 8.5 inches	Landscape	Continuous forms. 8 lines per inch (LPI). 64 lines per page.
P1L06464 [1]	14.88 x 11.0 inches	Landscape	Continuous forms. 6 lines per inch (LPI). 64 lines per page.
P1L08584 [1]	14.88 x 11.0 inches	Landscape	Continuous forms. 8 lines per inch (LPI). 85 lines per page.
P1V04863	8.27 x 11.00 inches	Portrait	Combined letter/A4 size forms. 6 lines per inch (LPI). 48 lines per page.
P1V06483	8.27 x 11.00 inches	Portrait	Combined letter/A4 size forms. 8 lines per inch (LPI). 64 lines per page.
P1V06683	8.27 x 11.00 inches	Portrait	Combined letter/A4 size forms. 8 lines per inch (LPI). 66 lines per page.
P1W240F3	8.27 x 11.00 inches	Portrait	Combined letter/A4 size forms using MULTIUP. 15 lines per inch. 240 lines printed per page. 4 logical pages printed on one physical page.
P1W120C2	8.27 x 11.00 inches	Portrait	Combined letter/A4 size forms using MULTIUP. 12 lines per inch. 120 lines printed per page. 2 logical pages printed on one physical page.
P1W12883	8.27 x 11.00 inches	Portrait	Combined letter/A4 size forms using MULTIUP. 8 lines per inch. 128 lines printed per page. 2 logical pages printed on one physical page.

Note:

[1] Can only be used with the 4224, 4230, and 4234 printers.

When page definition data is received from the S/370, you place it in a data file. To convert the page definition data to a format that can be used by the AS/400 system, use the **CRTPAGDFN** (Create Page Definition) command.

For detailed information on the CRTPAGDFN command, see the *CL Reference* manual.

What to do next

Once you are sure you have all the above resources in place, go to Chapter 11, "Printing AFPDS Data" on page 11-1.

Chapter 11. Printing AFPDS Data

This chapter discusses two ways of printing AFPDS data:

- Go to "Printing AFPDS Data Generated on the AS/400 System" to read about printing AFPDS data that was generated on the AS/400 system.
- Go to "System/370 AFPDS and Line Data" on page 11-2 to read about printing AFPDS and line data generated on a System/370.

Printing AFPDS Data Generated on the AS/400 System

Follow these steps to generate and print AS/400 AFPDS data:

Step 1 Creating AFPDS data.

- You can create AFPDS data on the AS/400 system from applications using a printer file with the device type (DEVTYPE) parameter value set to *AFPDS.
- You can create AFPDS data with DDS printing functions that are tailored for use with AFPDS. For more information about the DDS functions that support AFPDS, go to "Special DDS Considerations for AFPDS" on page 2-76.
- You can create and print AFPDS data from an existing database file, merged with an overlay, using the Advanced Function Printing Utilities/400 licensed program.

  You can learn more about this licensed program by going to "Advanced Function Printing Utilities/400" on page 14-1.

Step 2 Using overlays.

After overlays are created and placed in a library, you can use them by specifying them in the front overlay (FRONTOVL) and back overlay (BACKOVL) parameters of a printer file.

Overlays can also be specified using the DDS OVERLAY keyword. For more information on using overlays in a printer file, go to "Using the Overlay (OVERLAY) DDS Keyword" on page 2-86.

Step 3 Using application program.

The application program that creates the data to be used with the overlays may need to be tailored so that the printed output fits with the overlays that you designed.

Tailoring the program to fit the overlay is similar to tailoring the program to work with a pre-printed form.

System/370 AFPDS and Line Data

From an advanced function printing (AFP) perspective, data sent to the AS/400 system from the System/370 can be any of the following:

- Print Data (letters, documents, and so on)
  - Advanced Function Printing Data Stream (AFPDS)
  - AFPDSLINE (AFPDS and line data mixed)

    AFPDSLINE is data that has a mixture of line data and AFPDS data. AFPDSLINE contains data that specifies placement and presentation information needed for printing.
  - LINE (line data)

    Line data is data that has been prepared for printing on a line printer. Line data does not contain all placement or presentation information that is needed for printing on page printers. Line data is created on the System/370 computer.
- Resources
  - Fonts
  - Form definitions
  - Overlays
  - Page definitions
  - Page segments

Working with the System/370

Communication with the System/370 is important to determine how the System/370 will send data to your AS/400 system.

When data is sent from a System/370 to the AS/400 system, it can go directly to the output queue of a designated user ID or it can go into your network files.

Notes:

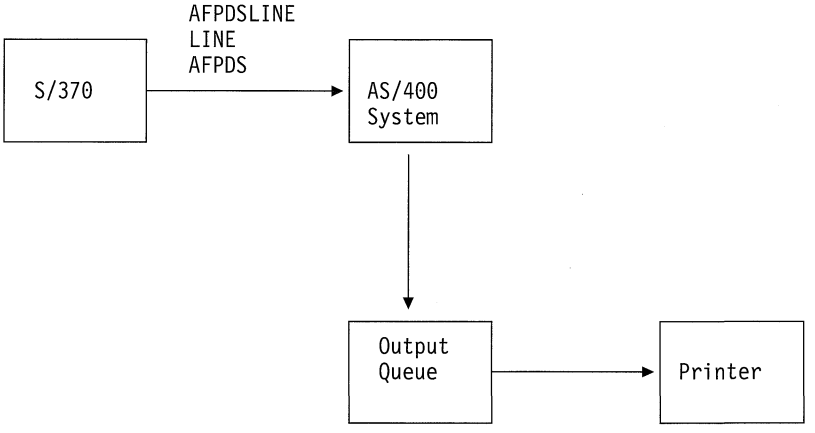
1. Sending print data to the output queue of a user ID is supported only when your host System/370 RSCS/JES subsystem is connected to the AS/400 system VM/MVS Bridge. Refer to the *Communications: Distribution Services Network Guide*, SC41-9588, for information on configuring the VM/MVS Bridge.
2. To send data to another system (AS/400 system or System/370), you can use the Send Network Spooled File (SNDNETSPLF) command. Go to "Using the Send Option" on page 3-17 for more information about this command.
3. The *Distribution Services Network Guide* contains information on how to create communications networks that enable you to send data from the AS/400 system to other systems.

If the data consists of print data (AFPDS, LINE, or AFPDSLINE data), the data can be sent directly to an output queue of a specified user ID on the AS/400 system. AFPDS data can go to your network files, but you must then use the Print Advanced Function Printer Data (PRTAFPDTA) command to put the file on an output queue.

If the data consists of resources (fonts, form definitions, overlays, page definitions, or page segments), the data must go into your network files.

Sending Print Data to the Output Queue of a User ID

The destination of print data sent from a System/370 to an AS/400 system should be the output queue of a specified user ID. The following diagram shows the flow of the print data.



Sending Print Data from VM System/370 to a User's Output Queue on an AS/400 System

A VM System/370 can issue either a PRINT command or a PSF command to place a file directly into an AS/400 user's output queue.

Using the PRINT Command: The following set of commands places the file named `reports letter a` into the output queue of the user named `userone` on the AS/400 system with a node ID of `as4002`.

```
'TAG DEV PRT as4002 userone'
'SPOOL PRT TO rscs COPY 1'
'PRINT reports letter a (NOCC'
```

Using the PSF Command: The following set of commands places the LINE data spooled file named `reports letter a` into the output queue of the user named `userone` on the AS/400 system with a node ID of `as4002`. A PAGEDEF will be used when the data is printed.

When using the PSF command, you must place the characters P1 in front of the PAGEDEF name. When using a FORMDEF, you must place the characters F1 in front of the FORMDEF name. This example uses PAGEDEF; the PAGEDEF object name in the command is P1MYFORM.

```
'TAG DEV PRT as4002 userone'
'SPOOL PRT TO RSCS COPY 1'
'PSF reports letter a (PAGEDEF (P1MYFORM RESOURCE A))'
```

Sending Print Data from MVS System/370 to a User's Output Queue on an AS/400 System

The following set of commands, when issued by an MVS System/370, places the AFPDS spooled file into the output queue of the specified user on an AS/400 system.

These commands are job control language (JCL) commands. Do not place a P1 (for PAGEDEF) or an F1 (for FORMDEF) in the instructions. In the example below a FORMDEF named MYFORM is used.

```
//INSTR       PROC     NODE='as4002',USER='userone'
                       INFILE='dept265.userx.files(report)'
//SPOOL       EXEC     PGM=IEBGENER
//MYOUT       OUTPUT   DEST=NODE..USER,
                       COPIES=1,
                       FORMDEF=MYFORM
//SYSPRINT    DD       SYSOUT=*
//SYSIN       DD       DUMMY
//SYSUT1      DD       DSN=&INFILE,DISP=SHR,DCB=(RECFM=FBA)
//SYSUT2      DD       SYSOUT=A,OUTPUT=*.MYOUT
// PEND
//STEP01      EXEC     PROC=INSTR
```

System/370 Parameters and Matching AS/400 Printer File Parameters

Be aware of the following special considerations when working with these System/370 (VM and MVS) parameters:

FCB If you specify the FCB parameter on VM or MVS, the printer file of that name in the library list of the user receiving the spooled file on the AS/400 system is used. If the FCB parameter is not specified, the AS/400 system printer file QSYSPRT is used.

BIN AND DUPLEX If the BIN and DUPLEX parameter values are not specified from VM and MVS and the form definition is not specified from VM or MVS, the values for the AS/400 system DRAWER and DUPLEX parameters are taken from the printer file specified in the FCB parameter. If the FCB parameter is not specified, the DRAWER and DUPLEX values are set to *FORMDEF, meaning that the values are taken from the form definition.

FORMDEF If the form definition (FORMDEF) parameter is not specified from VM or MVS, the AS/400 system form definition parameter value is set to *DEVD and *LIBL is used for the library. *DEVD means the form definition used is the one specified in the device description for the printer you want to use.

The following System/370 parameters are supported when data is sent directly to the output queue of a user on the AS/400 system.

If a System/370 printer parameter that is not in this table is specified, and there is no matching or equivalent AS/400 printer file parameter, the System/370 printer parameter is ignored when the data is printed on the AS/400 system.

Table 11-1. VM System/370 Parameters

System/370 Printer Parameter Names	VM Commands	Function	AS/400 Printer File Parameter Names
BIN	PSF	Specifies which drawer or bin the paper is taken from.	DRAWER
CC	PRINT, PSF	Specifies control characters.	CTLCHAR[1]
CHARS	SPOOL	Specifies a table of coded fonts.	No equivalent AS/400 parameter
COPY	SPOOL	Specifies the number of copies.	COPIES
DATACK	PSF	Specifies whether or not the printer will block print positioning and invalid character errors. Twinaxial attached printers will always block print positioning and invalid character errors unless the printer file used to create the spooled file has the fidelity parameter value set to *ABSOLUTE.	No equivalent AS/400 parameter
DEST	TAG	Specifies node and user ID.	No equivalent AS/400 parameter
DUPLEX	PSF	Specifies if duplex printing is to be used.	DUPLEX
FCB	SPOOL, TAG	Specifies the printer file used.	FILE
FORM	SPOOL	Specifies the form type to be used.	FORMTYPE
FORMDEF	PSF	Specifies the form definition to be used.	FORMDF
PAGEDEF	PSF	Specifies the page definition to be used.	PAGDFN
PRMODE	PSF	Specifies the device type, ideographic character data, processing shift-out/shift-in characters.	DEVTYPE, IGCDTA, IGCSOSI
TRC	PRINT, PSF	Specifies if the data stream contains table reference codes.	No equivalent AS/400 parameter

[1] In order to correctly print System/370 line data with first-character forms control, each channel value specified in the CTLCHAR parameter must have a unique line number associated with that channel value.

Table 11-2. MVS System/370 Parameters

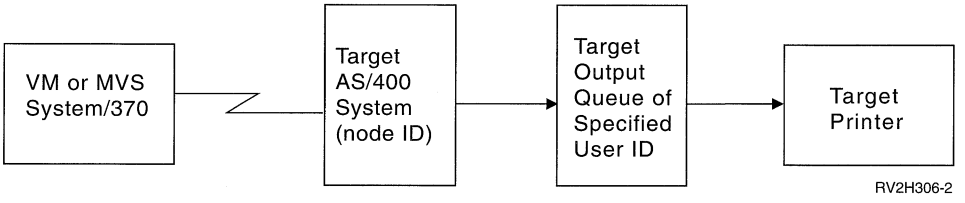
System/370 Printer Parameter Names	MVS JCL Statements	Function	AS/400 Printer File Parameter Names
CHARS	DD, OUTPUT	Specifies a table of coded fonts.	No equivalent AS/400 parameter
CONTROL	OUTPUT	Specifies line spacing.	No equivalent AS/400 parameter
COPIES	DD, OUTPUT	Specifies the number of copies.	COPIES
DATACK	OUTPUT	Specifies whether or not the printer will block print positioning and invalid character errors. Twinaxial attached printers will always block print positioning and invalid character errors unless the printer file used to create the spooled file has the fidelity parameter value set to *ABSOLUTE.	No equivalent AS/400 parameter
DCB=RECFM	DD	Specifies control characters.	CTLCHAR[1]
DEST	DD, OUTPUT	Specifies node and user ID.	No equivalent AS/400 parameter
FCB	DD, OUTPUT	Specifies the printer file used.	FILE
FORMDEF	OUTPUT	Specifies the form definition to be used.	FORMDF
FORMS	OUTPUT	Specifies the form type to be used.	FORMTYPE
PAGEDEF	OUTPUT	Specifies the page definition to be used.	PAGDFN
PRMODE	OUTPUT	Specifies the device type, ideographic character data, processing shift-out/shift-in characters.	DEVTYPE, IGCDTA, IGCSOSI
TRC	OUTPUT	Specifies if the data stream contains table reference codes.	No equivalent AS/400 parameter

[1] In order to correctly print System/370 line data with first-character forms control, each channel value specified in the CTLCHAR parameter must have a unique line number associated with that channel value.

Managing Print Data Sent to an AS/400 Output Queue

The ability of the System/370 to send these files directly to the output queue of a specified user ID on the AS/400 system eliminates the steps of receiving the files to a library and then using the PRTAFPDTA command to print them. The following diagram shows the path of the files from the System/370 to the AS/400 printer.

Note: If you cannot find the spooled file on the output queue of the specified user ID, look in the QNFTP job log for informational, diagnostic, and error messages. The QNFTP job runs under the QSNADS user profile.



Target AS/400 System

The target AS/400 system is the system in a communications network that the System/370 is sending the files to. The AS/400 system is providing the function of a file server for the host System/370. The AS/400 system is known to the host System/370 by a unique node name (node ID).

Note: The target user ID must have access to the libraries containing the resources (overlays, fonts, page segments) that the spooled file needs when it prints on the AS/400 system. Go to "Working with AFP Resources and Libraries" on page 10-2 for more information about resources and libraries.

Target User ID

The host System/370, working with the AS/400 system, can send spooled files directly to the output queue of a specified user ID. This capability eliminates manually receiving spooled files and then using the PRTAFPDTA command to print the files.

Target Output Queue

Caution should be used when having the sent file placed directly on the output queue. Spooled files placed directly into the output queue of the user ID could be printed without the owner of the user ID being aware of it if a printer is active for that output queue.

Possible solutions are:

- Create a special user ID and a special output queue for that user ID.

  You could then sign on using that user ID and assign a printer to your output queue to print the spooled files.
- Make sure the output queue of the receiving user ID is held before the System/370 sends the files.
- Use the End Writer (ENDWTR) command to end the printer assigned to that output queue before the System/370 sends the files.

Target Printer

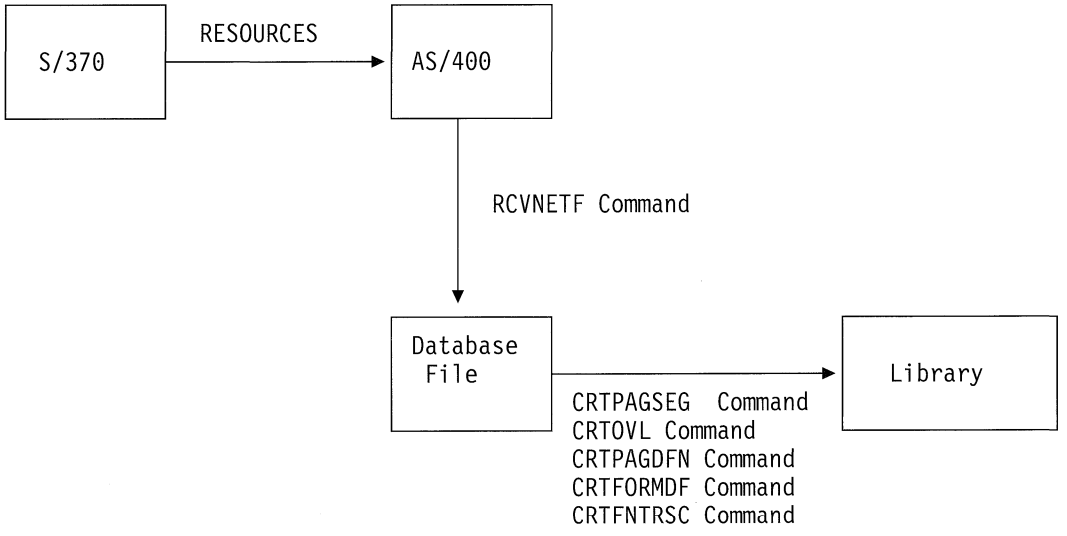
Make sure that the printer you want to print the files on is assigned to the correct output queue. If any special handling of the printer is necessary (form choice, drawer selection, envelopes, and so on), it should be done before the files are sent.

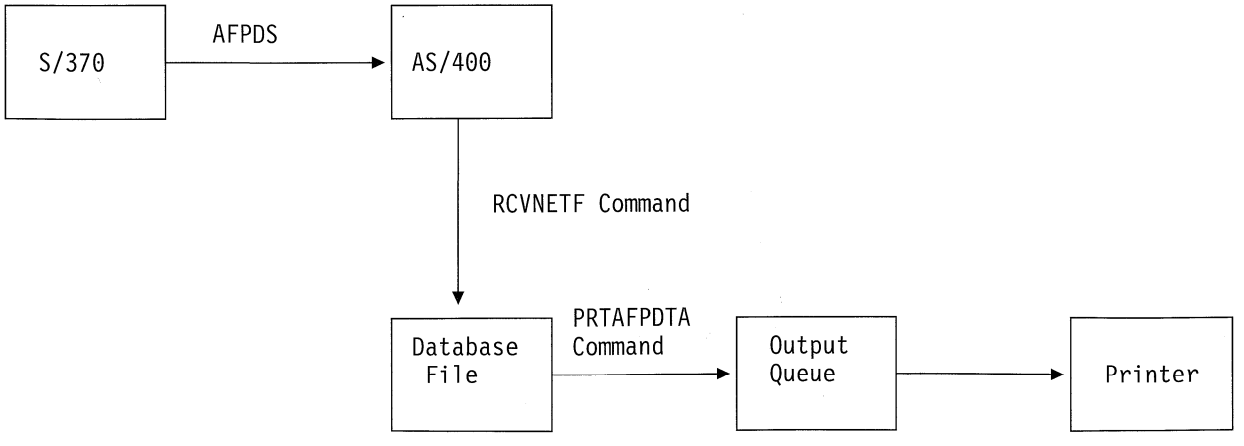
Sending Resources and AFPDS Data to Network Files

The destination of advanced function printing resources (fonts, overlays, page segments, page definitions, and form definitions) sent from a System/370 to an AS/400 system must be network files.

Note: AFPDS data can also be sent to network files. However, this is not the recommended way to send this data to an AS/400 system. If you choose this way, you must use the Print Advanced Function Printer Data (PRTAFPDTA) command to put the file on an output queue.

Below is a diagram that shows the flow of the resources and AFPDS data sent from System/370 to network files on the AS/400 system.





Sending Resources and AFPDS Data from VM System/370 to Network Files

The following command, when issued by a VM System/370, places the specified file into the network files of a user on an AS/400 system.

```
SENDFILE fonts resource a TO userone AT as4002
```

Sending Resources and AFPDS Data from MVS System/370 to Network Files

The following command, when issued by an MVS System/370, places the specified file into the network files of a user on an AS/400 system.

```
TRANSMIT as4002.userone DSNAME('system.afp.resources(font)')
```

Receiving Resources and AFPDS Data Sent to Network Files

To make receiving resources and AFPDS data as easy as possible, you should be aware of the following:

- Make sure you do not send LINE data or mixed data (AFPDSLINE data) to network files.
- The AFPDS files, as they exist on System/370, are in variable-length record format. Make sure the System/370 site converts the AFPDS files to a fixed length record format. If this is not done prior to sending the AFPDS files, large amounts of AS/400 system disk space will be required. You need to reach an agreement with the System/370 site as to what fixed-length record format you will use; for example, 4000 bytes. AFPDS records longer than the fixed-length record size must be converted into multiple fixed-length records, with the last record padded out with blank characters (if necessary).
- Before receiving AFPDS files from the System/370, you should consider creating a fixed-length physical data file to hold the files from the System/370. The command to do this is the CRTPF (Create Physical File) command.

  The length of the records in the physical data file should be the number that you and the System/370 site agreed to; for example, 4000 bytes.

Many types of resources are sent to the AS/400 system. Administratively, it is more convenient to store the different types of resources in separate physical files. That is, put all the font data in a physical file that contains only fonts, the overlay data in a physical file that contains only overlays, and so on.

The following sample command creates a physical file that can receive resources and AFPDS data:

```
CRTPF FILE(MYLIB/MYFILE) RCDLEN(4000) MBR(*NONE) MAXMBRS(*NOMAX) LVLCHK(*NO)
```

Using the Work with Network Files (WRKNETF) and Receive Network File (RCVNETF) Commands

These commands can be used to receive resources and AFPDS files from the System/370.

To see a prompt display for these commands, type WRKNETF or RCVNETF and press F4 (Prompt).

The Work with Network Files (WRKNETF) command allows you to work with a list of files that have arrived for a user, or creates a database file containing a list of the files.

If the list is displayed, you can enter an option to select a function to be performed on the file. You can:

- Receive the file into a user file.
- Delete the file.
- Browse the file (not valid for save files).
- Submit files (submit the job).

Restrictions: (1) A user with security officer authority can display the network files for any user. If you are not the security officer, you can display only those files that were sent to you or to your group profile. (2) To perform any of the options from this display, you must be authorized to the command corresponding to that option. For example, you must be authorized to the Browse Physical File Member (BRWPFM) command for the browse function, and the Submit Database Jobs (SBMDBJOB) command for the submit job function.

Examples

The following command allows you to work with all network files for the user running this command.

```
WRKNETF
```

If the command is issued as an interactive job, the list of files is displayed at the requesting work station. If the command is issued as a batch job, the list of files is printed with the job's spooled output.

The following command allows you to work with the network files for USR1 and prints the output with the job's spooled output.

```
WRKNETF  USER(USR1)  OUTPUT(*PRINT)
```

This command can only be issued by USR1, a member of the USR1 group, or a user with security officer rights.

The following command allows you to work with the network files for all users and is written to the first member of a database file named NETFILES.

```
WRKNETF  USER(*ALL)  OUTPUT(*OUTFILE)  OUTFILE(NETFILES)
```

If the file exists in a library on the library list, the existing file is used; otherwise, the file is created in library QGPL. If the file did not exist, or did not contain any members, a member with the same name as the file is added to the file; otherwise, the first member of the file is cleared and used. This command can be issued only by a user with security officer rights.

The following command receives the network file SCRIPT, member $REPORT, into a physical file named MYFILE in library MYLIB.

```
RCVNETF FROMFILE(SCRIPT) TOFILE(MYLIB/MYFILE) FROMMBR($REPORT)
```

The new member in MYFILE is $REPORT.

For more information on the WRKNETF or RCVNETF commands, see the *CL Reference* manual.

Creating Resources on the AS/400 System

When resource data is received from System/370, use the following commands to convert the resources to a format that can be used by the AS/400 system.

- CRTPAGSEG
- CRTOVL
- CRTFORMDF
- CRTFNTRSC
- CRTPAGDFN

For more information on how to use these commands go to Chapter 10, "Resources Needed to Perform Advanced Function Printing (AFP)" on page 10-1 or see the *CL Reference* manual.

Printing AFPDS Data on the AS/400 System

The PRTAFPDTA command can be used to print AFPDS files.

If you want to use a prompt display with this command, type PRTAFPDTA and press F4 (Prompt).

Notes:

1. The PRTAFPDTA command prints AFPDS data. Any padding between the AFPDS structured fields must be hex 40. The padding cannot be hex 00.
2. When using the PRTAFPDTA command, do not override the DEVTYPE parameter on the QSYSPRT printer file.
3. When using the PRTAFPDTA command, the form definition usually identifies the drawer to print from. An exception is when an Override Printer File (OVRPRTF) command has been issued with a different drawer value. In this case, the drawer value is taken from the override command.

Examples

The following command prints the first member in file MYFILE starting with page 2 and ending on page 6.

```
PRTAFPDTA  FILE(MYLIB/MYFILE) STRPAGE(2)  ENDPAGE(6)
```

The following command prints the member $REPORT in file MYFILE using a form definition of F10101 and all available exception handling.

```
PRTAFPDTA  FILE(MYLIB/MYFILE) MBR($REPORT)  FORMDF(F10101)  FIDELITY(*CONTENT)
```

For more detailed information on the Print Advanced Function Printer Data (PRTAFPDTA) command, see the *CL Reference* manual.

Part 4. Other Printing Functions Available on the AS/400 System

Chapter 12. Working with the Host Print Transform Function

This chapter provides information about the host print transform function and how to enable it to work with existing emulators that support ASCII printers attached to the AS/400 system. The host print transform function is an OS/400 function that converts an SNA character string (SCS) data stream into an ASCII data stream. The ASCII data stream is then formatted and sent to an ASCII printer through one or more hardware connections, such as PC Support/400, or the 3477 or 3487 work stations. This single location of the conversion allows for consistent ASCII printing through any of the hardware connections.

Existing emulators (discussed in this chapter) that support ASCII printers are:

- IBM PC Support/400 work station function
- IBM 348x InfoWindow II display
- IBM 3477 InfoWindow display
- IBM 3197 Display Station
- IBM ASCII Work Station Controller
- 5250 Work Station Feature of the IBM OS/2 Extended Edition and Extended Services
- 5250 Emulation of the IBM OS/2 Communications Manager/2
- IBM RUMBA/400
- IBM Enhanced 5250 Emulation Program
- IBM Remote 5250 Emulation Program

These emulators receive the AS/400 data stream and convert it to an ASCII data stream. The most common of these conversions is the SCS-to-ASCII transform. However, the SCS-to-ASCII transform performed by each emulator is different. Additionally, each emulator supports a different set of ASCII printers.

Using the host print transform function eliminates the problems of different ASCII data streams and limited printer support, as well as providing other printing advantages.

Why Use the Host Print Transform Function?

The host print transform function allows the SCS-to-ASCII data stream conversion to take place on the AS/400 system instead of on an emulator. Having the conversion take place on the AS/400 system provides these advantages:

- Consistent output for most ASCII printers

  The host print transform function is capable of supporting many different types of ASCII data streams. For example, the Hewlett-Packard** printer control language (PCL), the IBM personal printer data stream (PPDS), and the Epson** FX and LQ data streams.

  Having the conversion done on the AS/400 system ensures that the resultant ASCII data stream provides the same printed output regardless of the emulator the printer is physically attached to.

- 3812 SCS Printer Emulation

  The host print transform function is based on the 3812 SCS printer emulation of the PC Support work station function. Using the host print transform function,

all of the ASCII printers connected to an AS/400 system can perform a 3812 SCS level of function.

Note: This level of function allows you to use all the functions provided by your ASCII printer. However, you cannot perform functions that your printer does not support.

- Support for many different ASCII printers

  Currently, each emulator supports a limited number of ASCII printers. With the host print transform function, most IBM printers and a large number of other printers are supported.

- Customized printer support

  Workstation customizing objects that come with the host print transform function can be updated by the user to change or add characteristics to a particular printer. Also, if the host print transform function does not have a workstation customizing object for a printer you want to use, you can create your own.

How the Host Print Transform Function Works

The host print transform function converts the SCS data stream just before it is sent to one of the existing emulators. The spooled file contains SCS data and not the converted ASCII data.

Note: The host print transform function also works with jobs sent directly to the printer (SPOOL(*NO) on the printer file).

Figure 12-1 shows the data stream origination, flow, and conversion for a spooled file when the host print transform function is enabled.

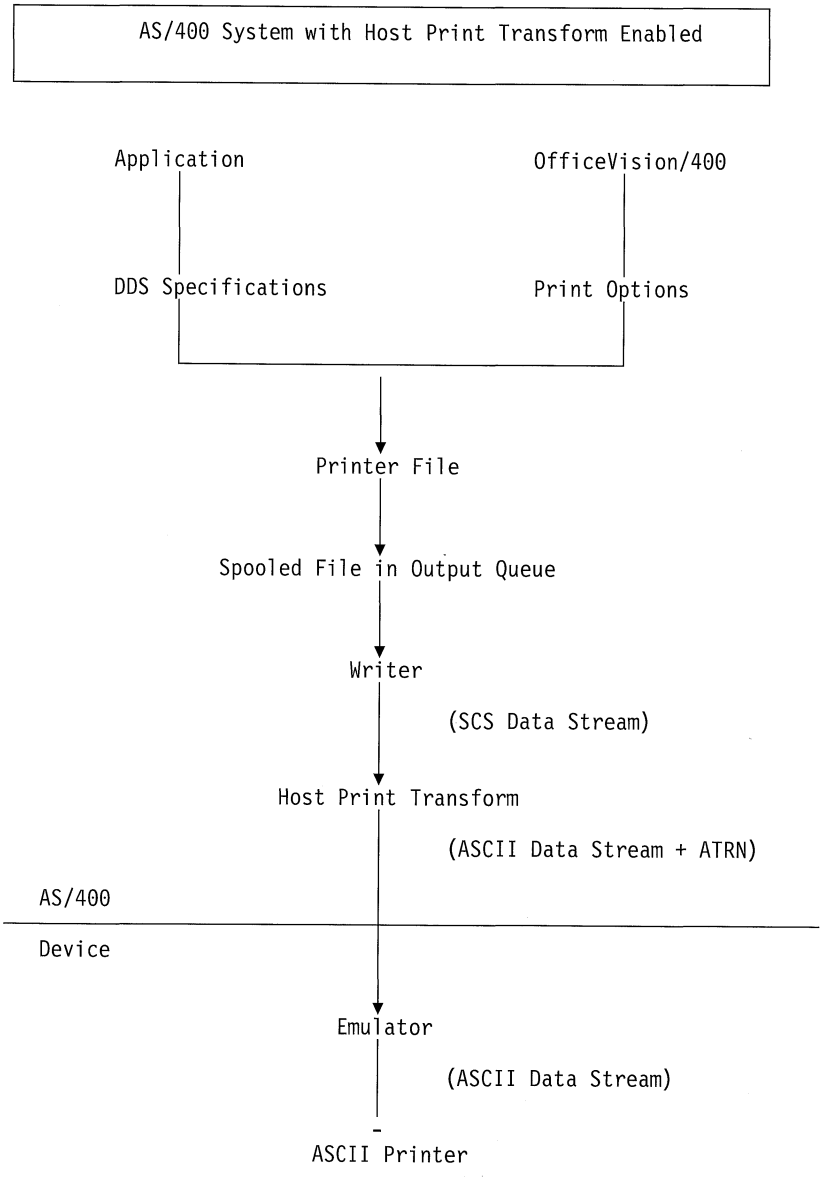


Figure 12-1. Data Stream Flow and Conversion using the Host Print Transform Function

ASCII printers support several different compositions of ASCII data streams. The host print transform function generates an ASCII printer data stream for a number of IBM and non-IBM printers. To generate the different ASCII data streams, the host print transform function uses AS/400 system objects that describe characteristics of a particular printer. The ASCII data stream is passed through the existing

emulator using the SCS ASCII Transparency (ATRN) command. The existing emulator deletes the ASCII Transparency commands and passes the ASCII data stream generated by the host print transform function to the personal printer.

Note: The emulator must support the SCS ASCII Transparency (ATRN) command to be used with the host print transform function. All the emulators described in this chapter support the ATRN command.

To enable the host print transform function, you work with the printer device description.

Enabling the Host Print Transform Function Using Printer Device Description Parameters

The host print transform function is enabled by selecting certain values for parameters in the printer device description. If you need more detailed information on these parameters, see the *Device Configuration Guide*.

Parameters Supporting the Host Print Transform Function

The following parameters on the printer device description are used by the host print transform function:

TRANSFORM
Host print transform function

***YES** Enables the host print transform function for this printer. This function is only to be used for ASCII printers.

***NO** Disables the host print transform function for this printer.

Note: When TRANSFORM(*YES) is specified, the FORMFEED parameter value for this device is ignored. The FORMFEED type is based on the value specified in the paper source 1 (PPRSRC1) parameter.

MFRTYPMDL
Manufacturer, type, and model.

Press F4 or the Help key for a list of printers supported by the host print transform function. Examples of the values for this parameter are *IBM4029 for the IBM 4029 LaserPrinter Model 10 or *HPIIID for the Hewlett-Packard LaserJet IIID**.

Note: You must choose a value for MFRTYPMDL if TRANSFORM(*YES) is specified. There is no default for this parameter. Default values for PPRSRC1, PPRSRC2, and ENVELOPE are selected based on the MFRTYPMDL value.

PPRSRC1
Paper source 1.

The value for this parameter is used to specify the size of the paper in drawer 1 or continuous size paper if applicable. Press F4 (Prompt) or the Help key for a list of paper sizes supported by the host print transform function.

Note: The paper size value is used by the host print transform function to support the computer output reduction (COR) function.

***MFRTYPMDL** This is the default. The AS/400 system substitutes the value that is most common for your printer. It substitutes *LETTER for all page printers, *CONT80 for narrow-carriage continuous-feed printers, and *CONT132 for wide-carriage continuous-feed printers. If the printer uses a paper size other than the default size, you should explicitly specify that size to completely support the COR function.

PPRSRC2

Paper source 2.

The value for this parameter is used to specify the size of the paper in drawer 2. The value in PPRSRC2 is ignored for continuous feed printers. Press F4 (Prompt) or the Help key for a list of paper sizes supported by the host print transform function.

***MFRTYPMDL** This is the default. The AS/400 system substitutes the value that is most common for your printer. It substitutes *LETTER for all page printers.

ENVELOPE

Envelope source.

The value for this parameter is used to specify the size of the envelope. Press F4 (Prompt) or the Help key for a list of envelope sizes supported by the host print transform function.

***MFRTYPMDL** This is the default. The AS/400 system substitutes a value of *NUMBER10 if your printer supports an envelope feeder.

ASCII899

ASCII code page 899 support.

***YES** Select *YES if your printer supports code page 899. Code page 899 is not resident on most ASCII printers. With the IBM 4029 LaserPrinter, a font card is required.

***NO** *NO is the default. If your printer does not support code page 899, use *NO.

The following additional parameter can be used by the host print transform function when a user-defined workstation customizing object is necessary. A user-defined customizing object for the printer is usually not needed due to the extended support provided by the host print transform function.

WSCST

Workstation customizing object and library.

If the host print transform function is enabled and an object name is specified on the WSCST parameter, that object must be compatible with the host print transform function.

See the *Operating System/400 Workstation Customization Function Programmer's Guide*, SC41-0056, for information about customizing objects for use with the host print transform function.

***NONE** The default is *NONE.

Working with Printer Device Descriptions

The host print transform function is enabled when you specify *YES for the TRANSFORM parameter in the printer device description. The TRANSFORM parameter can be specified when the printer device description is created or when you change an existing printer device description. Because of the complexity of creating a device description manually, it is recommended that you use automatic configuration. Then, after the device description has been created, change the device description to enable the host print transform function.

Notes:

1. Automatic configuration of devices (printers, in this case) attached to the ASCII Work Station Controller is not supported. The CRTDEVPRT command must be used to create the printer device description.
2. The work station function of PC Support/400 Version 2 Release 3 creates or changes its printer device descriptions based on the printer's session configuration. For this emulator, the host print transform function should be enabled by changing the session configuration on the personal computer and not the device description in the AS/400 system.

Creating Printer Device Descriptions Using a Command

You may not want your printer device descriptions to be created by automatic configuration, for example, if your printer is attached to the ASCII Work Station Controller.

In this case, you should create your printer device descriptions by typing the Create Device Description (Printer) (CRTDEVPRT) command and pressing F4 (Prompt). You will need to enter a value for most of the parameters. See "Enabling the Host Print Transform Function Using Printer Device Description Parameters" on page 12-4 for information on the parameters and values used by the host print transform function. For information on all printer device description parameters, see the *Device Configuration Guide*.

Automatically Creating Printer Device Descriptions

You can have printer device descriptions created automatically if the automatic configuration (QAUTOCFG) system value is *YES. The printer device description is automatically created when:

- A display or printer is powered on
- The personal computer or PS/2 emulation programs are started

To enable the host print transform function after automatic configuration, type the Change Device Description (Printer) (CHGDEVPRT) command and press F4 (Prompt).

Note: Before you change a printer device description, it is recommended that you:

- End the printer writer (ENDWTR command)
- Vary off the printer device (WRKCFGSTS command)

See "Enabling the Host Print Transform Function Using Printer Device Description Parameters" on page 12-4 for information on the parameters and values used by the host print transform function.

Note: The work station function of PC Support/400 Version 2 Release 3 can automatically configure printers with the host print transform function enabled.

Changing an Existing Printer Device Description

When working with existing printer device descriptions, you can enable the host print transform function by changing certain parameter values in the printer device description.

To enable the host print transform function, type the Change Device Description (Printer) (CHGDEVPRT) command and press F4 (Prompt).

Note: Before you change a printer device description, it is recommended that you:

- End the printer writer (ENDWTR command)
- Vary off the printer device (WRKCFGSTS command)

See "Enabling the Host Print Transform Function Using Printer Device Description Parameters" on page 12-4 for information on the parameters and values used by the host print transform function.

Note: The work station function of PC Support/400 Version 2 Release 3 can automatically configure printers with the host print transform function enabled.

Displaying the Printer Device Description

If you want to verify your host print transform function parameters, use the Display Device Description (DSPDEVD) command to display the printer device description. If the default value *MFRTYPMDL was specified for the PPRSRC1, PPRSRC2, and ENVELOPE parameters, the system-supplied values are shown when the device description is displayed.

Use the Change Device Description (Printer) (CHGDEVPRT) command to change any parameter values that are not correct for your printer.

Using the Host Print Transform Function with an Emulator

The following emulator products provide printer emulation for ASCII printers on the AS/400 system. Each section provides a brief description of the emulator, some advantages of using the host print transform function with this emulator, and suggested emulator configuration values.

Note: The host print transform function does not eliminate the need for existing emulators. Existing emulators are still necessary to attach the personal printer to the AS/400 system.

Go to Page	To Work With:
12-8	IBM PC Support/400 work station function program
12-9	IBM 348x InfoWindow II displays
12-11	IBM 3477 InfoWindow display
12-12	IBM 3197 Display Station
12-14	IBM ASCII Work Station Controller
12-15	IBM 5250 Work Station Feature (OS/2 Extended Edition and Extended Services)

	12-17	IBM 5250 Emulation (OS/2 Communications Manager/2)
	12-17	RUMBA/400
	12-18	IBM Enhanced 5250 Emulation Program or the S36/38 Work Station Emulation Program
	12-20	IBM Remote 5250 Emulation Program

Using the Host Print Transform Function with the IBM PC Support/400 Work Station Function

The PC Support/400 program provides the following data link control attachment of IBM personal computer systems for work station function and printer emulation:

- Twinaxial
- Token-ring
- Asynchronous
- Synchronous

The PC Support/400 work station function provides a DOS 5250 emulator for all of the supported PC Support connection methods. Up to five work station sessions, in any combination of display or printer sessions, can be configured. The work station function provides 3812 SCS printer emulation. The personal printer can be attached to the personal computer through either the parallel or serial interface.

Advantages of Using the Host Print Transform Function

The PC Support work station function generates similar data streams whether or not you use the host print transform function. However, using the host print transform function ensures consistency with other emulators. Additional functions that are supported by the host print transform function include color, more flexible code page selection, and better font support.

Configuration Recommendations

To use the host print transform function, change the printer session profile on the personal computer using the options on the CFGWSF configuration program. CFGWSF is the configuration program for the PC Support/400 work station function. The CFGWSF program provides options for specifying:

Printer manufacturer, type, and model
Paper sizes
Envelope sizes
Symbols code page support
Workstation customizing object.

When the printer session is started, these parameters are passed from the personal computer to the AS/400 system. The printer device description is created or changed to reflect the values passed from the CFGWSF program. Any changes must be made by changing the printer session profile on the personal computer instead of using the CHGDEVPRT command.

Maintaining Printer Customization

Before you do the work of creating a workstation customizing object for a printer, try printing jobs using the host print transform function support. You may not need to create a customizing object for the printer due to the extended support provided by the host print transform function.

The PC Support work station function uses the Printer Function Table Setup (PFTSETUP) program to customize features on a printer. If you have used PFTSETUP to customize a printer, use of the host print transform function overrides this customization.

However, if you need to customize your printer while using the host print transform function, you should:

1. Make a note of the printer features that you customized.

   You can use the PFTSETUP program to locate the customized features.

2. Transfer those customized features to an object compatible with the host print transform function.

   This means changing some features on this object to match the features you customized with the PFTSETUP program.

3. Use this object name as the value for the workstation customizing object parameter in that printer's session profile.

See the *Operating System/400 Workstation Customization Function Programmer's Guide*, SC41-0056, for detailed information on customizing printers.

Using the Host Print Transform Function with the 3486/3487/3488 InfoWindow Display

The 3486/3487/3488 InfoWindow II display stations are twinaxial display stations that attach to the AS/400 system using a twinaxial controller or a remote workstation controller. The displays support up to two display sessions and a printer session. The 3486/3487/3488 display provides 5256, 4214, or 3812 SCS printer emulation for many IBM personal printers and some Hewlett-Packard personal printers.

Advantages of Using the Host Print Transform Function

The host print transform function supports many more ASCII printers than are supported by the 3486/3487/3488 InfoWindow displays. Also, using the host print transform function ensures consistency with other emulators.

For some printers, additional fonts are available with the host print transform function. For example, without the host print transform function, type style selection with the IBM 2380 Personal Printer Series II is not supported because the 2380 is configured to emulate a 4214 SCS printer.

Configuration Recommendations

Configure printers that are supported by the InfoWindow display as recommended in the InfoWindow display's configuration menus. Configure any printer that is not included in the list of supported printers as a 4201/4202 printer.

When you leave the InfoWindow display's configuration menu, the printer device description is automatically created if both the following are true:

- The printer is powered on
- Automatic configuration is on

After the printer device description is created on the AS/400 system, enable the host print transform function using the CHGDEVPRT command. The display's printer configuration is not used after the host print transform function is enabled. The data stream generated for the printer is based on the MFRTYPMDL parameter value specified in the printer device description on the AS/400 system.

Note: Do not change the display's printer configuration after your device description has been created on the AS/400 system. Doing so can cause the AS/400 printer device description to be replaced. In this case, the host print transform function is no longer enabled. The CHGDEVPRT command can be used to enable the host print transform function again.

Maintaining Printer Customization

Before you do the work of creating a workstation customizing object for a printer, try printing jobs using the host print transform function support. You may not need to create a customizing object for the printer due to the extended support provided by the host print transform function.

The 348x displays can use a workstation customizing object (located in the device description of the display) to define the printer attached to it. Conversely, the host print transform function uses a workstation customizing object located in the device description of the printer. If you have customized some printer features in the display's workstation customizing object, use of the host print transform function overrides the customization.

However, if you need to customize your printer while using the host print transform function, you should:

1. Make sure the host print transform function is enabled.

   The TRANSFORM parameter value for the printer device description must be *YES.

2. Use a workstation customizing object that is compatible with the host print transform function.

   Customize the printer features in this object to match the customized features that you used in the display's workstation customizing object.

3. Use the workstation customizing object name that is compatible with the host print transform function as the value for the WSCST parameter in the printer device description.

   Remember: The location of the WSCST object name (in the printer device description, not the display device description) is important when using customization with the host print transform function.

See the *Operating System/400 Workstation Customization Function Programmer's Guide*, SC41-0056, for detailed information on customizing printers.

Using the Host Print Transform Function with the 3477 InfoWindow Display

The 3477 InfoWindow display station is a twinaxial display station that attaches to the AS/400 system using a twinaxial controller or a remote workstation controller such as 5294, 5394, or 5494. The display supports up to two display sessions, or one display session and one printer session. The 3477 display provides 5256, 4214, or 5219 SCS printer emulation for most IBM personal printers.

Advantages of Using the Host Print Transform Function

Using the host print transform function ensures consistency with other emulators. The host print transform function also supports more ASCII printers than are supported by the 3477 InfoWindow display.

Additional function is available when using the host print transform function. For example, without the host print transform function enabled, you could not use computer output reduction (COR) (which can be used by the IBM LaserPrinter) because the 3477 does not support COR.

Configuration Recommendations

Configure printers that are supported by the InfoWindow display as recommended in Appendix A of the *IBM 3477 InfoWindow User's Guide*. Configure printers that are not supported by the 3477 with the following values:

- Type A for *Printer Character Set*
- 5256 for *Printer Emulation*

When you leave the display's configuration menu, the printer device description is automatically created if both the following are true:

- The printer is powered on
- Automatic configuration is on

After the printer device description is created on the AS/400 system, enable the host print transform function using the CHGDEVPRT command. The display's printer configuration is not used after the host print transform function is enabled. The data stream generated for the printer is based on the MFRTYPMDL parameter value specified in the printer device description on the AS/400 system.

Note: Do not change the display's printer configuration after your device description has been created on the AS/400 system. Doing so can cause the AS/400 printer device description to be replaced. In this case, the host print transform function is no longer enabled. The CHGDEVPRT command can be used to enable the host print transform function again.

Understanding the 3477 Power-On Initialization Sequence

The 3477 sends a power-on initialization sequence to the attached printer every time the printer or display is powered on. This initialization is designed for IBM printers. If a printer is attached that does not support the IBM data stream, some unrecognizable characters may be printed. After this initialization sequence, the data stream generated is based on the MFRTYPMDL parameter in the printer device description on the AS/400 system. No more unrecognizable characters will be printed.

If your 3477 is a Model H, you can turn off the power-on initialization sequence by doing the following:

1. From the 3477's setup menu, select *Test Workstation*.
2. Press the Alt, Shift, and Setup keys together.
3. The F6 key is now set to switch between power-on initialization active and power-on initialization not active.

   Pressing F6 displays +6 or *6 on the bottom of the screen. If +6 is displayed, power-on initialization is not active. If *6 is displayed, power-on initialization is active.
4. Press the Reset key to return to the 3477 setup menu.

Maintaining Printer Customization

Before you do the work of creating a workstation customizing object for a printer, try printing jobs using the host print transform function support. You may not need to create a customizing object for the printer due to the extended support provided by the host print transform function.

The 3477 Model H is the only 3477 InfoWindow display that supports customization. The 3477 Model H display can use a workstation customizing object (located in the device description of the display) to define the printer attached to it. Conversely, the host print transform function uses a workstation customizing object located in the device description of the printer. If you have customized some printer features in the display's workstation object, use of the host print transform function overrides the customization.

However, if you need to customize your printer while using the host print transform function, you should:

1. Make sure the host print transform function is enabled.

   The TRANSFORM parameter value for the printer device description must be *YES.
2. Use a workstation customizing object that is compatible with the host print transform function.

   Customize the printer features in this object to match the customized features that you used in the display's workstation customizing object.
3. Use the workstation customizing object name that is compatible with the host print transform function as the value for the WSCST parameter in the printer device description.

   Remember: The location of the WSCST object name (in the printer device description, not the display device description) is important when using customization with the host print transform function.

See the *Operating System/400 Workstation Customization Function Programmer's Guide*, SC41-0056, for detailed information on customizing printers.

Using the Host Print Transform Function with the 3197 Display Station

The 3197 display station is a twinaxial display station that attaches to the AS/400 system using a twinaxial controller or a remote workstation controller such as 5294, 5394, or 5494. The 3197 supports a single display, two displays, or one display and one emulated printer. The 3197 provides 5256 or 4214 printer emulation for many IBM personal printers.

Advantages of Using the Host Print Transform Function

The host print transform function supports many more ASCII printers than are supported by the 3197. Also, using the host print transform function ensures consistency with other emulators.

Additional function is available when using the host print transform function. For example, without the host print transform function enabled, a function such as page rotation for an ASCII printer emulating a 5256 or 4214 printer would not be supported.

Configuration Recommendations

Refer to the IBM *3197 Display Stations User's Guide* to set up your display for a printer session. Select *Display-Printer Mode* with a *Printer Device ID* of 5256. Specify 850 as the *Printer Character Set Selection*.

When you leave the InfoWindow display's configuration menu, the printer device description is automatically created if both the following are true:

- The printer is powered on
- Automatic configuration is on

After the printer device description is created on the AS/400 system, enable the host print transform function using the CHGDEVPRT command. The display's printer configuration is not used after the host print transform function is enabled. The data stream generated for the printer is based on the MFRTYPMDL parameter value specified in the printer device description on the AS/400 system.

Notes:

1. The 3197 sends a power-on initialization sequence to the attached printer every time the printer or display is powered on. This initialization is designed for IBM printers. If a printer is attached that does not support the IBM data stream, some unrecognizable characters may be printed. After this initialization sequence, the data stream generated is based on the MFRTYPMDL parameter in the printer device description on the AS/400 system. No more unrecognizable characters will be printed.
2. Do not change the display's printer configuration after your device description has been created on the AS/400 system. Doing so can cause the AS/400 printer device description to be replaced. In this case, the host print transform function is no longer enabled. The CHGDEVPRT command can be used to enable the host print transform function again.

The order in which the 3197 display and its attached printer are powered on can affect the AS/400 system's ability to recognize the printer. This order is dependent on the model of the 3197. Use the Work with Configuration Status (WRKCFGSTS) command to check the status of a printer device. If the status of the printer is ***vary on pending*** or if the printer is not automatically configured, reverse the order in which the display and printer were powered on.

Using the Host Print Transform Function with the ASCII Work Station Controller

The ASCII Work Station Controller (AWSC) resides on the AS/400 system and allows up to 18 ASCII displays or printers to attach to each controller. The AWSC provides 3812, 5219, 5224, or 5256 SCS printer emulation for most IBM printers that support an EIA-232 or EIA-422 serial interface.

Advantages of using the Host Print Transform Function

The host print transform function supports more ASCII printers than are supported by the AWSC. Also, additional function is available when using the host print transform function. For example, without the host print transform function enabled, a function such as type style selection for an ASCII printer emulating a 5224 SCS printer would not be supported

Configuration Recommendations

There is no automatic configuration capability for printers attached to the AWSC. The Create Device Description (Printer) (CRTDEVPRT) command must be used to create the configuration descriptions. For existing printers, use the Change Device Description (Printer) (CHGDEVPRT) command.

See the *ASCII Work Station Reference and Example*, SA41-9922, to determine which printers are supported by the AWSC. Configure them as recommended in that manual.

Configure printers not supported by the AWSC with 4019 as the device type, Model 1 as the model, and 3812 as the emulated printer. Many of the other parameters depend on the attached printer (line speed, data bits, and so on). To avoid AS/400 parameter checking, specify *YES as the value on the emulating ASCII parameter in the printer device description. For example, this allows a communications line speed of 38400 bps.

After the host print transform function is enabled, the device type and model parameters in the device description have no effect on the data stream sent to the printer. The data stream generated for the printer is based on the MFRTYPMDL parameter in the AS/400 printer device description.

Maintaining Printer Customization

Before you do the work of creating a workstation customizing object for a printer, try printing jobs using the host print transform function support. You may not need to create a customizing object for the printer due to the extended support provided by the host print transform function.

The ASCII work station controller can use a workstation customizing object in the printer device description to define the printer's characteristics. That workstation customizing object can be customized to use special features of a printer that the AWSC does not support.

If the host print transform function is enabled, the customizing object specified for the AWSC printer device description must be removed or replaced. The customizing objects created for the AWSC are not compatible with the host print transform function.

However, if you need to customize your printer while using the host print transform function, you should:

1. Make sure the host print transform function is enabled.

   The TRANSFORM parameter value for the printer device description must be *YES.

2. Use a workstation customizing object that is compatible with the host print transform function.

   Customize the printer features in this object to match the customized features that you initially used in the workstation customizing object specified in the AWSC printer device description.

3. Use the workstation customizing object name that is compatible with the host print transform function as the new value for the WSCST parameter in the printer device description.

   Remember: The AWSC and the host print transform function both use the workstation customizing object parameter in the printer device description. That object must contain the customized features and be compatible with the host print transform function.

See the *Operating System/400 Workstation Customization Function Programmer's Guide*, SC41-0056, for detailed information on customizing printers.

Using the Host Print Transform Function with OS/2 5250 Work Station Feature

The OS/2 5250 Work Station Feature is part of OS/2 Extended Edition or Extended Services Communications Manager. Communications Manager provides twinaxial, IBM token-ring, X.25, asynchronous, and synchronous data link control attachment of personal computers and PS/2 personal computer systems to the AS/400 system.

5250 Work Station Feature is a 5250 emulator for all the connection types supported by the Communications Manager. Five work station sessions in any combination of display or printer sessions can be configured. The 5250 Work Station Feature provides 5219, 5224, and 5256 printer emulation for personal printers. The personal printer can be attached to the personal computer through either the parallel or serial interface.

Advantages of Using the Host Print Transform Function

The host print transform function supports many more ASCII printers than are supported by the OS/2 5250 Work Station Feature. Also, using the host print transform function ensures consistency with other emulators.

Additional function is available when using the host print transform function. For example, without the host print transform function enabled, a function such as computer output reduction (COR) (which can be used by the IBM LaserPrinter) would not be supported.

Configuration Recommendations

OS/2 5250 Work Station Feature can support printers through a printer function table (PFT). To use PFTs to create your printer device descriptions on the AS/400 system, follow these steps:

1. If you are working with a printer that has a PFT, you need to:
   a. Select printer emulation type 5219, 5224, or 5256.
   b. Select the PFT for the printer you are working with.
   c. Go to step 3.
2. If you are working with a printer that does not have a PFT, you need to:
   a. Copy the DEFAULT.PFT file from the QIWSFLR or QIWSFL2 folder on the AS/400 system into your personal computer's CMLIB directory. Name the file PFTHPT.
   b. Configure the printer session on your personal computer with 5219 printer emulation and use the PFT named PFTHPT.
   c. Go to step 3.
3. Start your printer session on the personal computer. This creates a new device description on the AS/400 system.
4. Use the CHGDEVPRT command to enable the host print transform function. See "Enabling the Host Print Transform Function Using Printer Device Description Parameters" on page 12-4 for the parameters that enable the host print transform function.
5. On the personal computer, stop the emulated print session and then restart it to reestablish the printer session. The session ended when the printer device was varied off (at the AS/400 system) before you used the CHGDEVPRT command.

Maintaining Printer Customization

Before you do the work of creating a workstation customizing object for a printer, try printing jobs using the host print transform function support. You may not need to create a customizing object for the printer due to the extended support provided by the host print transform function.

The OS/2 5250 Work Station Feature supports printers through a printer function table (PFT). If you have customized a printer by changing the supplied PFT, use of the host print transform function overrides this customization.

However, if you need to customize your printer while using the host print transform function, you should:

1. Make sure the host print transform function is enabled.

   The TRANSFORM parameter value of the printer device description must be *YES.
2. Make a note of the features you customized in the PFT.
3. Use a workstation customizing object that is compatible with the host print transform function.

   Update the features in this object to reflect the customized features you used in the PFT.

4. Use the workstation customizing object name that is compatible with the host print transform function as the value for the WSCST parameter in the printer device description.

See the *Operating System/400 Workstation Customization Function Programmer's Guide*, SC41-0056, for detailed information on customizing printers.

Using the Host Print Transform Function with OS/2 5250 Emulation

OS/2 5250 Emulation is part of OS/2 Communications Manager/2. Communications Manager/2 provides coaxial, ISDN, LAN, SDLC, twinaxial, and X.25 attachment of IBM PS/2 and other work stations to the AS/400 system.

OS/2 5250 Emulation is a 5250 emulator for all the connection types supported by Communications Manager/2. Up to 15 work station sessions in any combination of display or printer sessions can be configured. OS/2 5250 Emulation provides 3812 SCS printer emulation for all printers supported by OS/2 2.0 or later. Personal printers can be attached to personal computers through either the parallel or serial interface.

Advantages of Using the Host Print Transform Function

Using the host print transform function ensures consistency with the other emulators. Additional functions that are supported by the host print transform function are color, more flexible code page selection, better font support, embedded ASCII commands, and more flexible page rotation.

Configuration Recommendations

Configure printers using an OS/2 printer driver. If the printer driver required by your personal printer is not available, select a printer driver that most closely matches the one your printer uses.

When the OS/2 5250 printer session has been connected, the AS/400 system automatically creates a printer device description.

On the AS/400 system, use the CHGDEVPRT command to enable the host print transform function. See "Enabling the Host Print Transform Function Using Printer Device Description Parameters" on page 12-4 for the parameters that enable the host print transform function.

On the work station, restart the printer session. You need to do this to reestablish the printer session. The session ended when the printer device was varied off (at the AS/400 system) before you used the CHGDEVPRT command.

Using the Host Print Transform Function with the RUMBA/400 Program

The PC Support/400 program provides the following data link control attachment of IBM personal computer systems for work station function and printer emulation:

- Twinaxial
- Token-ring
- Asynchronous
- Synchronous

RUMBA/400 provides an OS/2 or Windows 5250 emulator for all of the supported connection methods. Any number of work station sessions (limited by available memory) in any combination of display or printer sessions can be configured.

RUMBA/400 provides 3812 SCS printer emulation for all printers supported by OS/2 2.0 or later and Microsoft Windows 3.0 or later. The personal printers can be attached to personal computers through either the parallel or serial interface.

Advantages of Using the Host Print Transform Function

Using the host print transform function ensures consistency with other emulators. Additional functions that are supported by the host print transform function are color, more flexible code page selection, and better font support.

Configuration Recommendations

Configure printers using an OS/2 or Windows printer driver. If the printer driver required by your printer is not available, select a printer driver that most closely matches the one your printer uses.

When the RUMBA/400 printer session has been connected, the AS/400 system automatically creates a printer device description.

On the AS/400 system, use the CHGDEVPRT command to enable the host print transform function. See "Enabling the Host Print Transform Function Using Printer Device Description Parameters" on page 12-4 for the parameters that enable the host print transform function.

On the personal computer, restart the printer session. You need to do this to reestablish the printer session. The session ended when the printer device was varied off (at the AS/400 system) before you used the CHGDEVPRT command.

Using the Host Print Transform Function with the IBM Enhanced 5250 or the IBM S36/38 Work Station Emulation Program

The Enhanced 5250 Emulation Program is a personal computer program. This program allows a non-Micro Channel** personal computer to emulate a display, two displays, or a display and a printer session on the AS/400 system. The program uses a card to communicate through a twinaxial cable to the twinaxial port or remote controller attached to the AS/400 system.

The S36/38 Work Station Emulation Program is a personal computer program. This program allows a Micro Channel PS/2 to emulate up to four display or printer sessions. The program uses a card in the PS/2 to communicate through a twinaxial cable to a twinaxial port or remote controller.

Advantages of Using the Host Print Transform Function

The host print transform function supports more ASCII printers than are supported by the Enhanced 5250 Emulation or S36/38 Work Station Emulation programs. Also, using the host print transform function ensures consistency with other emulators.

Additional function is available when using the host print transform function. For example, without the host print transform function, page rotation would not be supported

Configuration Recommendations

Configure printers supported by the IBM Enhanced 5250 Emulation program or S36/38 Work Station Emulation program as recommended in the *IBM Enhanced 5250 Emulation Program User's Guide*, G570-2221, or the *IBM S36/38 Work Station Emulation User's Guide*, SC21-8068. For example, use the IBM4019.PFT and select 5219 Printer emulation for the IBM 4019 LaserPrinter. Configure printers that were not previously supported by the emulation program using the DEFAULT.PFT file and selecting 5219 printer emulation.

When the printer session is started, the AS/400 system automatically creates the printer device description (if automatic configuration is turned on).

On the AS/400 system, use the CHGDEVPRT command to enable the host print transform function. See "Enabling the Host Print Transform Function Using Printer Device Description Parameters" on page 12-4 for the parameters that enable the host print transform function.

Maintaining Printer Customization

Before you do the work of creating a workstation customizing object for a printer, try printing jobs using the host print transform function support. You may not need to create a customizing object for the printer due to the extended support provided by the host print transform function.

The Enhanced 5250 and S36/38 Work Station Emulation programs support printers through a printer function table (PFT). If you have customized a printer by changing the supplied PFT, use of the host print transform function overrides this customization.

However, if you need to customize your printer while using the host print transform function, you should:

1. Make sure the host print transform function is enabled.

   The TRANSFORM parameter value for the printer device description must be *YES.

2. Make a note of the features you customized in the PFT.
3. Use a workstation customizing object that is compatible with the host print transform function.

   Update the features in this object to reflect the customized features you used in the PFT.

4. Use the workstation customizing object name that is compatible with the host print transform function as the value for the WSCST parameter in the printer device description.

See the *Operating System/400 Workstation Customization Function Programmer's Guide*, SC41-0056, for detailed information on customizing printers.

Using the Host Print Transform Function with the IBM Remote 5250 Emulation Program

The Remote 5250 Emulation Program is a personal computer program that allows a personal computer or PS/2 to emulate an IBM 5294 Remote Workstation Controller. The Remote 5250 Emulation Program relies on an SDLC communications line to communicate with the AS/400 system. The Remote 5250 Emulation Program provides the ability to establish up to two display sessions or one display and one printer session.

Advantages of Using the Host Print Transform Function

The host print transform function supports more ASCII printers than are supported by the IBM Remote 5250 Emulation Program. Also, using the host print transform function ensures consistency with other emulators.

Additional function is available when using the host print transform function. For example, without the host print transform function, page rotation would not be supported.

Configuration Recommendations

See the *Remote 5250 Emulation Program User's Guide*, G570-2203, for information on configuring printer sessions. For example, use the IBM5204.PDT file and select 5219 Printer emulation for the IBM 5204 Quickwriter*. Configure printers that were not previously supported by the emulation program using the TBLPRT.PDT and selecting 5219 printer emulation.

When the printer session is started, the AS/400 system automatically creates the printer device description (if automatic configuration is turned on).

On the AS/400 system, use the CHGDEVPRT command to enable the host print transform function. See "Enabling the Host Print Transform Function Using Printer Device Description Parameters" on page 12-4 for the parameters that enable the host print transform function.

Maintaining Printer Customization

Before you do the work of creating a workstation customizing object for a printer, try printing jobs using the host print transform function support. You may not have to create a customizing object for the printer due to the extended support provided by the host print transform function.

The Remote 5250 Emulation Program supports printers through a printer description table (PDT). If you have customized a printer by changing the supplied PDT, use of the host print transform function overrides this customization.

However, if you need to customize your printer while using the host print transform function, you should:

1. Make sure the host print transform function is enabled.

   The TRANSFORM parameter value for the printer device description must be *YES.

2. Make a note of the features you customized in the PDT.
3. Use a workstation customizing object that is compatible with the host print transform function.

Update the features in this object to reflect the customized features you used in the PDT.

4. Use the workstation customizing object name that is compatible with the host print transform function as the value for the WSCST parameter in the printer device description.

See the *Operating System/400 Workstation Customization Function Programmer's Guide*, SC41-0056, for detailed information on customizing printers.

Chapter 13. Other Printing Functions Provided by the OS/400 Program

The OS/400 program contains the advanced function printing (AFP) support, discussed in Part 3, "Advanced Function Printing (AFP)" of this guide. It also contains these printing functions:

- PrintManager/400
- Data Description Specifications (DDS)
- Advanced Printer Function (APF)
- Graphical Data Display Manager (GDDM)
- QWP4019 Program

PrintManager/400

PrintManager is the collective name of a group of IBM licensed programs or operating system functions designed to provide common access to printing, including advanced function printing (AFP), across the supported environments. PrintManager/400 provides the PrintManager functions within the OS/400 operating system and IBM SAA PrintManager provides those functions in the VM and MVS operating systems.

PrintManager/400 consists of the following:

- The AS/400 implementation of the PrintManager Interface, an element of the IBM Systems Application Architecture (SAA) common programming interface (CPI). This implementation allows you to write portable applications for sending spooled files to an output queue for printing.

  Among other benefits, the PrintManager Interface allows you to specify and validate print-option values from within an application in a form that is consistent across the supported environments. Applications that use the PrintManager Interface, therefore, are portable because they can be developed for one environment and used with little or no modification in another environment.

- An application programming interface (API) that allows you to create print descriptors that can contain common information about printer routing, printer capabilities, and printer and job defaults. Applications that use the PrintManager Interface can use print descriptors created by the API. To create and maintain print descriptors, you write C language applications using the API verbs.

PrintManager/400 provides C programming language support for the API, and C, COBOL, and RPG programming language support for the PrintManager Interface.

PrintManager defines a set of print options that are consistent across the supported environments, and it allows you to specify these print options within the application. PrintManager also provides the ability to:

- Select AFP resources from a system library on the printing system
- Package AFP resources with the print job (inline) when you send the job from one system to another.

These print options, combined with the ability to create common, portable applications and printing definitions (with print descriptors), make possible easy and consistent access to printing across your organization. With PrintManager/400 you can use the PrintManager Interface and API to create batch applications or installation-specific end-user interfaces for printing.

For more information about the PrintManager Interface, refer to *Systems Application Architecture Common Programming Interface PrintManager Reference*, S544-3698. For more information about the API, refer to *PrintManager Application Programming Interface Reference*, S544-3699.

Data Description Specifications (DDS)

The manual *Data Description Specifications Reference*, SC41-9620, contains detailed instructions for coding the data description specifications (DDS) for printer files that are described externally.

This allows the programmers to add more flexibility in defining how their printed output will look.

See the *DDS Reference* manual for information on how to use DDS with printing.

Advanced Printer Function

The *APF Guide* is intended for system and application programmers to use in designing changed-to-tailor forms.

The advanced printer function utility (APF) allows you to create and maintain changed-to-tailor forms by using special print capabilities available on the 5224 Models 1 and 2 and 5225 Models 1, 2, 3, and 4 dot matrix printers. APF can create the background information needed to make it appear as though you are using a preprinted form or a printer with a variety of special fonts.

For more information on APF, you can order *Application Development Tools: Advanced Printer Function Guide*, SC09-1361.

Functions of APF

APF provides support to allow you to:

- Design the layout of a form
- Specify fields on a form that will contain special features
- Design special features for a form
- Produce blank copies of a form
- Merge spooled data with a predefined form

The special features you can design with APF include:

- Logos, special symbols, or large characters
- Bar codes[1]

[1] The bar codes that this utility prints are representations of Code 3 of 9, EAN (8 digit and 13 digit), changed PLESSEY (MSI), and UPC (versions A and E) bar codes. Test all bar codes you print on the 5224 Printer or 5225 Printer to make sure the wanding or scanning devices you use can read the codes created. Nonglossy paper is recommended.

- Bar charts
- Constant fields, such as column headings
- Vertical and horizontal lines, that can be used to form boxes
- Highlighted fields
- Underlined fields

Graphical Data Display Manager (GDDM)

GDDM lets you add color and pictures to application programs by having your application programs pull in user-created GDDM routines.

GDDM routines perform basic graphics tasks, such as drawing a line from point A to point B. Also, GDDM routines are called in an application program to start and stop the graphics environment, set color and width of a line, send the picture to the work station, and so forth.

GDDM works with the following high-level languages (HLL):

- BASIC
- COBOL/400
- RPG/400
- PL/I

Required AS/400 System Hardware

You can write and run GDDM application programs using any model of the AS/400 system that has the Operating System/400 program installed.

Although you can write and compile the programs on any work station that has been described to the system, only the following devices can be used to display graphics:

- IBM Personal Computer with work station function
- IBM Personal Computer with work station emulation
- 5292 Model 2
- IBM Personal Computer with 5250 emulation

In this manual the term "graphics work station" means one of these devices.

On the IBM Personal Computer and IBM Personal System/2, the graphics configuration of the device is determined by the hardware capability and the virtual device interface (VDI) driver that is loaded in the CONFIG.SYS file on the personal computer or Personal System/2. The following table describes the capabilities of each VDI driver:

VDI Driver	Resolution	Colors	Gray Levels
VDIDY004	320 x 200	4	
VDIDY006	640 x 200		2
VDIDY00D	320 x 200	8	4
VDIDY00E	640 x 200	8	4
VDIDY00F	640 x 350		4
VDIDY010	640 x 350	4/8	2/4
VDIDYPGD	640 x 480	8	8
VDIDYA11	640 x 480		2
VDIDYA12	320 x 200	8	8
VDIDY011	640 x 480		2
VDIDY012	640 x 480	8	8
VDIDY013	320 x 200	8	8
VDIDYAF1	1024 x 768	8	8
VDIDYAF2	1024 x 768	8	8

These plotters can be attached to graphics work stations:

- IBM 6180 Plotter
- IBM 7371 Plotter
- IBM 7372 Plotter

Graphics can be printed on these SNA character string (SCS) devices:

- IBM 4214 Printer
- IBM 4234-2 Printer
- IBM 5224 Printer
- IBM 5225 Printer

or these intelligent printer data stream (IPDS) devices:

- IBM 3812 Printer
- IBM 3816 Printer
- IBM 4028 Printer
- IBM 4224 Printer
- IBM 4230 Printer
- IBM 4234-8, or 4234-12 Printer

It is also possible to send a graphics data format (GDF) file (the internal data GDDM interprets to draw the picture) to other systems. The device receiving the graphics data must have the software necessary to interpret the data.

Required AS/400 System Software

Besides having the OS/400 program installed, you must have a compiler for one of the following high-level languages:

BASIC	IBM AS/400 BASIC Version 2, Program 5738-BA1
RPG/400	IBM SAA AD/Cycle* RPG/400 Version 2, Program 5738-RG1
COBOL/400	IBM SAA AD/Cycle COBOL/400 Version 2, Program 5738-CB1
PL/I	IBM AS/400 PL/I Version 2, Program 5738-PL1 (with library QGDDM in your library list)

Required Knowledge

To write graphics application programs for the AS/400 system, you must know AS/400 application programming in one of the four high-level languages.

In the *GDDM Programming Reference*, you can learn the concepts and fundamentals of the Graphical Data Display Manager program.

QWP4019 Program

QWP4019 is an IBM-supplied program that you can call to set flags on and off in a printer device description. Setting the flags on enables functions not accessible through the Create Device Description (Printer) (CRTDEVPRT) or Change Device Description (Printer) (CHGDEVPRT) commands.

The QWP4019 program allows you to take advantage of functions available on an attached printer but not supported by the emulator you are using.

Note: The QWP4019 program was designed to make the 4019 fonts available for the IBM LaserPrinter 4019 printer using emulation. Additional parameters can be specified to enable functions in printers that are configured as a 5219 or 3812 SCS printer.

QWP4019 Parameter Names and Functions

The following list contains the QWP4019 parameter names and explains the function provided when they are called.

Parameter	Function Provided
***ON**	This parameter sets a flag in the printer device description that: • Indicates to the AS/400 system that the 4019 fonts are to be used instead of the 5219 or 3812 fonts. See Table D-2 on page D-22 to view the font mapping and substitution for the 4019 printer. • Enables manual paper feed selection if the value in the form feed (FORMFEED) parameter is *CUT. • Prevents the value of *COR in the page rotation (PAGRTT) parameter from being sent to a 3477 InfoWindow display that has an attached printer configured as a 5219. This is important because the 3477 does not support computer output reduction (COR). Without this flag, the PAGRTT(*COR) value in the printer file cannot be used for these printers.
***OFF**	This parameter sets the *ON flag off. Also, if the *SIC or *COR flags were set on, using the *OFF parameter sets them off.
***CHECK**	This parameter asks how the printer appears to the AS/400 system (as a 3812, 5219, or 4019). If the value 4019 is returned, it indicates that the QWP4019 program has been called with the *ON parameter.
***CNT**	This parameter sets a flag in the printer device description that tells the AS/400 system that the printer has a continuous form feed device. The flag is used by the system to determine whether forms alignment is possible for printers that are config-

ured as a 3812 printer. The 3812 printer does not support continuous forms.

This flag can only be set for printers that are configured as a 3812 printer.

***CNTOFF** This parameter sets the *CNT flag off.

***IMP** This parameter sets a flag in the printer device description that allows a print quality selection other than draft when:

- The value in the page rotation (PAGRTT) parameter of the printer file is *AUTO.
- The printer is attached to an emulator (for example, a 3477 InfoWindow display) that supports page rotation.

For automatic page rotation to be done by an actual 3812 SCS printer, the print quality control sent to the printer must specify draft quality. Therefore, without the *IMP flag on the AS/400 system sends controls to the printer for draft selection. Because the 3812 SCS printer supports only one level of print quality, printed output is not affected by print quality selection.

With the *IMP flag set on, the AS/400 system sends the value in the print quality (PRTQLTY) parameter of the printer file directly to the emulator. This is done instead of changing the print quality to draft when the value of the page rotation (PAGRTT) parameter is *AUTO.

***IMPOFF** This parameter sets the *IMP flag off.

***SIC** This parameter sets a flag in the printer device description that sends an ASCII Set Initial Conditions command to the printer. This command turns off the font intervention messages for a 4019 or 4029 printer.

The 4019 or 4029 printer must be attached to a 3477 InfoWindow display and be configured as a 5219 printer.

The *ON flag must be set in the 4019 or 4029 device description.

Note: Do not attempt to turn this flag on for any device other than a 4019 or 4029 attached to a 3477 InfoWindow display.

***SICOFF** This parameter sets the *SIC flag off.

***COR** This parameter sets a flag in the printer device description that enables computer output reduction (value of *COR in the page rotation (PAGRTT) parameter of the printer file.)

*COR is only needed if the *ON flag is set.

The printers must be attached to a 348x InfoWindow, configured as a 5219, and have the *ON flag set in the printer device description.

To the AS/400 system, printers configured as 5219 appear the same whether they are attached to a 3477 or to a 348x InfoWindow display.

The *ON flag prevents computer output reduction from being done on printers attached to the 348x or 3477. This is because the 3477 does not support computer output reduction. Therefore, if the *ON flag is set, the *COR flag must be set on to enable computer output reduction for printers configured as 5219 and attached to a 348x InfoWindow display.

***COROFF** This parameter sets the *COR flag off.

How Does the QWP4019 Program Work?

The QWP4019 program sets flags in the printer device description through calls to the program with certain parameters specified. For example,

```
CALL QWP4019 (PRT01 *CNT)
```

sets *CNT on and tells the AS/400 system that PRT01 has a continuous form feed device.

Flags are set off by calling QWP4019 with certain parameters specified. For example,

```
CALL QWP4019 (PRT01 *OFF)
```

sets the 4019 flag off in the device description for PRT01.

Since the flags are stored in the device description, QWP4019 only needs to be run once for each printer and each function. The flags can be changed only by running QWP4019 or deleting the device description. To make sure the flag is set, it is recommended that the printer writer for that printer be restarted after the QWP4019 program has been called.

QWP4019 Program Examples

Following are examples that show how to use the QWP4019 program.

Example 1: Setting the 4019 flag on and then off in the device description for PRT01.

QWP4019 CALL	Result
`CALL QWP4019 (PRT01 *ON)`	Sets the 4019 flag on in the device description for PRT01.
`CALL QWP4019 (PRT01 *CHECK)`	The system returns 4019 because the 4019 flag is set on.
`CALL QWP4019 (PRT01 *OFF)`	Sets the 4019 flag off in the device description for PRT01. **Note:** This CALL also sets flags *SIC and *COR off.
`CALL QWP4019 (PRT01 *CHECK)`	The system returns 5219 or 3812 because the 4019 flag is off.

Example 2: Enabling COR and the 4019 fonts for a 4019 printer attached to a 348x InfoWindow display.

QWP4019 CALL	Result
`CALL QWP4019 (PRT01 *ON)`	Sets the 4019 flag on in the device description for PRT01. This supplies the 4019 fonts but disables computer output reduction.
`CALL QWP4019 (PRT01 *COR)`	Sets the *COR flag on in the device description. This enables computer output reduction for PRT01.

Example 3: Enabling near letter quality (NLQ) print quality for a IBM Personal Printer Series II 2390 printer attached to a 3477 InfoWindow display.

QWP4019 CALL	Result
`CALL QWP4019 (PRT01 *IMP)`	Turns the *IMP flag on in the device description for PRT01.
`CALL QWP4019 (PRT01 *CHECK)`	The system returns 5219 or 3812 because the 4019 flag is off. There is no check for *IMP, *SIC, or *COR flags.

The following table provides a summary of the QWP4019 parameters, the call used to set flags on, and the call used to set flags off.

Table 13-1. QWP4019 Parameter Names and Calls

Parameter Name	Call to Set Flag On	Call to Set Flag Off
*ON	`CALL QWP4019 (PRT01 *ON)`	`CALL QWP4019 (PRT01 *OFF)`[1]
*IMP	`CALL QWP4019 (PRT01 *IMP)`	`CALL QWP4019 (PRT01 *IMPOFF)`
*SIC	`CALL QWP4019 (PRT01 *SIC)`	`CALL QWP4019 (PRT01 *SICOFF)`
*COR	`CALL QWP4019 (PRT01 *COR)`	`CALL QWP4019 (PRT01 *COROFF)`
*CNT	`CALL QWP4019 (PRT01 *CNT)`	`CALL QWP4019 (PRT01 *CNTOFF)`

Note:

1 Using the CALL QWP4019 (PRT01 *OFF) command sets the *SIC, *COR, and *ON flags off.

Chapter 14. Other Printing Functions Provided by Licensed Programs and AS/400 System Hardware

Printing functions are provided by the following IBM licensed programs:

- Advanced Function Printing Utilities/400
- Business Graphics Utility (BGU)
- OfficeVision/400
- PC Support/400
- TCP/IP Connectivity Utilities/400

A **licensed program** is a separately orderable program, supplied by IBM, that performs functions related to processing user data.

Printing functions are provided by these IBM products:

- IBM InfoWindow* 3477
- ASCII Work Station Controller

Advanced Function Printing Utilities/400

What Is AFP Utilities/400?

The IBM Advanced Function Printing Utilities/400 is a licensed program (Program 5738-AF1) that provides utilities that work together to reduce the cost of printing text and images on paper when using advanced function printing (AFP) on the AS/400 system.

The AFP Utilities make the most efficient use of an IPDS-capable printer, provide a display screen editor that allows you to see the actual position-by-position design of the overlay, and are supported on all displays that attach to the AS/400 system. The following make up the AFP Utilities:

- Overlay Utility
- Print Format Utility
- Resource Management Utility

The information in this guide identifies and describes the major elements of the AFP Utilities. See the *Application System/400 Advanced Function Printing Utilities/400 User's Guide and Reference*, SH18-2416, for detailed operating and reference information.

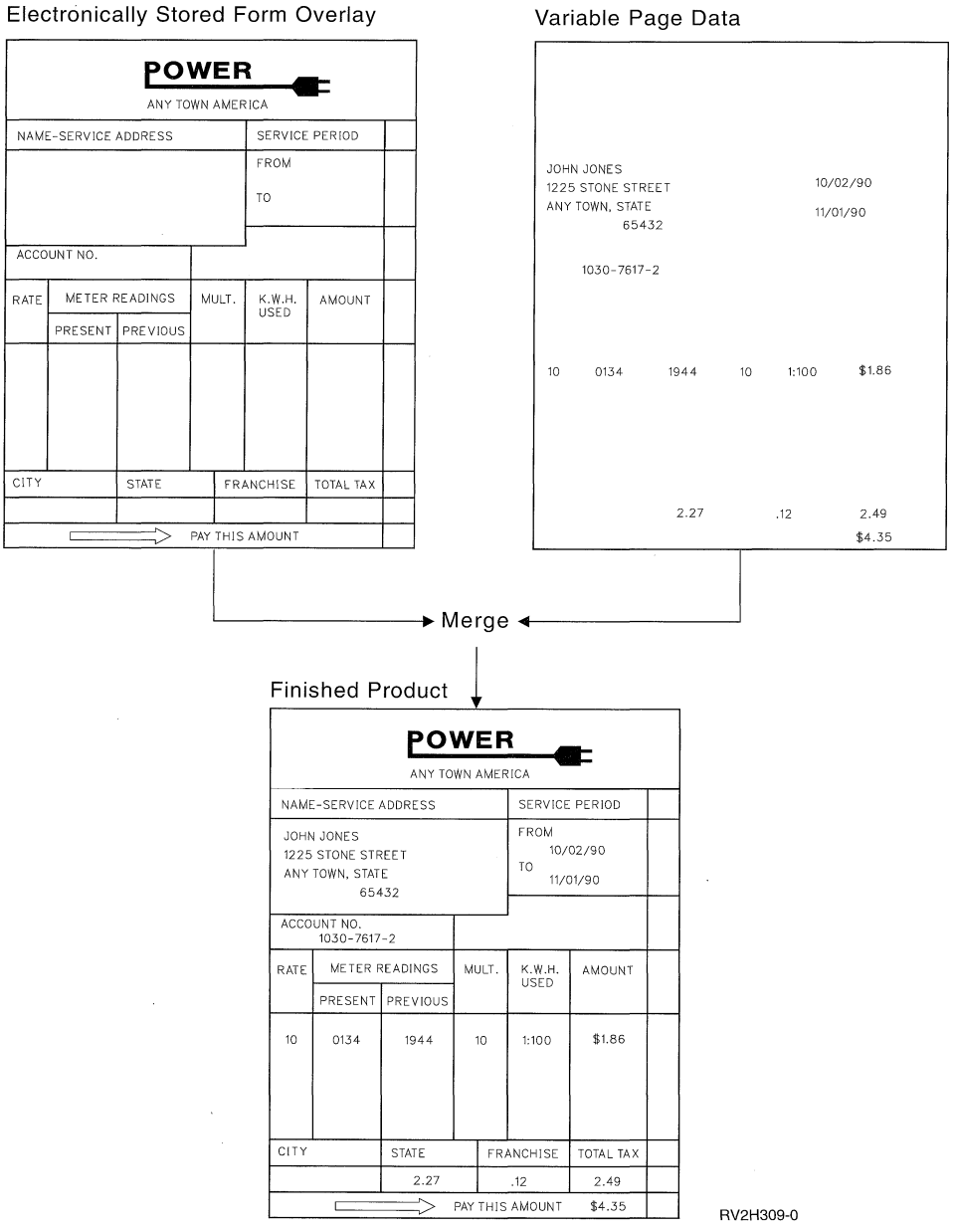
Overlay Utility

The overlay utility allows you to design electronic form overlays.

You can use overlays to reduce or eliminate the use of preprinted paper forms.

The overlay can be composed of text, image (page segments), lines, boxes, and bar codes. All of the environmental data (font references, location on the page, and so on) is defined as a part of the overlay definition.

The following diagram is an example of an overlay you can create using the AFP Utilities.



Element Descriptions

The overlay created by the AFP Utilities is composed of any combination of the following elements:

- Text

  Text can be placed at a specified position on the overlay. The text attribute may also be specified to describe the text characteristics such as font selection, format and highlighting of underline, overstrike, color, degree of rotation, and character enlargement.

  Note: If underlining or overstriking are used in an overlay generated by AFP Utilities/400, that overlay will not print on a System/370 system. The

Print Service Facility (PSF) support on the System/370 does not recognize the commands in the overlay which generate the underline and overstrike functions.

- Line

  The line is any straight line vertically or horizontally connecting two points. You may select the type of line (such as dotted, dashed, or solid) and the width of the line.

- Box

  The box can be placed on the overlay by specifying two diagonally opposite corners. You can select the shade pattern inside the box, the type of box line (dotted, dashed, or solid), and the width of the line. Also, you may define the text inside the box. The text may be justified inside the box.

- Bar Code

  A bar code can be placed at a specified position on the overlay. You can specify the following bar code data: position to be placed on overlay, type of bar code, size, color, and whether or not to print Human Readable Interpretation (HRI).

- Page Segment

  You can include a page segment that is in the AFP resource library. You can refer to this page segment by its name and specify print position to define it as an overlay element. You can include the same page segment repeatedly in an overlay. A page segment contains an image, such as a logo, a picture, or a map.

- Graphics

  A graphic can be placed at a specified position on the overlay.

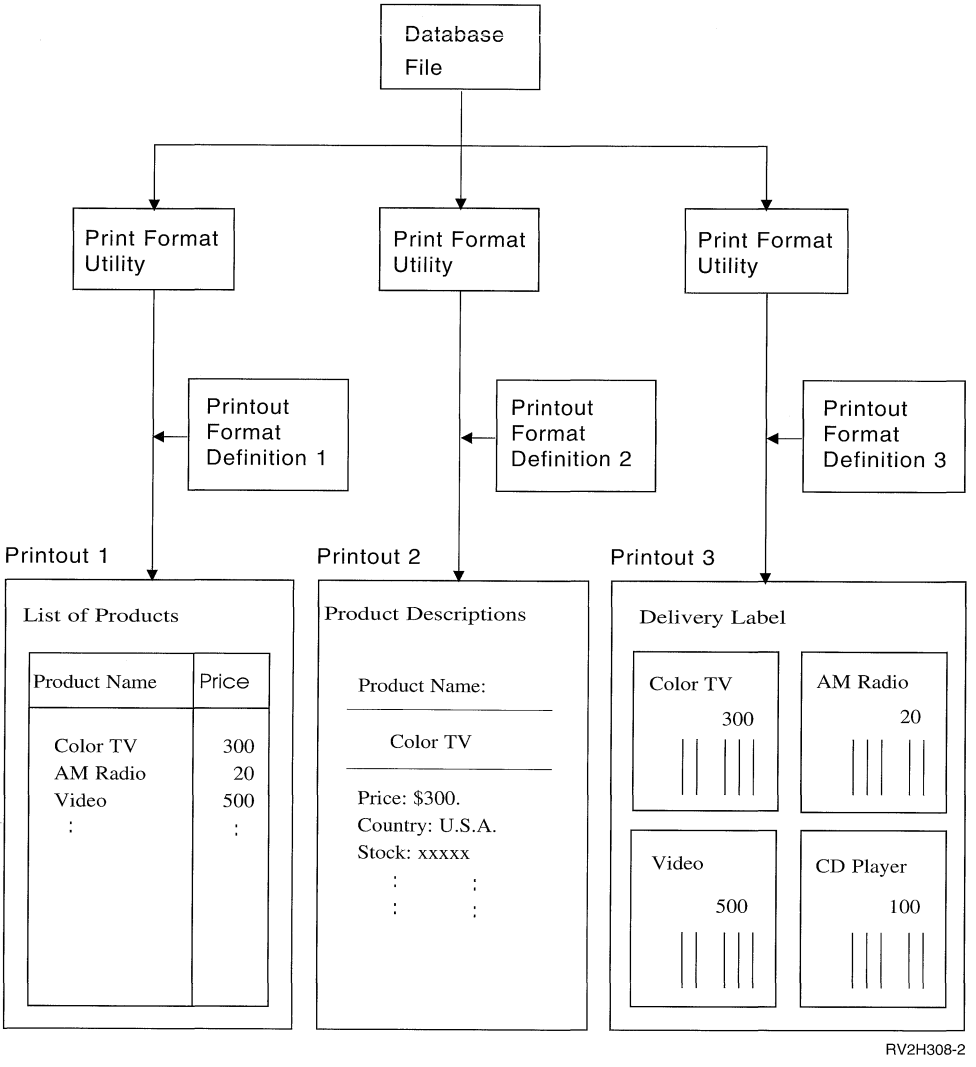
Print Format Utility

The print format utility allows you to print data from database file members, which are created by application programs or utilities, in various forms such as text or bar codes, and in various formats on IPDS printers.

With the AFP Utilities, the forms and formats for printing are designed by defining a **printout format definition** instead of writing your own application programs.

In addition to the data from database file members, you can print fixed data, such as a logo or a title.

The following diagram is an example of what you can print using the print format utility.



Creating the Printout Format Definition

The following list identifies the things you can specify when you create a printout format definition using the Print Format Utility.

- Printout format definition specifications
- Printout format definition fonts
- Name of database file, library, and record format
- Record layout elements (text, images, lines, boxes, or bar codes)
- Page layout elements (record layout, text, images, lines, boxes, or bar codes)
- Record selection
- Printout specifications

Resource Management Utility

The resource management utility allows you to manage AFP resources such as overlay objects or page segment objects.

The resource management utility has the following functions:

- Creating page segments
- Working with overlays
- Working with page segments

Creating Page Segments

This function allows you to convert or transform a page segment from an AS/400 database file member or a PC document that contains image data stream data. If the page segment is from a PC document, it can be stored in an AS/400 folder using the PC Support shared folders function.

Working with Overlays

This function allows you to:

- Copy an overlay object in a library.
- Delete an overlay object in a library.
- Print an overlay in a library on an IPDS printer. You can also specify that your overlay be printed over the top of a grid. The appearance of the grid under the overlay provides you with an excellent tool for detailed design of an overlay.
- Display the description of an overlay object.
- Put an overlay into a file.
- Change the description of an overlay object.

Working with Page Segments

This function allows you to:

- Copy a page segment object in a library
- Delete a page segment object in a library
- Print a page segment object in a library on an IPDS printer
- Display the description of a page segment
- Put a page segment into a file.
- Change the description of a page segment

Advanced DBCS Printer Support/400

The IBM Advanced DBCS Printer Support/400 program (5738-AP1) is designed for users who have DBCS printers. This program provides DBCS support with five utilities:

- Advanced printer writer (APW)
- Advanced page printer writer (APPW)
- Kanji printer function (KPF)
- Print form description/symbol migration aid
- Printer function control (PFC)

The advanced printer writer utility supports printers that are capable of printing Japanese, Korean, Traditional Chinese, and Simplified Chinese including the following:

- Work station printers 4028, 4216, 5317, 5553, 5557, 5563, 5575, 5577, and 5587
- Floor-standing printers 5227 (Models 1, 2, 3, and 5) and 5327 (Models 1, 2, and 3)

The advanced page printer writer utility supports the Japanese 5337 page printer. The Kanji printer function utility supports the Japanese 5583 page printer.

The print form description/symbol migration aid utility converts the form descriptions and symbol files of the System/36 advanced printer writer and Kanji printer function to equivalent form descriptions and symbol files for the AS/400 system.

The printer function control utility gives users the capability of printing user data with user-defined single-byte character set (SBCS) fonts.

The following manuals contain more detailed information about Advanced DBCS Printer Support/400:

- *Advanced Page Printer Writer User's Guide and Reference*, SH18-2176
- *Advanced Print Writer User's Guide and Reference*, SH18-2178
- *IBM 5583 Kanji Print Function User's Guide and Reference*, SH18-2179
- *IBM AS/400 S/36 APW/KPF Migration Utility User's Guide*, SH18-2234
- *IBM AS/400 Advanced DBCS Printer Support Licensed Program*, GH18-2204

Business Graphics Utility (BGU)

What Is BGU?

The IBM Application System/400 Business Graphics Utility (BGU) is a licensed program (Program 5738-DS1) that allows you to create, change, store, display, print, and plot charts representing data. You can also store, retrieve, delete, change, rename, and copy charts using the *Manage existing chart formats* option. All AS/400 graphics hardware devices are supported.

For more information on BGU, see the *BGU User's Guide and Reference*.

The following lists the functions and features of BGU.

- Menu-driven interface to powerful business graphics functions.
- Extensive options for creating and changing chart formats.

  Use BGU to create new charts or change existing charts. When you create a chart, you see a series of menus where you can specify the appearance of the chart, including its type, headings, axis definition, margins, legend position and attributes, line types, fill patterns, and colors. Once the chart format is defined, data can be supplied. Because data is handled separately, any suitable data can be displayed or printed with a chart format.
- Varied chart types, including:
  - Bar charts
  - Line graphs
  - Surface charts
  - Histograms

  - Pie charts
  - Venn diagrams
  - Text charts
- Support for missing values.
- Convenient storage, retrieval, copying, renaming, deleting, and changing functions.
- Ability to display charts from the control language (CL) application programs using the Display Chart (DSPCHT) command.
- Ability to save charts in the form of a graphics data file (GDF).
- Option to display, print, or plot a GDF with BGU.
- Charts saved in a GDF can be displayed, printed, or plotted using the Display Graphics Data File (DSPGDF) command.
- Access to IBM AS/400 graphics hardware:
  - Display terminals
    - IBM Personal System/2 (PS/2) Models 50, 60, and 80 with IBM work station emulation
    - IBM Personal Computer or PS/2 Models 25 and 30 with Enhanced 5250 Display Station Emulation
    - IBM Personal Computer or PS/2 (all models) with work station function
    - IBM 5292 Model 2 Color Display Station
  - Plotters
    - IBM 7372 six-pen Plotter
    - IBM 7371 two-pen Plotter
    - IBM 6180 Plotter configured as an IBM 7372 or 7371
  - Printers
    - IBM 3812 IPDS Printer
    - IBM 3816 IPDS Printer
    - IBM 4028 Printer
    - IBM 4214 Printer
    - IBM 4224 IPDS Color Printer
    - IBM 4230 Printer
    - IBM 4234 Model 2 Printer
    - IBM 4234 Model 12 Printer
    - IBM 5152 Model 2 Printer
    - IBM 5224 Printer
    - IBM 5225 Printer

Data Access Capability

Data values can be typed or taken from a database file. Charts displayed from typed data allow for graphing and manipulation of data. Charts using database files for data input offer on-demand charts to display the most current user data.

Data retrieved from database files can also be changed from a keyboard, allowing the user to manipulate data from analysis, such as "what if" conditions.

Printing and OfficeVision/400

Information about printing while using OfficeVision is contained in manuals that support OfficeVision/400 on the AS/400 system.

The following manuals contain information about printing tasks within OfficeVision:

Systems Application Architecture OfficeVision/400*: Planning For and Setting Up OfficeVision/400*, SC41-9626 has information to help the office administrator plan to set up and manage printing of office documents and mail.

Systems Application Architecture OfficeVision/400*: Using OfficeVision/400 Word Processing*, SC41-9618 has information about using the OfficeVision/400 print options to print documents. Information about working with the OfficeVision/400 print queue is also provided.

PC Support/400

The AS/400 system is well suited to support personal computers and personal computer printers (hereafter called personal printers). In your daily operations you may have need for data that is created and stored on your personal computers to be printed on AS/400 system printers. Conversely, you may have requirements for data created and stored on your AS/400 system to be printed on personal printers.

Introducing Virtual Printers

The virtual printer function is one of the functions available with the licensed program PC Support/400. PC Support runs on both your AS/400 system and your personal computer.

You use the virtual printer function to print data from your PC application programs on AS/400 printers. A **virtual printer** allows you to use a printer attached to the host system as though the printer were directly attached to a personal computer.

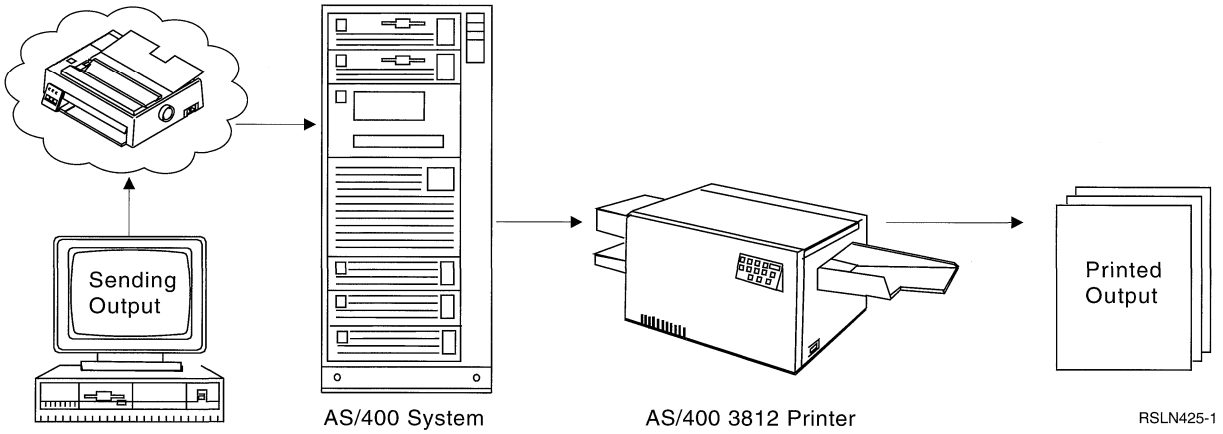
The PC data could be as simple as a personal computer print screen, or as complicated as a word processing document.

The diagram below illustrates the virtual printer concept. For this example, you will need to set up your PC application programs as if they were sending output to an IBM Proprinter, Model 4201. The virtual printer function intercepts and routes the PC output to an AS/400 spooled file. Since AS/400 system printers like the 3812 are not designed to print data from personal computers, the virtual printer function converts the PC data to SNA character string (SCS) data.

There are several reasons why you might want to use a virtual printer. You can take advantage of the faster speed or better quality of the large AS/400 system printers. If your personal computer work station does not have a personal printer attached, you could print your PC data on AS/400 printers.

There are a variety of AS/400 printers that you can use as your virtual printer. The list includes:

- AS/400 system printers, like the 4028, 3816, or 3812.
- Personal printers attached to personal computers running the PC Support/400 work station function printer program.



- Personal printers attached to personal computers running the Operating System/2 Extended Edition Version 1.3 or Extended Services, 5250 Work Station Feature printer program.
- Personal printers attached to AS/400 displays, like the 3477 or 3197.
- Personal printers attached to an ASCII Work Station Controller.
- Personal printers attached to personal computers running the IBM System 36/38 Work Station Emulation Program, Version 1.0.
- Personal printers attached to personal computers running the IBM Enhanced 5250 Emulation Program, Version 2.3.

For both personal computer operating systems, Disk Operating System (DOS) or Operating System/2 Extended Edition Version 1.3 or Extended Services, the virtual printer function is part of the licensed program PC Support/400.

For further information about virtual printers and PC Support/400, see the following manuals:

- *PC Support/400: DOS Installation and Administration Guide*, SC41-0006
- *PC Support/400: OS/2 Installation and Administration Guide*, SC41-0007
- *PC Support/400: DOS User's Guide*, SC41-8199
- *PC Support/400: OS/2 User's Guide*, SC41-8200
- *PC Support/400: DOS and OS/2 Technical Reference*, SC41-8091
- *PC Support/400* (Redbook), GG24-3255
- *PC Support/400 Under OS/2 Extended Edition Version 1.2* (Redbook), GG24-3446

Advanced Function Printing Using the Virtual Printer Function

The PC Support virtual printer function provides an AFP printer driver for users of Microsoft Windows 3.0 or later and one for users of OS/2 2.0 or later. Using either of these printer drivers, AS/400 users can print their application output on AFP-configured IPDS printers.

The printer driver converts the standard print format generated by Windows or OS/2 applications to an all-points-addressable raster format, suitable for printing on AFP-configured IPDS printers. Best results are achieved by using an outline font

manager such as the Adobe Type Manager in the Microsoft Windows or OS/2 environment.

The AFP-configured IPDS printers supported on the AS/400 system include the 3812, 3816, 3820, 3825, 3827, 3828, 3829, 3835, and 4028. The IPDS printer must be configured for AFP support. The format generated by the printer drivers will not drive the IPDS printers at rated speed.

The printer drivers allow the user to define the following print characteristics:

- The IBM printer being used (for example, a 4028)
- Resolution: pels supported
- Orientation: landscape or portrait
- Duplex mode: single-sided, double-sided, or double-sided tumble
- Draft or Quality mode
- Number of copies
- Form type
- Type of forms in each bin for multiple bin printers
- No-print border

  No-print border (sometimes called clip limits) defines the border around the outside of the page where printing is not allowed.

The printer drivers also have an option to convert the Windows or OS/2 print format into AFP page segment or overlay resource objects. These AFP resource objects can then be moved to the AS/400 system using the PC Support transfer function, to be used by AS/400 system applications printing on AFP-configured IPDS printers.

For more information about using the printer driver in a DOS environment, see the *PC Support/400: DOS Installation and Administration Guide*, SC41-0006. For more information about using the printer driver in an OS/2 environment, see the *PC Support/400: OS/2 Installation and Administration Guide*, SC41-0007.

Introducing Work Station Function (Feature) Printers

The work station function is one of the functions available with the licensed program PC Support/400. PC Support runs on both your AS/400 system and your personal computer. You use a work station function printer when the operating system installed on your personal computer is the Disk Operating System (DOS).

The 5250 Work Station Feature is available with the Operating System/2 Extended Edition Version 1.2 or 1.3. The 5250 Work Station Feature runs on your personal computer. You use a 5250 Work Station Feature printer when the operating system installed on your personal computer is the Operating System/2 Extended Edition Version 1.3 or Extended Services.

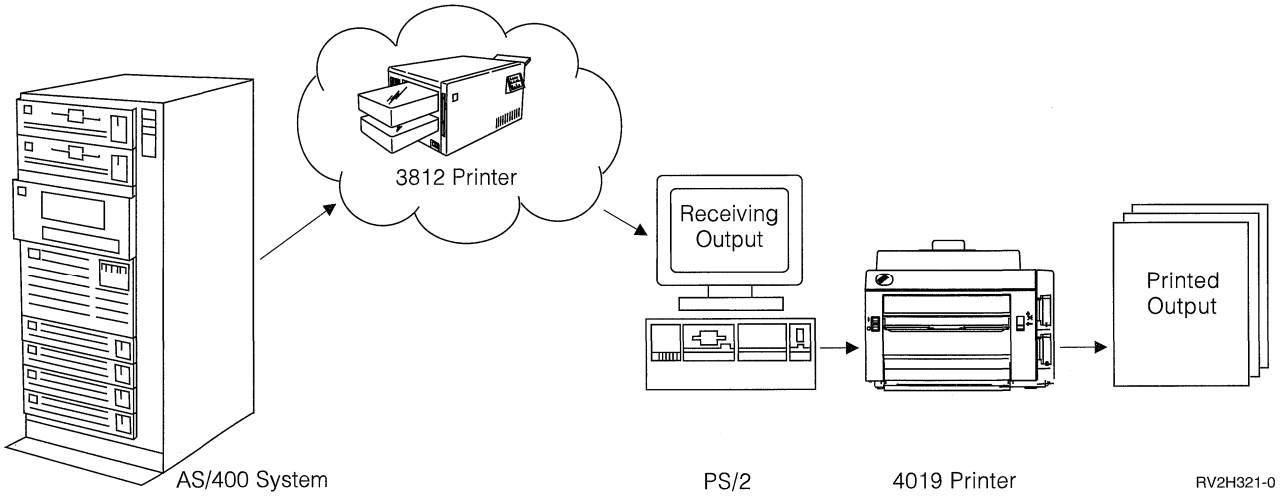
We will use the term work station function printer to include both the PC Support/400 work station function printer and the Operating System/2 5250 Work Station Feature printer.

You can print data created by application programs running on your AS/400 system on personal printers. These personal printers are attached to personal computers that are connected to your AS/400 system. The following list contains examples of personal printers:

- IBM LaserPrinter SE, Model 4029

- IBM ExecJet Printer, Model 4072
- IBM Personal Printer Series II, Model 2380

The diagram below illustrates the work station function printer concept. The AS/400 application creates output for an AS/400 system printer. The work station function printer has informed the AS/400 system that it is actually an AS/400 printer device. The spooled file is sent to the work station function printer for printing. Since personal printers like the IBM LaserPrinter are not designed to print data from AS/400 systems, the work station function printer will convert the AS/400 data.



There are several advantages to using work station function or 5250 Work Station Feature printers. The lower cost and smaller size of personal printers makes it convenient to put personal printers at personal computer work stations that are attached to your AS/400 system.

For further information about PC Support and work station function printers, see the following manuals:

- *PC Support/400: DOS Installation and Administration Guide*, SC41-0006
- *PC Support/400: DOS User's Guide*, SC41-8199
- *PC Support/400: DOS and OS/2 Technical Reference*, SC41-8091
- *PC Support/400* (Redbook), GG24-3255

For further information about the Operating System/2 5250 Work Station Feature printers, see the following manuals:

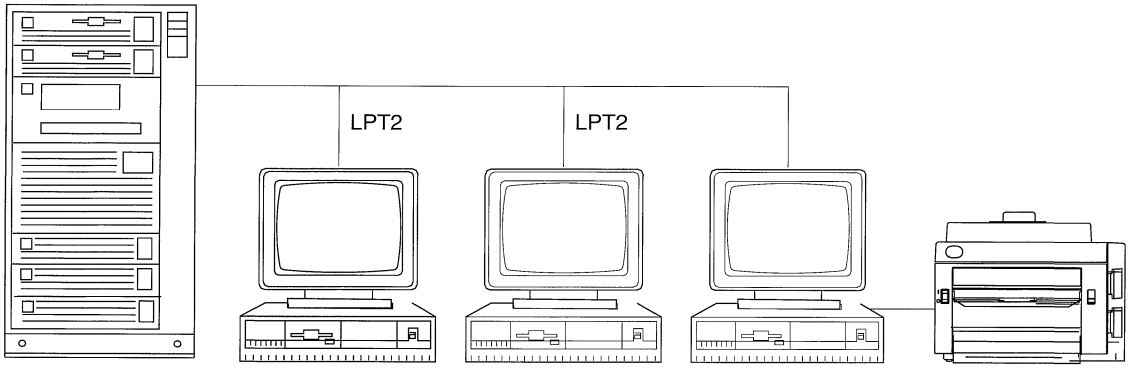
- *IBM Operating System/2 Extended Edition Version 1.3 Getting Started*
- *IBM Operating System/2 Extended Edition Version 1.3 System Administrator's Guide for Communications*
- *IBM Operating System/2 Extended Edition Extended Services Getting Started*
- *IBM Operating System/2 Extended Edition Extended Services System Administrator's Guide for Communications*

Introducing Sharing Personal Printers

You can share a personal printer among several personal computer work stations. Sharing personal printers is a special case of the virtual printer function used with a work station function printer.

The personal computers are attached to the AS/400 system using either the Disk Operating System and PC Support/400, or the Operating System/2 Extended Edition Version 1.3 or Extended Services and PC Support/400. Each personal computer work station that shares the personal printer uses the virtual printer function of PC Support/400.

The diagram below shows how you can share personal printers using the specific example of attaching the IBM 4019 LaserPrinter to your AS/400 system as a PC Support work station function printer.



Your PC application programs are set up as if they are sending output to the IBM 4019 LaserPrinter that you are sharing. The virtual printer function is set up with the ASCII data type. The virtual printer function intercepts and routes the output to an AS/400 spooled file. Since the PC data is going to print on a personal printer, the IBM 4019 LaserPrinter, the virtual printer function does not convert the PC data.

For further information about sharing personal printers when using the DOS operating system, see *PC Support/400: DOS Installation and Administration Guide*, SC41-0006.

IBM InfoWindow 3477, 3486, 3487, and 3488 Printer Support

The IBM InfoWindow* display station can be locally attached to the AS/400 system or remotely attached to the IBM 5294 or 5394 Remote Control Unit via twinaxial cable. The InfoWindow has a printer port that can support attachment of most IBM personal printers. Examples of such personal printers are:

- IBM LaserPrinter, Model 4019
- IBM Quietwriter III, Model 5202
- IBM Quickwriter, Model 5204
- IBM Proprinter II, Model 4201

The attached printer can be used either as a local screen printer or as a system printer to print AS/400 spooled jobs (for example, printing an OfficeVision/400 document or a job generated on a personal computer using the virtual printer function).

There are several advantages to using personal printers that attach to the InfoWindow. The lower cost and smaller size of personal printers makes it convenient to put personal printers at your display stations that are attached to your AS/400 system.

Note: If you specify `local` for the type style option for printer setup on a 3477, 3486, 3487, or 3488 InfoWindow display, font selection or substitution by the printer may give you unpredictable results.

For further information about attachment of personal printers to the 3477, see the following manuals:

- *IBM InfoWindow 3477 User's Guide*, GA18-2923
- *Connecting Personal Printers to IBM Systems*, S544-4209
- *IBM AS/400 Printing* (Redbook), GG24-3452

ASCII Work Station Controller

The ASCII Work Station Controller provides the ability to attach ASCII displays, ASCII printers, and personal computers to the AS/400 system through the RS232 or RS422 interface. The work station controller supports attachment of a wide range of printers. Examples of such personal printers are:

- IBM Proprinter II, Model 4201
- IBM LaserPrinter, Model 4019
- IBM Quickwriter, Model 5204
- IBM 4234, Model 13

The work station controller also provides the ability to attach a personal computer running PC Support work station function. A personal printer attached to the personal computer can be used as an AS/400 system printer

For further information about attachment of printers to the work station controller, see the following manuals:

- *ASCII Work Station Reference and Example*, SA41-9922
- *Connecting Personal Printers to IBM Systems*, S544-4209
- *IBM AS/400 Printing*, GG24-3452

Sending and Printing Files with TCP/IP

The TCP/IP Connectivity Utilities/400 is a licensed program (5738-TC1) that provides connection services to other systems. Important to printing is the spooling and print support available with this licensed program.

You can request to have your spooled files sent and printed on any system in your TCP/IP network. The term often used by UNIX** TCP/IP software to describe this support is **line printer requester (LPR)**. LPR is the sending, or client portion, of a spooled file transfer. On the AS/400 system, the Send TCP/IP Spooled File (SNDTCPSPLF) command provides this function by allowing you to specify what system you want the spooled file printed on and how you want it printed. There is

also a TCP/IP command, LPR, that provides the same parameters and function as the SNDTCPSPLF command.

The printing of the file is done by the printing facilities of the destination system. The destination system must be running TCP/IP. On the AS/400 system, the **line printer daemon (LPD)** is the process on the destination system that receives the file sent by the SNDTCPSPLF command. The LPD process places the spooled file on a local printer queue. To print the spooled file, the spooled file must be put on an output queue already started to an active printer writer or a writer must be started to that output queue.

For additional information about printing using TCP/IP, see:

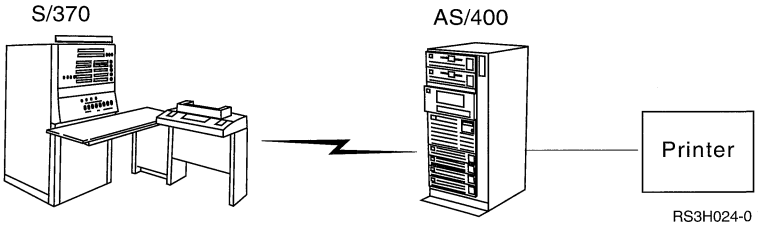
- *Transmission Control Protocol/Internet Protocol Guide*, SC41-9875.
- *IBM AS/400 Printing III, GG24-4028*.

Part 5. Network Printing

Chapter 15. Network Printing

This chapter covers some of the printing functions available on the AS/400 system when it is part of a communications network.

The examples in this part of the guide are intended to show you different methods you can use to send data, within a network, to be printed on an AS/400 system.



3270 Printer Emulation

When configuring 3270 printer emulation on the AS/400 system, you must decide which communications line protocol to use. The AS/400 system supports both binary synchronous communication (BSC) and Systems Network Architecture (SNA) 3270 printer emulation. Therefore, the choice is normally dictated by the protocol supported by the System/370 host communications software and controller.

BSC 3270 Printer Emulation

BSC 3270 printer emulation can be used with any System/370 host system that supports a 3274 control unit (Model 51C) in a BSC multipoint tributary network using a nonswitched line. BSC 3270 printer emulation supports the following features:

- Emulation on any line attached to an AS/400 system.
- Ability to print information received from the host system on any printer normally supported by the AS/400 system.
- Emulation of 3284, 3286, 3287, 3288, or 3289 host printers.

Configuring for BSC 3270 Printer Emulation

Details for configuring for BSC 3270 printer emulation are in Chapter 2 in the *3270 Device Emulation Guide*.

SNA 3270 Printer Emulation

SNA 3270 printer emulation enables the AS/400 system to connect into any existing SNA 3270 network. Any printers attached to the AS/400 system print information received from the System/370 host. The 3270 emulation session is linked to a printer file, which in turn is linked to a printer device. All 3270 printers are emulated as LU 3 printers with the exception of the 3287 and 3289 printers, which may be emulated as either LU 1 or LU 3 printers.

The difference between LU 1 and LU 3 printers is essentially the level of intelligence which the System/370 host expects to find at the printer device. If the

printer is emulated as an LU 1 printer, an LU-LU session can be established with the host. Depending on the host applications, such a printer would be able to fully support SNA character string (SCS) data streams sent to it. If the AS/400 printer emulates an LU 3 printer, only an LU-PU session can be established between it and the System/370 system. This could cause unexpected results when using host print applications. For example, if the host application was expecting to communicate with an LU 1 printer, the printed output would probably not be correctly formatted in terms of line spacing, page length, and so on.

For detailed information on printer emulation, see *Communications: 3270 Device Emulation Guide*, SC41-9602.

RJE Printing

Remote job entry (RJE) allows an AS/400 user to use System/370-based applications and data in combination with AS/400 functions. RJE is part of the IBM Communications Utilities licensed program (5738-CM1), which runs on all AS/400 systems with communications capabilities installed.

When using RJE, the AS/400 system functions as a remote work station that submits jobs to a System/370 host for processing under one or more of the following systems:

- MVS/SP JES2 (SNA and BSC)
- MVS/SP JES3 (SNA and BSC)
- VM/SP RSCS (BSC only)
- DOS/VSE POWER/VSE (SNA only)
- OS/VS1 RES (SNA and BSC)

RJE can communicate with the host system using either of the following line protocols:

- Systems Network Architecture (SNA) over point-to-point switched or non-switched connections
- Binary synchronous communications (BSC) over point-to-point switched or non-switched connections

For BSC, multiple user-defined RJE subsystems may be used concurrently on different lines, each subsystem operating independently of the other. For SNA, multiple subsystems can share the same line.

A writer (printer or punch) output stream can be directed to one of the following:

- A printer file (spooled or nonspooled)
- A physical database file member
- A diskette file (spooled)
- A DDM file
- User program

Configuring for RJE Printing

See the *RJE Guide*, Chapters 2, 3, and 4, for detailed information on installing and configuring RJE. This task requires a knowledge of data communications.

Communications Line Protocols for RJE

A communications line physically connects an AS/400 system to the host. It can be a remote link operating over a long distance, or a cable connecting them on a local area network. The protocol used depends on whether you are in an SNA or a BSC environment. See Figure 15-1 for the protocols supported.

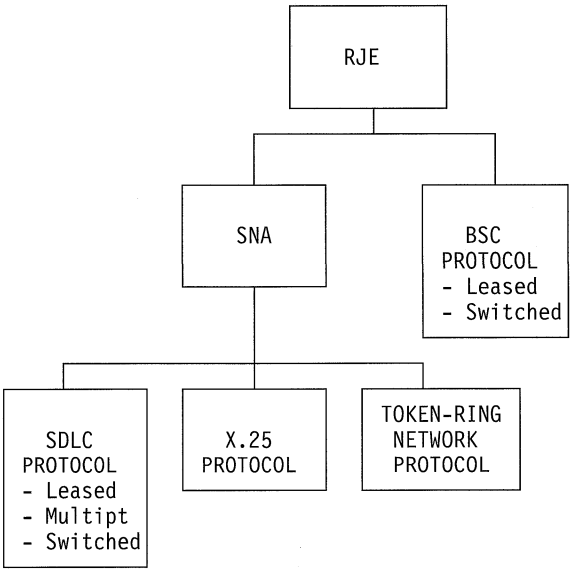


Figure 15-1. Communications Protocols Used by RJE

The physical interfaces supported by RJE are shown in Table 15-1.

Table 15-1. Physical Interfaces Supported by RJE

	SDLC	X.25	Token-Ring Network	BSC
V.35	Yes	No	No	Yes
X.21bisV.35	Yes	Yes	No	Yes
RS232/V.24	Yes	Yes	No	Yes
X.21bisV.24	Yes	Yes	No	Yes
X.21	Yes	Yes	No	No
Medium Access Control (MAC) IEEE 802.5 / ISO 8802-5	No	No	Yes	No

Printer Files

A destination must be defined for each writer specified in the RJE session description. If a printer file is used, it must have a description that the AS/400 system can use to transfer data to a device. The Create Remote Job Entry Configuration (CRTRJECFG) command uses the following command to create a printer file:

```
CRTPRTF  FILE(&CFGLIB/QxxPRTFPRn) +
         CTLCHAR(*FCFC) +
         OUTQ(&OUTQ) +
         MAXRCDS(*NOMAX) +
         SCHEDULE(*FILEEND) +
         LVLCHK(*NO) +
         TEXT('RJE output file for Printer PRnn').
```

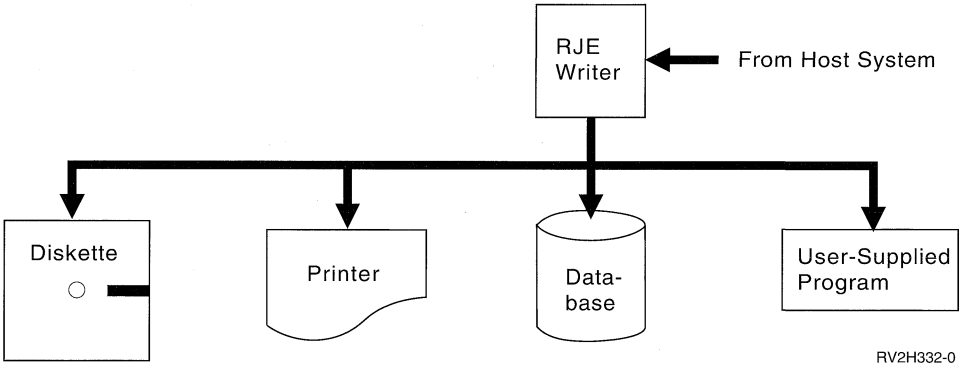
The destination for the writer data may be a device file (printer or diskette file), a physical database file, a DDM file, or a user program.

Notes:

1. RJE printer output streams received from the host system can be directed to an AS/400 system printer.
2. If these RJE printer files are used by any high-level language program, they have to be *program-described*. The term program-described means that the file was created without DDS source describing record formats and fields. Externally described printer files (with DDS source) are not supported under these conditions.

RJE Writer Function

The RJE writer function receives output streams from the host system and sends them to a printer, database file, diskette, or user program.



RJE supports up to seven independent printers for BSC, and up to fifteen independent printers for SNA. The actual number supported depends on the host. Printer output streams consist of printed data in extended binary-coded decimal interchange code (EBCDIC) character format. The output streams can be routed by:

- A writer entry in the session description
- Parameters specified in the Start RJE Writer (STRRJEWTR) command
- A forms entry in the FCT.

RJE Forms Control Table

The RJE forms control table (FCT) assigns special processing requirements for specific output streams received from the host system. The FCT functions as a routing table for sending data to a specific output file.

The FCT also functions as a translation table by converting the forms name or number used by the host system into a corresponding name or number more meaningful to the AS/400 user.

When the host system sends a peripheral data set information record (PDIR) (SNA), or a forms-mount message (BSC), the FCT is searched for the host-system-defined name or number. If the name or number is found, the corresponding AS/400 form name for that entry is sent in the forms mount message to the system operator. Both names must be placed in an FCT entry. For example:

```
ADDFCTE  FCT(MYRJELIB/MYRJEFCT) +
         FORMTYPE(X2QH) +
         LCLFORM(INVOICE)
```

When a forms-mount message containing the name X2QH is received from the host system, the name INVOICE is used in the forms-mount message to the AS/400 system operator. There is no limit to the number of FCTs that can be defined, but each RJE session uses only one at a time.

Controlling the FCT: The following commands are supplied with RJE:

CRTFCT	Create Forms Control Table
CHGFCT	Change Forms Control Table
DLTFCT	Delete Forms Control Table
WRKFCT	Work with Forms Control Table
ADDFCTE	Add Forms Control Table Entry
CHGFCTE	Change Forms Control Table Entry
RMVFCTE	Remove Forms Control Table Entry

The following is an example of FCT creation:

```
CRTFCT  FCT(MYRJEFCT)
        AUT(*ALL)
        TEXT('User-defined forms control table')
```

The following is an example of adding an entry to the FCT:

```
ADDFCTE  FCT(MYRJELIB/MYRJEFCT) +
         FORMTYPE(STD) +
         DEVTYPE(*PRT) +
         LCLFORM(*FORMTYPE) +
         FILE(*WTRE) +
         MBR(*WTRE) +
         FSN*WTRE) +
         DTAFMT(*WTRE) +
         CHLVAL(*FILE) +
         FORMSIZE(*FILE) +
         LPI(*FILE) +
         CPI(*FILE) +
         COPIES(*FILE) +
         PGM(*WTRE) +
         MSGQ(*WTRE)
```

Printing Using RJE

Starting Writers

The following commands can be used to start an RJE writer:

STRRJESSN — Start RJE Session: Starts the writers defined in the session description (when WTRS(*YES) is specified). If this command is used, the writer options cannot be selected: each writer starts with the defaults of the Start RJE Writer (STRRJEWTR) command.

STRRJEWTR — Start RJE Writer: Starts either individual writers or all writers defined in the session description. If this command is used, individual options can be selected for each writer.

WRKRJESSN — Work with RJE Session: Allows one or more writers defined in the session description to be started. If this command is used, the RJE session status of all writers and readers defined in the session is displayed on the screen.

Cancelling Writers

If writers are cancelled with OPTION(*IMMED), or if a session ends abnormally during processing, blocks of data may be lost. Each host system has the capability to save a backup of the data. Refer to the appropriate host system manual for details.

The following commands and control statements can be used to cancel an RJE writer:

- RJE control statements

  ..CANCEL — Cancel: Control statement that cancels a printer or punch. This control statement can be issued only from the RJE console. To issue it from the console, type it on the command line and press F10.

  ..END — End: Control statement that ends the session in a controlled manner. This control statement can be issued only from the RJE console. To issue it from the console, type it on the command line and press F10.

- AS/400 commands

ENDRJESSN End RJE Session: Command that cancels all writers that are active and defined in the session description.

CNLRJEWTR Cancel RJE Writer: Command that cancels either individual writers or all writers that are active and defined in the session description. If this command is issued, the session does not end and the AS/400 system continues to communicate with the host system.

WRKRJESSN Work with RJE Session: Command that permits one or more writers defined in the session description to be cancelled.

Receiving Printer Output from the Host System

When RJE receives an output stream from the host, it uses the host-system form type value to determine how that output stream should be processed. For SNA, the form type is in the peripheral data set information record (PDIR); for BSC, it is in the forms-mount message.

The host-system form type is compared with certain values at the AS/400 system, and processing continues as shown in Figure 15-2.

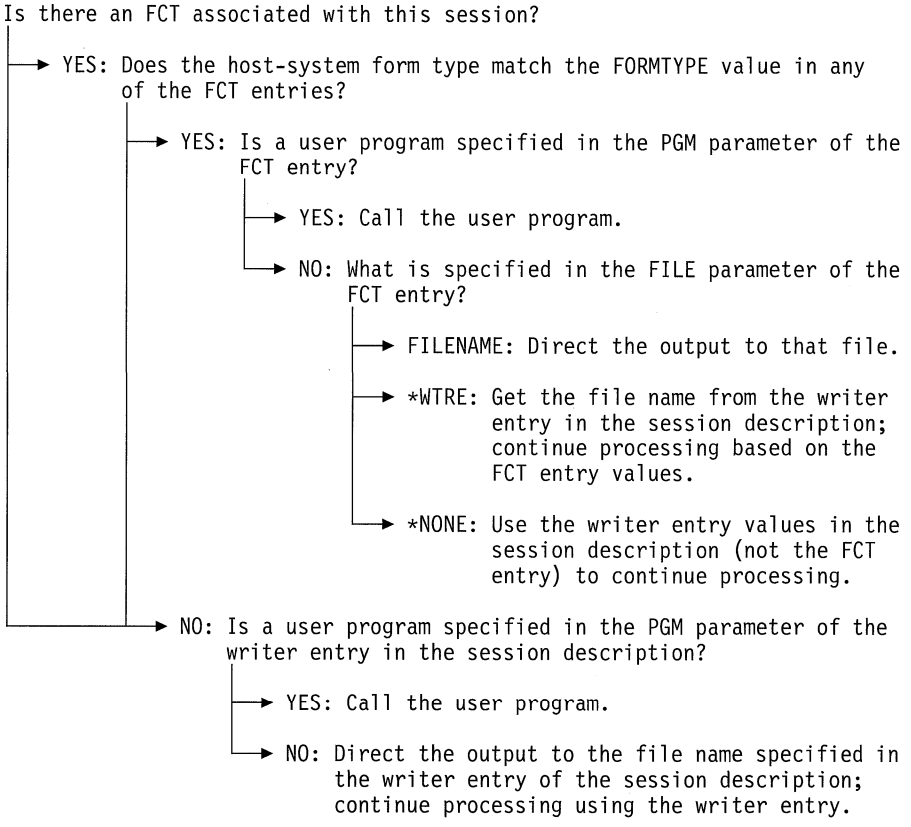


Figure 15-2. Processing Output Streams

Record Length of Output Data

In RJE, to determine the record length of output data, use the OUTRCDLEN parameter of the CRTRJECFG, CRTSSND, CHGSSND, or CVTRJEDTA command. This parameter controls how RJE reblocks the output stream received from the host. It has two values: *FIXED and *FILE.

If you specify *FIXED, RJE reblocks the output stream according to its own defaults, which are as follows:

- When an RJE printer is processing the output stream:
  - If data is being written to a printer file, the record length is 132 bytes for 10 or fewer characters per inch (CPI), and 198 bytes when the CPI is greater than 10. You must specify *FCFC for the CTLCHAR parameter of either the Create Printer File (CRTPRTF) or Change Printer File (CHGPRTF) command.
  - If data is being written to a physical file, the record length is 132 bytes for data format, and 133 bytes for FCFC format. Physical files do not have any CPI value associated with them. The record length of the physical file must equal the record length of the output data (132 or 133 bytes) to prevent record misalignment.
- RJE punches reblock data as 80-byte records.
- For diskette files, the output stream is reblocked as 128-byte records. If the record length is greater than 128, data is truncated.

If you specify *FILE, RJE reblocks the output stream as follows:

- When an RJE printer is processing the output stream:
  - If data is being written to a printer file, the record length is determined by the page width of the printer file. You must specify *FCFC for the CTLCHAR parameter of either the Create Printer File (CRTPRTF) or Change Printer File (CHGPRTF) command.
  - If data is being written to a physical file, the record length of the output data is determined by the record length of that file. If the data is FCFC format, the record length of the file must include one extra byte for the FCFC code.
- When an RJE punch is processing the output stream:
  - If data is being written to a printer file, the record length is determined by the page width of the printer file.
  - If data is being written to a physical file, the record length of the output data is determined by the record length of that file.
- For diskette files, the output stream is reblocked as 128-byte records. If the record length is greater than 128, data is truncated.

The maximum record length that RJE supports, including carriage-control characters, is 255 bytes. To ensure record alignment, the record length of the output file must be greater than or equal to the logical record length of the data that is received from the host subsystem. If the record length of the output file is greater than the logical record length of the data received, the records are right-padded with blanks.

If you need to use both OUTRCDLEN(*FILE) and OUTRCDLEN(*FIXED) in one session, specify the former and then have it function as OUTRCDLEN(*FIXED) by setting the record length of the output files to 80, 132, 133, or 198.

Example of Using OUTRCDLEN(*FILE)

Assume that you want to send a report that has a record length of 144 bytes from a host to an AS/400 system. To do this using OUTRCDLEN(*FILE):

1. Create a physical file with a record length of 144 bytes using either the Create Physical File (CRTPF) or the Create Source Physical File (CRTSRCPF) command. Specify *NOMAX for the MAXMBRS parameter to allow RJE to create as many members as needed in the file.
2. Change the writer or FCT entry FILE parameter to specify the new physical file. When the data is written to the file, it is reblocked to 144-byte records.

Printing Using FCFC

The host system sends output streams as 132- or 198-byte records with carriage-control characters that go before each record. RJE converts records containing host system carriage-control characters to records containing ANS FCFC codes (before printing) that are supported by the OS/400 program.

For SNA, carriage control is provided by the extended SNA character string (SCS) controls. These are shown in Table 15-2.

Table 15-2. SNA Character String (SCS) Controls

SCS	Meaning
CR	Carriage return
FF	Forms feed (page end)
IRS	Inter-record separator
NL	New line
SVF	Set vertical format
VCS	Vertical channel set

For BSC, carriage control is provided by carriage-control bytes (CCBs). These are shown in Table 15-3.

Table 15-3. BSC Carriage-Control Bytes

Code	Meaning
1010 00nn	Space immediately nn spaces (no printing)
1011 nnnn	Skip immediately to channel nnnn (no printing)
1000 00nn	Space nn lines after printing
1001 nnnn	Skip to channel nnnn after printing
1000 0000	Suppress space after printing

The ANS FCFC codes are shown in Table 15-4 on page 15-10.

Table 15-4. ANS First-Character Forms Control (FCFC) Codes

Code	Meaning
	Space 1 line before printing (blank code)
0	Space 2 lines before printing
-	Space 3 lines before printing
+	Suppress space before printing
1	Skip to channel 1
2	Skip to channel 2
3	Skip to channel 3
4	Skip to channel 4
5	Skip to channel 5
6	Skip to channel 6
7	Skip to channel 7
8	Skip to channel 8
9	Skip to channel 9
A	Skip to channel 10
B	Skip to channel 11
C	Skip to channel 12

When you specify *FIXED for the OUTRCDLEN parameter of the CRTRJECFG, CRTSSND, CHGSSND, or CVTRJEDTA command, the output stream is reblocked as follows:

- When an RJE printer is writing the output data to a printer file, the record length is 132 bytes for 10 or fewer cpi, and 198 bytes when the cpi is greater than 10. You must specify *FCFC for the CTLCHAR parameter of either the Create Printer File (CRTPRTF) or Change Printer File (CHGPRTF) command.
- When an RJE printer is writing the output data to a physical file, the record length is 132 bytes for data format, and 133 bytes for FCFC format. Physical files do not have any cpi value associated with them. The record length of the physical file must equal the record length of the output data (132 or 133 bytes) to prevent record misalignment.

When you specify *FILE for the OUTRCDLEN parameter, the record length (page width) of the file that receives the data determines the record length of the output data.

Using a User Program to Receive Host-System Output

Three programs supplied with RJE can be called by user-written programs to receive data from the host system. See Chapter 8 of the *RJE Guide* for details.

3x74 Attached Printers

There is no 3270 emulation pass-through (*pipeline*) support for 3x74 remote-attached printers. Printing capability is limited to the LU 1 support. Printer data management and spool support is not provided for printers that use the 3270 Information Display System data-stream capability (DSC).

For AS/400 printing applications, the extent of the function is limited to that provided by a 3287 printer, regardless of the type and model of the printer actually attached. This is functionally equivalent to a 5256-003 printer. For example, a 4224 printer, which has all-points-addressable capability, only provides 3287 printer capability when attached to a 3x74 controller. However, if a 3284 printer is

attached to the 3x74 controller, it does not provide the 6 or 8 LPI support of the 3287 printer because it is not equipped with the necessary hardware features.

When using a 3x74 remote-attached printer (for example, a 4224) configured as a 3287 printer, make sure that the page length set on the printer hardware switch matches the length of the forms that are in the printer. If the length of the forms loaded does not match the printer hardware switch setting, the application will still print correctly on the forms. However, when the spooled file completes printing, the 4224 uses the default page size set on the printer hardware switches.

For example, assume your page length set on the printer hardware switches is 11 inches, your actual forms are 3 inches long, the spooled file just completed printing, and you press the Page Eject key to get the last printed form. By pressing the Page Eject key, you may advance the forms 11 inches instead of the 3 inches your form takes up.

DBCS Printer Considerations

If the spooled file contains double-byte data (IGCDTA(*YES) specified on the printer file), it can be printed on printers attached to a 3x74 controller.

However, the following attributes or DDS keywords are ignored if the target printer is attached to a 3x74 controller.

- IGCCPI (DBCS attribute)
- IGCCHRRTT (DBCS attribute and DDS keyword)
- IGCEXNCHR (DBCS attribute)
- IGCCHRSIZ (DDS keyword)
- DFNLIN (DDS keyword)

The IGCSOSI printer file parameter is processed in the OS/400 program and not in the printer being used to print the spooled file.

Distributed Data Management (DDM) Printing

DDM enables users or application programs on the AS/400 system to access data files that reside on remote systems and allows these remote systems to access data on the local AS/400 system. This remote file access is transparent to the application program command or utility. Remote file requests are routed through a DDM file, which contains the name of the file on the remote system as well as the name of this system as it is known on the network.

There are, however, certain limitations to the DDM support, particularly where printing applications are concerned. For example:

- The AS/400 Query licensed program does not support DDM files.
- It is not possible to print on a remote AS/400 system using, for example, an OVRPRTF of QSYSPRT to the source DDM file because the print request is rejected by DDM, as shown by the following job log extract:

```
3 > OVRPRTF FILE(QSYSPRT) TOFILE(ITSCID03/DDMQSYSPRT)
    DDM file DDMSRC in MYLIB uses remote file QSYS/QSYSPRT.
    File DDMSRC in MYLIB not a data base file.
    Cannot open DDM file DDMSRC in MYLIB.
    Function check. CPF4207 unmonitored by QWSGET at statement *N,
    instruction X'0F9D'.
    A function check was received while opening the print file.
    The print operation used the default printer device file.
```

One way in which data could be printed on a remote AS/400 system using DDM is as follows:

1. Create a DDM file on the source system using the Create DDM File (CRTDDMF) command.

   ```
   CRTDDMF FILE(MYLIB/DDMSRC) RMTFILE(QSYS/QSYSPRT)
   RMTLOCNAME(B20) TEXT('DDM file for remote printing on B20').
   ```

2. Create a physical file of the appropriate record length to receive the spooled data (80 bytes for print screen output, 132 bytes for normal spooled output), using the Create Physical File (CRTPF) command.

   ```
   CRTPF FILE(MYLIB/PFILE) RCDLEN(80) TEXT('CPYSPLF data file').
   ```

3. Create a similar file on the remote AS/400 system using the Submit Remote Command (SBMRMTCMD) command.

   ```
   SBMRMTCMD CMD('crtpf file (rlib/rfile) rcdlen(80)') DDMFILE(DDMSRC).
   ```

4. Copy the spool entry to the physical file using the Copy Spooled File (CPYSPLF) command, taking the defaults (no control character).

   ```
   CPYSPLF FILE(QSYSPRT) TOFILE(MYLIB/PFILE)
   JOB(003049/USER/DSP06).
   ```

5. Use the Copy File (CPYF) command to copy the data from this physical file to the remote physical file created in Step 3.

   ```
   CPYF FROMFILE(MYLIB/PFILE) TOFILE(MYLIB/DDMSRC)
   MBROPT(*ADD).
   ```

6. Use the SBMRMTCMD command once again to copy the data from the remote physical file to QSYS/QSYSPRT in order to create a spooled file on the remote AS/400 system's default output queue.

   ```
   SBMRMTCMD CMD('cpyf fromfile(rlib/rfile) tofile(qsysprt) mbropt(*add)')
   DDMFILE(DDMSRC).
   ```

This procedure can be adapted to direct AS/400 printing to remote System/36 systems and System/38 systems with DDM installed. See the *DDM Guide* for details of the differences in DDM implementation on these other systems.

Object Distribution Printing

Object distribution provides the facility to send objects, messages, job streams, and spooled files across a suitably configured SNA link to another AS/400 system or group of AS/400 systems. File distribution (data, source, and spooled files) to System/36, System/38, and System/370 CICS systems is also possible using OS/400 object distribution support. See the *Distribution Services Network Guide* for details.

Part 6. Appendixes

Appendix A. Examples of Working with Printing Elements

The examples in this appendix are intended to help you become familiar with the printing elements used to perform printing tasks.

Any one element by itself will probably not allow you to control your printing environment. However, by becoming familiar with all the elements and how they interact, you will be able to create and control your printing environment.

Structure of Examples in This Appendix

Most of the examples assume that spooled files have been created and are in an output queue. If you want to quickly create a spooled file to use with these examples, you can press the Print key. Pressing the Print key creates a spooled file containing the data shown on the display at the time the Print key was pressed.

Throughout the examples, the use of CL commands and F4 (Prompt) are emphasized as a way to work with all the elements that make up printing.

Type of Example	Where to Find It
Working with your user profile	To see how to display and change your user profile, go to "Working with Your User Profile" on page A-2.
Working with QPRTDEV system value	To see how to use the system value QPRTDEV to find out what the default system printer (printer device) is, go to "Working with System Values" on page A-3.
Creating output queues	To see how to create output queues, go to "Working with Output Queues" on page A-4.
Working with printer files	To see how to specify different output queues and printer devices by changing printer file attributes, go to "Using the Printer File to Select a Different Output Queue" on page A-4.
Moving spooled files	To see how to move spooled files from one output queue to a different output queue, go to "Moving a Spooled File to a Different Output Queue" on page A-6.
Assigning printers to output queues	To see how to assign a printer from one output queue to a different output queue, go to "Working with Printer Writers (WRKWTR)" on page A-8.
Locating spooled files	To see how to locate spooled files created by you, go to "Locating Spooled Files" on page A-10.

Working with Your User Profile

Everyone who uses the system has a user profile; information stored in the user profile will help you with your printing needs.

These commands allow you to display and change your user profile:

- DSPUSRPRF (your user ID) allows you to display your user profile.
- CHGUSRPRF (your user ID) allows you to change your user profile.

Displaying Your User Profile

From a command line, type DSPUSRPRF (your user ID) and press the Enter key.

Your user profile appears. From a printing perspective, the important parameters are: *Output Queue* and *Printer Device*. Page through your displayed user profile and locate the output queue and printer device parameter values. These values indicate where your spooled files go (the output queue) and which printer (the printer device) they are printed on.

When you display your user profile, you cannot change any of the attributes you are viewing.

Changing Your User Profile

Let's say that your organization purchased a printer that supports letter-quality printing as compared to the dot-matrix printer you currently use. You want your output to be printed on the new, letter-quality printer.

Your system administrator has configured the new printer and created an output queue for it.

The printer name is PRT99 and its output queue name is also PRT99.

Different Methods to Change Your User Profile

There are two ways to change your user profile to reflect the new printer's name and output queue.

Method one: From a command line, type CHGUSRPRF (your user ID), and press F4 (Prompt).

Your user profile with all its assigned values appear. Page through the user profile until you find the output queue and printer device parameter values. Type PRT99 over the current values, and press the Enter key.

Method two: From a command line, type

```
CHGUSRPRF (your User ID) OUTQ(PRT99) DEV(PRT99)
```

Press the Enter key.

Verification of Change

To verify that the requested change took place (regardless of the method of change) use the Display User Profile command DSPUSRPRF (your user ID). Page forward to view the output queue and printer device parameters values. They will be PRT99.

Note: When you change your user profile, the change does not become effective until the next time you sign on.

Working with System Values

The QPRTDEV system value determines which printer is defined as the system printer.

Displaying the System Value for the System Printer

To find the name of the system printer, display the system value called QPRTDEV. Type DSPSYSVAL QPRTDEV and press the Enter key. The following is displayed:

```
                          Display System Value

System value . . . . . :   QPRTDEV
Description  . . . . . :   Printer device description


Printer device . . . . :   PRT01          Name
```

You can see, from the displayed system value QPRTDEV, that the name of the printer your output goes to is PRT01 (if the SPOOL parameter of the printer file is *NO).

If the SPOOL parameter of the printer file is *YES, your spooled files go to output queue PRT01.

Note: This is true only if the default values for the printer file, job description, and user profile have not been changed.

Changing System Values

Very few users have the authority to change system values.

If system values are changed, everyone on the system could be affected.

In this case, if you are using *SYSVAL for the output queue and printer device values in your user profile and someone changes the QPRTDEV value, your printed output could go to a different output queue or printer.

Working with Output Queues

Output queues can be created by any user of the system.

You might choose to create additional output queues if you have application programs that have special forms requirements, limited number of printers available on the system, low speed printers, or spooled files that you do not want printed. Creating additional output queues to hold spooled files that require special handling allows you to determine what gets printed, on what printer, and when it gets printed.

Until you become very familiar with using CL commands to create output queues, the best way to start is to type CRTOUTQ and press F4 (Prompt). The following display appears:

```
                        Create Output Queue (CRTOUTQ)
 Type choices, press Enter.
Output queue . . . . . .    XXXXXXXXX     Name
   Library  . . . . . .      *CURLIB     Name, *CURLIB
 Order of files on queue  . . . .  *FIFO        *FIFO, *JOBNBR
 Text 'description' . . . . . .  *BLANK
                       Additional Parameters
 Display any file . . . . . .  *NO          *NO, *YES
 Job separators . . . . . .  0             0-9, *MSG
 Operator controlled  . . . . . .  *YES         *YES, *NO
 Authority to check . . . . . .  *OWNER       *OWNER, *DTAAUT
 Authority  . . . . . .  *USE           *USE, *ALL, *CHANGE, *EXCLUDE
```

The only required value is for the *Output queue* parameter. The name you assign here is the name you will use when specifying this output queue in a printer file, job description, or user profile.

The remainder of the output queue parameters have a default value assigned.

For detailed information on the CRTOUTQ command and its parameters, press the Help key or see the *CL Reference*.

Using the Printer File to Select a Different Output Queue

An output queue is an object that holds your spooled files until they are printed. Printer files, job descriptions, and user profiles all have parameters that allow you to specify a particular output queue.

In this example, let us assume that an application program that is run every day uses a printer file, called PRTF1, to control which output queue your spooled files are sent to.

In the printer file named PRTF1, the output queue value is OUTQ1 and the printer device value is PRT3812.

Let us also assume that PRT3812 is out of operation for an unknown amount of time. You need to print the spooled files from your application program but will have to use a printer named PRT3816 and an output queue named OUTQ3816. How can you change printer file PRTF1 to have your spooled files printed on PRT3816?

There are two ways, one temporary and one permanent, that you can send your spooled files to PRT3816.

- Temporarily, using the Override Printer File (OVRPRTF) command.
- Permanently, using the Change Printer File (CHGPRTF) command.

Using the OVRPRTF Command to Change Printer File PRTF1

The Override Printer File (OVRPRTF) command changes PRTF1 only for the job, program, or display session in which it is issued.

In our example,

1. Type OVRPRTF (PRTF1) and press F4 (Prompt).
2. Page forward until you locate the output queue and printer device parameters.
3. Type over the existing values for output queue and printer device with OUTQ3816 and PRT3816 respectively.

   Note: At this point the spooled files will go to OUTQ1 if the SPOOL parameter in the printer file is set to *YES. The output will go directly to PRT3812 if the SPOOL parameter in the print file is set to *NO.
4. Press the Enter key.

The application program that uses printer file PRTF1 will now send the spooled files to output queue OUTQ3816.

Using the CHGPRTF Command to Change Printer File PRTF1

The Change Printer File (CHGPRTF) command changes PRTF1 permanently and will be in effect as soon as the command is run by the system.

When a change is made to the printer file, it affects all users who use that particular printer file.

In our example,

1. Type CHGPRTF (PRTF1) and press F4 (Prompt).
2. Page forward until you locate the output queue and printer device parameters.
3. Type over the existing values for output queue and printer device with OUTQ3816 and PRT3816 respectively.
4. Press the Enter key.

The application program that uses printer file PRTF1 will now send the spooled files to output queue OUTQ3816.

Moving a Spooled File to a Different Output Queue

Notes:

1. Spooled files on the AS/400 system are protected by security measures enforced by the system. You may discover that you cannot move some spooled files to some output queues. Contact your security officer if this happens. For example, you can move ***your*** spooled files to other output queues; however, you cannot move ***someone else's*** spooled files to other output queues unless you have certain authorities. Contact your security officer for specific details, or see the *Security Reference* manual.
2. When moving spooled files to other output queues, you should keep in mind that, if a printer is not assigned to the target output queue, you may have to assign a printer to the output queue.

Different Methods to Move Spooled Files

Here are three methods to move spooled files from one output queue to another output queue.

1. Using the Work with Spooled Files (WRKSPLF) command
2. Using the Work with Output Queue (WRKOUTQ) command
3. Using the Work with Job (WRKJOB) command

Note: If you choose to move spooled files from one output queue to another using CL commands from a command line, you must know the library the target output queue is in.

Method one: Moving spooled files using the WRKSPLF command.

The Work with Spooled Files (WRKSPLF) command can be used to move a spooled file from one output queue to another:

1. Type WRKSPLF and press the Enter key.

   The Work with All Spooled Files display appears. This display lists all of your spooled files and shows you what output queue they reside in.

2. Move the cursor to the spooled file you want to move and type a 2 (Change) in the option field next to the file name.

   This allows you to change the attributes of this spooled file. In this example, the attribute you will change is the output queue name (and library if the output queue is in a different library).

3. Press the Enter key and the Change Spooled File Attributes (CHGSPLFA) display appears.

4. Move the cursor to the *Output queue* parameter, and type over the current output queue name with the name of the output queue you want the spooled file moved to.

   If the library of the target output queue is different from the library that your current output queue is in, type the name of the library that your target output queue is in.

5. Press the Enter key, and you return to the Work with All Spooled Files display.

   The name of the target output queue is now shown in the *Queue* column next to the spooled file that you moved.

Method two: Moving spooled files using the WRKOUTQ command.

The Work with Output Queue (WRKOUTQ) command can be used to move a spooled file from one output queue to another:

1. Type WRKOUTQ and press the Enter key

   The Work with All Output Queues display appears.

2. Page forward until you find the output queue that your spooled files go to.

3. Type a 5 (Work with) next to the output queue you want to work with.

   The Work with Output Queue display appears.

4. Page forward until you locate the spooled file you want to move to a different output queue.

5. Move the cursor to the spooled file and type a 2 (Change) in the option field next to the file name.

   This allows you to change the attributes of this spooled file. In this example, the attribute you will change is the output queue name (and library if the output queue is in a different library).

6. Press the Enter key and the Change Spooled File Attributes (CHGSPLFA) display appears.

7. Move the cursor to the *Output queue* parameter and type over the current output queue name with the name of the output queue you want the spooled file moved to.

   If the library of the target output queue is different from the library that your current output queue is in, type the name of the library that your target output queue is in.

8. Press the Enter key, and you return to the Work with Output Queue display.

   The value in the status (Sts) column is now *CHG. The spooled file is now in the target output queue.

Method three: Moving spooled files using the WRKJOB command.

The Work with Job (WRKJOB) command can be used to move any spooled file that was created by the present job from one output queue to another:

1. Type WRKJOB and press the Enter key.

   The Work with Job display appears.

2. Select option 4 (Work with spooled files).

   The Work with Job Spooled Files display appears.

3. Page forward until you locate the spooled file you want to move to a different output queue.

4. Move the cursor to the spooled file and type a 2 (Change) in the option field next to the file name.

   This allows you to change the attributes of this spooled file. In this example, the attribute you will change is the output queue name (and library if the output queue is in a different library).

5. Press the Enter key and the Change Spooled File Attributes (CHGSPLFA) display appears.
6. Move the cursor to the *Output queue* parameter and type over the current output queue name with the name of the output queue you want the spooled file moved to.

   If the library of the target output queue is different from the library that your current output queue is in, type the name of the library that your target output queue is in.
7. Press the Enter key, and you return to the Work with Job Spooled Files display.

   The name of the target output queue is now shown in the *Queue* column next to the spooled file that you moved.

Working with Printer Writers (WRKWTR)

The WRKWTR command allows you to control the printers that are configured to your system. When you type WRKWTR and press the Enter key, the Work with All Printers display appears. From this display you can:

- Start a writer.

  When this option is selected, the printer writer program tells the printer to start printing spooled files from the output queue it is assigned to.
- Change a writer.

  When this option is selected, you can change some of the attributes of the printer. For example: form type, number of file separator pages, or output queue the printer is assigned to.
- Display the messages for the writer.

  When this option is selected you can view messages that are returned to the person working with a particular printer. Answering messages is important to keep the printer in an active state.
- Hold a writer.

  When this option is selected, the printer writer program tells the printer to stop printing.
- Release a writer.

  When this option is selected, the printer is again available for use.
- End a writer.

  When this option is selected, the printer stops and becomes the printer available to the system for use. For example: the printer can now be assigned to print spooled files from a different output queue.

Assigning a Printer to a Different Output Queue

This example shows how to assign a printer to print spooled files from an output queue the printer is not currently assigned to.

Assumptions for This Example

1. Assume you have an output queue named MYOUTQ.
2. Assume it is not currently assigned to any printer.

3. Assume your system has a printer named PRT3816 and it is assigned to an output queue also named PRT3816. PRT3816 is the printer you want assigned to the output queue named MYOUTQ.

Different Methods to Assign Printers to Output Queues

1. Using the displays.

   This is the method you would use if you are not familiar with CL commands.

2. Using a CL command.

   This is the method you would use if you are familiar with CL commands and are familiar with the elements that help you manage your printing work load.

Method one: Before you can assign a printer to print spooled files you have to know the status of the printer you want to use.

1. To find the status of the printer you want to use, type WRKWTR on any command line and press the Enter key. The Work with All Printers display appears. This display shows all printers configured to the system.
2. Page forward until you find PRT3816.

   Look at the Sts (status) column to determine the status of the printer. Let us assume it is STR (started).

3. To find out which output queue it is assigned to, type an 8 (Work with output queue) next to PRT3816 and press the Enter key.

   The Work with Output Queue display appears. You can now see the name of the output queue PRT3816 is assigned to and if there are any spooled files in that output queue.

   Note: If there are spooled files in the output queue and you assign the printer to a different output queue, the spooled files in PRT3816 will not print. You should notify the owner of those spooled files if you assign the printer to a different output queue.

   Let us assume there are no spooled files in the output queue assigned to PRT3816.

4. Press F12 to return to the Work with All Printers display.
5. Type a 2 (Change) next to PRT3816 and press the Enter key. The Change Writer display appears.
6. Move the cursor to the *output queue* parameters.
7. Type the name of the output queue you want to use (in this case, MYOUTQ).

   The writer will start processing spooled files from MYOUTQ.

8. Press the Enter key.

   You are returned to the Work with All Printers display.

9. Press F5 (Refresh).
10. Type an 8 (Work with output queue) next to PRT3816 and press the Enter key.

    The Work with Output Queue display appears. At the top of the display, you will see `Queue: MYOUTQ`.

This verifies that printer PRT3816 is now assigned to the output queue named MYOUTQ.

11. Press F12 to return to the Work with All Printers display.

Method two: Using a CL command.

From a command line type:

```
CHGWTR WTR(PRT3816) OUTQ(MYOUTQ)
```

This command assigns printer PRT3816 to print spooled files from output queue MYOUTQ.

Locating Spooled Files

Most application programs create spooled files. Depending on the tasks you are performing, your spooled files could go to different output queues. Which output queues are used depends on the element used to direct the spooled files. For example: printer file, job description, or user profile can be the element that specifies which output queue is used.

Using the Work with Spooled Files (WRKSPLF) Command

To display ***all*** of your spooled files:

1. Type WRKSPLF and press the Enter key.

   The Work with All Spooled Files display appears.

2. Page forward to see all of your spooled files.

   The Device or Queue column shows you which output queue a particular spooled file is in.

Using the Work with Job (WRKJOB) Command

The difference between the WRKSPLF command and the WRKJOB command is that the WRKJOB command displays spooled files from the current sign-on session only.

To display all of your spooled files for this sign-on session:

1. Type WRKJOB and press the Enter key.

   The Work with Job display appears.

2. Select option 4, Work with spooled files.

   The Work with Job Spooled Files display appears.

   The Device or Queue column shows you which output queue a particular spooled file is in.

Options You Can Select Using WRKSPLF or WRKJOB

From the Work with All Spooled Files display or Work with Job Spooled Files display you can:

- Send a spooled file to another system through the network (option 1)
- Change spooled file attributes (option 2)

- Hold spooled files (option 3)
- Delete spooled files (option 4)
- Display the contents of a spooled file (option 5)
- Release the spooled file if it was previously held (option 6)
- Display the messages that prevent the spooled file from printing (option 7)
- View the attributes of a spooled file (option 8)
- Work with the printing status of a spooled file (option 9)

Appendix B. CL Commands Frequently Used While Working with Printing Tasks

Below are lists of CL commands with a short description of each command. You can copy them for your use. For a complete description of the command, press the Help key or see the *CL Reference*.

These commands can be entered with the required parameters from any command line, you can enter the command and press F4 to use the command prompt display.

Commands Used with a User Profile

WRKUSRPRF Work with User Profiles. This command allows you to work with a list of user profiles.

CRTUSRPRF Create User Profile. This command is used to identify new users to the system. You can specify that user's output queue and printer device.

Note: You need special authority to create and delete user profiles.

DSPUSRPRF Display User Profile. This command allows you to display your user profile. It is useful for checking the user profile values. You can see the output queue and printer device values. To display user profiles of other users, you must have special authority.

CHGUSRPRF Change User Profile. This command allows you to change the current values of your user profile. If you have the correct level of authority, you can change the user profiles of other users.

DLTUSRPRF Delete User Profile. This command allows you to delete a user profile.

Note: You need special authority to create and delete user profiles.

Commands Used with a Job Description

WRKJOBD Work with Job Descriptions. This command allows you change the attributes of a user's job description. To change the values of a job description other than your own requires special authority.

CRTJOBD Create Job Description. This command allows you to create job descriptions. When a user signs on, the values in the job description determine which output queue and printer device will be used.

CHGJOBD Change Job Description. This command allows you to change the values of a job description. If you have the correct level of authority, you can change other users' job description values.

Commands Used with Spooled Files

The following commands may be used to work with spooled files.

WRKSPLF Work with Spooled Files. Allows you to display or print a list of all spooled files on the system.

WRKSPLFA Work with Spooled File Attributes. Shows the current attributes of a spooled file.

CHGSPLFA Change Spool File Attributes. Allows you to change some attributes of a spooled file, such as the output queue name or the number of copies requested, while the spooled file is on an output queue.

CPYSPLF Copy Spooled File. Copies a spooled file to a specified database file. The database file may then be used for other applications, such as those using microfiche or data communications.

DLTSPLF Delete Spooled File. Deletes a spooled file from the output queue.

DSPSPLF Display Spooled File. Allows you to display data records of a spooled file.

HLDSPLF Hold Spooled File. Stops the processing of an output file by a printer writer. The next spooled file in line is processed.

RLSSPLF Release Spooled File. Releases a previously held spooled output file for processing by the printer writer.

SNDNETSPLF Send Network Spooled Files. Allows you to send spooled files to another system.

Commands Used with Output Queues

The following commands may be used to create and control output queues.

WRKOUTQ Work with Output Queue. Shows the overall status of all output queues, or the detailed status of a specific output queue.

WRKOUTQD Work with Output Queue Description. Shows descriptive information for an output queue.

CLROUTQ Clear Output Queue. Removes all spooled files from an output queue.

CRTOUTQ Create Output Queue. Allows you to create a new output queue.

DLTOUTQ Delete Output Queue. Deletes an output queue from the system.

HLDOUTQ Hold Output Queue. Prevents all spooled files from being processed by the printer writer.

RLSOUTQ Release Output Queue. Releases a previously held output queue for processing by the printer writer.

Commands Used with Printer Writers

The following commands may be used to control printer writers.

WRKWTR Work with Writers. Displays all the printers configured to the system. The status for all printers is also displayed.

STRPRTWTR Start Printer Writer. Starts a printer writer to a specified printer device to print spooled files on that device.

CHGWTR Change Writer. Allows you to change some printer writer attributes, such as form type, number of file separator pages, or output queue attributes.

HLDWTR Hold Writer. Stops the printer writer at the end of a record, at the end of a file, or at the end of a page.

RLSWTR Release Writer. Releases a previously held printer writer for additional processing.

ENDWTR End Writer. Ends a printer writer and makes the associated printer device available to the system.

Appendix C. Printer File Return Codes

This appendix contains descriptions of all major and minor return codes for printer files. These return codes are set in the I/O feedback area of the printer file. Return codes report the results of each operation. The appropriate return code is available to the application program that issued the operation. The program then checks the return code and acts appropriately. Refer to your high-level language manual for information about how to access these return codes.

The return code is a four-digit value: the first two digits contain the major code, and the last two digits contain the minor code. With some return codes, a message is also sent to the job log or the system operator message queue (QSYSOPR). You can refer to the message for additional information. Message IDs followed by an asterisk (*) may be received by applications while spooling output.

Note: Return codes that refer to a condition on the printer are available to the application program only when printing with SPOOL = *NO specified in the printer file. When SPOOL = *YES has been specified, the printer writer program is the program communicating with the printer, not your application program.

Major Code 00

Major Code 00 – Operation completed successfully.

Description: The operation issued by your program completed successfully.

Action: Continue with the next operation.

Code **Description/Action**

0000 **Description:** For output operations performed by your program, 0000 indicates that the last output operation completed successfully.

The notify messages are used after certain error conditions to give the operator the choice of continuing or canceling the printing of that file. If the reply is `CANCEL`, another message is issued with a nonzero return code.

Action: Your program may continue. One of the following diagnostic messages may have been issued to warn of an unusual condition that may be significant to your program even though it is not an error.

Messages:

CPA4001 (Inquiry)
CPA4003 (Inquiry)
CPA4004 (Inquiry)
CPA4005 (Inquiry)
CPA4007 (Inquiry)
CPA4008 (Inquiry)
CPA4009 (Inquiry)
CPA4010 (Inquiry)
CPA4011 (Inquiry)
CPA4012 (Inquiry)
CPA4013 (Inquiry)
CPA4014 (Inquiry)
CPA4015 (Inquiry)
CPA4017 (Inquiry)
CPA4019 (Inquiry)
CPA4037 (Inquiry)
CPA4038 (Inquiry)
CPA4039 (Inquiry)
CPA4040 (Inquiry)
CPA4042 (Inquiry)
CPA4043 (Inquiry)
CPA4046 (Inquiry)
CPA4047 (Inquiry)
CPA4048 (Inquiry)
CPA4065 (Inquiry)
CPA4066 (Inquiry)
CPA4072 (Inquiry)*
CPA4073 (Inquiry)
CPA4074 (Inquiry)
CPA4075 (Inquiry)
CPA4076 (Inquiry)
CPA4251 (Inquiry)
CPA4256 (Inquiry)
CPA5335 (Inquiry)
CPA5339 (Inquiry)
CPA5340 (Inquiry)
CPA5341 (Inquiry)
CPA5342 (Inquiry)
CPA5343 (Inquiry)
CPA5344 (Inquiry)
CPA5347 (Inquiry)
CPA5348 (Inquiry)
CPD4005 (Diagnostic)
CPD4006 (Diagnostic)
CPD4007 (Diagnostic)
CPD4008 (Diagnostic)
CPD4069 (Diagnostic)
CPD4071 (Diagnostic)*
CPD4072 (Diagnostic)
CPF4032 (Diagnostic)
CPF4033 (Diagnostic)
CPF4056 (Diagnostic)
CPF4057 (Diagnostic)
CPF4239 (Escape)
CPF4245 (Escape)
CPF4249 (Escape)
CPF4260 (Escape)*
CPF4420 (Diagnostic)
CPF4421 (Diagnostic)
CPF4905 (Notify)*
CPF4913 (Diagnostic)
CPF4914 (Diagnostic)
CPF4916 (Notify)*
CPF4918 (Notify)*
CPF4919 (Notify)*
CPI4015 (Informational)
CPI4016 (Informational)
CPI4017 (Informational)
CPI4018 (Informational)
CPI4019 (Informational)
CPI4020 (Informational)
CPI4024 (Informational)

Major Code 80

Major Code 80 – Permanent system or file error (nonrecoverable).

Description: A nonrecoverable file or system error occurred. Recovery is unlikely until the problem causing the error has been corrected.

Action: The following general actions can be taken by your program for each 80xx return code. Other specific actions are given in each return code description.

- Continue processing without the printer.
- Close the printer file and open the file again.
- End.

Code **Description/Action**

8081 **Description:** The operation was not successful because a system error condition was detected.

Action: Your printer may need to be varied off and then on again. Your program can either:

- Continue processing without the printer.
- Close the device file and open the file again.
- End.

Messages:

CPF4182 (Escape)*
CPF4289 (Escape)
CPF4510 (Escape)*
CPF4516 (Escape)
CPF4552 (Escape)
CPF4591 (Escape)
CPF5159 (Escape)
CPF5196 (Escape)
CPF5246 (Escape)
CPF5257 (Escape)*
CPF5261 (Escape)
CPF5262 (Escape)*
CPF5401 (Escape)
CPF5408 (Escape)
CPF5409 (Escape)
CPF5410 (Escape)
CPF5414 (Escape)
CPF5416 (Escape)
CPF5418 (Escape)
CPF5423 (Escape)
CPF5429 (Escape)
CPF5431 (Escape)*
CPF5433 (Escape)
CPF5434 (Escape)
CPF5447 (Escape)
CPF5453 (Escape)
CPF5507 (Escape)

8082 **Description:** The operation attempted was not successful because the printer is unusable. This may occur because:

- A cancel reply has been taken to an error recovery message for the device.
- A cancel reply was returned to a maximum records reached inquiry message.
- The printer has been held by a Hold Communications Device (HLDCMNDEV) command.

No operations should be issued to the device.

Action: Communications with the printer cannot be resumed until the device has been reset to a varied-on state. If the device has been held, use the Release Communications Device (RLSCMNDEV) command to reset the device. If the device is in an error state, vary the device off and then on again. Once the device is reset, normal operation can be started again by reopening the printer file.

Messages:

```
CPF4502 (Escape)
CPF5104 (Escape)
CPF5116 (Escape)*
CPF5269 (Escape)
```

80B3 **Description**: The open operation was not successful because the printer file or printer device is not available.

Action: The printer file cannot be opened again until the necessary resources are available. Your program can wait for the resources to become available, then issue another open operation. Otherwise, you may continue other processing or end the program. The Work with Configuration Status (WRKCFGSTS) command may be used to determine whether the printer device is in use or not varied on. If the device is in use, the WRKCFGSTS command will also identify the job that is using it.

Consider increasing the WAITFILE parameter with the Change Printer File (CHGPRTF) or Override with Printer File (OVRPRTF) command to allow more time for the file resources to become available.

Messages:

```
CPF4128 (Escape)*
CPF9808 (Diagnostic)*
```

80C0 **Description**: A nonrecoverable error has occurred on the printer device.

Action: Your printer may need to be varied off and then on again. Your program can either:

- Continue processing without the printer.
- Close the printer file and open the file again.
- End.

Messages:

```
CPF4262 (Escape)        CPF5413 (Escape)
CPF4509 (Escape)        CPF5419 (Escape)
CPF5103 (Escape)        CPF5420 (Escape)
CPF5247 (Escape)        CPF5430 (Escape)
CPF5412 (Escape)        CPF5437 (Escape)
```

80EB **Description**: An open operation was not successful because an open option that was not valid or an invalid combination of options was specified in your program, in the printer file, or in an override command.

Action: Close the printer file, correct the problem, and issue the open operation again. See the individual messages to determine what options are not valid.

Messages:

```
CPD4012 (Diagnostic)    CPF4209 (Escape)
CPD4013 (Diagnostic)*   CPF4214 (Escape)*
CPD4020 (Diagnostic)    CPF4217 (Escape)
CPD4021 (Diagnostic)*   CPF4219 (Escape)
CPD4023 (Diagnostic)    CPF4224 (Escape)
CPD4024 (Diagnostic)    CPF4237 (Escape)*
CPD4025 (Diagnostic)    CPF4238 (Escape)
CPD4033 (Diagnostic)    CPF4263 (Escape)*
CPF411E (Escape)        CPF4264 (Escape)*
CPD4034 (Diagnostic)*   CPF4295 (Escape)*
CPD4036 (Diagnostic)*   CPF4296 (Escape)*
CPD4037 (Diagnostic)*   CPF4335 (Escape)
CPD4038 (Diagnostic)*   CPF4336 (Escape)
CPF4133 (Escape)        CPF4337 (Escape)
CPF4138 (Escape)*       CPF4338 (Escape)
CPF4139 (Escape)*       CPF4339 (Escape)*
CPF4148 (Escape)        CPF4340 (Escape)
CPF4156 (Escape)        CPF4345 (Escape)
CPF4157 (Escape)*       CPF4352 (Escape)
CPF4159 (Escape)*       CPF4637 (Escape)
CPF4162 (Escape)        CPF5370 (Escape)
CPF4181 (Escape)*
CPF4196 (Escape)*
CPF4206 (Escape)*
```

80ED **Description**: An open operation was not successful because the record format descriptions in the printer file have changed since your program was compiled.

Action: Close the printer file and end the program. Determine whether the changes affect your application program. If they do, then recompile the program. If the changes do not affect your program, the file should be changed or overridden to LVLCHK(*NO). When LVLCHK(*NO) is specified, the system does not compare the record format descriptions.

Messages:

CPF4131 (Escape)*

80EF **Description**: An open operation was not successful because your program is not authorized to the printer device.

Action: Close the file, correct the problem, then issue the open operation again. Obtain authority to the device from your security officer or the device owner.

Messages:

CPF4104 (Escape)*

80F8 **Description:** An operation was not successful because the file is marked in error.

Action: Close the file. Refer to messages in the job log to determine what errors occurred. Take the appropriate recovery action for those errors.

Messages:

CPF4132 (Escape)*
CPF5129 (Escape)*
CPF5293 (Escape)*
CPF5427 (Escape)*

Major Code 81

Major Code 81 – Permanent device error (nonrecoverable).

Description: A nonrecoverable device-related error occurred during an I/O operation. Any attempt to continue using this printer device will probably fail again until the cause of the problem is found and corrected.

Action: The following general actions can be taken for each 81xx return code. Other specific actions are given in each return code description.

- Continue processing without the printer device.
- Close the file, correct the problem, and open the file again. If the operation is still unsuccessful, try it again only a limited number of times. (The number of times should be specified in your program.)
- End.

Several return codes indicate that an error condition must be corrected by varying the device off and on again.

Code **Description/Action**

8181 **Description**: A system error condition was detected during an I/O operation to the printer device.

Action: Close the file. You may need to vary the device off and on again to clear the error. Determine the cause of the failure from the accompanying message. Check for any system operator messages indicating that additional corrective action must be performed. Open the file again to continue.

Messages:

```
CPF4289 (Escape)
CPF4552 (Escape)
CPF4553 (Escape)
CPF5105 (Escape)
CPF5159 (Escape)
CPF5507 (Escape)
```

8191 **Description:** The operation was not successful because a permanent line error occurred, and the system operator took a recovery option in response to the line error message. (You can find out what type of line error occurred by asking the system operator.) The device has been marked unusable.

Action: Close the file. Vary the device off and on again to clear the error. Open the file again to continue.

Messages:

```
CPF4146 (Escape)
CPF4193 (Escape)
CPF4526 (Escape)
CPF4542 (Escape)
CPF5128 (Escape)
CPF5198 (Escape)
```

8197 **Description:** A nonrecoverable error condition was detected at the device.

Action: Close the file. Vary the device off and on again to clear the error. Refer to the accompanying error message for additional information regarding the source of the specific error detected. Open the file again to continue.

Messages:

```
CPF4149 (Escape)        CPF4583 (Escape)
CPF4192 (Escape)        CPF5106 (Escape)
CPF4197 (Escape)        CPF5143 (Escape)
CPF4216 (Escape)        CPF5199 (Escape)
CPF4524 (Escape)        CPF5201 (Escape)
CPF4533 (Escape)        CPF5268 (Escape)
CPF4538 (Escape)        CPF5360 (Escape)
```

81C2 **Description:** The operation issued by your program was not successful because the Systems Network Architecture (SNA) session with the printer is not active.

Action: Close the file. Vary the device off and on again to clear the error. Open the file again to continue.

Messages:

```
CPF5422 (Escape)
```

Major Code 82

Major Code 82 – Open operation failed.

Description: An attempt to open the printer file was not successful. The error may be recoverable or permanent, but is limited to the printer device. Recovery is unlikely until the problem causing the error has been corrected.

Action: The following general actions can be taken for each 82xx return code. Other specific actions are given in each return code description. You can either:

- Continue processing without the device.
- Close the file, correct the problem, and open the file again. A subsequent operation could be successful if the error occurred because of some temporary condition such as the device being in use at the time.

  If the operation is still unsuccessful, try it again only a limited number of times. (The number of times should be specified in your program.)
- End.

Several return codes indicate that an error condition must be corrected by changing a value in the file. To change a parameter value for the file, use the Change Printer File (CHGPRTF) or the Override with Printer File (OVRPRTF) command.

Code **Description/Action**

8281 **Description:** A system error condition was detected on an open operation that was not successful. The printer file may previously have been in error, or the printer file could not be opened due to a system error.

Action: Your printer may need to be varied off and then on again to clear the error. Your program can either:

- Continue processing without the printer.
- Close the file, correct the problem, and open the file again.
- End.

Determine the cause of the failure from the accompanying message.

Messages:

```
CPF4168 (Escape)*
```

8282 **Description:** The open operation was not successful because the printer device is unusable. This may occur because a cancel reply has been taken to an error recovery message for the printer or because the printer has been held by a Hold Communications Device (HLDCMNDEV) command. No operations should be issued to the device.

Action: Close the file. Communications with the printer cannot be resumed until the device has been reset to a varied-on state. If the device has been held, use the Release Communications Device (RLSCMNDEV) command to reset the device. If the device is in an error state, vary the device off and then on again. Once the device is reset, normal operation can be started by opening the printer device file again.

Messages:

```
CPF4110 (Escape)
CPF4298 (Escape)
CPF4354 (Escape)
```

8291 **Description:** A permanent line error occurred on an open operation. The printer device has been marked unusable.

Action: Close the file. Vary the device off and on again to clear the error. Open the file again to continue.

Messages:

```
CPF4179 (Escape)
CPF4291 (Escape)
```

82A6 **Description:** The open operation failed because of a Systems Network Architecture (SNA) protocol violation.

Action: Ensure that the printer with which your program is communicating is configured properly. Refer to the device response codes in the accompanying error message for additional information regarding the specific error detected.

Messages:

```
CPF4124 (Escape)        CPF4533 (Escape)
CPF4190 (Escape)        CPF5103 (Escape)
CPF4192 (Escape)        CPF5143 (Escape)
CPF4527 (Escape)        CPF5453 (Escape)
```

82AA **Description:** The open operation was not successful because the printer device description was not found.

Action: Your program can continue without the printer, attempt to use a different printer, or end.

Verify that the name of the printer was correctly specified in the DEV parameter on the CRTPRTF, CHGPRTF, OVRPRTF, or CRTPRTF command.

Messages:

```
CPF4103 (Escape)*
```

82B3 **Description:** The open operation was not successful because the printer you requested is in use in another file in your job.

Action: Close both of the printer device files, then open the one that you want to use again.

Messages:

CPF4106 (Escape)

82EE **Description:** An open operation was attempted to a device that is not supported for a printer file.

Your program is attempting to open a device that is not a valid printer.

Action: Your program can continue without the printer, attempt to use a different printer, or close the file and end.

Verify that the name of the printer was specified correctly on the CHGPRTF or OVRPRTF command.

Messages:

CPF4105 (Escape)

82EF **Description:** An open operation was attempted for a device that the user is not authorized to, or that is in service mode.

Action: Your program can continue without the printer, attempt to use a different printer, or end.

Close the file, correct the problem, and then issue the open operation again.

For authority errors, obtain authority to the device from your security officer or device owner. If the device is in service mode, the system service tools (SST) function is currently using the device. Wait until the device is available to issue the operation again.

Messages:

CPF4104 (Escape)*
CPF4186 (Escape)
CPF9802 (Diagnostic)*

Major Code 83

Major Code 83 – Device error occurred (recoverable).

Description: An error occurred during an I/O operation, but the printer device is still usable. Recovery within your program might be possible.

Action: The following general actions can be taken for each 83xx return code. Other specific actions are given in each return code description.

- Continue processing without the printer device.
- Correct the problem and continue processing with the printer device. If the attempt to recover from the operation is unsuccessful, try it again only a limited number of times. (The number of times should be specified in your program.)
- End.

Several return codes indicate that an error condition must be corrected by changing a value in the file. To change a parameter value for the file, use the Change Printer File (CHGPRTF) or Override with Printer File (OVRPRTF) command.

Code **Description/Action**

8319 **Description:** A negative response was received to the last printer operation attempted by your program. The error may have been caused by the user pressing the Cancel key on the printer.

Action: Your program can try a different operation, or close the file and end. Refer to the device response code in the accompanying message to determine why the operation was rejected. Correct the error in your program before attempting to try the operation again.

Messages:

```
CPF4158 (Escape)
CPF4531 (Escape)
CPF5050 (Escape)
```

831D **Description:** The operation just attempted by your program was rejected because a parameter was not valid, out of limits, or missing.

Action: Your program can bypass the failing step and continue, or close the file and end. Refer to the accompanying message to determine what parameter was incorrect. Correct the error in your program before attempting to try the operation again.

Messages:

```
CPD4016 (Diagnostic)*   CPF5275 (Escape)
CPD4017 (Diagnostic)*   CPF5276 (Escape)*
CPD4027 (Diagnostic)*   CPF5288 (Escape)*
CPD4028 (Diagnostic)*   CPF5289 (Escape)*
CPD4029 (Diagnostic)*   CPF5324 (Escape)*
CPD4030 (Diagnostic)*   CPF5359 (Escape)*
CPD4041 (Diagnostic)*   CPF5363 (Escape)
CPF4909 (Notify)*       CPF5366 (Escape)*
CPF5108 (Escape)*       CPF5367 (Escape)*
```

CPF5148 (Escape)* CPF5368 (Escape)*
CPF5273 (Escape)*

831E **Description:** The operation just issued by your program was not valid or an invalid combination of operations was specified.

Action: Your program can bypass the invalid operation and continue, or close the file and end. Refer to the accompanying message to determine why the operation was rejected. Correct the error in your program before attempting to try the failing operation again.

Messages:

CPD4015 (Diagnostic)* CPF5290 (Escape)*
CPD4018 (Diagnostic)* CPF5320 (Escape)*
CPD4031 (Diagnostic) CPF5321 (Escape)*
CPF4915 (Notify)* CPF5322 (Escape)*
CPF5149 (Escape)* CPF5323 (Escape)*
CPF5185 (Escape)* CPF5325 (Escape)*
CPF5245 (Escape)* CPF5362 (Escape)*

831F **Description:** A length that is not valid was specified on the operation.

On an output operation, your program has tried to send a data record having a length that exceeds the maximum record length allowed for the printer or the page size defined for the file. If you are using direct I/O, you have exceeded the maximum number of bytes allowed per page. The data has been truncated.

Action: Issue the output operation again with a smaller output length. The record length for a program-described printer file cannot exceed the page size. The record length for any printer file must be no greater than 32 767 characters.

Messages:

CPF4906 (Notify)*
CPF5160 (Escape)

8343 **Description:** The designated page overflow line number has been reached.

Action: Your program should take whatever application dependent action is appropriate. This may include printing page totals or a running foot line.

Messages:

CPF5004 (Status)*

83E0 **Description:** Your program attempted to issue an operation using a record format that was not defined for the printer file, or omitted the record format name.

Action: Check the name of the record format in your program to be sure it is correct. Then check that the record format is defined properly in the DDS for the file.

Messages:

CPF5186 (Escape)*
CPF5187 (Escape)*

83F6 **Description:** Your program sent invalid data to the printer. The data type may be incorrect for the field in which it is used.

Action: Check the name of the record format in your program to be sure it is correct. Verify that the data definition statements in your program match the output record defined in the DDS for the file. Correct the error in your program before attempting to repeat the failing operation.

Messages:

```
CPD4014 (Diagnostic)*    CPF5075 (Notify)*
CPD4022 (Diagnostic)*    CPF5234 (Escape)*
CPD4026 (Diagnostic)*    CPF5246 (Escape)
CPD4035 (Diagnostic)*    CPF5261 (Escape)
CPD4516 (Informational)  CPF5297 (Escape)*
CPD4591 (Escape)         CPF5364 (Escape)
CPF4634 (Escape)         CPF5365 (Escape)
CPF4635 (Escape)         CPF5369 (Escape)
CPF4636 (Escape)         CPF5372 (Escape)
CPF4642 (Escape)         CPF5373 (Escape)
CPF4643 (Escape)         CPF5374 (Escape)
CPF4644 (Escape)         CPF5375 (Escape)
CPF4645 (Escape)         CPF5376 (Escape)
CPF4646 (Escape)         CPF5377 (Escape)
CPF4647 (Escape)         CPF5411 (Escape)
```

Appendix D. Working with Fonts, Font Character Sets, Code Pages, CHRIDs, and Coded Fonts

Understanding the relationship between these elements on the AS/400 system gives you flexibility in preparing your documents for printing.

The first part of this appendix discusses these elements and the second part contains tables that show how the elements work together.

Fonts and the AS/400 System

The AS/400 system comes with a certain variety of fonts called the IBM-supplied compatibility fonts or the compatibility set. These fonts provide a range of font styles that support different types of printers that can be attached to the AS/400 system.

The compatibility set can be supplemented by installing IBM licensed programs that provide additional fonts, creating your own fonts on the AS/400 system, or purchasing them from other companies.

See the "Bibliography" on page J-1 for a list of manuals that contain additional information about fonts and font-related products.

Downloading

Downloading is the process of sending something (for example, character sets or code pages) to another computer or printer.

Some printers do not have fonts built into them. The host system can send (download) character sets and code pages to the printer with the document or ahead of time, to be stored for future use.

Considerations When Using 240- and 300-Pel Fonts

Most printers support 240-pel font character sets. However, the 4028 printer supports only 300-pel font character sets. If printed output is sent to a combination of 4028 and other IPDS printers by applications that use font character sets that are downloaded from the AS/400 system, some special considerations apply:

- Font name

  The font character set used with the document must exist in both the 240- and 300-pel versions and have the same name. The application selects the font character set by name, not by pel density.

- Font character set selection

  The system knows which pel density a printer supports and downloads the correct font character set to the printer.

- Libraries

  Font character sets are font resource objects regardless of pel density. The 240-pel and 300-pel fonts must be stored in separate libraries. However, to ensure that both pel densities (240 and 300) are available, both libraries must be defined to the user's library list.

When an application program calls for a particular element (font or code page), the system looks for it in the printer being used or in the AS/400 system. If it cannot find the designated font or code page, a substitution or mapping takes place. Information concerning the substitution of fonts and code pages is contained in this appendix.

If you need to know more about fonts, font character sets, code pages, or coded fonts, read on. If not, you can skip to "Font Substitution Tables" on page D-9 for information describing how fonts are substituted between printers and computers.

Font Character Sets and Font Global Identifiers (FGID)

Fonts are a family or assortment of characters. Three elements usually provide a font identity:

- Type Family

  Courier is an example of a type family.

- Typeface

  Style, weight (for example, italic or bold), and width (normal or expanded) define typeface.

  Normal means the usual size of characters, while expanded means that the character is wider than normal.

- Type Size

  Fonts can range from small (4 point) to large (72 point).

For example, a font could be identified as:

Type family Sonoran Serif

Typeface Roman medium normal

Type Size 10-point

Font Character Sets

Fonts are named in a number of ways. One way is with a character set name. These character sets are downloaded to the printer. Multiple code pages can be used with a single character set. For valid code pages that can be used with a character set, see the manual *About Type: IBM's Technical Reference for 240-Pel Digitized Type*, GS544-3516.

Some font character sets come with the AS/400 system; some can be downloaded from a System/370 to an AS/400 system; some can be received from another AS/400 system; and some are available as licensed programs.

The following printers accept downloaded font character sets:

- 3812 (has resident fonts also)
- 3816 (has resident fonts also)
- 3820
- 3825
- 3827
- 3828 (MICR printer)
- 3829

- 3831
- 3835
- 3900
- 4028 (has resident fonts also)

Note: Any printer attached to Print Services Facility/2 (PSF/2) accepts downloaded fonts.

The use of font character sets provides consistent or similar fonts across printers. For example, a document created at one location using a specific font character set could be sent to a different location, printed on a different model printer, and still look the same.

The above printers support font character sets that are 240 pels with the exception of the 4028 printer, which supports 300-pel fonts. A pel is a picture element, representing the number of dots in a square inch (for example, 240 across and 240 down).

Naming Convention for Font Character Sets

Font character set names on the AS/400 system can be up to 8 characters long. Each character or group of characters tells something about the font character set.

For example, in the font character set name C0D0GT10:

C0 The **C0** means that this object is a font character set.

D The **D** indicates the origin of the font. In this example, C0D0GT10 is a font character set designed for Document Control Facility (DCF) for a 3800 Model 1 printer or a 3825 printer.

0 This **0** indicates that this font is for uniformly spaced and mixed-pitch font character sets.

GT10 The **GT10** indicates the type family, typeface, and pitch for uniformly spaced and mixed-pitch fonts. In this example, the GT10 means that this font character set is a Gothic Text style and the characters are 10 pitch or 10 characters per inch.

For more information about font character sets, see the manual *About Type: IBM's Technical Reference for 240-Pel Digitized Type*, GS544-3516.

Selecting Font Character Sets

Selecting a font character set to use with an application program is done by specifying the 8-character font character set name as the value on the FNTCHRSET parameter of the printer file.

If you choose to use font character sets with your applications, you must also specify a code page (by providing a value for the CDEPAG parameter of the printer file being used).

Substituting Font Character Set

Substitution is determined by the AS/400 system, based on which font character sets are specified in the application, the type of printer to be used, and the value assigned to the fidelity parameter of the printer file being used (*CONTENT or *ABSOLUTE).

Example 1: Assume:

- The application calls for font character set C0D0GB10 (Gothic Bold, 10 pitch).
- The printer supports only resident fonts.
- The fidelity parameter value is *CONTENT.

In this example, the spooled file will print, with substituted font ID 39 (Gothic Bold 10 pitch) because the fidelity parameter value is *CONTENT. If the fidelity parameter value had been *ABSOLUTE, the spooled file would be held on the output queue and it would not print.

Example 2: Assume:

- The application calls for FGID 51 (Matrix Gothic).
- The printer supports only downloaded font character sets.
- The fidelity parameter value is *CONTENT.

In this example, the spooled file will print. The AS/400 system substitutes a font character set (C0S0CR10, Courier Roman 10 pitch) for FGID 51. This is not an exact match. The AS/400 system matched (as closely as possible) the font character to the FGID specified in the application.

Note: In this example, if the fidelity parameter was *ABSOLUTE, the spooled file would be HELD.

Font Global Identifiers (FGIDs)

Another method of naming a font is by a font global identifier (FGID). An FGID names a type family and a typeface.

FGIDs are identified by a number such as 3, 8, or 11.

There is a different FGID assigned for the same type family but different typeface. For example, a Courier Roman Medium 10 pitch (characters-per-inch) is FGID 11 and Courier Roman Bold 10 pitch (characters per inch) is FGID 46.

Below is an example of FGID 11. The text in the box represents how data would print if your application uses FGID 11.

```
FGID 11 is a monospaced courier font that
will print 10 characters per inch.
```

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Printers with resident fonts use FGIDs to name the resident fonts. Depending on the technology used with the printer, resident fonts can be stored on font cards, diskettes, in the memory of the printer, or mechanically on a font element or daisy wheel.

The following printers have resident fonts:

- 5219
- 4224
- 4230

- 4234 Models 8 and 12
- 3812 (can also accept downloaded fonts)
- 3816 (can also accept downloaded fonts)
- 4028 (can also accept downloaded fonts)

To find out which fonts are supported by a printer, check the reference manual for that printer.

Selecting Resident Fonts

Selecting a resident font to use with an application program is done by specifying an FGID value on the FONT parameter of the printer file.

Font Substitution

Substitution can be one FGID for another, an FGID for a font character set, or a font character set for an FGID.

Example 1: Assume:

- Your application calls for a font character set (FNTCHRSET specified on the printer file), for example, C0S0CR10 for Courier Roman medium 10 pitch.
- The printer is a 4224 and has resident fonts identified by FGIDs.
- FGID 11 will be substituted for C0S0CR10 and sent to the printer.

In this example, the AS/400 system substitutes a font that is resident on that printer.

Example 2: Assume:

- Your application calls for a font (specified on the FONT parameter of the printer file). The font specified is font 26 (Gothic Matrix, Roman medium 10 pitch) and the printer is a 3812.
- You decide to print the document on a 4019 printer. Font 26 is not supported on the 4019.

In this example, the AS/400 system substitutes font 11 (Courier, Roman medium 10 pitch)

You can figure out such substitutions by looking at Table D-2 on page D-22.

Example 3: Assume:

- Your application uses a font (specified on the FONT parameter of the printer file). The font specified is font 40 (Gothic, Roman medium 10 pitch).
- The printer you are going to print on supports only font character sets (for example, a 3827).

In this example, the AS/400 system substitutes font character set C0D0GT10 (Gothic Text, Roman medium 10 pitch).

You can figure out such substitutions by looking at Table D-5 on page D-52.

Code Pages

Code pages come in two types:

- Code page (standalone)
- Character set and code page combination (referred to as a CHRID).

Code pages are groups of characters. Within a code page, there are unique hexadecimal identifiers assigned to each of the characters.

As you enter your text at a computer keyboard, each keyboard character is translated into a code point. When the text is printed, each code point is matched to a character ID on the code page you specified. The character ID is then matched to the image (raster pattern) of the character in the character set you specified.

Some of these characters can be repeated in different code pages and have a different hexadecimal identifier assigned to them. Conversely, the hexadecimal identifier can be the same, but the characters will be different. Therefore, if you have applications that use certain characters contained in only one particular code page, it is important to know which code page you are using.

Below is a diagram of two code pages: code page 37 and code page 285. They are printed in a 10-characters-per-inch (courier 10) font. Notice the different character that occurs at code point hex '5B'. One is a $ sign and the other an English pound or currency sign. This example shows that different characters will print depending on the code page you specify even though you are using an identical font style.

Code page 37 with courier 10

Code point 5B

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
4			â	ä	à	á	ã	å	ç	ñ	¢	.	<	(	+	|
5	&	é	ê	ë	è	í	î	ï	ì	ß	!	$	*	)	;	¬
6	-	/	Â	Ä	À	Á	Ã	Å	Ç	Ñ	]	,	%	_	>	?
7	ø	É	Ê	Ë	È	Í	Î	Ï	Ì	`	:	#	@	'	=	"
8	Ø	a	b	c	d	e	f	g	h	i	«	»	ð	ý	þ	±
9	°	j	k	l	m	n	o	p	q	r	ª	º	æ	,	Æ	¤
A	µ	~	s	t	u	v	w	x	y	z	¡	¿	Ð	Ý	Þ	®
E	\		S	T	U	V	W	X	Y	Z	²	Ô	Ö	Ò	Ó	Õ
F	0	1	2	3	4	5	6	7	8	9	³	Û	Ü	Ù	Ú	

Code page 285 with courier 10

Code point 5B

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
4			â	ä	à	á	ã	å	ç	ñ	$	.	<	(	+	|
5	&	é	ê	ë	è	í	î	ï	ì	ß	!	£	*	)	;	¬
6	-	/	Â	Ä	À	Á	Ã	Å	Ç	Ñ	]	,	%	_	>	?
7	ø	É	Ê	Ë	È	Í	Î	Ï	Ì	`	:	#	@	'	=	"
8	Ø	a	b	c	d	e	f	g	h	i	«	»	ð	ý	þ	±
9	°	j	k	l	m	n	o	p	q	r	ª	º	æ	,	Æ	¤
A	µ	~	s	t	u	v	w	x	y	z	¡	¿	Ð	Ý	Þ	®
E	\		S	T	U	V	W	X	Y	Z	²	Ô	Ö	Ò	Ó	Õ
F	0	1	2	3	4	5	6	7	8	9	³	Û	Ü	Ù	Ú	

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Standalone Code Pages

Code pages supply consistent or similar characters across systems. For example, a document created at one location using a specific code page could be sent to a different location, printed on a different model printer, and still look the same.

Code pages must be downloaded to the printer for use.

The following printers accept downloaded code pages:

- 3812 (also supports CHRIDs)
- 3816 (also supports CHRIDs)

- 3820
- 3825
- 3827
- 3828 (MICR)
- 3829
- 3831
- 3835
- 3900
- 4028 (also supports CHRIDs)

Naming Convention for Code Pages

Like character sets, code pages are named in a number of ways. One way is with a code page name. These code pages are downloaded to the printer. The code page name can be up to 8 characters long. Code page names are used with character set names for printing on printers such as the 3820, 3825, 3827, or 3835.

Another way is with a code page global identifier (CPGID). CPGIDs are printer-resident code pages and have numbers for names (for example, 259 or 500). Generally, printers with resident fonts use CPGIDs to name the printer-resident code pages. CPGIDs are also used within CHRIDs.

For example, in the code page name T1V10500:

T The **T** means that this object is a code page.

1 This always a 1.

V1 The **V1** means that this is version 1 of this code page.

0500 The **0500** is the code page name, number, or category. In this example 500 is the code page name.

Selecting Code Pages

Code pages are selected by specifying a certain value for the code page (CDEPAG) parameter of the printer file.

If you choose to use code pages with your applications, you must also specify a font character set (by providing a value for the FNTCHRSET parameter of the printer file being used).

Substituting Code Pages

Substitution of code pages occurs for the following reasons:

- The application specifies a code page that is resident on a printer and the printer being used does not have resident code pages.
- The application specifies a code page that is resident on the host system (AS/400 system) and the printer being used has resident code pages (not capable of accepting downloaded code pages).
- The job requesting the code page is not authorized to it.
- The code page cannot be found.
- The job is not authorized to the library where the code page is stored.

Character Set and Code Page Combination (CHRIDs)

This type of code page is made up of a specific graphic character set and a specific code page and is referred to by a character identifier (CHRID).

These graphic character sets and code pages (CHRIDs) are used for fonts that are resident on the printer. They are used in conjunction with a font ID to obtain a resident font.

The following printers support CHRIDs:

- 3812
- 3816
- 4028
- 4214
- 4224
- 4230
- 4234
- 5219
- 5224
- 5225

Naming Convention for CHRIDs

The names of character identifiers (CHRIDs) are made up of two elements: graphic character set and code page. These two elements define a collection of characters. Below is an example of the multinational CHRID 697-500.

697 This is the name of the graphic character set.

Some graphic character sets identify a character set that is a subset of the code page. Others identify a character set that is equivalent to the code page.

500 This is the name of the code page.

Selecting CHRIDs

CHRIDs are selected by specifying a certain value for the character identifier (CHRID) parameter of the printer file. Additionally, a font ID value must be specified for the FONT parameter on the printer file.

Substituting CHRIDs

If the CHRID is not available on the printer your application is using, the AS/400 system will substitute the CHRID that most closely matches the one requested by the application.

Coded Fonts

A coded font is the pairing of a font character set and a code page. Coded fonts allow users to specify a font character set and a code page with one value specified on the printer file.

Coded fonts available on the AS/400 system can be viewed by using the Work with Font Resources (WRKFNTRSC) command.

Coded font names are read by the AS/400 system and then translated to a font character set and a code page. These two elements are then sent to the printer.

Naming Convention for Coded Fonts

Unlike other uniformly spaced and mixed-pitch font components, coded font names are generally shortened by excluding the origin and reserved characters (the first two characters of their name). This is necessary because some Advanced Function Printing (AFP) licensed programs accept only 6 characters for coded font names. However, some applications can use coded fonts named with 6 or 8 characters.

Coded font names on the AS/400 system are 6 or 8 characters long. Each character or group of characters tells something about the coded font.

For example, in the coded font name X0GT10:

X0 The X0 means that this object is a coded font.

GT10 The **GT10** indicates the type family, typeface, and pitch for uniformly spaced and mixed-pitch fonts. In this example the GT10 means that this font character set is a Gothic Text style and the characters are 10 pitch or 10 characters per inch.

To find out which font character set and code page make up a coded font name, use the Work with Font Resources (WRKFNTRSC) command. This command allows you to specify the font resource to be worked with, the library it is in, and the attribute (coded font).

Additional naming conventions have been adopted to more explicitly name the code page used with a character set.

For more information about coded fonts, see the manual *About Type: IBM's Technical Reference for 240-Pel Digitized Type*, GS544-3516.

Selecting Coded Fonts

A coded font is selected by specifying the coded font name as the value on the coded font (CDEFNT) parameter of the printer file.

You can use the Work with Font Resources (WRKFNTRSC) command to view the coded fonts that are available on the AS/400 system.

Substituting Coded Fonts

No substitution of coded fonts takes place on the AS/400 system. If the coded font is not available, the document will not print.

Font Substitution Tables

The following tables contain information on fonts, character identifiers and other printing characteristics.

Notes:

1. The AS/400 system supports Font Object Content Architecture (FOCA) 2 font character sets. This means it does not support the font character sets used by the various models of the IBM 3800 printer. For more information on FOCA 2 fonts, see the *Font Object Content Architecture Reference*, S544-3285.
2. Font global identifier (FGID) is used interchangeably with font ID in these tables.

Font Attributes

Font attributes are characteristics about a font that combine to give a font identity. An example of a font attribute would be bold or italic.

Table D-1 on page D-14 is a list of AS/400-supported fonts and their attributes.

Font Substitution

Table D-2 on page D-22 contains font ID substitution information which identifies which fonts are supported by certain printers.

For example: if your application specified a certain font ID that your printer did not support, you could find out which printers support that font and route your printed output to a printer that supports that font ID. Also, this table provides information on what fonts are substituted if the font id is not supported by the printer the document is routed to.

Font Substitution by Font ID Range

Table D-3 on page D-31 divides font IDs into ranges. The ranges represent fonts of the same weight and size. A default font is selected in each range for substitution when a font is not found.

For example, one range in the table is all font IDs greater than 0 but less than or equal to 65. These fonts are all Roman medium, 10 pitch fonts. The default font is Courier Roman medium, 10 pitch.

By using this table, you can identify which font ID is substituted for any font ID that is not in Table D-2 on page D-22.

You need to use this table only if you cannot find your font ID in Table D-2 on page D-22.

Host Resident to Printer Resident Font Character Set Mapping

Table D-4 on page D-32 contains the substitutions made when your application specifies a font character set and you want to print the spooled file on an AFP-configured 4224, 4230, or 4234 printer.

These printers do not support downloading of font character sets. These printers use font IDs. When the printer writer program sends the spooled file to one of these printers, a substitution from font character sets to font global identifiers (FGIDs) takes place.

For the 3812, 3816, and 4028 printers, if the host resident font character set (or host resident code page) cannot be found on the AS/400 system and your printer supports printer resident fonts as well as host resident fonts, a substitution from host resident font character set to FGID takes place. This is true of host resident code pages to CPGIDs as well.

Go to Table D-4 on page D-32 to find out which FGID is substituted for each font character set.

Printer Resident to Host Resident Font Character Set Mapping

Table D-5 on page D-52 contains the substitutions made when your application specifies an FGID or font ID and you want to print the spooled file on a 3820, 3825, 3827, 3829, 3831, 3835, or 3900 printer. These printers support only host font character sets.

The font character sets reside on the AS/400 system. When the printer writer program sends the spooled file to one of these printers, a substitution from FGIDs to font character sets takes place.

Go to Table D-5 on page D-52 to find out which host font character set is substituted for each FGID.

Printer Resident to Host Resident Code Page Mapping

Table D-6 on page D-66 contains the substitutions made when your application specifies an AS/400 code page global identifier (CPGID) and you want to print the spooled file on a 3820, 3825, 3827, 3829, 3831, 3835 or 3900 printer.

These printers support code page names, but not CPGIDs.

When the printer writer program sends the spooled file to one of these printers, a substitution from CPGID to code page name takes place.

Go to Table D-6 on page D-66 to find out which code page name is substituted for each CPGID.

Character Identifier (CHRID) Values Supported

Table D-7 on page D-70 contains the character identifier (CHRID) values and supported printers for the different language groups.

Host Resident to Printer Resident Code Page Mapping

Table D-8 on page D-74 contains the substitutions made when your application specifies a code page name and you want to print the spooled file on an AFP-configured 4224, 4230 or 4234 printer.

These printers support CPGIDs, but not code page names.

When the printer writer program sends the spooled file to one of these printers, a substitution from code page name to CPGID takes place.

For the 3812, 3816, and 4028 printers, if the host resident font character set (or host resident code page) cannot be found on the AS/400 system and your printer supports printer resident fonts as well as host resident fonts, a substitution from host resident font character set to FGID takes place. This is true of host resident code pages to CPGIDs as well.

Go to Table D-4 on page D-32 to find out which FGID is substituted for each font character set.

Go to Table D-8 on page D-74 to find out which CPGID is substituted for each code page name.

Lines Per Inch (LPI) Values Supported

Table D-9 on page D-77 contains the lines per inch (LPI) values supported for certain printers.

Characters Per Inch (CPI) Values Supported

Table D-10 on page D-78 contains the characters-per-inch (CPI) values supported for certain printers.

4019 Printer Information

Table D-11 on page D-79 contains specific information about the 4019 printer.

4234 Compressed Font Substitution

Table D-12 on page D-81 contains information about font substitution on 4234 printers when printing with a lines per inch (LPI) value greater than or equal to 8.

Font Attributes

Font attributes are the characteristics or properties that combine to give a font identity. For example: attributes can be 14 point (height of the font), bold, and italic.

Types of Fonts

The following diagram identifies the types of fonts and gives examples of each type:

- Mixed pitch fonts which simulate proportionally spaced fonts.

  Characters in the font have a limited number of widths. Overall spacing is about 12 characters per inch. Examples are Document or Essay fonts.

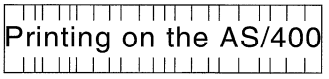
- Uniformly spaced fonts which are similar to typewriter fonts.

  Characters in the font are all the same width. Examples are Courier and Gothic Text fonts.

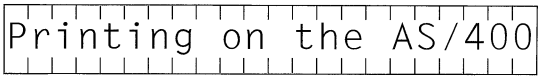
- Typographic fonts

  Typographic fonts have variable height, measured in points (1 point = 1/72 inch). Therefore, a 36-point font has characters that are 1/2 inch high. Typographic fonts have variable widths. Width is part of the design and varies on a character-by-character basis. Examples are Sonoran Serif and Century Schoolbook.

Mixed Pitch



Uniformly Spaced



Typographic

Printing on the AS/400	6 pt Century Schoolbook
Printing on the AS/400	8 pt Century Schoolbook
Printing on the AS/400	10 pt Century Schoolbook

RV2H301-2

The legend and table below provide information about each font. This information could save you time in trial-and-error testing when choosing a font for your application.

Table Legend	
FGID	Font Global Identifier
Name	Name of Font
Font Type	**U** = Uniformly Spaced
	M = Mixed Pitch
	T = Typographic
Attributes	**Blank** = Roman
	b = Bold
	i = Italics
	s = Second Strike
	w = Double Wide
Point	Point size (Blank for uniformly spaced & mixed pitch fonts)
Pitch	Characters per inch

Table D-1 (Page 1 of 7). Font Information

FGID	Name	Type of Font	Attributes	Point	Pitch (CPI)
2	Delegate	U			10
3	OCR-B	U			10
5	Rhetoric/Orator	U			
8	Scribe/Symbol	U			10
10	Cyrillic 22	U			10
11	Courier	U			10
12	Prestige	U			10
13	Artisan	U			10
18	Courier Italic	U	I		10
19	OCR-A	U			10
20	Pica	U			10
21	Katakana	U			10
25	Presentor	U			10
26	Matrix Gothic	U			10
30	Symbol	U			10
31	Aviv	U			10
36	Letter Gothic	U			10
38	Orator Bold	U	b		10
39	Gothic Bold	Ub	b		10
40	Gothic	U			10
41	Roman Text	U			10
42	Serif	U			10
43	Serif Italic	U	i		10
44	Katakana Gothic	U			10
46	Courier Bold	U	b		10
49	Shalom	U			10
50	Shalom Bold	U	b		10
51	Matrix Gothic	U			10
52	Courier	U			10
55	Aviv Bold	U	b		10
61	Nasseem	U			10
62	Nasseem Italic	U	i		10

Table D-1 (Page 2 of 7). Font Information

FGID	Name	Type of Font	Attri-butes	Point	Pitch (CPI)
63	Nasseem Bold	U	b		10
64	Nasseem Italic Bold	U	bi		10
66	Gothic	U		12	
68	Gothic Italic	U	i		12
69	Gothic Bold	U	b		12
70	Serif	U			12
71	Serif Italic	U	i		12
72	Serif Bold	U	b		12
74	Matrix Gothic	U			12
75	Courier	U			12
76	APL	U			12
78	Katakana	U			12
80	Symbol	U			12
84	Script	U			12
85	Courier	U			12
86	Prestige	U			12
87	Letter Gothic	U			12
91	Light Italic	Ui			12
92	Courier Italic	U	i		12
95	Adjudant	U			12
96	Old World	U			12
98	Shalom	U			12
99	Aviv	U			12
101	Shalom Bold	U	b		12
102	Aviv Bold	U	b		12
103	Nasseem	U			12
109	Letter Gothic Italic	U	i		12
110	Letter Gothic Bold	U	b		12
111	Prestige Bold	U	b		12
112	Prestige Italic	U	i		12
154	Essay	M			12
155	Boldface Italic	M	bi		12
157	Title	M			12
158	Modern	M			12
159	Boldface	M	b		12
160	Essay	M			12
162	Essay Italic	M	i		12
163	Essay Bold	M	b		12
164	Prestige	M			12
167	Barak	M			12
168	Barak Bold	M	b		12
173	Essay	M			12

Table D-1 (Page 3 of 7). Font information

FGID	Name	Type of Font	Attri-butes	Point	Pitch (CPI)
174	Gothic	M			12
175	Document	M			12
178	Barak	M			18
179	Barak Bold	M	b		18
180	Barak	M			15
181	Barak (8) Mixed Bold	M	b		15
182	Barak	M			5
183	Barak Bold	M	b		5
186	Press Roman	M			12
187	Press Roman Bold	M	b		12
188	Press Roman Italic	M	i		12
189	Press Roman Italic Bold	M	bi		12
190	Foundry	M			12
191	Foundry Bold	M	b		12
194	Foundry Italic	M	i		12
195	Foundry Italic Bold	M	bi		12
204	Matrix Gothic	U			13
205	Matrix Gothic	U			13
211	Shalom	U			15
212	Shalom Bold	U	b		15
221	Prestige	U			15
222	Gothic	U			15
223	Courier	U			15
225	Symbol	U			15
226	Shalom	U			15
229	Serif	U			15
230	Gothic	U			15
232	Matrix Gothic	U			15
233	Matrix Courier	U			15
234	Shalom Bold	U	b		15
244	Courier Double Wide	U	w		5
245	Courier Bold Double Wide	U	wb		5
247	Shalom Bold	U	b		17
248	Shalom	U			17
249	Katakana	U			17
252	Courier	U			17
253	Courier Bold	U	b		17
254	Courier	U			17
255	Matrix Gothic	U			17
256	Prestige	U			17
258	Matrix Gothic	U			18
259	Matrix Gothic	U			18

Table D-1 (Page 4 of 7). Font Information

FGID	Name	Type of Font	Attri-butes	Point	Pitch (CPI)
279	Nasseem	U			17
281	Gothic Text	U			20
282	Aviv	U			20
283	Letter Gothic	U			20
285	Letter Gothic	U			25
290	Gothic Text	U			27
300	Gothic	U			17
400	Gothic	U			17
434	Orator Bold	U	b		8
435	Orator Bold	U	b		6
751	Sonoran Serif	T		8P.	27
752	Nasseem	T		12P	18
753	Nasseem Bold	T	b	12P	18
754	Nasseem Bold	T	b	18P	12
755	Nasseem Bold	T	b	24P	9
756	Nasseem Italic	T	i	12P	18
757	Nasseem Bold Italic	T	bi	12P	18
758	Nasseem Bold Italic	T	bi	18P	12
759	Nasseem Bold Italic	T	bi	24P	9
760	Times Roman	T		6P	36
761	Times Roman Bold	T	b	12P	18
762	Times Roman Bold	T	b	10P	15
763	Times Roman Italic	T	i	12P	18
764	Times Roman Bold Italic	T	bi	10P	21
765	Times Roman Bold Italic	T	bi	12P	18
1051	Sonoran Serif	T		10P	21
1053	Sonoran Serif Bold	T	b	10P	21
1056	Sonoran Serif Italic	T	i	10P	21
1351	Sonoran Serif	T		12P	18
1653	Sonoran Serif Bold	T	b		13
1803	Sonoran Serif Bold	T	b	18P	12
2103	Sonoran Serif Bold	T	b	24P	9
4407	Sonoran Serif	T		8P	*27
4407	Sonoran Serif	T		10P	*21
4407	Sonoran Serif	T		12P	*18
4427	Sonoran Serif Bold	T	b	10P	*21
4427	Sonoran Serif Bold	T	b	16P	*13
4427	Sonoran Serif Bold	T	b	24P	*9
4535	Sonoran Serif Italic	T	i	10P	*21
4919	Goudy	T		6P	*36
4919	Goudy	T		8P	*27
4919	Goudy	T		10P	*21

Table D-1 (Page 5 of 7). Font Information

FGID	Name	Type of Font	Attri-butes	Point	Pitch (CPI)
4919	Goudy	T		12P	*18
4939	Goudy Bold		Tb	10P	*21
4939	Goudy Bold	T	b	14P	*15
4939	Goudy Bold	T	b	18P	*12
5047	Goudy Italic	T	i	10P	*21
5067	Goudy Bold Italic	T	bi	10P	*21
5687	Times Roman	T		6P	*36
5687	Times Roman	T		8P	*27
5687	Times Roman	T		10P	*21
5687	Times Roman	T		12P	*18
5707	Times Roman Bold	T	b	10P	*21
5707	Times Roman Bold	T	b	12P	*18
5707	Times Roman Bold	T	b	14P	*15
5707	Times Roman Bold	T	b	18P	*12
5707	Times Roman Bold	T	b	24P	*12
5815	Times Roman Italic	T	i	10P	*21
5815	Times Roman Italic	T	i	12P	*18
5835	Times Roman Italic Bold	T	bi	10P	*21
5835	Times Roman Italic Bold	T	bi	12P	*18
5943	University	T		12P	*18
5943	University	T		14P	*15
5943	University	T		18P	*12
6199	Palatino**	T		6P	*36
6199	Palatino	T		8P	*27
6199	Palatino	T		10P	*21
6199	Palatino	T		12P	*18
6219	Palatino Bold	T	b	10P	*21
6219	Palatino Bold	T	b	14P	*15
6219	Palatino Bold	T	b	18P	*12
6327	Palatino Italic	T	i	10P	*21
6347	Palatino Italic Bold	T	bi	10P	*21
8503	Baskerville	T		6P	*36
8503	Baskerville	T		8P	*27
8503	Baskerville	T		10P	*21
8503	Baskerville	T		12P	*18
8523	Baskerville Bold	T	b	10P	*21
8523	Baskerville Bold	T	b	14P	*15
8523	Baskerville Bold	T	b	18P	*12
8631	Baskerville Italic	T	i	10P	*21
8651	Baskerville Italic Bold	T	bi	10P	*21
8759	Nasseem	T		12P	*18
8779	Nasseem Bold	T	b	12P	*18

Table D-1 (Page 6 of 7). Font Information

FGID	Name	Type of Font	Attri-butes	Point	Pitch (CPI)
8779	Nasseem Bold	T	b	18P	*12
8779	Nasseem Bold	T	b	24P	*9
8887	Nasseem Italic	T	i	12P	*18
8907	Nasseem Italic Bold	T	bi	12P	*18
8907	Nasseem Italic Bold	T	bi	18P	*12
8907	Nasseem Italic Bold	T	bi	24P	*9
12855	Narkisim	T		8P	*27
12855	Narkisim	T		10P	*21
12855	Narkisim	T		18P	*12
12855	Narkisim	T		24P	*9
12875	Narkisim Bold	T	b	8P	*27
12875	Narkisim Bold	T	b	10P	*21
12875	Narkisim Bold	T	b	12P	*18
16951	Century Schoolbook**	T		6P	*36
16951	Century Schoolbook	T		8P	*27
16951	Century Schoolbook	T		10P	*21
16951	Century Schoolbook	T		12P	*18
16971	Century Schoolbook Bold	T	b	10P	*21
16971	Century Schoolbook Bold	T	b	14P	*15
16971	Century Schoolbook Bold	T	b	18P	*12
17079	Century Schoolbook Italic	T	i	10P	*21
17099	Century Schoolbook Italic Bold	T	bi	10P	*21
33335	Optima**	T		6P	*36
33335	Optima	T		8P	*27
33335	Optima	T		10P	*21
33335	Optima	T		12P	*18
33355	Optima Bold	T	b	10P	*21
33355	Optima Bold	T	b	14P	*15
33355	Optima Bold	T	b	18P	*12
33463	Optima Italic	T	i	10P	*21
33483	Optima Italic Bold	T	bi	10P	*21
33591	Futura**	T		6P	*36
33591	Futura	T		8P	*27
33591	Futura	T		10P	*21
33591	Futura	T		12P	*18
33601	Futura Bold	T	b	10P	*21
33601	Futura Bold	T	b	14P	*15
33601	Futura Bold	T	b	18P	*12
33719	Futura Italic	T	i	10P	*21
33729	Futura Italic Bold	T	bi	10P	*21
34103	Helvetica**	T		6P	*36
34103	Helvetica	T		8P	*27

Table D-1 (Page 7 of 7). Font Information					
FGID	**Name**	**Type of Font**	**Attri-butes**	**Point**	**Pitch (CPI)**
34103	Helvetica	T		10P	*21
34103	Helvetica	T		12P	*18
34123	Helvetica Bold	T	b	10P	*21
34123	Helvetica Bold	T	b	14P	*15
34123	Helvetica Bold	T	b	18P	*12
34231	Helvetica Italic	T	i	10P	*21
34251	Helvetica Italic Bold	T	bi	10P	*21
37431	Old English	T		12P	*18
37431	Old English	T		14P	*15
37431	Old English	T		18P	*12
41783	Coronet Cursive	T		12P	*18
41803	Coronet Cursive Bold	T	b	14P	*15
41803	Coronet Cursive Bold	T	b	18P	*12
Note: Pitch or CPI column for typographic fonts indicates the width of the space character between printed characters. Width, pitch, and CPI of other space characters will vary.					

Font Substitution

Font substitution is done by the AS/400 system when the application specifies a font ID that is not supported by the designated printer or cannot be downloaded from the AS/400 system to the designated printer.

Table D-2 on page D-22 lists many fonts (by FGID number) and printers that are supported. A blank in any column indicates that the font ID is supported by that printer, and no substitution takes place. However, if your application specifies a font ID that is not in the table, you need to refer to Table D-3 on page D-31. Table D-3 on page D-31 provides the substituted FGID for font IDs in ranges such as FGID 0 through FGID 65.

How To Use the Font Substitution Charts

Following are three examples to familiarize you with font substitution on the AS/400 system.

- Example one shows how to verify whether or not your font ID is supported by a certain printer.
- Example two shows how to find out what font ID the AS/400 system substitutes if the printer you want to use does not support your font ID.
- Example three shows how to find out what font ID the AS/400 system substitutes if your font ID is not available on the AS/400 system or on the printer.

Example One

If you want to verify that a font ID is supported by a certain printer, locate the font ID in Table D-2 on page D-22. For example, locate font ID 112. Font ID 112 is supported by the 3812 and 3816 SCS and IPDS printers and the 4028 printer (this is indicated by blanks in those spaces). The 4019 printer supports font ID 112 on a

font card resident in the 4019 printer. The 4224, 4234, and 5219 printers substitute font ID 87 or 86.

Note: A font card is a hardware card that can have many font character sets resident on it. Font cards can be installed in printers to provide additional fonts.

Example Two

If your application uses a font ID that is not supported on all printers, you can determine the substitution by looking in Table D-2 on page D-22. For example, locate font ID 30. The table shows that font ID 30 is supported on the 3812 and 3816 SCS and IPDS printers. However, if you are using any of the other printers listed in the table, font ID 11 is substituted for font ID 30.

Example Three

Let us say your application calls for font ID 4 and you want to print the spooled file on a 4224 printer. To determine if font ID 4 is a supported font or one that is substituted for, read through the following steps:

Step 1 Look in Table D-2 on page D-22 to see if font ID 4 is listed. Font ID 4 is not in Table D-2 on page D-22.

Step 2 Next, look in Table D-3 on page D-31. The table shows that font ID 11 is substituted for fonts 0 through 65.

Step 3 Return to Table D-2 on page D-22 and locate font ID 11. This table shows that font ID 11 is supported on the 4224 printer.

Step 4 The result of the font ID substitution is that your application will print using font ID 11.

Changing Font IDs

To permanently change the font ID, you could, in your application, specify a different font ID or use the Change Printer File (CHGPRTF) command to specify a new font ID for the printer file. Information in Table D-1 on page D-14 can help you choose a replacement font ID.

To temporarily change the font ID for your application, you could override the font selection in your printer file by using the Override with Printer File (OVRPRTF) command before the application runs.

Font Substitution and the 4019 Printer

The 4019 printer is supported by the AS/400 system, as an emulated printer (usually 3812 or 5219). The AS/400 system treats the device as a physical 3812 or 5219. Therefore, the font support and font substitution of the emulated printer is used. This emulation limits access to some of the 4019 fonts.

To access most of the 4019-supported fonts, an IBM-supplied program named QWP4019 is available. QWP4019 sets a flag in the emulated printer's device description to inform the system to use the 4019 font tables.

| For more information and examples on how the QWP4019 program works, see
| "QWP4019 Program" on page 13-5.

Note to Reader

An asterisk is used in the following chart to indicate that the substituted font has a different pitch.

Table D-2 (Page 1 of 9). Font Substitution

FGID	Printers						
	4224 4230	4234	3812 or 3816 SCS	3812 or 3816 IPDS	5219	4028	4019[1]
2	11	11	11	11	11	11[2]	
3					11		
5	11	26				11[2]	
8	11	11	11	11	11	11	
10	11	11	11	11	11	11	
11							
12	11	26					
13	11	11				11	11
18	11	26			11		
19					11		
20	11	26				11	11
21	11	11	11	11	11	11	
25	11	11	11	11	11	11[2]	
26						11	11
30	11	11			11	11	11
31	26	26	26		26	11	11
36	11	11	11	11	11	11[2]	
38	11	26			11	46	46
39	26	26			11	46	46
40	26	26			11	11	11
41	11	26			11	11	11
42	11	26			11	11	11
43	11	26			11	18	11
44	11	11			11	11	11
46	11	26			11		
49	26	26	26		26	11	
50	26	26			26	46	
51	26				26	11	11
52	11				11	11	11
55	26	26	26		26	46	46
61	11	11	11	11	11	11	
62	11	11	11	11	11	18	
63	11	11	11	11	11	46	
64	11	11	11	11	11	46	
66	87	87			87	85	85
68	87	87			87	92	85
69	87	87			87	111	85

Table D-2 (Page 2 of 9). Font Substitution

FGID	Printers						
	4224 4230	4234	3812 or 3816 SCS	3812 or 3816 IPDS	5219	4028	4019[1]
70	87	87			87	85	85
71	87	87			87	92	85
72	87	87			87	111	85
74	87		87	87	87	85	85
75	85		85	85	85	85	85
76	85	85	85	85	85		
78	85	85	85	85	85	85	
80	87	87				85	
84	87	87				85[2]	
85							
86	87	87					
87						85[2]	
91	87	87				92[2]	
92	85	85	85	85	85		
95	85	85	85	85	85	85[2]	
96	85	85	85	85	85	85[2]	
98	87	87	87		87	85	
99	87	87	87		87	85	85
101	87	87	87		87	111	85
102	87	87	87		87	111	85
103	85	85	85	85	85	85	
109	85	85	85	85	85	92[2]	
110	87	87			87	11[2]	
111	87	87			86		
112	87	87			86		
154	85		160	160	160	164	159
155	160	160			160	159[2]	
157	160	160	160	160	160	164[2]	
158	160	160				164[2]	
159	160	160					
160						164[2]	
162	160	160				164[2]	
163	160	160			160	159	159
164	160	160	160	160	160		
167	160	160	160		160	164	
168	160	160	160		160	159	159
173	160	160			160	164	159
174	160	160	160	160	160	164	159
175	160	160			160	164	159
178	*400	*258	*281		*222	*281	*254
179	*400	*258	*281		*222	*281	*254

Table D-2 (Page 3 of 9). Font Substitution

FGID	Printers						
	4224 4230	4234	3812 or 3816 SCS	3812 or 3816 IPDS	5219	4028	4019[1]
180	*222	*222	*230		*222	*223	*254
181	*222	*222	*230		*222	*223	*254
182	*11	*11	*244		*11	*11	*11
183	*11	*11	*244		*11	*46	*46
186	160	160	160	160	160	164[2]	
187	160	160	160	160	160	159[2]	
188	160	160	160	160	160	164[2]	
189	160	160	160	160	160	159[2]	
190	160	160	160	160	160	164[2]	
191	160	160	160	160	160	159[2]	
194	160	160	160	160	160	164[2]	
195	160	160	160	160	160	159[2]	
204	*222				*222	*223	*254
205	*222		204	204	*222	*223	*254
211	222	222	230		222	223	*254
212	222	222	230		222	223	*254
221	222	222					
222			230	230		223[2]	
223							
225	222	222				223	*254
226	222	222	230		222	223	
229	222	222			222	223	*254
230	222	222			222	223	*254
232	222		230	230	222	223	*254
233	223		230	230	223	223	*254
234	222	222	230		222	223	*254
244	*11	*26			*11	*11	
245	*11	*26			*11	*46	
247	*400	*258	252		*222	254	254
248	*400	*258	252		*222	254	254
249	*400	*258	252	252	*222	254	
252	*400	*258			*222	254	254
253	*400	*258			*222	254	254
254	*400	*258			*222.		
255	*400	*258	252	252	*222	254	
256	*400	*258	252	252	*222.		
258	*400		*281	*281	*222	*281	*254
259	*400		*281	*281	*222	*281	*254
279	*400	*258	252	252	*222	254	
281	*400	*258			*222		
282	*400	*258	281		*222	281	

Table D-2 (Page 4 of 9). Font Substitution

FGID	Printers						
	4224 4230	4234	3812 or 3816 SCS	3812 or 3816 IPDS	5219	4028	4019[1]
283	*400	*258	281	281.	*222	281	
285	*400	*258	*290	*290	*222	281[2]	
290	*400	*258			*222	*281	*254
300	400		*252	*252	*222	*254	*254
400			*252	*252	*222	*254	*254
434	*11	*11	*11	*11	*11	46[2]	
435	*11	*11	*11	*11	*11	46[2]	
751	*400	*258			*222.		*254
752	*400	*258	*281	*281	*222		*254
753	*400	*258	*281	*281	*222		*254
754	*85	*85	*85	*85	*85		*85
755	*11	*11	*11	*11	*11		*46
756	*400	*258	*281	*281	*222		*254
757	*400	*258	*281	*281	*222		*254
758	*85	*85	*85	*85	*85		*85
759	*11	*11	*11	*11	*11		*46
760	*400	*258	*290	*290	*222		*254
761	*400	*258	*281	*281	*222		*254
762	*222	*222	*230	*230	*222		*254
763	*400	*258	*281	*281	*222		*254
764	*400	*258	*290	*290	*222		*254
765	*400	*258	*281	*281	*222		*254
1051	*400	*258			*222		*254
1053	*400	*258			*222		*254
1056	*400	*258			*222		*254
1351	*400	*258			*222		*254
1653	*222	*222			*222		*254
1803	*85	*85	*85	*85	*85		*85
2103	*11	*11			*11		*46
4407 (8P)	*400	*258			*222	5687[2]	*254
4407 (10P)	*400	*258			*222	5687[2]	*254
4407 (12P)	*400	*258			*222	5687[2]	*254
4427 (10P)	*400	258			*222	5687[2]	*254
4427 (16P)	*222	*222			*11	*5707	*254
4427 (24P)	*11	*11			*11	5707[2]	*254
4535 (10P)	*400	*258			*222	5687[2]	*46

Table D-2 (Page 5 of 9). Font Substitution

FGID	Printers						
	4224 4230	4234	3812 or 3816 SCS	3812 or 3816 IPDS	5219	4028	4019[1]
4919 (6P)	*400	*258	*290	*290	*222	5687[2]	
4919 (8P)	*400	*258	*751	*751	*222	5687[2]	
4919 (10P)	*400	*258	*1051	*1051	*222	5687[2]	
4919 (12P)	*400	*258	*1351	*1351	*222	5687[2]	
4939 (10P)	*400	*258	*1053	*1053	*222	5707[2]	
4939 (14P)	*222	*222	*1351	*1351	*222	5707[2]	
4939 (18P)	*85	*85	*1653	*1653	*85	5707[2]	
5047 (10P)	*400	*258	*1056	*1056	*222	5687[2]	
5067 (10P)	*400	*258	*1053	*1053	*222	5687[2]	
5687 (6P)	*400	*258	*290	*290	*222		
5687 (8P)	*400	*258	*751	*751	*222		
5687 (10P)	*400	*258	*1051	*1051	*222		
5687 (12P)	*400	*258	*1351	*1351	*222		
5707 (10P)	*400	*258	*1053	*1053	*222		
5707 (12P)	*400	*258	*1351	*1351	*222		*254
5707 (14P)	*222	*222	*1351	*1351	*222		
5707 (18P)	*85	*85	*1653	*1653	*85		
5707 (24P)	*11	*11	*2103	*2103	*11		
5815 (10P)	*400	*258	*1056	*1056	*222		
5815 (12P)	*400	*258	*1351	*1351	*222		*254
5835 (10P)	*400	*258	*1053	*1053	*222		
5835 (12P)	*400	*258	*1351	*1351	*222		
5943 (12P)	*400	*258	*1351	*1351	*222	5687[2]	
5943 (14P)	*222	*222	*1351	*1351	*222	5707[2]	

Table D-2 (Page 6 of 9). Font Substitution

FGID	Printers						
	4224 4230	4234	3812 or 3816 SCS	3812 or 3816 IPDS	5219	4028	4019[1]
5943 (18P)	*85	*85	*1653	*1653	*85	5707[2]	
6199 (6P)	*400	*258	*290	*290	*222	5687[2]	
6199 (8P)	*400	*258	*751	*751	*222	5687[2]	
6199 (10P)	*400	*258	*1051	*1051	*222	5687[2]	
6199 (12P)	*400	*258	*1351	*1351	*222	5687[2]	
6219 (10P)	*400	*258	*1053	*1053	*222	5687[2]	
6219 (14P)	*222	*222	*1351	*1351	*222	5707[2]	
6219 (18P)	*85	*85	*1653	*1653	*85	5707[2]	
6327 (10P)	*400	*258	*1056	*1056	*222	5687[2]	
6347 (10P)	*400	*258	*1053	*1053	*222	5686[2]	
8503 (6P)	*400	*258	*290	*290	*222	5687[2]	
8503 (8P)	*400	*258	*751	*751	*222	5687[2]	
8503 (10P)	*400	*258	*1051	*1051	*222	5687[2]	
8503 (12P)	*400	*258	*1351	*1351	*222	5687[2]	
8523 (10P)	*400	*258	*1053	*1053	*222	5687[2]	
8523 (14P)	*222	*222	*1351	*1351	*222	5707[2]	
8523 (18P)	*85	*85	*1653	*1653	*85	5707[2]	
8631 (10P)	*400	*258	*1056	*1056	*222	5687[2]	
8651 (10P)	*400	*258	*1053	*1053	*222	5687[2]	
8759 (12P)	*400	*258	*1351	*1351	*222	5687[2]	
8779 (12P)	*400	*258	*1351	*1351	*222	5707[2]	
8779 (18P)	*85	*85	*1653	*1653	*85	5707[2]	
8779 (24P)	*11	*11	*2103	*2103	*11	5707[2]	
8887 (12P)	*400	*258	*1351	*1351	*222	5687[2]	

Table D-2 (Page 7 of 9). Font Substitution

FGID	Printers						
	4224 4230	4234	3812 or 3816 SCS	3812 or 3816 IPDS	5219	4028	4019[1]
8907 (12P)	*400	*258	*1351	*1351	*222	5687[2]	
8907 (18P)	*85	*85	*1653	*1653	*85	5707[2]	
8907 (24P)	*11	*11	*2103	*2103	*11	5707[2]	
12855 (8P)	*400	*258	*751		*222	5687[2]	
12855 (10P)	*400	*258	*1051	*1051	*222	5687[2]	
12855 (18P)	*85	*85	*1653	*1653	*85	5707[2]	
12855 (24P)	*11	*11	*2103	*2103	*11	5707[2]	
12875 (8P)	*400	*258	*751		*222	5687[2]	
12875 (10P)	*400	*258	*1053	*1053	*222	5687[2]	
12875 (12P)	*400	*258	*1351	*1351	*222	5687[2]	
16951 (6P)	*400	*258	*290	*290	*222	5687[2]	
16951 (8P)	*400	*258	*751	*751	*222	5687[2]	
16951 (10P)	*400	*258	*1051	*1051	*222	5687[2]	
16951 (12P)	*400	*258	*1351	*1351	*222	5687[2]	
16971 (10P)	*400	*258	*1053	*1053	*222	5687[2]	
16971 (14P)	*222	*222	*1351	*1351	*222	5707[2]	
16971 (18P)	*85	*85	*1653	*1653	*85	5707[2]	
17079 (10P)	*400	*258	*1056	*1056	*222	5687[2]	
17099	*400	*258	*1053	*1053	*222	5687[2]	
33335 (6P)	*400	*258	*290	*290	*222	5687[2]	
33335 (8P)	*400	*258	*751	*751	*222	5687[2]	
33335 (10P)	*400	*258	*1051	*1051	*222	5687[2]	
33335 (12P)	*400	*258	*1351	*1351	*222	5687[2]	
33355 (10P)	*400	*258	*1053	*1053	*222	5687[2]	
33355 (14P)	*222	*222	*1351	*1351	*222	5707[2]	

Table D-2 (Page 8 of 9). Font Substitution

FGID	Printers						
	4224 4230	4234	3812 or 3816 SCS	3812 or 3816 IPDS	5219	4028	4019[1]
33355 (18P)	*85	*85	*1653	*1653	*85	5707[2]	
33463 (10P)	*400	*258	*1056	*1056	*222	5687[2]	
33483 (10P)	*400	*258	*1053	*1053	*222	5687[2]	
33591 (6P)	*400	*258	*290	*290	*222	5687[2]	
33591 (8P)	*400	*258	*751	*751	*222	5687[2]	
33591 (10P)	*400	*258	*1051	*1051	*222	5687[2]	
33591 (12P)	*400	*258	*1351	*1351	*222	5687[2]	
33601 (10P)	*400	*258	*1053	*1053	*222	5687[2]	
33601 (14P)	*222	*222	*1351	*1351	*222	5707[2]	
33601 (18P)	*85	*85	*1653	*1653	*85	5707[2]	
33719 (10P)	*400	*258	*1056	*1056	*222	5687[2]	
33729 (10P)	*400	*258	*1053	*1053	*222	5687[2]	
34103 (6P)	*400	*258	*290	*290	*222	5687[2]	
34103 (8P)	*400	*258	*751	*751	*222	5687[2]	
34103 (10P)	*400	*258	*1051	*1051	*222	5687[2]	
34103 (12P)	*400	*258	*1351	*1351	*222	5687[2]	
34123 (10P)	*400	*258	*1053	*1053	*222	5687[2]	
34123 (14P)	*222	*222	*1351	*1351	*222	5707[2]	
34123 (18P)	*85	*85	*1653	*1653	*85	5707[2]	
34231 (10P)	*400	*258	*1056	*1056	*222	5687[2]	
34251 (10P)	*400	*258	*1053	*1053	*222	5687[2]	
37431 (12)	*400	*258	*1351	*1351	*222	5687[2]	
37431 (14P)	*222	*222	*1351	*1351	*222	5707[2]	
37431 (18P)	*85	*85	*1653	*1653	*85	5707[2]	

Table D-2 (Page 9 of 9). Font Substitution

FGID	Printers						
	4224 4230	**4234**	**3812 or 3816 SCS**	**3812 or 3816 IPDS**	**5219**	**4028**	**4019[1]**
41783 (12P)	*400	*258	*1351	*1351	*222	5687[2]	
41803 (14P)	*222	*222	*1351	*1351	*222	5707[2]	
41803 (18P)	*85	*85	*1653	*1653	*85	5707[2]	

1 The 4019 printer has five resident fonts: FGID 11, 46, 85, 159, and 254. The AS/400 system sends any of those FGIDs that do not show a substitution in Table D-2 to the emulator that the 4019 is attached to. The emulator may not support all of the FGIDs and may report an error or perform a substitution of its own.

2 The 4028 performs the font substitution as shown unless a font card has been installed that contains that FGID. For example, if a font card with an FGID of 2 is installed, the AS/400 system sends the FGID of 2 to the printer. However, if the font card is not installed, the AS/400 system substitutes an FGID of 11.

Font Substitution by Font ID Range

If your application specifies a font ID that is not found in Table D-2 on page D-22 or is not resident in the printer (font card), the system makes a substitution based on the font ID ranges in the following table. For example, if font ID 4 is specified in your application, the AS/400 system substitutes font ID 11 as shown in the table below.

Table D-3. Font Substitution by Font ID Range.

FGID		Substituted FGID
Fonts 0 through 65		11
Fonts 66 through 153		85
Fonts 154 through 200		160
Fonts 201 through 210		204
Fonts 211 through 239		223
Fonts 240 through 246		245
Fonts 247 through 257		252
Fonts 258 through 259		259
Fonts 260 through 273		434
Fonts 274 through 279		279
Fonts 280 through 284		281
Fonts 285 through 289		285
Fonts 290 through 299		290
Fonts 300 through 511		252
Fonts 512 through 2303		252
Fonts 2304 through 3839 or Fonts 4069 through 65279	Fonts with point size equal to 0	252
	Fonts with point size greater than 0 but less than 7.6	5687-6p
	Fonts with point size greater than or equal to 7.6 but less than 9.6	5687-8p
	Fonts with point size greater than or equal to 9.6 but less than 11.6	5687-10p
	Fonts with point size greater than or equal to 11.6 but less than 13.6	5687-12p
	Fonts with point size greater than or equal 13.6 but less than 17.6	5707-14p
	Fonts with point size greater than or equal to 17.6 but less than 23.6	5707-18p
	Fonts with point size greater than or equal to 23.6	5707-24p
Fonts 3840 through 4095 (User-defined)		No Substitution
Fonts 65280 through 65534 (User-defined)		No Substitution

Host Resident to Printer Resident Font Character Set Mapping

If your application specifies a host resident font character set (fonts are stored on the AS/400 system) and you want to print the spooled file on an AFP-configured 4028, 4224, 4230, or 4234 printer, the AS/400 system must substitute a printer resident font character set (fonts stored on the printer).

The following table can help you determine what printer resident font character set is requested when your spooled file references a host resident font character set instead of a registered font identifier (ID). This font substitution is necessary because these printers do not support the downloading of 240-pel host resident font character sets. Depending upon the host resident font character set that is

requested, the appropriate registered ID value, font width value, and font attributes are selected to match (as closely as possible) your font request.

The font width specifies the width of the blank character in 1440ths of an inch. This is an indicator of how many characters will fit per inch of space on the paper.

The Map Fidelity indicates whether or not the substituted printer resident font is considered to be an exact match to the font character set that is requested in your spooled file.

Table D-4 (Page 1 of 20). Host Resident to Printer Resident Font Character Set Mapping

Font Character Set Name	Registered Font ID	Font Width	Font Attributes	Map Fidelity
C0A053A0	33079	54	Normal	Exact
C0A053B0	33079	60	Normal	Exact
C0A053D0	33079	66	Normal	Exact
C0A053F0	33079	72	Normal	Exact
C0A053H0	33079	84	Normal	Exact
C0A053J0	33079	96	Normal	Exact
C0A053N0	33079	114	Normal	Exact
C0A053T0	33079	150	Normal	Exact
C0A053Z0	33079	174	Normal	Exact
C0A05300	33079	48	Normal	Exact
C0A05360	33079	30	Normal	Exact
C0A05370	33079	36	Normal	Exact
C0A05380	33079	36	Normal	Exact
C0A05390	33079	42	Normal	Exact
C0A055A0	33079	72	Normal	Exact
C0A055B0	33079	78	Normal	Exact
C0A055B1	33079	318	Normal	Exact
C0A055D0	33079	96	Normal	Exact
C0A055F0	33079	108	Normal	Exact
C0A055H0	33079	120	Normal	Exact
C0A055J0	33079	132	Normal	Exact
C0A055N0	33079	162	Normal	Exact
C0A055N1	33079	402	Normal	Exact
C0A055T0	33079	198	Normal	Exact
C0A055Z0	33079	240	Normal	Exact
C0A055Z1	33079	480	Normal	Exact
C0A05500	33079	66	Normal	Exact
C0A05560	33079	42	Normal	Exact
C0A05570	33079	48	Normal	Exact
C0A05580	33079	54	Normal	Exact
C0A05590	33079	60	Normal	Exact
C0A057A0	33079	72	Normal	Exact
C0A057B0	33079	78	Normal	Exact

Table D-4 (Page 2 of 20). Host Resident to Printer Resident Font Character Set Mapping

Font Character Set Name	Registered Font ID	Font Width	Font Attributes	Map Fidelity
C0A057D0	33079	96	Normal	Exact
C0A057F0	33079	108	Normal	Exact
C0A057H0	33079	120	Normal	Exact
C0A057J0	33079	132	Normal	Exact
C0A057N0	33079	162	Normal	Exact
C0A057T0	33079	198	Normal	Exact
C0A057Z0	33079	240	Normal	Exact
C0A05700	33079	66	Normal	Exact
C0A05760	33079	42	Normal	Exact
C0A05770	33079	48	Normal	Exact
C0A05780	33079	54	Normal	Exact
C0A05790	33079	60	Normal	Exact
C0A073A0	33099	54	Bold	Exact
C0A073B0	33099	60	Bold	Exact
C0A073D0	33099	66	Bold	Exact
C0A073F0	33099	72	Bold	Exact
C0A073H0	33099	84	Bold	Exact
C0A073J0	33099	96	Bold	Exact
C0A073N0	33099	114	Bold	Exact
C0A073T0	33099	150	Bold	Exact
C0A073Z0	33099	174	Bold	Exact
C0A07300	33099	48	Bold	Exact
C0A07360	33099	30	Bold	Exact
C0A07370	33099	36	Bold	Exact
C0A07380	33099	36	Bold	Exact
C0A07390	33099	42	Bold	Exact
C0A075A0	33099	72	Bold	Exact
C0A075B0	33099	78	Bold	Exact
C0A075B1	33099	318	Bold	Exact
C0A075D0	33099	96	Bold	Exact
C0A075F0	33099	108	Bold	Exact
C0A075H0	33099	120	Bold	Exact
C0A075J0	33099	132	Bold	Exact
C0A075N0	33099	162	Bold	Exact
C0A075N1	33099	402	Bold	Exact
C0A075T0	33099	198	Bold	Exact
C0A075Z0	33099	240	Bold	Exact
C0A075Z1	33099	480	Bold	Exact
C0A07500	33099	66	Bold	Exact
C0A07560	33099	42	Bold	Exact
C0A07570	33099	48	Bold	Exact

Table D-4 (Page 3 of 20). Host Resident to Printer Resident Font Character Set Mapping

Font Character Set Name	Registered Font ID	Font Width	Font Attributes	Map Fidelity
C0A07580	33099	54	Bold	Exact
C0A07590	33099	60	Bold	Exact
C0A077A0	33099	72	Bold	Exact
C0A077B0	33099	78	Bold	Exact
C0A077D0	33099	96	Bold	Exact
C0A077F0	33099	108	Bold	Exact
C0A077H0	33099	120	Bold	Exact
C0A077J0	33099	132	Bold	Exact
C0A077N0	33099	162	Bold	Exact
C0A077T0	33099	198	Bold	Exact
C0A077Z0	33099	240	Bold	Exact
C0A07700	33099	66	Bold	Exact
C0A07760	33099	42	Bold	Exact
C0A07770	33099	48	Bold	Exact
C0A07780	33099	54	Bold	Exact
C0A07790	33099	60	Bold	Exact
C0A153A0	33207	54	Italic	Exact
C0A153B0	33207	60	Italic	Exact
C0A153D0	33207	66	Italic	Exact
C0A153F0	33207	72	Italic	Exact
C0A153H0	33207	84	Italic	Exact
C0A153J0	33207	96	Italic	Exact
C0A153N0	33207	114	Italic	Exact
C0A153T0	33207	150	Italic	Exact
C0A153Z0	33207	174	Italic	Exact
C0A15300	33207	48	Italic	Exact
C0A15360	33207	30	Italic	Exact
C0A15370	33207	36	Italic	Exact
C0A15380	33207	36	Italic	Exact
C0A15390	33207	42	Italic	Exact
C0A155A0	33207	72	Italic	Exact
C0A155B0	33207	78	Italic	Exact
C0A155B1	33207	318	Italic	Exact
C0A155D0	33207	96	Italic	Exact
C0A155F0	33207	108	Italic	Exact
C0A155H0	33207	120	Italic	Exact
C0A155J0	33207	132	Italic	Exact
C0A155N0	33207	162	Italic	Exact
C0A155N1	33207	402	Italic	Exact
C0A155T0	33207	198	Italic	Exact
C0A155Z0	33207	240	Italic	Exact

Table D-4 (Page 4 of 20). Host Resident to Printer Resident Font Character Set Mapping

Font Character Set Name	Registered Font ID	Font Width	Font Attributes	Map Fidelity
C0A155Z1	33207	480	Italic	Exact
C0A15500	33207	66	Italic	Exact
C0A15560	33207	42	Italic	Exact
C0A15570	33207	48	Italic	Exact
C0A15580	33207	54	Italic	Exact
C0A15590	33207	60	Italic	Exact
C0A175A0	33227	72	Bold Italic	Exact
C0A175B0	33227	78	Bold Italic	Exact
C0A175B1	33227	318	Bold Italic	Exact
C0A175D0	33227	96	Bold Italic	Exact
C0A175F0	33227	108	Bold Italic	Exact
C0A175H0	33227	120	Bold Italic	Exact
C0A175J0	33227	132	Bold Italic	Exact
C0A175N0	33227	162	Bold Italic	Exact
C0A175N1	33227	402	Bold Italic	Exact
C0A175T0	33227	198	Bold Italic	Exact
C0A175Z0	33227	240	Bold Italic	Exact
C0A175Z1	33227	480	Bold Italic	Exact
C0A17500	33227	66	Bold Italic	Exact
C0A17560	33227	42	Bold Italic	Exact
C0A17570	33227	48	Bold Italic	Exact
C0A17580	33227	54	Bold Italic	Exact
C0A17590	33227	60	Bold Italic	Exact
C0C055A0	16951	96	Normal	Exact
C0C055B0	16951	102	Normal	Exact
C0C055D0	16951	120	Normal	Exact
C0C055F0	16951	138	Normal	Exact
C0C055H0	16951	156	Normal	Exact
C0C055J0	16951	174	Normal	Exact
C0C055N0	16951	210	Normal	Exact
C0C055T0	16951	264	Normal	Exact
C0C055Z0	16951	312	Normal	Exact
C0C05500	16951	84	Normal	Exact
C0C05560	16951	54	Normal	Exact
C0C05570	16951	60	Normal	Exact
C0C05580	16951	72	Normal	Exact
C0C05590	16951	78	Normal	Exact
C0C075A0	16971	96	Bold	Exact
C0C075B0	16971	102	Bold	Exact
C0C075D0	16971	120	Bold	Exact
C0C075F0	16971	138	Bold	Exact

Table D-4 (Page 5 of 20). Host Resident to Printer Resident Font Character Set Mapping

Font Character Set Name	Registered Font ID	Font Width	Font Attributes	Map Fidelity
C0C075H0	16971	156	Bold	Exact
C0C075J0	16971	174	Bold	Exact
C0C075N0	16971	210	Bold	Exact
C0C075T0	16971	234	Bold	Exact
C0C075Z0	16971	264	Bold	Exact
C0C07500	16971	84	Bold	Exact
C0C07560	16971	54	Bold	Exact
C0C07570	16971	60	Bold	Exact
C0C07580	16971	72	Bold	Exact
C0C07590	16971	78	Bold	Exact
C0C155A0	17079	96	Italic	Exact
C0C155B0	17079	102	Italic	Exact
C0C155D0	17079	120	Italic	Exact
C0C155F0	17079	138	Italic	Exact
C0C155H0	17079	156	Italic	Exact
C0C155J0	17079	174	Italic	Exact
C0C155N0	17079	210	Italic	Exact
C0C155T0	17079	264	Italic	Exact
C0C155Z0	17079	312	Italic	Exact
C0C15500	17079	84	Italic	Exact
C0C15560	17079	54	Italic	Exact
C0C15570	17079	60	Italic	Exact
C0C15580	17079	72	Italic	Exact
C0C15590	17079	78	Italic	Exact
C0C175A0	17099	96	Bold Italic	Exact
C0C175B0	17099	102	Bold Italic	Exact
C0C175D0	17099	120	Bold Italic	Exact
C0C175F0	17099	138	Bold Italic	Exact
C0C175H0	17099	156	Bold Italic	Exact
C0C175J0	17099	174	Bold Italic	Exact
C0C175N0	17099	210	Bold Italic	Exact
C0C175T0	17099	264	Bold Italic	Exact
C0C175Z0	17099	312	Bold Italic	Exact
C0C17500	17099	84	Bold Italic	Exact
C0C17560	17099	54	Bold Italic	Exact
C0C17570	17099	60	Bold Italic	Exact
C0C17580	17099	72	Bold Italic	Exact
C0C17590	17099	78	Bold Italic	Exact
C0D0GB10	39	144	Bold	Exact
C0D0GB12	69	120	Bold	Exact
C0D0GC15	222	96	Normal	Not Exact

Table D-4 (Page 6 of 20). Host Resident to Printer Resident Font Character Set Mapping

Font Character Set Name	Registered Font ID	Font Width	Font Attributes	Map Fidelity
C0D0GI12	68	120	Italic	Exact
C0D0GL10	26	144	Normal	Not Exact
C0D0GL12	87	120	Normal	Not Exact
C0D0GL15	222	96	Normal	Not Exact
C0D0GP12	174	120	Normal	Exact
C0D0GR10	26	144	Normal	Not Exact
C0D0GT10	40	144	Normal	Exact
C0D0GT12	66	120	Normal	Exact
C0D0GT13	203	108	Normal	Exact
C0D0GT15	230	96	Normal	Exact
C0D0GT18	400	80	Normal	Not Exact
C0D0GT20	281	72	Normal	Exact
C0D0GT24	290	54	Normal	Exact
C0D0RT10	41	144	Normal	Exact
C0D0SB12	72	120	Bold	Exact
C0D0SI10	43	144	Italic	Exact
C0D0SI12	71	120	Italic	Exact
C0D0SO12	70	120	Normal	Not Exact
C0D0ST10	42	144	Normal	Exact
C0D0ST12	70	120	Normal	Exact
C0D0ST15	229	96	Normal	Exact
C0E0CR0R	10	144	Normal	Not Exact
C0G055A0	4663	72	Normal	Exact
C0G055B0	4663	78	Normal	Exact
C0G055D0	4663	96	Normal	Exact
C0G055F0	4663	108	Normal	Exact
C0G055H0	4663	120	Normal	Exact
C0G055J0	4663	132	Normal	Exact
C0G055N0	4663	162	Normal	Exact
C0G055T0	4663	198	Normal	Exact
C0G055Z0	4663	240	Normal	Exact
C0G05500	4663	66	Normal	Exact
C0G05560	4663	42	Normal	Exact
C0G05570	4663	48	Normal	Exact
C0G05580	4663	54	Normal	Exact
C0G05590	4663	60	Normal	Exact
C0G075A0	4683	72	Bold	Exact
C0G075B0	4683	78	Bold	Exact
C0G075D0	4683	96	Bold	Exact
C0G075F0	4683	108	Bold	Exact
C0G075H0	4683	120	Bold	Exact

Table D-4 (Page 7 of 20). Host Resident to Printer Resident Font Character Set Mapping

Font Character Set Name	Registered Font ID	Font Width	Font Attributes	Map Fidelity
C0G075J0	4683	132	Bold	Exact
C0G075N0	4683	162	Bold	Exact
C0G075T0	4683	198	Bold	Exact
C0G075Z0	4683	240	Bold	Exact
C0G07500	4683	66	Bold	Exact
C0G07560	4683	42	Bold	Exact
C0G07570	4683	48	Bold	Exact
C0G07580	4683	54	Bold	Exact
C0G07590	4683	60	Bold	Exact
C0G155A0	4791	72	Italic	Exact
C0G155B0	4791	78	Italic	Exact
C0G155D0	4791	96	Italic	Exact
C0G155F0	4791	108	Italic	Exact
C0G155H0	4791	120	Italic	Exact
C0G155J0	4791	132	Italic	Exact
C0G155N0	4791	162	Italic	Exact
C0G155T0	4791	198	Italic	Exact
C0G155Z0	4791	240	Italic	Exact
C0G15500	4791	66	Italic	Exact
C0G15560	4791	42	Italic	Exact
C0G15570	4791	48	Italic	Exact
C0G15580	4791	54	Italic	Exact
C0G15590	4791	60	Italic	Exact
C0G175A0	4811	72	Bold Italic	Exact
C0G175B0	4811	78	Bold Italic	Exact
C0G175D0	4811	96	Bold Italic	Exact
C0G175F0	4811	108	Bold Italic	Exact
C0G175H0	4811	120	Bold Italic	Exact
C0G175J0	4811	132	Bold Italic	Exact
C0G175N0	4811	162	Bold Italic	Exact
C0G175T0	4811	198	Bold Italic	Exact
C0G175Z0	4811	240	Bold Italic	Exact
C0G17500	4811	66	Bold Italic	Exact
C0G17560	4811	42	Bold Italic	Exact
C0G17570	4811	48	Bold Italic	Exact
C0G17580	4811	54	Bold Italic	Exact
C0G17590	4811	60	Bold Italic	Exact
C0H200A0	2304	73	Normal	Exact
C0H200B0	2304	80	Normal	Exact
C0H200D0	2304	93	Normal	Exact
C0H200F0	2304	107	Normal	Exact

Table D-4 (Page 8 of 20). Host Resident to Printer Resident Font Character Set Mapping

Font Character Set Name	Registered Font ID	Font Width	Font Attributes	Map Fidelity
C0H200H0	2304	120	Normal	Exact
C0H200J0	2304	133	Normal	Exact
C0H200N0	2304	160	Normal	Exact
C0H200T0	2304	200	Normal	Exact
C0H200Z0	2304	240	Normal	Exact
C0H20000	2304	67	Normal	Exact
C0H20060	2304	40	Normal	Exact
C0H20070	2304	47	Normal	Exact
C0H20080	2304	53	Normal	Exact
C0H20090	2304	60	Normal	Exact
C0H300A0	2306	73	Italic	Exact
C0H300B0	2306	80	Italic	Exact
C0H300D0	2306	93	Italic	Exact
C0H300F0	2306	107	Italic	Exact
C0H300H0	2306	120	Italic	Exact
C0H300J0	2306	133	Italic	Exact
C0H300N0	2306	160	Italic	Exact
C0H300T0	2306	200	Italic	Exact
C0H300Z0	2306	240	Italic	Exact
C0H30000	2306	67	Italic	Exact
C0H30060	2306	40	Italic	Exact
C0H30070	2306	47	Italic	Exact
C0H30080	2306	53	Italic	Exact
C0H30090	2306	60	Italic	Exact
C0H400A0	2305	73	Bold	Exact
C0H400B0	2305	80	Bold	Exact
C0H400D0	2305	93	Bold	Exact
C0H400F0	2305	107	Bold	Exact
C0H400H0	2305	120	Bold	Exact
C0H400J0	2305	133	Bold	Exact
C0H400N0	2305	160	Bold	Exact
C0H400T0	2305	200	Bold	Exact
C0H400Z0	2305	240	Bold	Exact
C0H40000	2305	67	Bold	Exact
C0H40060	2305	40	Bold	Exact
C0H40070	2305	47	Bold	Exact
C0H40080	2305	53	Bold	Exact
C0H40090	2305	60	Bold	Exact
C0H500A0	2307	73	Bold Italic	Exact
C0H500B0	2307	80	Bold Italic	Exact
C0H500D0	2307	93	Bold Italic	Exact

Table D-4 (Page 9 of 20). Host Resident to Printer Resident Font Character Set Mapping

Font Character Set Name	Registered Font ID	Font Width	Font Attributes	Map Fidelity
C0H500F0	2307	107	Bold Italic	Exact
C0H500H0	2307	120	Bold Italic	Exact
C0H500J0	2307	133	Bold Italic	Exact
C0H500N0	2307	160	Bold Italic	Exact
C0H500T0	2307	200	Bold Italic	Exact
C0H500Z0	2307	240	Bold Italic	Exact
C0H50000	2307	67	Bold Italic	Exact
C0H50060	2307	40	Bold Italic	Exact
C0H50070	2307	47	Bold Italic	Exact
C0H50080	2307	53	Bold Italic	Exact
C0H50090	2307	60	Bold Italic	Exact
C0J055J0	4407	132	Normal	Not Exact
C0J055Z0	4407	240	Normal	Not Exact
C0L0AD10	45	144	Normal	Exact
C0L0AD12	76	120	Normal	Exact
C0L0AG10	45	144	Normal	Not Exact
C0L0AG12	76	120	Normal	Not Exact
C0L0AG15	76	96	Normal	Not Exact
C0L0AI10	45	144	Italic	Not Exact
C0L0AI12	105	120	Italic	Exact
C0L0AT10	45	144	Normal	Not Exact
C0L0AT12	76	120	Normal	Not Exact
C0L0DUMP	222	96	Normal	Not Exact
C0L0FM10	30	144	Normal	Not Exact
C0L0FM12	80	120	Normal	Not Exact
C0L0FM15	225	96	Normal	Not Exact
C0L0GU10	26	144	Normal	Not Exact
C0L0GU12	87	120	Normal	Not Exact
C0L0GU15	222	96	Normal	Not Exact
C0L0KATA	44	144	Normal	Exact
C0L0KN12	78	120	Normal	Exact
C0L0KN20	249	84	Normal	Not Exact
C0L0TU10	40	144	Normal	Not Exact
C0L00AOA	19	144	Normal	Exact
C0L00AON	19	144	Normal	Exact
C0L00APL	45	144	Normal	Not Exact
C0L00BOA	3	144	Normal	Exact
C0L00BON	3	144	Normal	Exact
C0L00GSC	230	96	Normal	Not Exact
C0L00GUC	230	96	Normal	Not Exact
C0L00OAB	3	144	Normal	Exact

Table D-4 (Page 10 of 20). Host Resident to Printer Resident Font Character Set Mapping

Font Character Set Name	Registered Font ID	Font Width	Font Attributes	Map Fidelity
C0L00T11	42	144	Normal	Not Exact
C0MO55A0	225	72	Normal	Not Exact
C0MO55B0	225	78	Normal	Not Exact
C0MO55B1	30	318	Normal	Not Exact
C0MO55D0	225	96	Normal	Not Exact
C0MO55F0	225	108	Normal	Not Exact
C0MO55H0	80	120	Normal	Not Exact
C0MO55H1	30	360	Normal	Not Exact
C0MO55J0	225	132	Normal	Not Exact
C0MO55L0	30	144	Normal	Not Exact
C0MO55N0	30	162	Normal	Not Exact
C0MO55N1	30	402	Normal	Not Exact
C0MO55R0	30	186	Normal	Not Exact
C0MO55T0	30	198	Normal	Not Exact
C0MO55V0	30	216	Normal	Not Exact
C0MO55Z0	30	240	Normal	Not Exact
C0MO55Z1	30	480	Normal	Not Exact
C0MO5500	30	66	Normal	Not Exact
C0MO5541	26	264	Normal	Not Exact
C0MO5560	225	42	Normal	Not Exact
C0MO5570	225	48	Normal	Not Exact
C0MO5580	225	54	Normal	Not Exact
C0MO5581	30	294	Normal	Not Exact
C0MO5590	80	60	Normal	Not Exact
C0MP55A0	225	72	Normal	Not Exact
C0MP55B0	225	78	Normal	Not Exact
C0MP55D0	225	96	Normal	Not Exact
C0MP55F0	225	108	Normal	Not Exact
C0MP55H0	80	120	Normal	Not Exact
C0MP55N0	30	162	Normal	Not Exact
C0MP55Z0	30	240	Normal	Not Exact
C0MP5500	225	66	Normal	Not Exact
C0MP5560	225	42	Normal	Not Exact
C0MP5570	225	48	Normal	Not Exact
C0MP5580	225	54	Normal	Not Exact
C0MP5590	225	60	Normal	Not Exact
C0MP75A0	225	72	Bold	Not Exact
C0MP75B0	225	78	Bold	Not Exact
C0MP75D0	225	96	Bold	Not Exact
C0MP75F0	225	108	Bold	Not Exact
C0MP75H0	80	120	Bold	Not Exact

Table D-4 (Page 11 of 20). Host Resident to Printer Resident Font Character Set Mapping

Font Character Set Name	Registered Font ID	Font Width	Font Attributes	Map Fidelity
C0MP75N0	30	162	Bold	Not Exact
C0MP75Z0	30	240	Bold	Not Exact
C0MP7500	225	66	Bold	Not Exact
C0MP7560	225	42	Bold	Not Exact
C0MP7570	225	48	Bold	Not Exact
C0MP7580	225	54	Bold	Not Exact
C0MP7590	225	60	Bold	Not Exact
C0MQ55A0	225	72	Normal	Not Exact
C0MQ55B0	225	78	Normal	Not Exact
C0MQ55D0	225	96	Normal	Not Exact
C0MQ55F0	225	108	Normal	Not Exact
C0MQ55H0	80	120	Normal	Not Exact
C0MQ55N0	30	162	Normal	Not Exact
C0MQ55Z0	30	240	Normal	Not Exact
C0MQ5500	225	66	Normal	Not Exact
C0MQ5560	225	42	Normal	Not Exact
C0MQ5570	225	48	Normal	Not Exact
C0MQ5580	225	54	Normal	Not Exact
C0MQ5590	225	60	Normal	Not Exact
C0MQ75A0	225	72	Bold	Not Exact
C0MQ75B0	225	78	Bold	Not Exact
C0MQ75D0	225	96	Bold	Not Exact
C0MQ75F0	225	108	Bold	Not Exact
C0MQ75H0	80	120	Bold	Not Exact
C0MQ75N0	30	162	Bold	Not Exact
C0MQ75Z0	30	240	Bold	Not Exact
C0MQ7500	225	66	Bold	Not Exact
C0MQ7560	225	42	Bold	Not Exact
C0MQ7570	225	48	Bold	Not Exact
C0MQ7580	225	54	Bold	Not Exact
C0MQ7590	225	60	Bold	Not Exact
C0N200A0	2308	73	Normal	Exact
C0N200B0	2308	80	Normal	Exact
C0N200D0	2308	93	Normal	Exact
C0N200F0	2308	107	Normal	Exact
C0N200H0	2308	120	Normal	Exact
C0N200J0	2308	133	Normal	Exact
C0N200N0	2308	160	Normal	Exact
C0N200T0	2308	200	Normal	Exact
C0N200Z0	2308	240	Normal	Exact
C0N20000	2308	67	Normal	Exact

Table D-4 (Page 12 of 20). Host Resident to Printer Resident Font Character Set Mapping

Font Character Set Name	Registered Font ID	Font Width	Font Attributes	Map Fidelity
C0N20060	2308	40	Normal	Exact
C0N20070	2308	47	Normal	Exact
C0N20080	2308	53	Normal	Exact
C0N20090	2308	60	Normal	Exact
C0N204B0	752	80	Normal	Not Exact
C0N300A0	2310	73	Italic	Exact
C0N300B0	2310	80	Italic	Exact
C0N300D0	2310	93	Italic	Exact
C0N300F0	2310	107	Italic	Exact
C0N300H0	2310	120	Italic	Exact
C0N300J0	2310	133	Italic	Exact
C0N300N0	2310	160	Italic	Exact
C0N300T0	2310	200	Italic	Exact
C0N300Z0	2310	240	Italic	Exact
C0N30000	2310	67	Italic	Exact
C0N30060	2310	40	Italic	Exact
C0N30070	2310	47	Italic	Exact
C0N30080	2310	53	Italic	Exact
C0N30090	2310	60	Italic	Exact
C0N304B0	756	80	Italic	Not Exact
C0N400A0	2309	73	Bold	Exact
C0N400B0	2309	80	Bold	Exact
C0N400D0	2309	93	Bold	Exact
C0N400F0	2309	107	Bold	Exact
C0N400H0	2309	120	Bold	Exact
C0N400J0	2309	133	Bold	Exact
C0N400N0	2309	160	Bold	Exact
C0N400T0	2309	200	Bold	Exact
C0N400Z0	2309	240	Bold	Exact
C0N40000	2309	67	Bold	Exact
C0N40060	2309	40	Bold	Exact
C0N40070	2309	47	Bold	Exact
C0N40080	2309	53	Bold	Exact
C0N40090	2309	60	Bold	Exact
C0N404B0	753	80	Bold	Not Exact
C0N404H0	754	120	Bold	Not Exact
C0N404N0	755	160	Bold	Not Exact
C0N500A0	2311	73	Bold Italic	Exact
C0N500B0	2311	80	Bold Italic	Exact
C0N500D0	2311	93	Bold Italic	Exact
C0N500F0	2311	107	Bold Italic	Exact

Table D-4 (Page 13 of 20). Host Resident to Printer Resident Font Character Set Mapping

Font Character Set Name	Registered Font ID	Font Width	Font Attributes	Map Fidelity
C0N500H0	2311	120	Bold Italic	Exact
C0N500J0	2311	133	Bold Italic	Exact
C0N500N0	2311	160	Bold Italic	Exact
C0N500T0	2311	200	Bold Italic	Exact
C0N500Z0	2311	240	Bold Italic	Exact
C0N50000	2311	67	Bold Italic	Exact
C0N50060	2311	40	Bold Italic	Exact
C0N50070	2311	47	Bold Italic	Exact
C0N50080	2311	53	Bold Italic	Exact
C0N50090	2311	60	Bold Italic	Exact
C0N504B0	757	80	Bold Italic	Not Exact
C0N504H0	758	120	Bold Italic	Not Exact
C0N504N0	759	160	Bold Italic	Not Exact
C0OCRA10	19	144	Normal	Exact
C0OCRB10	3	144	Normal	Exact
C0P055B0	49719	78	Normal	Exact
C0P05500	49719	66	Normal	Exact
C0P05560	49719	42	Normal	Exact
C0P05580	49719	54	Normal	Exact
C0P05580	49719	54	Normal	Exact
C0P075B0	49739	78	Bold	Exact
C0P07500	49739	66	Bold	Exact
C0P07560	49739	42	Bold	Exact
C0P07580	49739	54	Bold	Exact
C0Q055B0	49719	78	Normal	Not Exact
C0Q05500	49719	66	Normal	Not Exact
C0Q05560	49719	42	Normal	Not Exact
C0Q05580	49719	54	Normal	Not Exact
C0Q075B0	49739	78	Bold	Not Exact
C0Q07500	49739	66	Bold	Not Exact
C0Q07560	49739	42	Bold	Not Exact
C0Q07580	49739	54	Bold	Not Exact
C0S0AE10	26	144	Normal	Exact
C0S0AE10	45	144	Normal	Exact
C0S0AE20	280	72	Normal	Exact
C0S0AP10	45	144	Normal	Not Exact
C0S0AP13	76	108	Normal	Not Exact
C0S0AP20	76	72	Normal	Not Exact
C0S0BITR	155	120	Italic	Exact
C0S0BRTR	159	120	Normal	Exact
C0S0CB10	11	144	Bold	Exact

Table D-4 (Page 14 of 20). Host Resident to Printer Resident Font Character Set Mapping

Font Character Set Name	Registered Font ID	Font Width	Font Attributes	Map Fidelity
C0S0CB12	85	120	Bold	Exact
C0S0CB15	223	96	Bold	Exact
C0S0CD15	223	96	Double Wide	Exact
C0S0CE10	11	144	Normal	Not Exact
C0S0CE12	85	120	Normal	Exact
C0S0CH10	11	144	Normal	Not Exact
C0S0CI10	18	144	Italic	Exact
C0S0CI12	85	120	Italic	Exact
C0S0CI15	223	96	Italic	Exact
C0S0CO10	11	144	Normal	Not Exact
C0S0CR10	11	144	Normal	Exact
C0S0CR12	85	120	Normal	Exact
C0S0CR15	223	96	Normal	Exact
C0S0CW15	223	96	Double Wide Italic	Exact
C0S0DOTR	175	120	Normal	Exact
C0S0D224	204	108	Normal	Exact
C0S0D225	204	108	Normal	Exact
C0S0D226	204	108	Bold	Exact
C0S0D227	204	108	Italic	Exact
C0S0EBTR	163	120	Bold	Exact
C0S0EITR	162	120	Italic	Exact
C0S0ELTR	173	120	Normal	Exact
C0S0EOTR	160	120	Normal	Not Exact
C0S0ESTR	160	120	Normal	Exact
C0S0LB12	110	120	Bold	Exact
C0S0LR12	87	120	Normal	Exact
C0S0OB10	38	144	Bold	Exact
C0S0OR10	5	144	Normal	Exact
C0S0PB12	111	120	Bold	Exact
C0S0PI12	112	120	Italic	Exact
C0S0PR10	12	144	Normal	Exact
C0S0PR12	86	120	Normal	Exact
C0S0SR12	84	120	Normal	Exact
C0S0SYM0	80	120	Normal	Not Exact
C0S0SYM2	30	144	Normal	Not Exact
C0S0S192	114	120	Normal	Not Exact
C0S0S193	113	120	Normal	Not Exact
C0S0S198	30	144	Normal	Not Exact
C0S055A0	28983	72	Normal	Exact
C0S055B0	28983	78	Normal	Exact

Table D-4 (Page 15 of 20). Host Resident to Printer Resident Font Character Set Mapping

Font Character Set Name	Registered Font ID	Font Width	Font Attributes	Map Fidelity
C0S055D0	28983	96	Normal	Exact
C0S055F0	28983	108	Normal	Exact
C0S055H0	28983	120	Normal	Exact
C0S055J0	28983	132	Normal	Exact
C0S055N0	28983	162	Normal	Exact
C0S055T0	28983	198	Normal	Exact
C0S055Z0	28983	240	Normal	Exact
C0S05500	28983	66	Normal	Exact
C0S05560	28983	42	Normal	Exact
C0S05570	28983	48	Normal	Exact
C0S05580	28983	54	Normal	Exact
C0S05590	28983	60	Normal	Exact
C0S075A0	29003	72	Bold	Exact
C0S075B0	29003	78	Bold	Exact
C0S075D0	29003	96	Bold	Exact
C0S075F0	29003	108	Bold	Exact
C0S075H0	29003	120	Bold	Exact
C0S075J0	29003	132	Bold	Exact
C0S075N0	29003	162	Bold	Exact
C0S075T0	29003	198	Bold	Exact
C0S075Z0	29003	240	Bold	Exact
C0S07500	29003	66	Bold	Exact
C0S07560	29003	42	Bold	Exact
C0S07570	29003	48	Bold	Exact
C0S07580	29003	54	Bold	Exact
C0S07590	29003	60	Bold	Exact
C0S155A0	29111	72	Italic	Exact
C0S155B0	29111	78	Italic	Exact
C0S155D0	29111	96	Italic	Exact
C0S155F0	29111	108	Italic	Exact
C0S155H0	29111	120	Italic	Exact
C0S155J0	29111	132	Italic	Exact
C0S155N0	29111	162	Italic	Exact
C0S155T0	29111	198	Italic	Exact
C0S155Z0	29111	240	Italic	Exact
C0S15500	29111	66	Italic	Exact
C0S15560	29111	42	Italic	Exact
C0S15570	29111	48	Italic	Exact
C0S15580	29111	54	Italic	Exact
C0S15590	29111	60	Italic	Exact
C0S175A0	29131	72	Bold Italic	Exact

Table D-4 (Page 16 of 20). Host Resident to Printer Resident Font Character Set Mapping

Font Character Set Name	Registered Font ID	Font Width	Font Attributes	Map Fidelity
C0S175B0	29131	78	Bold Italic	Exact
C0S175D0	29131	96	Bold Italic	Exact
C0S175F0	29131	108	Bold Italic	Exact
C0S175H0	29131	120	Bold Italic	Exact
C0S175J0	29131	132	Bold Italic	Exact
C0S175N0	29131	162	Bold Italic	Exact
C0S175T0	29131	198	Bold Italic	Exact
C0S175Z0	29131	240	Bold Italic	Exact
C0S17500	29131	66	Bold Italic	Exact
C0S17560	29131	42	Bold Italic	Exact
C0S17570	29131	48	Bold Italic	Exact
C0S17580	29131	54	Bold Italic	Exact
C0S17590	29131	60	Bold Italic	Exact
C0TN10M0	011	144	Normal	Exact
C0TN15M0	222	96	Normal	Exact
C0T055A0	4407	72	Normal	Exact
C0T055B0	4407	78	Normal	Exact
C0T055B1	4407	318	Normal	Exact
C0T055D0	4407	96	Normal	Exact
C0T055F0	4407	108	Normal	Exact
C0T055H0	4407	120	Normal	Exact
C0T055J0	4407	132	Normal	Exact
C0T055N0	4407	162	Normal	Exact
C0T055N1	4407	402	Normal	Exact
C0T055T0	4407	198	Normal	Exact
C0T055Z0	4407	240	Normal	Exact
C0T055Z1	4407	480	Normal	Exact
C0T05500	4407	66	Normal	Exact
C0T05560	4407	42	Normal	Exact
C0T05570	4407	48	Normal	Exact
C0T05580	4407	54	Normal	Exact
C0T05590	4407	60	Normal	Exact
C0T075A0	4427	72	Bold	Exact
C0T075B0	4427	78	Bold	Exact
C0T075B1	4427	318	Bold	Exact
C0T075D0	4427	96	Bold	Exact
C0T075F0	4427	108	Bold	Exact
C0T075H0	4427	120	Bold	Exact
C0T075J0	4427	132	Bold	Exact
C0T075N0	4427	162	Bold	Exact
C0T075N1	4427	402	Bold	Exact

Table D-4 (Page 17 of 20). Host Resident to Printer Resident Font Character Set Mapping

Font Character Set Name	Registered Font ID	Font Width	Font Attributes	Map Fidelity
C0T075T0	4427	198	Bold	Exact
C0T075Z0	4427	240	Bold	Exact
C0T075Z1	4427	480	Bold	Exact
C0T07500	4427	66	Bold	Exact
C0T07560	4427	42	Bold	Exact
C0T07570	4427	48	Bold	Exact
C0T07580	4427	54	Bold	Exact
C0T07590	4427	60	Bold	Exact
C0T155A0	4535	72	Italic	Exact
C0T155B0	4535	78	Italic	Exact
C0T155B1	4535	318	Italic	Exact
C0T155D0	4535	96	Italic	Exact
C0T155F0	4535	108	Italic	Exact
C0T155H0	4535	120	Italic	Exact
C0T155J0	4535	132	Italic	Exact
C0T155N0	4535	162	Italic	Exact
C0T155N1	4535	402	Italic	Exact
C0T155T0	4535	198	Italic	Exact
C0T155Z0	4535	240	Italic	Exact
C0T155Z1	4535	480	Italic	Exact
C0T15500	4535	66	Italic	Exact
C0T15560	4535	42	Italic	Exact
C0T15570	4535	48	Italic	Exact
C0T15580	4535	54	Italic	Exact
C0T15590	4535	60	Italic	Exact
C0T175A0	4555	72	Bold Italic	Exact
C0T175B0	4555	78	Bold Italic	Exact
C0T175B1	4555	318	Bold Italic	Exact
C0T175D0	4555	96	Bold Italic	Exact
C0T175F0	4555	108	Bold Italic	Exact
C0T175H0	4555	120	Bold Italic	Exact
C0T175J0	4555	132	Bold Italic	Exact
C0T175N0	4555	162	Bold Italic	Exact
C0T175N1	4555	402	Bold Italic	Exact
C0T175T0	4555	198	Bold Italic	Exact
C0T175Z0	4555	240	Bold Italic	Exact
C0T175Z1	4555	480	Bold Italic	Exact
C0T17500	4555	66	Bold Italic	Exact
C0T17560	4555	42	Bold Italic	Exact
C0T17570	4555	48	Bold Italic	Exact
C0T17580	4555	54	Bold Italic	Exact

Table D-4 (Page 18 of 20). Host Resident to Printer Resident Font Character Set Mapping

Font Character Set Name	Registered Font ID	Font Width	Font Attributes	Map Fidelity
C0T17590	4555	60	Bold Italic	Exact
C0V055A0	33847	72	Normal	Exact
C0V055B0	33847	78	Normal	Exact
C0V055D0	33847	96	Normal	Exact
C0V055F0	33847	108	Normal	Exact
C0V055H0	33847	120	Normal	Exact
C0V055J0	33847	132	Normal	Exact
C0V055N0	33847	162	Normal	Exact
C0V055T0	33847	198	Normal	Exact
C0V055Z0	33847	240	Normal	Exact
C0V05500	33847	66	Normal	Exact
C0V05560	33847	42	Normal	Exact
C0V05570	33847	48	Normal	Exact
C0V05580	33847	54	Normal	Exact
C0V05590	33847	60	Normal	Exact
C0V075A0	33867	72	Bold	Exact
C0V075B0	33867	78	Bold	Exact
C0V075D0	33867	96	Bold	Exact
C0V075F0	33867	108	Bold	Exact
C0V075H0	33867	120	Bold	Exact
C0V075J0	33867	132	Bold	Exact
C0V075N0	33867	162	Bold	Exact
C0V075T0	33867	198	Bold	Exact
C0V075Z0	33867	240	Bold	Exact
C0V07500	33867	66	Bold	Exact
C0V07560	33867	42	Bold	Exact
C0V07570	33867	48	Bold	Exact
C0V07580	33867	54	Bold	Exact
C0V07590	33867	60	Bold	Exact
C0V155A0	33975	72	Italic	Exact
C0V155B0	33975	78	Italic	Exact
C0V155D0	33975	96	Italic	Exact
C0V155F0	33975	108	Italic	Exact
C0V155H0	33975	120	Italic	Exact
C0V155J0	33975	132	Italic	Exact
C0V155N0	33975	162	Italic	Exact
C0V155T0	33975	198	Italic	Exact
C0V155Z0	33975	240	Italic	Exact
C0V15500	33975	66	Italic	Exact
C0V15560	33975	42	Italic	Exact
C0V15570	33975	48	Italic	Exact

Table D-4 (Page 19 of 20). Host Resident to Printer Resident Font Character Set Mapping

Font Character Set Name	Registered Font ID	Font Width	Font Attributes	Map Fidelity
C0V15580	33975	54	Italic	Exact
C0V15590	33975	60	Italic	Exact
C0V175A0	33995	72	Bold Italic	Exact
C0V175B0	33995	78	Bold Italic	Exact
C0V175D0	33995	96	Bold Italic	Exact
C0V175F0	33995	108	Bold Italic	Exact
C0V175H0	33995	120	Bold Italic	Exact
C0V175J0	33995	132	Bold Italic	Exact
C0V175N0	33995	162	Bold Italic	Exact
C0V175T0	33995	198	Bold Italic	Exact
C0V175Z0	33995	240	Bold Italic	Exact
C0V17500	33995	66	Bold Italic	Exact
C0V17560	33995	42	Bold Italic	Exact
C0V17570	33995	48	Bold Italic	Exact
C0V17580	33995	54	Bold Italic	Exact
C0V17590	33995	60	Bold Italic	Exact
C0Z05640	4407	24	Normal	Not Exact
C04200B0	416	144	Normal	Exact
C04200D0	416	169	Normal	Exact
C04200J0	416	240	Normal	Exact
C0420000	416	120	Normal	Exact
C0420070	416	84	Normal	Exact
C0420080	416	96	Normal	Exact
C04202B0	11	144	Normal	Exact
C0420200	85	120	Normal	Exact
C0420270	254	84	Normal	Exact
C0420280	223	96	Normal	Exact
C04203B0	11	144	Normal	Exact
C0420300	85	120	Normal	Exact
C0420380	223	96	Normal	Exact
C04204B0	61	144	Normal	Exact
C0420400	103	120	Normal	Exact
C0420480	213	96	Normal	Not Exact
C04205B0	49	144	Normal	Exact
C0420500	98	120	Normal	Exact
C0420570	282	72	Normal	Not Exact
C0420580	226	96	Normal	Not Exact
C04300B0	424	144	Italic	Exact
C04300D0	424	169	Italic	Exact
C04300J0	424	240	Italic	Exact
C0430000	424	120	Italic	Exact

Table D-4 (Page 20 of 20). Host Resident to Printer Resident Font Character Set Mapping				
Font Character Set Name	**Registered Font ID**	**Font Width**	**Font Attributes**	**Map Fidelity**
C0430070	424	84	Italic	Exact
C0430080	424	96	Italic	Exact
C04304B0	62	144	Italic	Exact
C0430400	104	120	Italic	Exact
C04400B0	420	144	Bold	Exact
C04400D0	420	169	Bold	Exact
C04400J0	420	240	Bold	Exact
C0440000	420	120	Bold	Exact
C0440070	420	84	Bold	Exact
C0440080	420	96	Bold	Exact
C0440200	159	120	Bold	Not Exact
C0440300	159	120	Bold	Not Exact
C04404B0	63	144	Bold	Exact
C04404D0	266	177	Bold	Not Exact
C0440470	279	84	Bold	Exact
C04405B0	50	144	Bold	Exact
C0440500	167	120	Bold	Not Exact
C04500B0	428	144	Bold Italic	Exact
C04500D0	428	169	Bold Italic	Exact
C04500J0	428	240	Bold Italic	Exact
C0450000	428	120	Bold Italic	Exact
C0450070	428	84	Bold Italic	Exact
C0450080	428	96	Bold Italic	Exact
C0450300	155	120	Bold Italic	Not Exact
C04504B0	64	144	Bold Italic	Exact
C04504D0	267	177	Bold Italic	Not Exact

Printer Resident to Host Resident Font Character Set Mapping

Often, when a spooled file is created on the AS/400 system, a font global identifier (FGID) or font ID is specified to be used when the spooled file is printed.

In the case of the 3820, 3825, 3827, 3828, 3829, 3831, 3835, and 3900 printer font IDs are not supported. Therefore, when the spooled file is directed to these printers, the AS/400 system substitutes font character sets that allow the spooled file to print on these printers.

The following table can help you determine what host resident character sets (font character sets stored on the AS/400 system) are downloaded to a 3820, 3825, 3827, 3828, 3829, 3831, 3835, or 3900 printer when your spooled file references a registered font identifier (font ID) instead of a host resident font character set.

Note: The 3828 is a MICR printer. When using this printer make sure the fonts specified are MICR fonts.

In the case of *CONTENT fidelity, depending upon the registered font ID value and the font attributes that are requested for a particular font reference, the appropriate host resident font character set is selected to match (as closely as possible) your font request.

In the case of *ABSOLUTE fidelity, depending upon the registered font ID value, the font width value, and the font attributes that are requested for a particular font reference, the appropriate host resident font character set is selected to match exactly your font request. The AS/400 system also ensures, for *ABSOLUTE fidelity, that the character set is compatible with the code page when mapping from printer resident fonts to host resident fonts.

The font width specifies the width of the blank character in 1440ths of an inch. This is an indicator of how many characters fit per inch of space on the paper.

Some FGIDs, such as 416, have multiple widths associated with them. The **Font Width** column of the table is blank for these FGIDs. Also, the primary and secondary character set names of these FGIDs have an XX in the last two positions, which identify the size of the font. For uniformly spaced fonts, there are six widths: 84, 96, 120, 144, 169, and 240. For typographic fonts, there are 14 widths: 40, 47, 53, 60, 67, 73, 80, 93, 107, 120, 133, 160, 200 and 240. The AS/400 system determines whether a uniformly spaced font or a typographic font is needed and then selects the host resident character set name based on the width provided.

The first choice is used if it is present on your AS/400 system. The second choice is used if the first choice cannot be found. The Map Fidelity column indicates whether or not the first choice is considered to be an exact match to the printer resident font (font ID) that is requested in your spooled file. As a rule, the second choice is not considered to be an exact match.

If the first choice contains a metric-only font character set name, the AS/400 system uses the second choice regardless of the fidelity setting. A metric-only font character set name begins with the characters ***C0E***.

If code page (CPGID) 259 (the symbol font code page) has been specified, this table is not used. Instead, if the FGID specified is a 10-pitch font, the C0S0SYM2 character set is substituted; otherwise, if the FGID specified is anything other than a 10-pitch font, the C0S0SYM0 character set is substituted.

Table D-5 (Page 1 of 15). Printer Resident to Host Resident Font Character Set Mapping

Registered Font ID	Font Width	Font Attributes	Map Fidelity	Font Character Set Name (first choice)	Font Character Set Name (second choice)
2	144	Normal	Exact	C0E0DE10	C0S0CR12
2	144	Normal	Exact	C0E0DE0R	C0S0SYM0
3	144	Normal	Exact	C0L00BOA	C0S0CR10
3	144	Normal	Exact	C0S0SYM2	
5	144	Normal	Exact	C0S0OR10	C0S0CR10
5	144	Bold	Exact	C0S0OB10	C0S0CR10
5	144	Normal	Exact	C0E0OR10	C0S0OR10
5	144	Normal	Exact	C0S0SYM2	
10	144	Normal	Exact	C0E0CY10	C04203B0

Table D-5 (Page 2 of 15). Printer Resident to Host Resident Font Character Set Mapping

Registered Font ID	Font Width	Font Attributes	Map Fidelity	Font Character Set Name (first choice)	Font Character Set Name (second choice)
10	144	Normal	Exact	C0E0CY0R	C0S0SYM0
11	144	Normal	Exact	C0S0CR10	
11	144	Bold	Exact	C0S0CB10	C0S0CR10
11	144	Italic	Exact	C0S0CI10	C0S0CR10
11	144	Normal	Exact	C0S0SYM2	
11	144	Normal	Exact	C0E0CR0K	C04203B0
11	144	Normal	Exact	C0E0CR0F	C0S0CR10
11	144	Normal	Exact	C0E0CR0N	C04203B0
11	144	Normal	Exact	C0E0CR0Q	C04203B0
11	144	Normal	Exact	C0E0CR0G	C04202B0
11	144	Normal	Exact	C0E0CR0H	C04202B0
12	144	Normal	Exact	C0S0PR10	C0S0CR10
12	144	Normal	Exact	C0S0SYM2	
12	144	Normal	Exact	C0E0PR0G	C04202B0
12	144	Normal	Exact	C0E0PR0H	C04202B0
13	144	Normal	Not Exact	C0S0CR10	
13	144	Normal	Exact	C0S0SYM2	
13	144	Bold	Not Exact	C0S0CB10	C0S0CR10
18	144	Italic	Exact	C0S0CI10	C0S0CR10
18	144	Normal	Exact	C0S0SYM2	
19	144	Normal	Exact	C0L00AOA	C0S0CR10
19	144	Normal	Exact	C0S0SYM2	
20	144	Normal	Not Exact	C0S0CR10	
20	144	Bold	Not Exact	C0S0CB10	C0S0CR10
20	144	Normal	Exact	C0S0SYM2	
21	144	Normal	Exact	C0E0KA10	C0L0KATA
25	144	Normal	Exact	C0E0PS10	C0S0CR10
26	144	Normal	Exact	C0L0KATA	C0S0CR10
26	144	Normal	Exact	C0S0AE10	C0S0AE20
26	144	Normal	Exact	C0D0GT10	C0S0CR10
26	144	Bold	Exact	C0D0GB10	C0S0CB10
30	144	Normal	Exact	C0S0S198	C0S0CR10
30	144	Normal	Exact	C0S0SYM2	
36	144	Normal	Exact	C0E0LR10	C0S0LR10
38	144	Bold	Exact	C0S0OB10	C0S0CR10
38	144	Bold	Exact	C0S0SYM2	
39	144	Bold	Exact	C0D0GB10	C0S0CR10
39	144	Bold	Exact	C0S0SYM2	
40	144	Normal	Exact	C0D0GT10	C0S0CR10
40	144	Normal	Exact	C0S0SYM2	
41	144	Normal	Exact	C0D0RT10	C0S0CR10

Table D-5 (Page 3 of 15). Printer Resident to Host Resident Font Character Set Mapping

Registered Font ID	Font Width	Font Attributes	Map Fidelity	Font Character Set Name (first choice)	Font Character Set Name (second choice)
41	144	Normal	Exact	C0S0SYM2	
42	144	Normal	Exact	C0D0ST10	C0S0CR10
42	144	Normal	Exact	C0S0SYM2	
43	144	Italic	Exact	C0D0SI10	C0S0CR10
43	144	Italic	Exact	C0S0SYM2	
44	144	Normal	Exact	C0L0KATA	C0S0CR10
44	144	Normal	Exact	C0S0SYM2	
45	144	Normal	Exact	C0S0AE10	C0S0AE20
46	144	Bold	Exact	C0S0CB10	C0S0CR10
46	144	Normal	Exact	C0S0SYM2	
49	144	Normal	Exact	C0E0HR10	C04205B0
50	144	Bold	Exact	C0H0HB10	C04405B0
50	144	Bold	Exact	C0E0HB10	C04405B0
50	144	Normal	Exact	C0S0SYM2	
51	144	Normal	Not Exact	C0S0CR10	
51	144	Bold	Not Exact	C0S0CB10	C0S0CR10
52	144	Normal	Not Exact	C0S0CR10	
52	144	Bold	Not Exact	C0S0CB10	C0S0CR10
61	144	Normal	Exact	C0E0NR10	C04204B0
62	144	Italic	Exact	C0E0NI10	C04304B0
63	144	Bold	Exact	C0E0NB10	C04404B0
64	144	Bold Italic	Exact	C0E0NM10	C04504B0
66	120	Normal	Exact	C0D0GT12	C0S0CR12
66	120	Bold	Exact	C0D0GB12	C0S0CR12
66	120	Normal	Exact	C0S0SYM0	
68	120	Italic	Exact	C0D0GI12	C0S0CR12
68	120	Italic	Exact	C0S0SYM0	
69	120	Bold	Exact	C0D0GB12	C0S0CB12
69	120	Bold	Exact	C0S0SYM0	
70	120	Normal	Exact	C0D0ST12	C0S0CR12
70	120	Normal	Exact	C0S0SYM0	
71	120	Italic	Exact	C0D0SI12	C0S0CR12
71	120	Italic	Exact	C0S0SYM0	
72	120	Bold	Exact	C0D0SB12	C0S0CR12
72	120	Bold	Exact	C0S0SYM0	
74	120	Normal	Not Exact	C0S0CR12	
74	120	Bold	Not Exact	C0S0CB12	C0S0CR12
75	120	Normal	Not Exact	C0S0CR12	
75	120	Bold	Not Exact	C0S0CB12	C0S0CR12
76	120	Normal	Exact	C0E0AP12	C0S0AE10
78	120	Normal	Exact	C0E0KA12	C0L0KN12

Table D-5 (Page 4 of 15). Printer Resident to Host Resident Font Character Set Mapping

Registered Font ID	Font Width	Font Attributes	Map Fidelity	Font Character Set Name (first choice)	Font Character Set Name (second choice)
80	120	Normal	Not Exact	C0S0CR12	
80	120	Bold	Not Exact	C0S0CB12	C0S0CR12
80	120	Normal	Exact	C0S0SYM0	
84	120	Normal	Exact	C0S0SR12	C0S0CR12
84	120	Normal	Exact	C0E0SR12	C0S0SR12
84	120	Normal	Exact	C0S0SYM0	
85	120	Normal	Exact	C0S0CR12	
85	120	Normal	Exact	C0S0CE12	C0S0CR12
85	120	Bold	Exact	C0S0CB12	C0S0CR12
85	120	Italic	Exact	C0S0CI12	C0S0CR12
85	120	Normal	Exact	C0S0SYM0	
85	120	Normal	Exact	C0E0CREF	C0420200
85	120	Normal	Exact	C0E0CREQ	C0420300
85	120	Normal	Exact	C0E0CREG	C0420200
85	120	Normal	Exact	C0E0CREH	C0420200
86	120	Normal	Exact	C0S0PR12	C0S0CR12
86	120	Bold	Exact	C0S0PB12	C0S0CR12
86	120	Normal	Exact	C0S0SYM0	
86	120	Normal	Exact	C0E0PREF	C0420200
86	120	Normal	Exact	C0E0PREQ	C0420300
86	120	Normal	Exact	C0E0PREG	C0420200
86	120	Normal	Exact	C0E0PREH	C0420200
87	120	Normal	Exact	C0S0LR12	C0S0CR12
87	120	Bold	Exact	C0S0LB12	C0S0CR12
87	120	Italic	Exact	C0D0GI12	C0S0CR12
87	120	Normal	Exact	C0S0SYM0	
87	120	Normal	Exact	C0E0LRSR	C0S0LR12
87	120	Normal	Exact	C0E0LREK	C0420300
87	120	Normal	Exact	C0E0LREF	C0420200
87	120	Normal	Exact	C0E0LREN	C0420300
87	120	Normal	Exact	C0E0LREQ	C0420300
87	120	Normal	Exact	C0E0LREG	C0420200
87	120	Normal	Exact	C0E0LREH	C0420200
91	120	Italic	Not Exact	C0S0CR12	
91	120	Bold Italic	Not Exact	C0S0CB12	C0S0CR12
91	120	Italic	Exact	C0S0SYM0	
92	120	Italic	Exact	C0S0CI12	C0S0CR12
92	120	Normal	Exact	C0E0CIER	C0S0SYM2
95	120	Normal	Exact	C0E0AJ12	C0S0CR12
95	120	Normal	Exact	C0E0AJER	C0S0SYM2
96	120	Bold	Exact	C0E0WB12	C0S0CR12

Table D-5 (Page 5 of 15). Printer Resident to Host Resident Font Character Set Mapping

Registered Font ID	Font Width	Font Attributes	Map Fidelity	Font Character Set Name (first choice)	Font Character Set Name (second choice)
98	120	Normal	Exact	C0E0HR12	C0420500
103	120	Normal	Exact	C0E0NR12	C0420400
104	120	Italic	Exact	C0E0NI12	C0430400
108	120	Bold	Exact	C0S0CB12	C0S0CR12
108	120	Normal	Exact	C0E0CBER	C0S0SYM2
109	120	Italic	Exact	C0E0LI12	C0S0CR12
109	120	Normal	Exact	C0E0LISR	C0S0SYM2
110	120	Bold	Exact	C0S0LB12	C0S0CR12
110	120	Bold	Exact	C0E0LBEK	C0440300
110	120	Bold	Exact	C0E0LBEN	C0440300
110	120	Normal	Exact	C0S0SYM0	
111	120	Bold	Exact	C0S0PB12	C0S0CR12
111	120	Normal	Exact	C0S0SYM0	
112	120	Italic	Exact	C0S0PI12	C0S0CR12
112	120	Normal	Exact	C0S0SYM0	
154	120	Normal	Exact	C0S0ESTR	
154	120	Bold	Exact	C0S0EBTR	C0S0ESTR
155	120	Bold Italic	Exact	C0S0BITR	C0S0ESTR
155	120	Bold Italic	Exact	C0E0BIRK	C0450300
155	120	Bold Italic	Exact	C0E0BIRN	C0450300
155	120	Bold	Exact	C0S0SYM0	
157	120	Bold	Exact	C0E0TBTR	C0S0ESTR
157	120	Bold	Exact	C0E0TBRF	C0420200
157	120	Normal	Exact	C0E0TBRR	C0S0SYM2
158	120	Normal	Not Exact	C0S0ESTR	
158	120	Bold	Not Exact	C0S0EBTR	C0S0ESTR
158	120	Normal	Exact	C0S0SYM0	
159	120	Bold	Exact	C0S0BRTR	C0S0ESTR
159	120	Bold	Exact	C0E0BRRK	C0440300
159	120	Bold	Exact	C0E0BRRN	C0440300
159	120	Bold	Exact	C0E0BRRQ	C0440300
159	120	Bold	Exact	C0E0BRRG	C0440200
159	120	Bold	Exact	C0E0BRRH	C0440200
159	120	Bold	Exact	C0S0SYM0	
160	120	Normal	Exact	C0S0ESTR	
160	120	Bold	Exact	C0S0EBTR	C0S0ESTR
160	120	Italic	Exact	C0S0EITR	C0S0ESTR
160	120	Normal	Exact	C0S0SYM0	
162	120	Italic	Exact	C0S0EITR	C0S0ESTR
162	120	Normal	Exact	C0S0SYM0	
163	120	Bold	Exact	C0S0EBTR	C0S0ESTR

Table D-5 (Page 6 of 15). Printer Resident to Host Resident Font Character Set Mapping

Registered Font ID	Font Width	Font Attributes	Map Fidelity	Font Character Set Name (first choice)	Font Character Set Name (second choice)
163	120	Bold	Exact	C0S0SYM0	
164	120	Normal	Exact	C0E0PRTR	C0S0ESTR
164	120	Normal	Exact	C0E0PRRR	C0S0SYM2
167	120	Bold	Normal	C0E0BKTR	C0440500
168	120	Bold	Exact	C0H0BRK2	
168	120	Bold	Exact	C0S0SYM0	
173	120	Normal	Exact	C0S0ELTR	C0S0ESTR
173	120	Normal	Exact	C0S0SYM0	
174	120	Normal	Exact	C0D0GP12	C0S0ESTR
175	120	Normal	Exact	C0S0DOTR	C0S0ESTR
175	120	Normal	Exact	C0S0SYM0	
186	120	Normal	Exact	C0E0RRTR	C0S0ESTR
186	120	Normal	Exact	C0E0RRRR	C0S0SYM2
187	120	Bold	Exact	C0E0RBTR	C0S0ESTR
187	120	Normal	Exact	C0E0RBRR	C0S0SYM2
188	120	Italic	Exact	C0E0RITR	C0S0ESTR
188	120	Normal	Exact	C0E0RIRR	C0S0SYM2
189	120	Bold Italic	Exact	C0E0RMTR	C0S0ESTR
189	120	Normal	Exact	C0E0RMRR	C0S0SYM2
190	120	Normal	Exact	C0E0FRTR	C0S0ESTR
190	120	Normal	Exact	C0E0FRRR	C0S0SYM2
191	120	Bold	Exact	C0E0FBTR	C0S0ESTR
191	120	Normal	Exact	C0E0FBRR	C0S0SYM2
194	120	Italic	Exact	C0E0FITR	C0S0ESTR
194	120	Normal	Exact	C0E0FIRR	C0S0SYM2
195	120	Bold Italic	Exact	C0E0FMTR	C0S0ESTR
195	120	Normal	Exact	C0E0FMRR	C0S0SYM2
201	108	Bold	Exact	C0S0D226	C0D0GT13
202	108	Italic	Exact	C0S0D227	C0D0GT13
203	108	Normal	Exact	C0S0D224	C0D0GT13
203	108	Normal	Exact	C0S0D225	C0D0GT13
204	108	Normal	Exact	C0S0D224	C0D0GT13
204	108	Normal	Exact	C0S0D225	C0D0GT13
204	108	Bold	Exact	C0S0D226	C0D0GT13
204	108	Italic	Exact	C0S0D227	C0D0GT13
204	96	Normal	Not Exact	C0S0CR15	C0D0GT13
204	96	Bold	Not Exact	C0S0CB15	C0D0GT13
204	111	Normal	Exact	C0S0SYM0	
205	96	Normal	Not Exact	C0S0CR15	C0D0GT13
205	96	Bold	Not Exact	C0S0CB15	C0D0GT13
213	96	Normal	Exact	C0E0NR15	C0420480

Table D-5 (Page 7 of 15). Printer Resident to Host Resident Font Character Set Mapping

Registered Font ID	Font Width	Font Attributes	Map Fidelity	Font Character Set Name (first choice)	Font Character Set Name (second choice)
214	96	Bold	Exact	C0S0CB15	C0S0CR15
215	96	Italic	Exact	C0S0CI15	C0S0CR15
217	96	Double Wide	Exact	C0S0CD15	C0S0CR15
218	96	Double Wide Italic	Exact	C0S0CW15	C0S0CR15
221	96	Normal	Not Exact	C0S0CR15	
221	96	Bold	Not Exact	C0S0CB15	C0S0CR15
221	96	Normal	Exact	C0E0PR15	C0S0CR15
221	96	Normal	Exact	C0S0SYM0	
222	96	Normal	Exact	C0D0GT15	C0S0CR15
222	96	Bold	Not Exact	C0S0CB15	C0S0CR15
222	96	Normal	Exact	C0E0LR15	C0S0LR15
222	96	Normal	Exact	C0E0LR5R	C0S0SYM2
223	96	Normal	Exact	C0S0CR15	
223	96	Double Wide	Exact	C0S0CD15	C0S0CR15
223	96	Bold	Exact	C0S0CB15	C0S0CR15
223	96	Italic	Exact	C0S0CI15	C0S0CR15
223	96	Double Wide Italic	Exact	C0S0CW15	C0S0CR15
223	96	Normal	Exact	C0E0CR15	C0S0CR15
223	96	Normal	Exact	C0S0SYM0	
223	96	Normal	Exact	C0E0CR5K	C0420380
223	96	Normal	Exact	C0E0CR5N	C0420380
223	96	Normal	Exact	C0E0CR5G	C0420280
223	96	Normal	Exact	C0E0CR5H	C0420280
225	96	Normal	Not Exact	C0S0CR15	
225	96	Bold	Not Exact	C0S0CB15	C0S0CR15
225	96	Normal	Exact	C0S0SYM0	
226	96	Normal	Exact	C0E0HR15	C0420580
229	96	Normal	Exact	C0D0ST15	C0S0CR15
229	96	Normal	Exact	C0S0SYM0	
230	96	Normal	Exact	C0D0GT15	C0S0CR15
230	96	Normal	Exact	C0S0SYM0	
232	96	Normal	Not Exact	C0S0CR15	
232	96	Bold	Not Exact	C0S0CB15	C0S0CR15
233	96	Normal	Exact	C0S0CD15	C0S0CR15
244	288	Normal	Exact	C0S0SYM0	
245	144	Normal	Not Exact	C0S0CR10	
245	144	Bold	Not Exact	C0S0CB10	C0S0CR10
245	288	Bold	Exact	C0S0SYM2	
249	84	Normal	Exact	C0E0KA17	C0L0KN20
252	78	Normal	Not Exact	C0D0GT18	

Table D-5 (Page 8 of 15). Printer Resident to Host Resident Font Character Set Mapping

Registered Font ID	Font Width	Font Attributes	Map Fidelity	Font Character Set Name (first choice)	Font Character Set Name (second choice)
252	84	Normal	Exact	C0D0GT18	
252	84	Normal	Exact	C0S0SYM0	
253	84	Bold	Not Exact	C0D0GT18	
253	84	Bold	Exact	C0S0SYM0	
254	78	Normal	Not Exact	C0D0GT18	
254	84	Normal	Exact	C0E0CR7F	C0D0GT18
254	84	Normal	Exact	C0E0CR7G	C0420270
254	84	Normal	Exact	C0E0CR7H	C0420270
254	84	Normal	Exact	C0E0CR17	C0D0GT18
254	84	Normal	Exact	C0S0SYM0	
255	84	Normal	Exact	C0E0LR17	C0D0GT18
255	84	Normal	Exact	C0E0LR7R	C0S0SYM2
256	84	Normal	Exact	C0E0PR17	C0D0GT18
256	84	Normal	Exact	C0E0PR7R	C0S0SYM2
258	78	Normal	Exact	C0D0GT18	
259	78	Normal	Not Exact	C0D0GT18	
266	177	Bold	Exact	C0E0NB08	C04404D0
267	177	Bold Italic	Exact	C0E0NM08	C04504D0
275	78	Normal	Exact	C0D0GT18	
279	84	Bold	Exact	C0E0NR17	C0440470
280	72	Normal	Exact	C0S0AE20	C0D0GT18
281	72	Normal	Exact	C0D0GT20	
281	72	Normal	Exact	C0E0LR20	C0D0GT20
281	72	Normal	Exact	C0S0SYM0	
282	72	Normal	Exact	C0E0LV20	C0420570
283	72	Bold	Exact	C0E0GN20	C0440470
285	58	Normal	Exact	C0E0LR25	C0D0GT20
290	54	Normal	Exact	C0D0GT24	
290	53	Normal	Not Exact	C0D0GT24	
290	53	Normal	Exact	C0S0SYM0	
300	54	Normal	Exact	C0D0GT18	
326	96	Bold	Exact	C0T40680	C0S0CB15
326	120	Bold	Exact	C0T40600	C0S0CB12
326	144	Bold	Exact	C0T406B0	C0S0CB10
326	180	Bold	Exact	C0T406E0	C0S0CB10
327	96	Italic	Exact	C0T30680	C0S0CI15
327	120	Italic	Exact	C0T30600	C0S0CI12
327	144	Italic	Exact	C0T306B0	C0S0CI10
327	180	Italic	Exact	C0T306E0	C0S0CI10
328	96	Normal	Exact	C0T20680	C0S0CR15
328	120	Normal	Exact	C0T20600	C0S0CR12

Table D-5 (Page 9 of 15). Printer Resident to Host Resident Font Character Set Mapping

Registered Font ID	Font Width	Font Attributes	Map Fidelity	Font Character Set Name (first choice)	Font Character Set Name (second choice)
328	144	Normal	Exact	C0T206B0	C0S0CR10
328	180	Normal	Exact	C0T206E0	C0S0CR10
400	80	Normal	Exact	C0D0GT18	
416		Normal	Exact	C04200XX	C0S0CRXX
416	115	Normal	Exact	C0420000	C0S0CR12
416		Normal	Exact	C04202XX	C0S0CRXX
416		Normal	Exact	C04203XX	C0S0CRXX
416		Normal	Exact	C04204XX	C0S0CRXX
416		Normal	Exact	C04205XX	C0S0CRXX
417	96	Double Wide	Exact	C0S0CD15	C0S0CR15
420		Bold	Exact	C04400XX	C0S0CBXX
420	115	Normal	Exact	C0440000	C0S0CB12
420		Bold	Exact	C04402XX	C0S0CBXX
420		Bold	Exact	C04403XX	C0S0CBXX
420		Bold	Exact	C04404XX	C0S0CBXX
420		Bold	Exact	C04405XX	C0S0CBXX
424		Italic	Exact	C04300XX	C0S0CIXX
424	115	Italic	Exact	C0430000	C0S0CI12
424		Italic	Exact	C04302XX	C0S0CIXX
424		Italic	Exact	C04303XX	C0S0CIXX
424		Italic	Exact	C04304XX	C0S0CIXX
424		Italic	Exact	C04305XX	C0S0CIXX
425	96	Double Wide Italic	Exact	C0S0CW15	C0S0CR15
428		Bold Italic	Exact	C04500XX	C0S0CIXX
428	115	Bold Italic	Exact	C0450000	C0S0CI12
428		Bold Italic	Exact	C04502XX	C0S0CIXX
428		Bold Italic	Exact	C04503XX	C0S0CIXX
428		Bold Italic	Exact	C04504XX	C0S0CIXX
428		Bold Italic	Exact	C04505XX	C0S0CIXX
434	177	Bold	Exact	C0E0OB08	C0S0CB10
435	221	Bold	Exact	C0E0OB06	C0S0CB10
751	53	Normal	Exact	C0T05580	C0S0CR15
751	53	Normal	Exact	C0S0SYM0	
752	80	Normal	Exact	C0E20NB0	C0N204B0
753	120	Bold	Exact	C0E0BNTR	C0N404B0
753	80	Bold	Exact	C0E40NB0	C0N404B0
754	120	Bold	Exact	C0E40NH0	C0N404H0
755	160	Bold	Exact	C0E40NN0	C0N404N0
756	80	Italic	Exact	C0E30NB0	C0N304B0
757	80	Bold Italic	Exact	C0E50NB0	C0N504B0

Table D-5 (Page 10 of 15). Printer Resident to Host Resident Font Character Set Mapping

Registered Font ID	Font Width	Font Attributes	Map Fidelity	Font Character Set Name (first choice)	Font Character Set Name (second choice)
758	120	Bold Italic	Exact	C0E50NH0	C0N504H0
759	160	Bold Italic	Exact	C0E50NN0	C0N504N0
1051	67	Normal	Exact	C0T05500	C0S0CR12
1051	67	Normal	Exact	C0S0SYM0	
1053	67	Bold	Exact	C0T07500	C0S0CB12
1053	67	Bold	Exact	C0S0SYM0	
1056	67	Italic	Exact	C0T15500	C0S0CI12
1056	67	Italic	Exact	C0S0SYM0	
1351	80	Normal	Exact	C0T055B0	C0S0CR10
1351	80	Normal	Exact	C0S0SYM2	
1653	107	Bold	Exact	C0T075F0	C0S0CB10
1653	107	Bold	Exact	C0S0SYM2	
2103	160	Bold	Exact	C0T075N0	C0S0CB10
2304		Normal	Exact	C0H200XX	C0S0CRXX
2304	96	Normal	Exact	C0H20080	C0D0GT15
2304	115	Normal	Exact	C0H200H0	C0D0GT13
2304	144	Normal	Exact	C0H200B0	C0D0GT10
2304	169	Normal	Exact	C0H200D0	C0D0GT10
2304	221	Normal	Exact	C0H200J0	C0D0GT10
2304	288	Normal	Exact	C0H200Z0	C0D0GT10
2304		Normal	Exact	C0H202XX	C0S0CRXX
2304		Normal	Exact	C0H203XX	C0S0CRXX
2304		Normal	Exact	C0H204XX	C0S0CRXX
2304		Normal	Exact	C0H205XX	C0S0CRXX
2305		Bold	Exact	C0H400XX	C0S0CBXX
2305	96	Bold	Exact	C0H40080	C0D0GT15
2305	115	Bold	Exact	C0H400H0	C0D0GT13
2305	144	Bold	Exact	C0H400B0	C0D0GB10
2305	169	Bold	Exact	C0H400D0	C0D0GB10
2305	221	Bold	Exact	C0H400J0	C0D0GB10
2305	288	Bold	Exact	C0H400Z0	C0D0GB10
2305		Bold	Exact	C0H402XX	C0S0CBXX
2305		Bold	Exact	C0H403XX	C0S0CBXX
2305		Bold	Exact	C0H404XX	C0S0CBXX
2305		Bold	Exact	C0H405XX	C0S0CBXX
2306		Italic	Exact	C0H300XX	C0S0CIXX
2306	96	Italic	Exact	C0H30080	C0D0GT15
2306	115	Italic	Exact	C0H300H0	C0D0GT13
2306	144	Italic	Exact	C0H300B0	C0D0GI12
2306	169	Italic	Exact	C0H300D0	C0D0GI12
2306	221	Italic	Exact	C0H300J0	C0D0GI12

Table D-5 (Page 11 of 15). Printer Resident to Host Resident Font Character Set Mapping

Registered Font ID	Font Width	Font Attributes	Map Fidelity	Font Character Set Name (first choice)	Font Character Set Name (second choice)
2306	288	Italic	Exact	C0H300Z0	C0D0GI12
2306		Italic	Exact	C0H302XX	C0S0CIXX
2306		Italic	Exact	C0H303XX	C0S0CIXX
2306		Italic	Exact	C0H304XX	C0S0CIXX
2306		Italic	Exact	C0H305XX	C0S0CIXX
2307		Bold Italic	Exact	C0H500XX	C0S0CIXX
2307	96	Bold Italic	Exact	C0H50080	C0D0GT15
2307	115	Bold Italic	Exact	C0H500H0	C0D0GT13
2307	144	Bold Italic	Exact	C0H500B0	C0D0GI12
2307	169	Bold Italic	Exact	C0H500D0	C0D0GI12
2307	221	Bold Italic	Exact	C0H500J0	C0D0GI12
2307	288	Bold Italic	Exact	C0H500Z0	C0D0GI12
2307		Bold Italic	Exact	C0H502XX	C0S0CIXX
2307		Bold Italic	Exact	C0H503XX	C0S0CIXX
2307		Bold Italic	Exact	C0H504XX	C0S0CIXX
2307		Bold Italic	Exact	C0H505XX	C0S0CIXX
2308		Normal	Exact	C0N200XX	C0S0CRXX
2308	96	Normal	Exact	C0N20080	C0S0CR15
2308	115	Normal	Exact	C0N200H0	C0S0CR12
2308	144	Normal	Exact	C0N200B0	C0S0CR10
2308	169	Normal	Exact	C0N200D0	C0S0CR10
2308	221	Normal	Exact	C0N200J0	C0S0CR10
2308	288	Normal	Exact	C0N200Z0	C0S0CR10
2308		Normal	Exact	C0N202XX	C0S0CRXX
2308		Normal	Exact	C0N203XX	C0S0CRXX
2308		Normal	Exact	C0N204XX	C0S0CRXX
2308		Normal	Exact	C0N205XX	C0S0CRXX
2309		Bold	Exact	C0N400XX	C0S0CBXX
2309	96	Bold	Exact	C0N40080	C0S0CB15
2309	115	Bold	Exact	C0N400H0	C0S0CB12
2309	144	Bold	Exact	C0N400B0	C0S0CB10
2309	169	Bold	Exact	C0N400D0	C0S0CB10
2309	221	Bold	Exact	C0N400J0	C0S0CB10
2309	288	Bold	Exact	C0N400Z0	C0S0CB10
2309		Bold	Exact	C0N402XX	C0S0CBXX
2309		Bold	Exact	C0N403XX	C0S0CBXX
2309		Bold	Exact	C0N404XX	C0S0CBXX
2309		Bold	Exact	C0N405XX	C0S0CBXX
2310		Italic	Exact	C0N300XX	C0S0CIXX
2310	96	Italic	Exact	C0N30080	C0S0CI15
2310	115	Italic	Exact	C0N300H0	C0S0CI12

Table D-5 (Page 12 of 15). Printer Resident to Host Resident Font Character Set Mapping

Registered Font ID	Font Width	Font Attributes	Map Fidelity	Font Character Set Name (first choice)	Font Character Set Name (second choice)
2310	144	Italic	Exact	C0N300B0	C0S0CI10
2310	169	Italic	Exact	C0N300D0	C0S0CI10
2310	221	Italic	Exact	C0N300J0	C0S0CI10
2310	288	Italic	Exact	C0N300Z0	C0S0CI10
2310		Italic	Exact	C0N302XX	C0S0CIXX
2310		Italic	Exact	C0N303XX	C0S0CIXX
2310		Italic	Exact	C0N304XX	C0S0CIXX
2310		Italic	Exact	C0N305XX	C0S0CIXX
2311		Bold Italic	Exact	C0N500XX	C0S0CIXX
2311	96	Bold Italic	Exact	C0N50080	C0S0CI15
2311	115	Bold Italic	Exact	C0N500H0	C0S0CI12
2311	144	Bold Italic	Exact	C0N500B0	C0S0CI10
2311	169	Bold Italic	Exact	C0N500D0	C0S0CI10
2311	221	Bold Italic	Exact	C0N500J0	C0S0CI10
2311	288	Bold Italic	Exact	C0N500Z0	C0S0CI10
2311		Bold Italic	Exact	C0N502XX	C0S0CIXX
2311		Bold Italic	Exact	C0N503XX	C0S0CIXX
2311		Bold Italic	Exact	C0N504XX	C0S0CIXX
2311		Bold Italic	Exact	C0N505XX	C0S0CIXX
4407		Normal	Exact	C0T055XX	C0S0CRXX
4407	42	Normal	Exact	C0T05560	C0D0GT18
4407	54	Normal	Exact	C0T05580	C0S0CR15
4407	60	Normal	Exact	C0T05590	C0S0CR15
4407	66	Normal	Exact	C0T05500	C0S0CR15
4407	72	Normal	Exact	C0T055A0	C0S0CR12
4407	78	Normal	Exact	C0T055B0	C0S0CR12
4427		Bold	Exact	C0T075XX	C0S0CBXX
4427	60	Bold	Exact	C0T07590	C0S0CB15
4427	66	Bold	Exact	C0T07500	C0S0CB15
4427	96	Bold	Exact	C0T075D0	C0S0CB10
4427	108	Bold	Exact	C0T075F0	C0S0CB10
4427	132	Bold	Exact	C0T075J0	C0S0CB10
4427	162	Bold	Exact	C0T075N0	C0S0CB10
4535		Italic	Exact	C0T155XX	C0S0CIXX
4535	60	Italic	Exact	C0T15590	C0S0CI15
4535	66	Italic	Exact	C0T15500	C0S0CI15
4535	72	Italic	Exact	C0T155A0	C0S0CI12
4555		Bold Italic	Exact	C0T175XX	C0S0CIXX
4555	60	Bold Italic	Exact	C0T17590	C0S0CI15
4555	66	Bold Italic	Exact	C0T17500	C0S0CI15
4555	78	Bold Italic	Exact	C0T175B0	C0S0CI12

Table D-5 (Page 13 of 15). Printer Resident to Host Resident Font Character Set Mapping					
Registered Font ID	**Font Width**	**Font Attributes**	**Map Fidelity**	**Font Character Set Name (first choice)**	**Font Character Set Name (second choice)**
4555	120	Bold Italic	Exact	C0T175H0	C0S0CI10
4555	132	Bold Italic	Exact	C0T175J0	C0S0CI10
4919	40	Normal	Exact	C0E20G60	C0D0GT18
4919	53	Normal	Exact	C0E20G80	C0S0CR15
4919	67	Normal	Exact	C0E20G00	C0S0CR12
4919	80	Normal	Exact	C0E20GB0	C0S0CR10
4939	67	Bold	Exact	C0E40G00	C0S0CB12
4939	93	Bold	Exact	C0E40GD0	C0S0CB10
4939	120	Bold	Exact	C0E40GH0	C0S0CB10
5047	67	Italic	Exact	C0E30G00	C0S0CI12
5067	67	Bold Italic	Exact	C0E50G00	C0S0CB12
5687	80	Normal	Exact	C0E20TB0	C0S0CR10
5687	67	Normal	Exact	C0E20T00	C0S0CR12
5687	53	Normal	Exact	C0E20T80	C0S0CR15
5687	40	Normal	Exact	C0E20T60	C0D0GT18
5707	160	Bold	Exact	C0E40TN0	C0S0CB10
5707	120	Bold	Exact	C0E40TH0	C0S0CB10
5707	93	Bold	Exact	C0E40TD0	C0S0CB10
5707	80	Bold	Exact	C0E40TB0	C0S0CB10
5707	67	Bold	Exact	C0E40T00	C0S0CB12
5815	80	Italic	Exact	C0E30TB0	C0S0CI10
5815	67	Italic	Exact	C0E30T00	C0S0CI12
5835	80	Bold Italic	Exact	C0E50TB0	C0S0CI10
5835	67	Bold Italic	Exact	C0E50T00	C0S0CI12
5943	120	Normal	Exact	C0E20MH0	C0S0CR10
5943	93	Normal	Exact	C0E20MD0	C0S0CR10
5943	80	Normal	Exact	C0E20MB0	C0S0CR10
6199	80	Normal	Exact	C0E20PB0	C0S0CR10
6199	67	Normal	Exact	C0E20P00	C0S0CR12
6199	53	Normal	Exact	C0E20P80	C0S0CR15
6199	40	Normal	Exact	C0E20P60	C0D0GT18
6219	120	Bold	Exact	C0E40PH0	C0S0CB10
6299	93	Bold	Exact	C0E40PD0	C0S0CB12
6299	67	Bold	Exact	C0E40P00	C0S0CB15
6327	67	Italic	Exact	C0E30P00	C0S0CI12
6347	67	Bold Italic	Exact	C0E50P00	C0S0CI12
8503	80	Normal	Exact	C0E20BB0	C0S0CR10
8503	67	Normal	Exact	C0E20B00	C0S0CR10
8503	53	Normal	Exact	C0E20B80	C0S0CR15
8503	40	Normal	Exact	C0E20B60	C0D0GT18
8523	120	Bold	Exact	C0E40BH0	C0S0CB10

Table D-5 (Page 14 of 15). Printer Resident to Host Resident Font Character Set Mapping

Registered Font ID	Font Width	Font Attributes	Map Fidelity	Font Character Set Name (first choice)	Font Character Set Name (second choice)
8523	93	Bold	Exact	C0E40BD0	C0S0CB10
8523	67	Bold	Exact	C0E40B00	C0S0CB12
8631	67	Italic	Exact	C0E30B00	C0S0CI12
8651	67	Bold Italic	Exact	C0E50B00	C0S0CI12
12855	80	Normal	Exact	C0E20KB0	C0S0CR10
12855	67	Normal	Exact	C0E20K00	C0S0CR12
12855	53	Normal	Exact	C0E20K80	C0S0CR15
12875	160	Bold	Exact	C0E40KN0	C0S0CB10
12875	120	Bold	Exact	C0E40KH0	C0S0CB10
12875	67	Bold	Exact	C0E40K00	C0S0CB12
12875	53	Bold	Exact	C0E40K80	C0S0CB15
12875	80	Bold	Exact	C0E40KB0	C0S0CB10
16951	80	Normal	Exact	C0E20CB0	C0S0CR10
16951	67	Normal	Exact	C0E20C00	C0S0CR10
16951	53	Normal	Exact	C0E20C80	C0S0CR15
16951	40	Normal	Exact	C0E20C60	C0D0GT18
16971	120	Bold	Exact	C0E40CH0	C0S0CB10
16971	93	Bold	Exact	C0E40CD0	C0S0CB10
16971	67	Bold	Exact	C0E40C00	C0S0CB12
17079	67	Italic	Exact	C0E30C00	C0S0CI12
17099	67	Bold Italic	Exact	C0E50C00	C0S0CI12
33079		Normal	Exact	C0A055XX	C0S0CRXX
33099		Bold	Exact	C0A075XX	C0S0CBXX
33207		Italic	Exact	C0A155XX	C0S0CIXX
33227		Bold Italic	Exact	C0A175XX	C0S0CIXX
33335	80	Normal	Exact	C0E20OB0	C0S0CR10
33335	67	Normal	Exact	C0E20O00	C0S0CR12
33335	53	Normal	Exact	C0E20O80	C0S0CR15
33335	40	Normal	Exact	C0E20O60	C0D0GT18
33355	120	Bold	Exact	C0E40OH0	C0S0CB10
33355	93	Bold	Exact	C0E40OD0	C0S0CB10
33355	67	Bold	Exact	C0E40O00	C0S0CB12
33463	67	Italic	Exact	C0E30O00	C0S0CI10
33483	67	Bold Italic	Exact	C0E50O00	C0S0CI12
33591	80	Normal	Exact	C0E20FB0	C0S0CR10
33591	67	Normal	Exact	C0E20F00	C0S0CR12
33591	53	Normal	Exact	C0E20F80	C0S0CR15
33591	40	Normal	Exact	C0E20F60	C0D0GT18
33601	120	Bold	Exact	C0E40FH0	C0S0CB10
33601	93	Bold	Exact	C0E40FD0	C0S0CB10
33601	67	Bold	Exact	C0E40F00	C0S0CB12

Table D-5 (Page 15 of 15). Printer Resident to Host Resident Font Character Set Mapping					
Registered Font ID	**Font Width**	**Font Attributes**	**Map Fidelity**	**Font Character Set Name (first choice)**	**Font Character Set Name (second choice)**
33719	67	Italic	Exact	C0E30F00	C0S0CI12
33729	67	Bold Italic	Exact	C0E50F00	C0S0CI12
34103	80	Normal	Exact	C0E20HB0	C0S0CR10
34103	67	Normal	Exact	C0E20H00	C0S0CR10
34103	53	Normal	Exact	C0E20H80	C0S0CR15
34103	40	Normal	Exact	C0E20H60	C0D0GT18
34123	120	Bold	Exact	C0E40HH0	C0S0CB10
34123	93	Bold	Exact	C0E40HD0	C0S0CB10
34123	67	Bold	Exact	C0E40H00	C0S0CB12
34231	67	Italic	Exact	C0E30H00	C0S0CI12
34251	67	Bold Italic	Exact	C0E50H00	C0S0CI10
37431	120	Normal	Exact	C0E20EH0	C0S0CR10
37431	93	Normal	Exact	C0E20ED0	C0S0CR10
37431	80	Normal	Exact	C0E20EB0	C0S0CR10
41783	80	Italic	Exact	C0E30SB0	C0S0CI10
41803	120	Bold Italic	Exact	C0E50SH0	C0S0CI10
41803	93	Bold Italic	Exact	C0E50SD0	C0S0CI10
49719	54	Normal	Exact	C0P05580	C0D0GT18

Printer Resident to Host Resident Code Page Mapping

The following table can help you determine what host resident code page will be downloaded to a 3820, 3825, 3827, 3829, 3831, 3835, or 3900 printer when your spooled file references a registered code page identifier (ID) instead of a host resident code page.

This font substitution is necessary because these printers do not support printer resident fonts. Depending upon the registered code page ID value that is requested for a particular font reference, the appropriate host resident code page is selected to match (as closely as possible) your font request.

The first choice is used if it is present on your AS/400 system. The second choice is used if the first choice cannot be found.

The Map Fidelity indicates whether or not the first choice is considered to be an exact match to the printer resident font that is requested in your spooled file. As a rule, the second choice is not considered to be an exact match.

Table D-6 (Page 1 of 5). Printer Resident to Host Resident Code Page Mapping			
Registered Code Page ID	**Host Resident Code Page Name (first choice)**	**Host Resident Code Page Name (second choice)**	**Map Fidelity**
29	T1V10871		Exact

Table D-6 (Page 2 of 5). Printer Resident to Host Resident Code Page Mapping

Registered Code Page ID	Host Resident Code Page Name (first choice)	Host Resident Code Page Name (second choice)	Map Fidelity
37	T1V10037		Exact
38	T1V10500		Exact
256	T1GDP256		Exact
259	T1000259		Exact
260	T1V10037		Exact
273	T1V10273		Exact
274	T1V10274		Exact
275	T1V10275		Exact
277	T1V10277		Exact
278	T1V10278		Exact
280	T1V10280		Exact
281	T1V10281		Exact
282	T1V10282		Exact
283	T1V10284		Exact
284	T1V10284		Exact
285	T1V10285		Exact
286	T1V10273		Exact
287	T1V10277		Exact
288	T1V10278		Exact
289	T1V10284		Exact
290	T1V10290		Exact
293	T1000293	T1S0AE10	Exact
297	T1V10297		Exact
310	T1000310	T1S0AE10	Exact
340	T1L0OCR1	T1V10500	Not Exact
361	T1000361	T1GI0361	Exact
363	T1GPI363		Exact
382	T1000382	T1GI0382	Exact
383	T1000383	T1GI0383	Exact
384	T1000384	T1GI0384	Exact
385	T1000385	T1GI0385	Exact
386	T1000386	T1GI0386	Exact
387	T1000387	T1GI0387	Exact
388	T1000388	T1GI0388	Exact
389	T1000389	T1GI0389	Exact
390	T1000390	T1GI0390	Exact
391	T1000391	T1GI0391	Exact
392	T1000392	T1GI0392	Exact
393	T1000393	T1GI0393	Exact
394	T1000394	T1GI0394	Exact
395	T1000395	T1GI0395	Exact

Table D-6 (Page 3 of 5). Printer Resident to Host Resident Code Page Mapping

Registered Code Page ID	Host Resident Code Page Name (first choice)	Host Resident Code Page Name (second choice)	Map Fidelity
396	T1GI0396		Exact
420	T1000420	T1V10500	Not Exact
423	T1000423		Exact
424	T1000424	T1V10500	Not Exact
437	T1000437	T1V10500	Not Exact
500	T1V10500		Exact
803	T1000803		Exact
813	T1000813		Exact
819	T1000819		Exact
829	T1M00829		Exact
831	T1V10282		Exact
838	T1000838		Exact
850	T1000850		Exact
851	T1000851		Exact
852	T1000852		Exact
853	T1000853		Exact
855	T1000855		Exact
856	T1000856		Exact
857	T1000857		Exact
860	T1000860		Exact
861	T1000861		Exact
862	T1000862		Exact
863	T1000863		Exact
864	T1000864		Exact
865	T1000865		Exact
869	T1000869		Exact
870	T1000870	T1V10500	Not Exact
871	T1V10871		Exact
874	T1V10874		Exact
875	T1000875		Exact
880	T1000880		Exact
890	T1000890	T1V10500	Not Exact
892	T1L0OCR1	T1V10500	Not Exact
893	T1L0OCRB	T1V10500	Not Exact
905	T1000905		Exact
912	T1000912		Exact
915	T1000915		Exact
916	T1000916		Exact
920	T1000920		Exact
1002	T1001002	T1D0BASE	Exact
1003	T1DCDCFS		Exact

Table D-6 (Page 4 of 5). Printer Resident to Host Resident Code Page Mapping

Registered Code Page ID	Host Resident Code Page Name (first choice)	Host Resident Code Page Name (second choice)	Map Fidelity
1004	T1001004		Exact
1008	T1001008		Exact
1025	T1001025		Exact
1026	T1001026		Exact
1028	T1001028		Exact
1029	T1001029		Exact
1070	T1GDP037		Exact
1071	T1GDP273		Exact
1072	T1GDP274		Exact
1073	T1GDP275		Exact
1074	T1GDP277		Exact
1075	T1GDP278		Exact
1076	T1GDP280		Exact
1077	T1GDP281		Exact
1078	T1GDP282		Exact
1079	T1GDP284		Exact
1080	T1GDP285		Exact
1081	T1GDP279		Exact
2063	T1D0BASE		Exact
2064	T1GDP276		Exact
2065	T1GI0361		Exact
2066	T1GPI363		Exact
2067	T1GI0382		Exact
2068	T1GI0383		Exact
2069	T1GI0384		Exact
2070	T1GI0385		Exact
2071	T1GI0386		Exact
2072	T1GI0387		Exact
2073	T1GI0388		Exact
2074	T1GI0389		Exact
2075	T1GI0390		Exact
2076	T1GI0391		Exact
2077	T1GI0392		Exact
2078	T1GI0394		Exact
2079	T1GI0395		Exact
2081	T1GE0200		Exact
2082	T1GE0300		Exact
2086	T1L0OCRB		Exact
2087	T1L0OCR1		Exact
2092	T1S0S193		Exact
2093	T1S0S198		Exact

Table D-6 (Page 5 of 5). Printer Resident to Host Resident Code Page Mapping			
Registered Code Page ID	**Host Resident Code Page Name (first choice)**	**Host Resident Code Page Name (second choice)**	**Map Fidelity**
2102	T1L02773		Exact
2103	T1L02774		Exact
2108	T1S0AE10		Exact

Character Identifier (CHRID) Values Supported

The following table lists all the character identifiers, the related national language groups, the correct code page, and which printers support which character identifier.

Table D-7 (Page 1 of 4). CHRID Values and Applicable Printers (CHRID Parameter)

	Code Pages		Printers[1]						
Language Groups	**CHRID Code Page xxx yyy**[2,3]	**Sub-stitute Code Page yyy**[2,4]	**3812**[5] **3816**[5]	**4214**[5]	**4224**[5] **4230**[5]	**4234**[5]	**5219**	**5224 5225**	**4028**[5]
Major Groups									
International (and US ASCII)	103 038	500	Yes	N/A	N/A	N/A	Yes	N/A	Yes
Multinational	697 500		Yes	Yes	Yes	Yes	N/A	N/A	Yes
	337 256	500	Yes	N/A	N/A	N/A	N/A	Yes	Yes
	697 256	500	Yes	N/A	Yes	IPDS[7]	N/A	N/A	Yes
United States	101 037		Yes	Yes	Yes	Yes	Yes	Yes	Yes
	697 037		Yes	Yes	N/A	Yes	N/A	N/A	Yes
Individual Countries/Languages									
Arabic	697 361		Yes	N/A	Yes	N/A	N/A	N/A	Yes
Arabic X/B	235 420	500	Yes	N/A	N/A	N/A	N/A	N/A	Yes
	697 420		Yes	N/A	N/A	IPDS[7]	N/A	N/A	Yes
Austria/Germany[6]	265 273		Yes	Yes	Yes	Yes	Yes	Yes	Yes
	697 273		Yes	Yes	Yes	Yes	N/A	N/A	Yes
Austria/Germany	697 286	273	Yes	N/A	Yes	N/A	N/A	N/A	Yes
Belgium[6]	697 500		N/A	Yes	Yes	Yes	Yes	Yes	N/A
	269 274		N/A	Yes	Yes	SCS[8]	Yes	Yes	N/A
	697 274		N/A	Yes	Yes	SCS[8]	N/A	N/A	N/A
Brazil[6]	273 275		Yes	Yes	Yes	Yes	Yes	Yes	Yes
	697 275		Yes	Yes	Yes	Yes	N/A	N/A	Yes
Canadian French[6]	277 276	297	Yes	N/A	N/A	N/A	Yes	Yes	Yes
	341 260	037	Yes	N/A	Yes	N/A	N/A	N/A	Yes
	697 260		Yes	N/A	N/A	N/A	N/A	N/A	Yes
Canada-Bilingual	038 256		Yes	N/A	N/A	N/A	Yes	N/A	Yes
	039 256		Yes	N/A	N/A	N/A	Yes	N/A	Yes
Canada-English	037 256		Yes	N/A	N/A	N/A	Yes	N/A	Yes
Cyrillic	960 880		N/A	N/A	Yes	IPDS[7]	N/A	N/A	Yes
Czechoslovakia/Czech	083 257		N/A	N/A	N/A	N/A	Yes	N/A	N/A
Czechoslovakia/Slovak	085 257		N/A	N/A	N/A	N/A	Yes	N/A	N/A
Denmark/Norway[6]	281 277		Yes	Yes	Yes	Yes	Yes	Yes	Yes
	697 277		Yes	Yes	Yes	Yes	N/A	N/A	Yes
Denmark/Norway	697 287	277	Yes	N/A	Yes	N/A	N/A	N/A	Yes

Table D-7 (Page 2 of 4). CHRID Values and Applicable Printers (CHRID Parameter)

Language Groups	Code Pages: CHRID Code Page xxx yyy[2,3]	Code Pages: Substitute Code Page yyy[2,4]	Printers[1]: 3812[5] 3816[5]	Printers[1]: 4214[5]	Printers[1]: 4224[5] 4230[5]	Printers[1]: 4234[5]	Printers[1]: 5219	Printers[1]: 5224 5225	Printers[1]: 4028[5]
Finland/Sweden[6]	285 278		Yes	Yes	Yes	Yes	Yes	Yes	Yes
	697 278		Yes	Yes	Yes	Yes	N/A	N/A	Yes
Finland/Sweden	697 288	278	Yes	N/A	Yes	N/A	N/A	N/A	Yes
France (1977)[6]	289 279	297	Yes	N/A	N/A	N/A	N/A	Yes	Yes
France (1980)[6]	288 297		Yes	Yes	Yes	Yes	Yes	N/A	Yes
	697 297		Yes	Yes	Yes	Yes	N/A	N/A	Yes
France	251 256		Yes	N/A	N/A	N/A	Yes	N/A	Yes
France/Belgium	031 256		Yes	N/A	N/A	N/A	Yes	N/A	Yes
Germany/Austria	028 256		Yes	N/A	N/A	N/A	Yes	N/A	Yes
	029 256		Yes	N/A	N/A	N/A	Yes	N/A	Yes
Greek	218 423		N/A	N/A	Yes	IPDS[7]	N/A	N/A	Yes
	925 875		N/A	N/A	Yes	IPDS[7]	N/A	N/A	Yes
Hebrew	941 424		Yes	N/A	Yes	IPDS[7]	N/A	N/A	Yes
	697 424		Yes	N/A	Yes	IPDS[7]	N/A	N/A	Yes
Hong Kong	119 256		Yes	N/A	N/A	N/A	Yes	N/A	Yes
Hungary	091 257		N/A	N/A	N/A	N/A	Yes	N/A	N/A
Icelandic	697 871		Yes	N/A	Yes	IPDS[7]	N/A	N/A	Yes
	697 029		Yes	N/A	N/A	N/A	N/A	N/A	Yes
Italy[6]	293 280		Yes	Yes	Yes	IPDS[7]	Yes	Yes	Yes
	697 280		Yes	Yes	Yes	Yes	N/A	N/A	Yes
Italy	041 256		Yes	N/A	N/A	N/A	Yes	N/A	Yes
Japan-English[6]	297 281		Yes	Yes	Yes	IPDS[7]	Yes	Yes	Yes
	697 281		Yes	Yes	Yes	Yes	N/A	N/A	Yes
	068 256		Yes	N/A	N/A	N/A	Yes	N/A	Yes
	069 256		Yes	N/A	N/A	N/A	Yes	N/A	Yes
Japan-Katakana[6]	332 290		Yes	N/A	Yes	Yes	N/A	Yes	Yes
Korean	933 833		N/A	N/A	4230-Yes 4224-N/A	N/A	N/A	N/A	N/A
	697 290		Yes	N/A	N/A	N/A	N/A	N/A	Yes
Latin	959 870		N/A	N/A	Yes	IPDS[7]	N/A	N/A	Yes
Latin America/Puerto Rico	025 256		Yes	N/A	N/A	N/A	Yes	N/A	Yes
Netherlands	043 256		Yes	N/A	N/A	N/A	Yes	N/A	Yes
Norway/Denmark	055 256		Yes	N/A	N/A	N/A	Yes	N/A	Yes
Poland	093 257		N/A	N/A	N/A	N/A	Yes	N/A	N/A
Portugal[6]	301 282		Yes	Yes	Yes	Yes	Yes	Yes	Yes
	697 282		Yes	Yes	Yes	Yes	N/A	N/A	Yes
Portugal	697 831	282	Yes	N/A	Yes	N/A	N/A	N/A	Yes
	063 256		Yes	N/A	N/A	N/A	Yes	N/A	Yes
Romania	087 258		N/A	N/A	N/A	N/A	Yes	N/A	N/A
South Africa	081 258		N/A	N/A	N/A	N/A	Yes	N/A	N/A
Spain[6]	305 283	284	Yes	N/A	Yes	Yes	Yes	Yes	Yes
	697 283	284	Yes	N/A	Yes	N/A	N/A	N/A	Yes
	697 289	284	Yes	N/A	Yes	N/A	N/A	N/A	Yes
	045 256		Yes	N/A	N/A	N/A	Yes	N/A	Yes
Spanish Speaking[6]	309 284		Yes	Yes	Yes	Yes	Yes	Yes	Yes
	697 284		Yes	Yes	Yes	Yes	Yes	N/A	Yes
	149 284		N/A	N/A	N/A	N/A	Yes	N/A	

Table D-7 (Page 3 of 4). CHRID Values and Applicable Printers (CHRID Parameter)

Language Groups	Code Pages: CHRID Code Page xxx yyy[2,3]	Code Pages: Substitute Code Page yyy[2,4]	Printers[1]: 3812[5] 3816[5]	4214[5]	4224[5] 4230[5]	4234[5]	5219	5224 5225	4028[5]
Sweden/Finland	052 256		Yes	N/A	N/A	N/A	Yes	N/A	Yes
	053 256		Yes	N/A	N/A	N/A	Yes	N/A	Yes
Switzerland/French	048 256		Yes	N/A	N/A	N/A	Yes	N/A	Yes
Switzerland/German	049 256		Yes	N/A	N/A	N/A	Yes	N/A	Yes
Thai	1102 889		N/A	N/A	Yes	IPDS[7]	N/A	N/A	N/A
	938 838		N/A	N/A	4230-Yes 4224-N/A	N/A	N/A	N/A	N/A
Turkish	965 905		N/A	N/A	4230-No 4224-Yes	IPDS[7]	N/A	N/A	Yes
	1152 1026		N/A	N/A	4230-Yes 4224-N/A	N/A	N/A	N/A	N/A
United Kingdom[6]	313 285		Yes	Yes	Yes	Yes	Yes	Yes	Yes
	697 285		Yes	Yes	Yes	Yes	N/A	N/A	Yes
U.K./Israel	066 256		Yes	N/A	N/A	N/A	Yes	N/A	Yes
U.K./Israel-Latin	067 256		Yes	N/A	N/A	N/A	Yes	N/A	Yes
USA-Accounting	017 256		Yes	N/A	N/A	N/A	Yes	N/A	Yes
USA/Australia	001 256		Yes	N/A	N/A	N/A	Yes	N/A	Yes
Countries of the former Yugoslavia	410 890		N/A	N/A	Yes	IPDS[7]	N/A	N/A	N/A
Countries of the former Yugoslavia-Latin	095 257		N/A	N/A	N/A	N/A	Yes	N/A	N/A
Noncountry Languages									
APL	697 293	Yes	Yes	N/A	N/A	N/A	N/A	N/A	Yes
APL Alternate	697 310		Yes	N/A	N/A	N/A	N/A	N/A	Yes
ASCII	103 256		Yes	N/A	N/A	N/A	Yes	N/A	Yes
DCF Compatibility	1132 1002		Yes	N/A	4230-Yes 4224-No	N/A	N/A	N/A	Yes
EBCDIC	101 256		Yes	N/A	N/A	N/A	Yes	N/A	Yes
International Typographic	697 361		Yes	N/A	N/A	N/A	N/A	N/A	Yes
OCR (unregistered)	697 340	500	Yes	N/A	Yes	IPDS[7]	N/A	N/A	Yes
OCR A	697 892	500	Yes	N/A	N/A	IPDS[7]	N/A	N/A	Yes
OCR A (unregistered)	580 340	500	Yes	N/A	Yes	IPDS[7]	N/A	N/A	Yes
OCR B	697 893	500	Yes	N/A	N/A	IPDS[7]	N/A	N/A	Yes
OCR B (unregistered)	590 340	500	Yes	N/A	Yes	IPDS[7]	N/A	N/A	Yes
Personal Computer	697 437		Yes	N/A	N/A	N/A	N/A	N/A	Yes
Symbol-Selectric	201 259	500	Yes	N/A	N/A	N/A	Yes	N/A	Yes
Symbol-6640	202 259	500	Yes	Yes	N/A	N/A	Yes	N/A	Yes
Symbol-6670	203 259		Yes	N/A	N/A	N/A	Yes	N/A	Yes

Table D-7 (Page 4 of 4). CHRID Values and Applicable Printers (CHRID Parameter)

	Code Pages		Printers[1]						
Language Groups	**CHRID Code Page xxx yyy**[2,3]	**Substitute Code Page yyy**[2,4]	**3812**[5] **3816**[5]	**4214**[5]	**4224**[5] **4230**[5]	**4234**[5]	**5219**	**5224 5225**	**4028**[5]
Symbols Set 7	697 259		Yes	N/A	N/A	N/A	N/A	N/A	Yes

1 The 5256, 5262, and 4245 work station printers do not support the hardware function required for alternative CHRID processing. If a nondefault character set and code page is selected for these printers, a diagnostic message is sent and processing continues using the default character set.

2 If the printer supports the code page specified (the second part *(yyy)* of the CHRID parameter) but not the character set *(xxx)*, then the character set supported by the printer is used along with the specified code page. For example, if 337 037 (extended character set for displays) is specified for the 5224 and 5225 Printers, the print file is printed with character set 101, code page 037.

3 In some cases, the printer will substitute a supported code page for an unsupported code page. Consult the various printer reference guides for defaults on the code page mapping.

4 If the printer does not support or map the code page specified, an attempt is made by the system to find a satisfactory substitute. This column shows the code page substitutes that are made if the specified printer supports the substitute.

5 The 3812, 3816, 4214, 4224, 4230, and 4234 Printers support character set 697 (full character set). This character set contains all the characters in the limited character sets. For example, 697 037 would contain all the characters in 101 037 or 337 037 (extended character set for displays).

6 This language is considered a primary language group. All other entries, if any, under the primary language group are considered as alternative language groups.

7 Supported by 4234 IPDS version only.

8 Supported by 4234 SCS version only.

Host Resident to Printer Resident Code Page Mapping

Code pages are necessary for jobs to print. Some printers have code pages stored in memory or on a font card; other printers do not.

For spooled files that are directed to a 4028, 4224, 4230, or 4234 printer that is configured as an AFP printer and have a host resident code page (stored on the AS/400 system) specified, the following table can help you determine what printer resident code page (stored on the printer) is substituted when your spooled file specifies a host resident code page instead of a registered code page identifier (ID).

This code page substitution is necessary because these printers do not support the downloading of 240-pel host resident fonts. Depending upon the host resident code page name that is requested for a particular font reference, the appropriate registered code page ID value is selected to match (as closely as possible) your font request.

The Map Fidelity indicates whether or not the substituted printer resident code page is considered to be an exact match to the code page that is requested in your spooled file.

Table D-8 (Page 1 of 3). Host Resident to Printer Resident Code Page Mapping

Host Resident Code Page Name	Registered Code Page ID	Map Fidelity
CTN	037	Exact
T1GDP500	500	Exact
T1V10037	37	Exact
T1GDP256	256	Exact
T1V10273	273	Exact
T1V10274	274	Exact
T1V10275	275	Exact
T1V10277	277	Exact
T1V10278	278	Exact
T1V10280	280	Exact
T1V10281	281	Exact
T1V10282	282	Exact
T1V10284	284	Exact
T1V10285	285	Exact
T1000290	290	Exact
T1L02773	290	Exact
T1L02774	290	Exact
T1S0AE10	293	Exact
T1V10297	297	Exact
T1000361	361	Exact
T1GI0361	361	Exact
T1000382	382	Exact

Table D-8 (Page 2 of 3). Host Resident to Printer Resident Code Page Mapping

Host Resident Code Page Name	Registered Code Page ID	Map Fidelity
T1GI0382	382	Exact
T1GI0383	383	Exact
T1000384	384	Exact
T1GI0384	384	Exact
T1000385	385	Exact
T1GI0385	385	Exact
T1000386	386	Exact
T1GI0386	386	Exact
T1000387	387	Exact
T1GI0387	387	Exact
T1000388	388	Exact
T1GI0388	388	Exact
T1000389	389	Exact
T1GI0389	389	Exact
T1000390	390	Exact
T1GI0390	390	Exact
T1000391	391	Exact
T1GI0391	391	Exact
T1000392	392	Exact
T1GI0392	392	Exact
T1000393	393	Exact
T1GI0393	393	Exact
T1000394	394	Exact
T1GI0394	394	Exact
T1000395	395	Exact
T1GI0395	395	Exact
T1000420	420	Exact
T1000424	424	Exact
T1GPI363	437	Exact
T1000437	473	Exact
T1V10500	500	Exact
T1000819	819	Exact
T1000850	850	Exact
T1000852	852	Exact
T1000857	857	Exact
T1000863	863	Exact
T1000870	870	Exact
T1V10871	871	Exact
T1000912	912	Exact
T1000920	920	Exact
T1001002	1002	Exact
T1D0BASE	1002	Exact

Table D-8 (Page 3 of 3). Host Resident to Printer Resident Code Page Mapping

Host Resident Code Page Name	Registered Code Page ID	Map Fidelity
T1001003	1003	Exact
T1DCDCFS	1003	Exact
T1001004	1004	Exact
T1001026	1026	Exact

Lines Per Inch (LPI) Values Supported

Lines per inch means the number of characters that can be printed vertically within an inch.

Each entry in the following table shows the valid range of values for lines per page for each printer type and for each value of lines per inch (LPI) valid for the printer.

Table D-9. Lines per Page (LPI Parameter)

Printer	3 Lines per Inch	4 Lines per Inch	6 Lines per Inch	7.5 Lines per Inch	8 Lines per Inch	9 Lines per Inch	12 Lines per Inch
3287	–	1-104	1-104	–	1-104	–	–
3812 SCS	–	1-56	1-84	–	1-112	1-126	1-168
3812 IPDS	–	2-56	2-84	–	2-112	2-112	2-168
3816 SCS	–	1-56	1-84	–	1-112	1-126	1-168
3816 IPDS	–	2-56	2-84	–	2-112	2-112	2-168
3820	–	1-56	1-84	–	1-112	1-126	1-168
3825	–	1-56	1-84	–	1-112	1-126	1-168
3827	–	1-56	1-84	–	1-112	1-126	1-168
3835	–	2-91	2-136	–	2-182	2-204	2-273
4028	–	2-56	2-84	–	1-112	1-112 or 2-126	2-168
4214	–	1-255	1-255	–	1-255	1-255	–
4224, 4234 IPDS	–	2-91	2-136	–	2-182	2-204	2-273
4230	–	2-91	2-136	–	2-182	2-204	2-273
4234 SCS	–	1-255	1-255	–	1-255	–	–
4245 Models T12 and T20	–	–	1-255	–	1-255	–	–
5211	–	–	2-84	–	2-112	–	–
5219 Continuous Forms	–	2-255	2-255	–	2-255	–	2-255
5219 Cut Sheet	–	57	86	–	114	–	172
5224	–	1-255	1-255	–	1-255	1-255	–
5225	–	1-255	1-255	–	1-255	1-255	–
5256 (set manually)	–	–	1-255	–	1-255	–	–
5262	–	–	1-255	–	1-255	–	–
5553	1-255	1-255	1-255	1-255	1-255	–	1-255
5583	1-255	1-255	1-255	1-255	1-255	–	–
6252	–	1-255	1-255	–	1-255	1-255	–

Characters Per Inch (CPI) Values Supported

Characters per inch means the number of characters printed horizontally within an inch across a page.

Each entry in the following table shows the valid range of values for the characters per line for each printer type and for each value of characters per inch (CPI) for the printer.

Table D-10. Characters per Line (CPI Parameter)

Printer	5 Characters per Inch	10 Characters per Inch	12 Characters per Inch	13.3 Characters per Inch	15 Characters per Inch	16.7 Characters per Inch	18 Characters per Inch	20 Characters per Inch
3287	–	1-132	–	–	–	–	–	–
3812[1]	1-42	1-85	1-102	–	1-127	–	–	–
3812[1] Rotated Form	1-70	1-140	1-168	–	1-210	–	–	–
3816[1]	1-42	1-85	1-102	–	1-127	–	–	–
3816[1] Rotated Form	1-70	1-140	1-168	–	1-210	–	–	–
3820[1]	–	1-85	1-102	–	1-127	–	–	–
3825[1]	–	1-85	1-102	–	1-127	–	–	–
3827[1]	–	1-85	1-102	–	1-127	–	–	–
3835[1]	–	1-132	1-158	–	1-198	–	–	–
4214 Continuous Forms	1-66	1-132	1-158	–	1-198	1-220	–	–
4214 Cut Sheet	1-60	1-120	1-144	–	1-180	1-200	–	–
4224[1]	–	1-132	1-158	–	1-198	1-220	–	–
4028[1]	1-42	1-85	1-102	–	1-127	–	–	–
4028[1] Rotated Form	1-70	1-140	1-168	–	1-210	–	–	–
4230[1]	–	1-132	1-158	–	1-198	1-220	–	–
4234 SCS[1]	–	1-132	–	–	1-198	–	–	–
4234 IPDS[1]	–	1-132	–	–	1-198	1-238	–	–
4245	–	1-132	–	–	–	–	–	–
5219	–	1-132	1-158	–	1-198	–	–	–
5224	–	1-132	–	–	1-198	–	–	–
5225	–	1-132	–	–	1-198	–	–	
5256 Model 3	–	1-132	–	–	–	–	–	–
5262	–	1-132	–	–	–	–	–	–
5553	–	1-136	1-163	1-181	1-204	–	1-244	1-272
5583	–	1-132	1-158	1-176	1-198	–	1-236	1-264
6252	–	1-132	–	–	1-198	–	–	–

1 Many character per inch values (implied by the pitch of the font, see the FONT parameter), are supported in addition to the ones listed here. To find the maximum characters per line, multiply the implied characters per inch value listed in the font table by maximum page width supported (in inches). The maximum page width supported by the 3812 and 3816 Printers is 8.5 inches for non-rotated forms and 14.0 inches for rotated forms.

4019 Printer Information

The following tables list the ways you can attach the 4019 printer, the emulation method used, and the function provided by the combination of the attachment and emulation methods. In this table a supported function is indicated by an X.

The 4019 is supported on the AS/400 system by treating it as an emulated version of another device. In some respects the result achieved with the 4019 is not identical to the emulated device. The following tables express capabilities in terms of the emulated printers, but indicate some situations in which the 4019 result exceeds that of the emulated device.

Note: Go to "QWP4019 Program" on page 13-5 for information on how to work with your emulated 4019 printer to make the 4019 resident fonts available.

Note that image, graphics, and bar codes are not supported under any emulation or means of attachment.

Pay special attention to the treatment of fonts and the footnotes relating to page length and width.

Table D-11 shows a matrix of functions when printing via any system function other than OfficeVision/400. In this table a supported function is indicated by an **X**.

Table D-11 (Page 1 of 3). 4019 Printer–System Functions

ATTACHED VIA ⇒	**3477**	**3197**	**AWSC**	**WSF**	**WSE**	**E5250**	**R5250**	**OS/2 WSF**
EMULATING ⇒	**5219**	**4214**	**3812**	**3812**	**5219**	**5219**	**5219**	**5219**
Printer File Commands								
Page Length[1]	X	X	X	X	X	X	X	X
Page Width[1]	X	X	X	X	X	X	X	X
LPI (4.0)	X	X	X	X	X	X	X	X
LPI (6.0)	X	X	X	X	X	X	X	X
LPI (8.0)	X	X	X	X	X	X	X	X
LPI (9.0)[2]	X	X	X	X				
FONT(*CPI)[3] CPI(5.0)[4]	X	X	X	X				
FONT(*CPI)[3] CPI(10.0)	X	X	X	X	X	X	X	X
FONT(*CPI)[3] CPI(12.0)	X	X	X	X	X	X	X	X
FONT(*CPI)[3] CPI(15.0)	X	X	X	X	X	X	X	X
FONT(*CPI)[3] CPI(16.7)		X	X	X	X	X	X	X
Fold Records	X	X	X	X	X	X	X	X
Truncate Records	X	X	X	X	X	X	X	X
Paper Drawer (1)	X	X	X	X	X	X	X	X
Paper Drawer (2)	X		X	X		X		
Paper Drawer (E1)	X		X	X	X	X		
Non-Typographical Fonts (See Font Table below for details.)								

Table D-11 (Page 2 of 3). 4019 Printer–System Functions

ATTACHED VIA ⇒	3477	3197	AWSC	WSF	WSE	E5250	R5250	OS/2 WSF
EMULATING ⇒	5219	4214	3812	3812	5219	5219	5219	5219
Typo and User Defined Fonts								
Form Feed (*CUT)		X		X	X		X	X
Form Feed (*AUTOCUT)	X	X	X	X	X	X	X	X
Print Quality (*Draft) with PAGRTT(*DEVD) automatically give PAGRTT (*COR)			X	X				
Change Char Set/Code Page ID	X		X	X				
Rotation 0	X	X	X	X	X	X	X	X
Rotation 90								
Rotation 180								
Rotation 270	X		X	X				
Rotation *COR			X	X				
Print Text	X	X	X	X	X	X	X	X
Hardware Justification 0	X	X	X	X	X	X	X	X
Hardware Justification 50	X			X	X	X	X	X
Hardware Justification 100	X		X	X	X	X	X	X
Duplex								
Copies	X	X	X	X	X	X	X	X
File Separators	X	X	X	X	X	X	X	X
Additional DDS Keywords								
Barcode								
Chrsiz								
Color								
Font (Changing Type Styles)								
Highlight			X					
Skipa	X	X	X	X	X	X	X	X
Skipb	X	X	X	X	X	X	X	X
Spacea	X	X	X	X	X	X	X	X
Spaceb	X	X	X	X	X	X	X	X
Underline	X	X	X	X	X	X	X	X
Other Functions								
Graphics								
Image								

Table D-11 (Page 3 of 3). 4019 Printer–System Functions								
ATTACHED VIA ⇒	**3477**	**3197**	**AWSC**	**WSF**	**WSE**	**E5250**	**R5250**	**OS/2 WSF**
EMULATING ⇒	**5219**	**4214**	**3812**	**3812**	**5219**	**5219**	**5219**	**5219**
Symbols Code Page 259	X		X	X				

1 Existing applications or documents may not fit on the 4019 page since there is an unprintable border around the outside edge. You may have to change the margins and lines per page (and re-paginate in some cases) to obtain the desired output.

This unprintable area applies to both envelopes and paper of any size. The unprintable area is 6.35 mm (0.25 in) from the sides and 4.23 mm (0.17 in) from the top and bottom. This results in an 8-inch writing line on 8.5 by 11 inch paper and a 7.7-inch writing line on A4 paper. With 6 LPI for example, this yields 64 lines on an 11-inch page or 68 lines on A4 paper.

Consideration should be given to the effect of this unprintable area when a document is formatted to assure that it prints correctly. If data is formatted to print beyond the printable area on the sides, the excess will print as an additional short line.

2 LPI(9.0) is not supported by the 5219 printer; therefore LPI(9.0) is not supported for any of the 5219 emulations.

3 On the CRTPRTF, CHGPRTF, and OVRPRTF commands you may avoid direct specification of a font by using FONT(*CPI). This allows the system to default to any font that supports the requested CPI value. However, the defaulted font may be one that is not supported on the 4019. An unsupported font will cause printing to halt and require operator intervention. We therefore recommend that you specify FONT explicitly on these commands.

4 CPI(5.0) is not supported by the 5219; therefore CPI(5.0) is not supported for any of the 5219 emulations.

4234 Compressed Font Substitution by Lines Per Inch (LPI) Value

The following table lists the font substitution that takes place when printing on a 4234 printer configured as follows:

Value of *NO for the AFP parameter
Value greater than or equal to 8 for the LPI parameter

This substitution allows the use of fonts that are slightly shorter when the LPI value is greater than or equal to 8.

Table D-12. 4234 Compressed Font Substitution by Lines Per Inch (LPI) Value	
Font Used When LPI is 4 or 6	**Font Substituted When LPI is Greater Than or Equal to 8**
11	52
26	51
85	75
87	74
160	154
204	205
222	232
223	233
258	259
400	300

Appendix E. Printer Data Streams

SNA Character String (SCS)

The SNA character string (SCS) has a relatively simple structure, consisting of a 1-byte hexadecimal control code followed by the data to be printed. Multiple control codes can be inserted into SCS by printing applications in order to achieve certain types of output. The SNA character string is sent to the printer in physical blocks of 256 bytes.

```
Hexadecimal  .    Data to be printed
Control Code .
```

The following are a few examples of SCS control codes:

Hex	Description	Code
03	ASCII transparent data	(TRNA)
05	Horizontal tab	(HT)
0B	Vertical tab	(VT)
0C	Forms feed	(FF)
0D	Carriage return	(CR)
1A	Unit backspace	(UBS)
15	New line	(NL)
16	Backspace	(BS)
35	Transparent	(TRN)
2843	Set attribute	(SA)
2BC1	Set horizontal format	(SHF)
2BC2	Set vertical format	(SVF)
2BC6	Set line density	(SLD)
2BD2	Set presentation page size	(SPPS)
2BD4	Begin underscore	(BUS)
2BFE	Load alternate character	(LAC)

How Print Attributes Are Implemented by SCS

The following examples show how common print functions can be implemented by printing applications using SCS.

Line spacing The equivalent number of NL (new line) control codes is inserted.

Underscoring The underscored text is first inserted into SCS, followed by the appropriate number of BS (backspace) control codes, and then the same number of underscores.

Overstriking This is similar to underscoring, except that the overstrike characters are used instead of the underscore.

Emphasis The text to be emphasized is put into SCS, followed by the necessary number of BS (backspace) control codes and then the emphasized text is repeated. This sequence could be repeated several times.

Page eject The FF (forms feed) control code is inserted.

Font changes Font changes are supported by printers such as the 5219 that support final-form text (FFT). Font changes issued by OfficeVision/400 word processing generate a message requesting a print wheel change.

Final-Form Text: Document Content Architecture (FFT DCA)

Final-Form Text: Document Content Architecture is an extension of SCS. It is used within the OfficeVision/400 Office environment and defines how the data streams that represent a document to be printed are organized. Data streams containing final-form text documents must be processed sequentially from beginning to end.

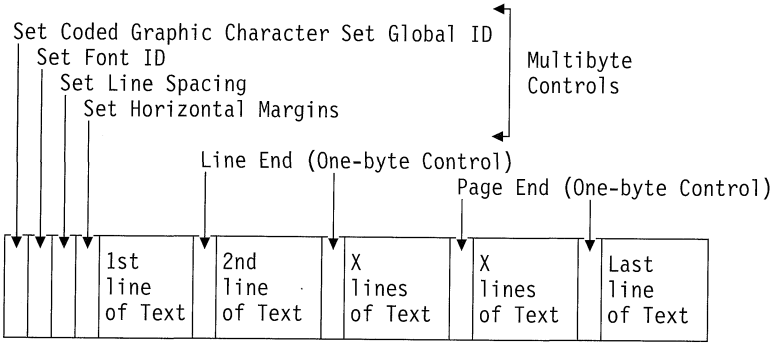


Figure E-1. Typical Final-Form Text Data Stream Organization

The EBCDIC 1-byte control characters provide functions such as line end, backspace, and indent that have an immediate effect. The multibyte (extended) control characters provide functions such as line spacing, horizontal and vertical margins, and tab settings. These have both a continual and an immediate effect. Some of the multibyte control characters remain in effect only until the line end, but the majority remain in effect until the end of the document or until they are redefined.

When a document is transformed from revisable-form text to final-form text, the formatting declarations specified within the revisable-form text data stream are converted to formatting control codes (1- and multibyte) within the final-form text data stream. These codes are embedded within the text of the document wherever they are needed to format the document. A final-form text data stream can be interpreted by printers that might not contain the function necessary to interpret revisable-form text data streams. These printers produce the same document content in consistent format, subject only to any limitations of the individual printers.

The final-form text document contains formatting control codes at the beginning to establish its initial format. If the control codes are omitted, pre-defined default values are used. These formatting controls are followed by the text of the document, interspersed with the required formatting control codes.

Formatting control codes within a final-form text document control the following functions:

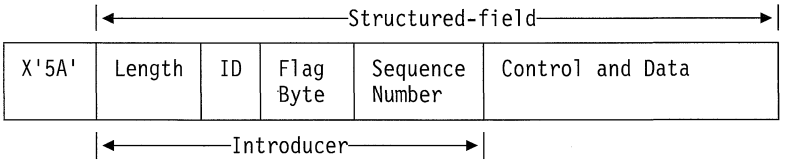
- Top margin location
- Left margin location
- Line spacing

- Font definition
- Justify (align) text
- Begin and end underscore
- Begin and end overstrike.

Advanced Function Printing Data Stream (AFPDS)

AFPDS is the application interface to advanced function printing (AFP) based on the Mixed Object:Document Content Architecture–Presentation (MO:DCA–P). It is independent of both printers and operating systems.

AFPDS is a structured data stream. Structured fields are used to define composed text pages, line format data, and a mixture of line and composed text data. The structured field is a self-identifying string of bytes containing data or parameters and must have an introducer, which contains a length field, an identifier, a flag, and a sequence number. This is followed by parameter bytes that contain control information or data to be printed.



Length A 2-byte field that specifies the length of the record (not including the 5A control character).

Identifier (ID) A 3-byte field that specifies the type of the structured field.

Flag byte A 1-byte field that specifies information about the data field.

Sequence number A 2-byte field that identifies the record.

Control and data A text control code, the name of an object, or coordinates for positioning an image or page segment. The control information is followed by the data to be printed.

Source Programs That Generate AFPDS

The following IBM licensed programs generate AFPDS data streams:

- Operating System/400 (OS/400)
- Advanced Function Printing Utilities/400 (AFP Utilities/400)
- Document Composition Facility (DCF)
- DisplayWrite/370 (DW/370)
- Graphical Data Display Manager (GDDM)
- System/370 advanced function printing utilities:
  - Page Printer Formatting Aid (PPFA)
  - Overlay Generation Language (OGL)
  - Font Library Service Facility (FLSF)
  - Print Management Facility (PMF)
  - Print Service Access Facility (PSAF).

Advanced Function Printing

AFPDS describes what the page of data looks like and references printer resource objects by name, assuming that they are resident on the system where the actual printing is to take place and not on the system where the output was spooled. The printer resource objects that are resident on the system are downloaded to the printer by the processor when needed.

The AS/400 system uses the following objects when processing AFPDS:

AFPDS spool buffers The AFPDS print file is sent to the AS/400 system in one or more buffers. These buffers contain single or multiple contiguous structured fields. A pointer to the buffer and the length of each buffer are passed to the AS/400 system.

AFPDS resource objects Resource objects contain data and control information that can be used in printing a job. These can be shared by different pages in the same job. A resource is composed entirely of structured fields.

Types of resources are:

- Fonts
- Form definitions (FORMDEFs)
- Page segments
- Overlays
- Page definitions

These resources can be transmitted from a host S/370 to an AS/400 system or loaded from tape into space objects using OS/400 commands. Overlays and page segments can be created by AFP Utilities/400.

Messages Messages generated during the processing of AFPDS print files are placed in the print writer job log.

Intelligent Printer Data Stream (IPDS)

Introduction to IPDS Architecture

Intelligent printer data stream (IPDS) is IBM's Systems Application Architecture host-to-printer data stream for advanced function printing subsystems. It provides an interface to all-points-addressable (APA) printers that makes possible the presentation of pages containing an architecturally unlimited mixture of different data types: high-quality text, raster image, vector graphics, and bar code.

IPDS incorporates the following features:

- Different applications may create source data (graphics, image, bar code, and text), independently of one another. IPDS makes it possible for the output of these independent applications to be merged at print time resulting in an integrated mixed data page.

  IPDS makes this possible by carrying independently defined blocks of data *(objects)*. The IBM 3270 display data stream also carries similarly defined independent objects, thus making it possible to use the same objects in both environments.

- IPDS is independent of the carrying communications protocol. This allows the transmission of the same data stream to channel-attached printers, controllers, local area networks, and any other networking link supporting transparent transmission of data.
- IPDS transfers all data and commands through self-identifying structured fields which describe the presentation of the page and provide for the following:
  - Dynamic management of downloaded resources (overlays, page segments, and loaded fonts) and resident fonts
  - Control of device functions such as duplexing, media bin selection, and output finishing
  - Comprehensive handling of exception functions, enabling users to control the level of exception handling.
- IPDS provides an extensive acknowledgement protocol at the data stream level. This acknowledgement protocol helps synchronize host and printer processes, exchange query/reply information, and return detailed exception information.

IPDS Functional Divisions

IPDS architecture is divided into several functional areas, each of which contains a set of IPDS commands representing a major printer capability. This function set design allows IPDS to support a wide range of printer products. Product developers can match function set implementations to the specific needs of their product. See Figure E-2 for details of IPDS function sets.

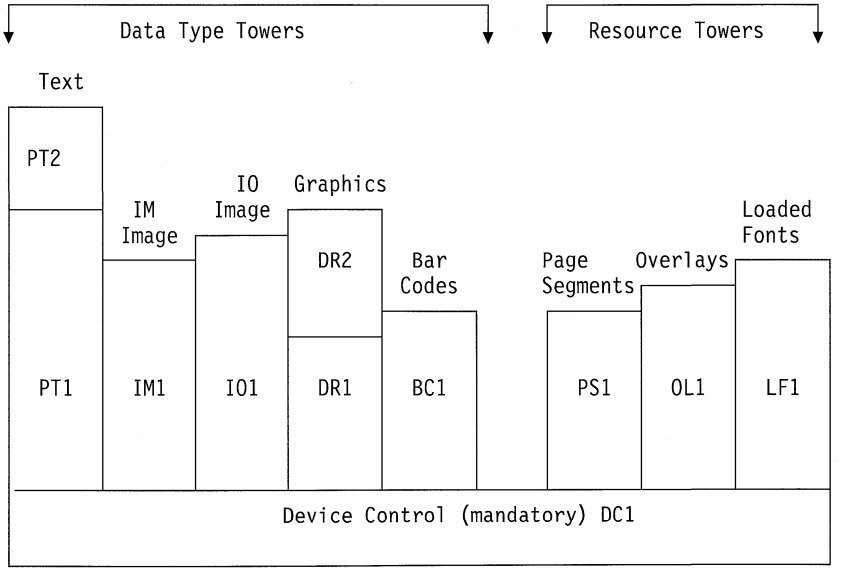


Figure E-2. IPDS Function Sets

Device control Function set is composed of the IPDS commands that set up a page, communicate device controls, and manage acknowledgement protocol. The device-control function set is the only mandatory function set for IPDS printers, although not all DC1 orders are required to be supported.

Text Function set composed of commands and orders (text controls) required to present text information on a page, page segment (stored command sequence), or an overlay (electronic form). The text function set contains two presentation text (PT) subsets: PT1 and PT2. Text printers support either subset. PT2 is a superset of PT1 and, therefore, all orders contained in PT1 are also in PT2.

IM image Function set containing the IPDS commands required to present raster image data on a page, page segment, or an overlay.

IO image Function set containing commands that present raster data (similar to IM image) but with additional functions.

Graphics Function set composed of the IPDS commands and drawing orders required to present vector graphics on a page, page segment, or overlay. The graphics function set contains two drawing (DR) subsets: DR1 and DR2. Vector graphics printers support DR2, which is a superset of DR1.

Bar code Function set composed of the IPDS commands required to present machine-readable bar code information on a page, page segment, or overlay.

Page segments and overlays
Function sets composed of the IPDS commands required to store and present IPDS constructs containing text, graphics, image, and bar code information. These stored constructs can be either page segments or overlays.

Loaded font Function set composed of the IPDS commands necessary to load and delete font information.

Function-Set Requirements for IPDS

In order to claim support of the IPDS architecture, a product must do the following:

- Implement all required commands in the device-control function set
- Implement at least one subset of one other data function set
- Implement all required commands, orders, and controls for each supported function set or subset.

Return of Function-Set Information

A host presentation services program determines the functional capabilities of an IPDS printer by issuing certain IPDS query commands to the printer and requesting an acknowledgement. The data that the printer returns in the acknowledge reply shows the printer type and model, details of the function sets supported, and a variety of printer characteristics.

The IPDS Page Environment

IPDS creates mixed-data pages within a hierarchy of presentation spaces. These presentation spaces are: physical page, logical page, and data blocks.

Physical page The medium (usually paper) on which information is placed. The physical page has boundaries of width and depth that define the limits of the medium.

Logical page The electronic representation of the page that is sent to the printer. The logical page is a rectangular area that may or may not be the same size as the physical page on which it is placed. Printing can only occur where the current logical page intersects the physical page (valid printable area).

Data blocks Rectangular areas positioned on the logical page. Data blocks can be one of three types:

- Image Data Blocks: Raster information
- Graphics Data Blocks: Lines, curves, areas, and other drawing elements
- Bar Code Data Blocks: Bar-coded, machine-readable characters or human-readable characters.

Note: There is no text data block. Text can be positioned anywhere in the valid printable area. Data blocks can be positioned in relation to the text.

IPDS has an hierarchical relationship between a physical page, a logical page, and data blocks. In the following figure, the logical page boundaries do not correspond to the physical page boundaries.

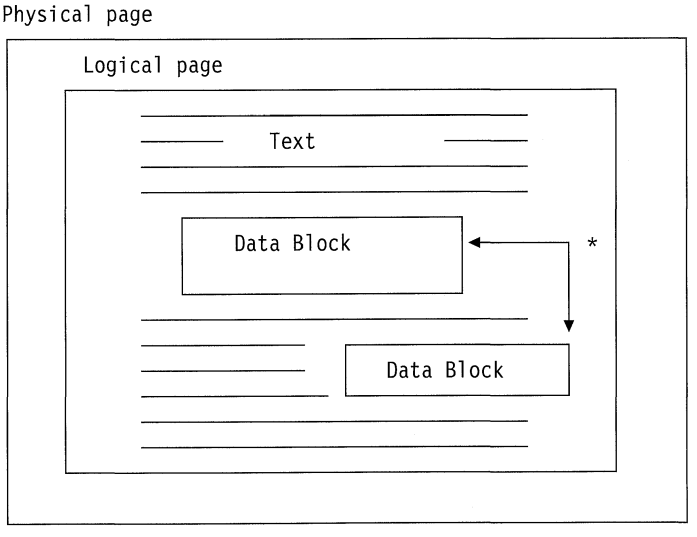


Figure E-3. IPDS Presentation Spaces

One of the strengths of IPDS is that independent applications can create source data for each data block. The output of these independent applications is merged at the printer to create an integrated mixed data page. For example, text data could be produced on an editor like the OfficeVision/400 editor, image data could be the output of a scanner stored in a folder, and graphics data could be produced by Business Graphics Utility. IPDS makes it possible to integrate application output rather than requiring the use of integrated applications.

Overlays and Page Segments

IPDS stores resources in the printer for later use. Overlays and page segments can be merged with the logical page before the logical page is printed on the physical page.

Overlay Macro-like construct loaded by the host processor and sent to the printer's storage. An overlay may consist of any combination of text data, image block data, graphics block data, or bar code block data. An overlay contains the same type of presentation commands used in the logical page, but overlays are independent of the logical page environment. The major difference between overlays and logical pages is that overlays are stored until deleted but logical pages, if stored, are only stored until printed. Overlays are often used as electronic forms.

Page segment This is like the overlay in makeup. The difference between a page segment and an overlay is that page segments are not independent of the page environment; they are merged with the logical page and assume the currently active environment.

Loaded Fonts

A font is a set of characters in a particular type style and size. Fonts can be downloaded from the host or may be resident in printer storage. Downloaded fonts are called *loaded fonts* and come in one of the following configurations:

Coded font A complete code page of graphic characters in a particular style. (A code page maps each character in a font to a numeric value or code point.)

Symbol set A set of characters simpler in structure than a coded font. Symbol sets are used where typographic quality is not required. Many dot matrix printers and displays use symbol sets.

Coordinate Systems

Xm, Ym Coordinate System (Physical Page)

IPDS uses orthogonal coordinate systems to define any point on a page. Distances between these coordinate systems are measured in logical units or *L-units* rather than physical pels.

The Xm, Ym coordinate system is the physical-page coordinate system. The top-left corner of the physical page is always (0,0).

The printer defines the top of a physical page.

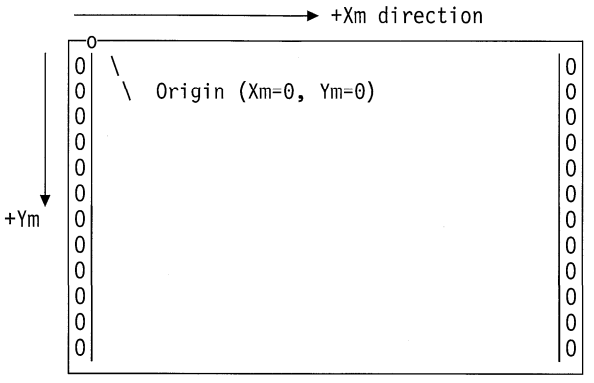


Figure E-4. Xm,Ym Coordinate System

The Xm, Ym coordinate system is fixed for each media size. IPDS commands cannot change the orientation of these coordinates.

Xp, Yp Coordinate System (Logical Page)

The Xp, Yp coordinate system is the logical-page coordinate system. The origin of this system (Xp=0, Yp=0) is specified as an offset from the physical page origin (Xm=0, Ym=0) through the Load Page Position command. IPDS commands cannot change the orientation of the Xp, Yp coordinate system; it is always parallel to, but offset from, the Xm, Ym coordinate system.

The size of the logical page in the Xp dimension is called the *Xp extent*. The size of the logical page in the Yp dimension is called the *Yp extent*. The Xp, Yp coordinate system is used to locate data blocks on the logical page.

The coordinate system for overlays is the same as the Xp, Yp coordinate system for logical pages.

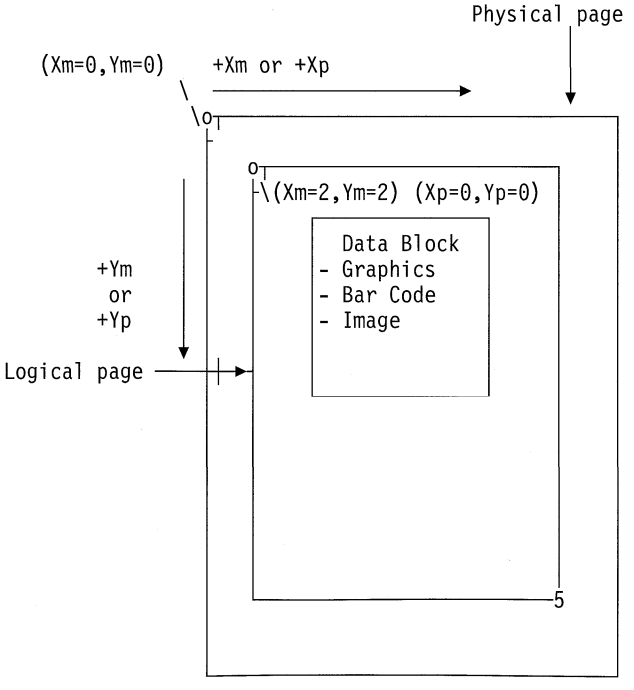


Figure E-5. Locating Data by Xm,Ym and Xp,Yp Coordinates

I, B Coordinate System (Text)

The Inline, Baseline (I, B) coordinate system describes the placement of data blocks on the logical page. The printer places characters along the I-axis to form a line of text and places lines of text along the B-axis on the logical page. IPDS commands can change both the origin and the orientation of the inline and baseline axes.

As characters are developed on the page, the inline coordinate is incremented in the **positive inline** (or +I) direction. As lines are developed on the page, the baseline coordinate is incremented in the **positive baseline** (or +B) direction.

Note: Characters are developed on a page in the direction in which they will be read (left to right, for example). The printer may actually place characters or lines on a page in various directions (as in bidirectional printing).

The coordinates of the first text position on the logical page are called the initial inline text coordinate (Io) and the initial baseline text coordinate (Bo). The coordinates of the current position on the logical page are called the current inline text coordinate (Ic) and the current baseline text coordinate (Bc).

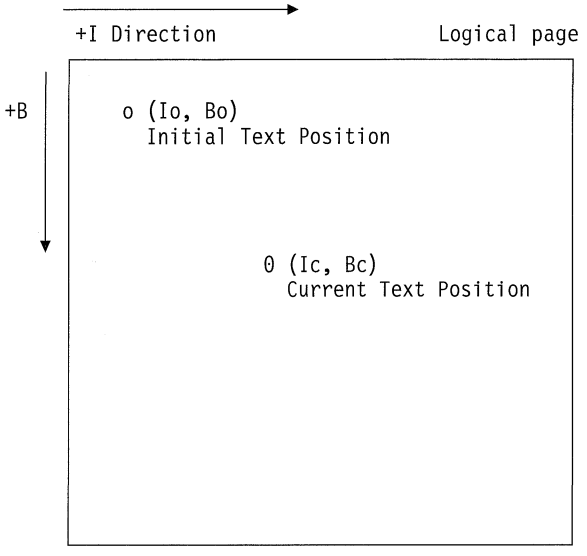


Figure E-6. I,B Coordinate System on the Logical Page

Processing IPDS Commands

The structured field format of IPDS allows commands to be sent to the printer in a continuous stream. Each command is self-describing. The command length, identifier, flag byte, and data (not always present) are all part of each command. The printer-host conversation is carried on as if IPDS commands were processed in sequential order by the printer.

Every IPDS command contains a flag byte. The setting on the acknowledgement-required bit on this flag byte indicates the end of a command sequence to the printer. The printer then sends an acknowledge reply to the host, as illustrated in the following diagram:

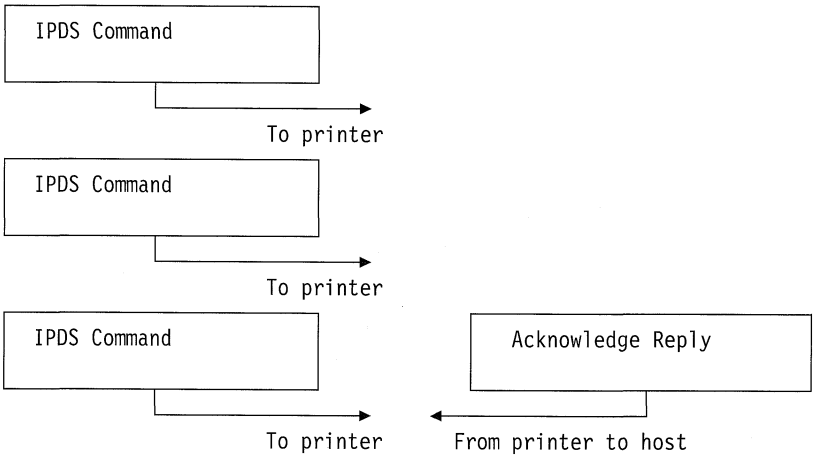


Figure E-7. Example of IPDS Command Processing

The IPDS Command Format

All IPDS commands are encoded in the following format:

Length	Command	Flag	CID	Data

Length A 2-byte field that specifies the length of the command. This count includes itself, the command field, the flag byte and the optional correlation ID (CID), and data fields. The length field can range from X'0005' to X'7FFF'.

Command A 2-byte field that specifies the IPDS command.

Flag A 1-byte field that contains the IPDS command stream flags.

- Bit 0 is the acknowledgement required (ARQ) flag. If this bit is on, the host requests the printer to send an acknowledge reply.
- Bit 1 is the correlation ID (CID) flag. If it is on, a 2-byte correlation ID follows. If it is off, the CID is not present and the following bytes (if any) contain the data field.

CID (correlation ID) A 2-byte field that specifies an identifier for the command. A presentation services program can use any value between X'0000' and X'FFFF' for the correlation ID.

Data Not present for all commands. If present, it contains specific orders, parameters, and data appropriate for the given command.

IPDS Operating States

IPDS commands are defined within the context of printer operating states. The printer moves between these operating states during command processing. IPDS printers are *state machines* with the following operating states:

- Home state
- Block state
  - IO image block state
  - IM image block state

  - Graphics block state
  - Bar code block state.
- Page state
- Overlay state
- Page segment state
- Font state
- Any-state

Home state

The initial IPDS operating state. The printer returns to home state at the end of each downloaded page, page segment, coded font, or overlay.

While in home state, the printer receives control and initialization commands to prepare for the print operation. In home state, the printer can also receive commands that delete resources or request the return of printer information to the host presentation services program.

Block states

State for establishing the initial processing conditions for a block of data and placing the block of data on the logical page, page segment or overlay. The printer can only enter a block state from page, page segment, or overlay states.

Page state

The operating state for printing a logical page. The printer enters page state from home state on receiving a Begin Page command and exits on receiving an End Page command.

In page state, the printer can receive commands that merge previously defined and loaded overlays and page segments with the current page information. The printer can also receive Write Text commands that position text on the logical page and can enter a block state to write image, bar code, and graphics blocks.

Overlay state

State that allows overlay data to be stored in the printer. The printer enters overlay state from home state on receiving a Begin Overlay command and exits on receiving an End Page command.

In overlay state, the printer can receive commands that merge previously defined and loaded overlays and page segments with the current page information. The printer can also receive Write Text commands that position text on the logical page and can enter a block state to write image, bar code, and graphics blocks.

Page segment state

State that allows page segment data to be stored in the printer. The printer enters page segment state from home state on receiving a Begin Page Segment command and exits on an End Page command.

In page segment state, the printer can receive Write Text commands that position text on the logical page and can enter a block state to write image, bar code, and graphics blocks.

Font state State that allows the printer to receive downloaded coded-font data. The printer enters font state from home state on receiving a Load Font Control command.

While the printer is in font state, the Load Font command can send coded-font, character-raster pattern data to the printer. Receipt of an End command returns the printer to home state.

Any-state Some IPDS commands can be received in any IPDS operating state. These commands do not change the IPDS operating state, with the exception of XOA Discard Buffered Data.

Default Handling

Defaults are values used as control parameters when no other values are specified in the current command. IPDS defaults are invoked through omission or through values transmitted in the data field portion of commands. The IPDS default structure is normally hierarchical. General IPDS default rules are:

- If power has been interrupted or if the printer has been initialized, printer-established page default values are used until specific IPDS default values are received.
- Initial page values are established when the printer receives a Load Page Descriptor command. If no such command is received, printer-established default values remain in effect.
- Initial data block values are established when the printer receives either a Write Image Control, Write Image Control 2, Write Bar Code Control, or Write Graphics Control command. These values remain in effect until data controls override them or until the printer receives an End command that ends the block.

Mixed Object: Document Content Architecture (MO:DCA)

The ability to print documents with consistent output, independent of either operating system or printer, is extremely important to the user of printed data. In order to help achieve this goal, IBM has defined a single object-oriented data stream—**Mixed Object Document Content Architecture (MO:DCA)**. (An object is a collection of data that can be treated as a unit.) This architecture has been developed in order to meet several objectives:

- The requirements relating to document and data sharing specified in IBM's Systems Application Architecture
- Co-existence and migration of existing IBM document architecture and printer data streams
- Device independence
- Separation of functions to simplify transformation of objects into other data streams
- National Language Support
- Office Document Architecture (ODA) support
- Standard Generalized Markup Language (SGML)

The strategic architecture for the interchange of revisable and presentation form of documents and objects used as resources is MO:DCA, which has evolved from Revisable Form Text: Document Content Architecture (RFT:DCA).

The data stream for an MO:DCA document consists of various objects, such as text, images, and graphics, as well as the logical and layout structure of the document. The logical structure defines the logical content of the document—chapters, figures, and lists. The layout structure defines the way the data should be presented.

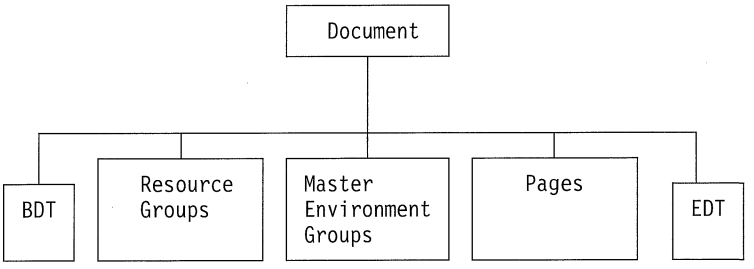


Figure E-8. MO:DCA Document Structure

BDT (Begin document)	Indicates the beginning of the document
Resource groups	Specifies fonts, overlays, and segments so that these objects can be transmitted as part of the data stream. They can be referenced by an MO:DCA Include structured field.
Master environment groups	Specifies the processing environment, such as space definitions, suppression of data, number of copies, and internal data stream references.
Pages	Contains objects that are part of the document. These objects could be text, graphics, and images.
EDT (End document)	Indicates the end of the document.

The following different types of objects make up MO:DCA. All of these objects are supported by IPDS:

- Bar Code Object Content Architecture (BCOCA)
- Image Object Content Architecture (IOCA)
- Graphics Object Content Architecture (GOCA)
- Presentation Text Object Content Architecture (PTOCA)
- Font Object Content Architecture (FOCA).

Bar Code Object Content Architecture (BCOCA)

A bar-code object could contain "draw rule" commands or raster data, depending on whether the bar code is to be drawn as a graphics object or has been scanned into the data stream as an image. A bar code object containing draw rule commands is built up using only lines of a specified length and width. A graphics object is constructed from a number of primitives, such as lines, arcs, symbols, shaded areas, and point arrays.

Image Object Content Architecture (IOCA)

IOCA represents images in device-independent format. A standard set of constructs has been defined to describe the image data, the characteristics of that data, and manipulation functions that may be performed on the data. The image content is inserted in an image segment.

Graphics Object Content Architecture (GOCA)

GOCA describes complex pictures. These pictures are formed from a collection of primitives, such as lines, arcs, characters, symbols, and shaded areas or point arrays. Each of these primitives has its own set of attributes, such as line width, orientation, and resolution. In addition to these attributes, there is a set of general drawing attributes like color, which apply to all primitives.

Presentation Text Object Content Architecture (PTOCA)

PTOCA describes the text part of a document. The presentation text object, in common with the other objects, is designed not only to be carried by, but to be an integral part of, the data stream, providing the following:

- Structured field introducer and syntax for the structured field
- Begin/end object structure
- Control of alternate action selection for error recovery
- Passing of exception conditions back to the originating process
- Initial state of the object
- Relationship of presentation text objects to other objects contained in the data stream.

Two structured fields provide the necessary presentation information to the printer:

P T descriptor structured field
: Defines several positional parameters for the object

P T data structured field
: Contains the presentation text and the control sequences for positioning graphic characters. These graphic characters are defined within the coded fonts.

Font Object Content Architecture (FOCA)

In order to achieve uniform document presentation output, it is essential that font resources be consistently defined and implemented. These resources must be identified by means of a constant, unvarying set of parameters.

FOCA makes it possible to achieve the required degree of consistency by defining:

- A common font and character definition model that can be used by all products and architectures as the basis for font applications
- A composite set of parameters specific to a font resource and references to that resource
- A device-and-technology-independent method of defining font measurements
- The specification of formats for conveying font information to suit the application

FOCA defines the parameter content of:

- IBM font resources
- References to the font resources

- Information accessed by the font resources

American National Standard Code for Information Interchange (ASCII)

There is no formal structure controlling the use of the ASCII data stream to control printers attached to systems providing ASCII support. Control of page printers, like the IBM 3812, is exercised using page map primitives (PMPs), which are a set of commands or basic instruction set of these printers when attached in ASCII mode. ASCII data sent to a page printer is translated into PMPs. The page printer composes the page of data in its internal memory or page map. Two page orientations (portrait and landscape) as well as four print directions are supported. Complexity of the printed data is determined by the application print program, which can set the pels on explicitly in the page set, or implicitly, by instructing the printer to generate characters or vectors (lines). Fonts available for printing are stored on the printer's microcode/font diskette. Most page printers support **macros**, which are a saved list of PMP commands, avoiding the necessity for the application program to send down a string of individual commands each time a particular printed function is required.

There are five basic categories of PMP commands:

Page commands	Set overall page parameters, such as size and orientation
Cursor commands	Move the cursor on the page map
Font commands	Manage fonts within the page printer
Generation commands	Create pels on the page map
Macro commands	Allow strings of other commands to be saved for later processing.

Printing capabilities and functions in ASCII attach mode are governed by individual application programs that are written to suit the capabilities of specific printers (or printers that provide an emulation of that printer). There is no architectural data stream standard to which ASCII printers can conform in the interests of uniformity. ASCII printing applications are therefore totally printer dependent.

In AS/400 printing, ASCII support is provided by translating native EBCDIC characters to the ASCII equivalents.

PostScript

PostScript is not a data stream but rather a page description language developed by Adobe Systems Incorporated and used to prepare page layouts for printing. This involves not only text with typesetting information on sizes and fonts, but graphics and scanned images as well. An example is Aldus Pagemaker**, which produces PostScript for downloading to the IBM personal pageprinter adapter. This adapter contains the PostScript Interpreter developed for IBM by Adobe Systems Incorporated. The Interpreter produces the video image for the IBM Personal Pageprinter 4216 Model 20, 4019, or 4029 with the postscript feature.

The following licensed programs produce PostScript output:

- IBM Personal Publishing System
- IBM Interleaf Publishing Series

- Document Composition Facility (DCF) Release 3.2
- Image Handling Facility (IHF) Release 1.2.

There is currently no support for PostScript on the AS/400 system.

Appendix F. Double-Byte Character Set Support

This appendix contains information that you need if you use double-byte characters. This includes the following topics:

- Double-byte character set (DBCS) fundamentals
- Processing double-byte characters
- Device file support
- Printer support
- Spooling support

Other DBCS device file support and conversion information can be found in the *Data Management Guide*.

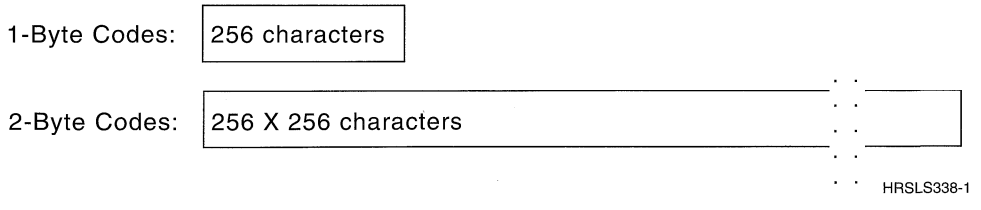
Double-Byte Character Set Fundamentals

Some languages, such as Chinese, Japanese, and Korean, have a writing scheme that uses many different characters that cannot be represented with single-byte codes. To create coded character sets for such languages, the system uses 2 bytes to represent each character. Characters that are encoded in 2-byte code are called double-byte characters. **A double-byte character set** (DBCS) is a set of characters in which each character is represented by 2 bytes.

The following example shows alphanumeric characters coded in a single-byte code scheme and double-byte characters coded in a double-byte code scheme.

1-Byte Code (SBCS)			2-Byte Code (DBCS)		
A	——	X'C1'	Ａ	——	X'42C1'
B	——	X'C2'	Ｂ	——	X'42C2'
1	——	X'F1'	１	——	X'42F1'
2	——	X'F2'	２	——	X'42F2'
			あ	——	X'4481'
			美	——	X'457D' (Japanese)
			ゔ	——	X'8877' (Japanese)
			橋	——	X'525F' (Korean)
			进	——	X'4F99' (Simplified Chinese)
			進	——	X'5B70' (Traditional Chinese)

X'hhhh' indicates that the code has the hexadecimal value, "hhhh".



You can use double-byte characters as well as single-byte characters in one application. For instance, you may want to store double-byte data and single-byte data in your database, create your display screens with double-byte text and fields, or print reports with double-byte characters.

DBCS Code Scheme

IBM supports two DBCS code schemes: one for the host system, the other for personal computers. The IBM-host code scheme has the following code-range characteristics:

First byte	hex 41 to hex FE
Second byte	hex 41 to hex FE
Double-byte blank	hex 4040

In the following figure, using the first byte as the vertical axis and the second byte as the horizontal axis, 256 x 256 intersections (code points) are expressed. The lower-right code area is designated as the valid double-byte code area and X is assigned to the double-byte blank.

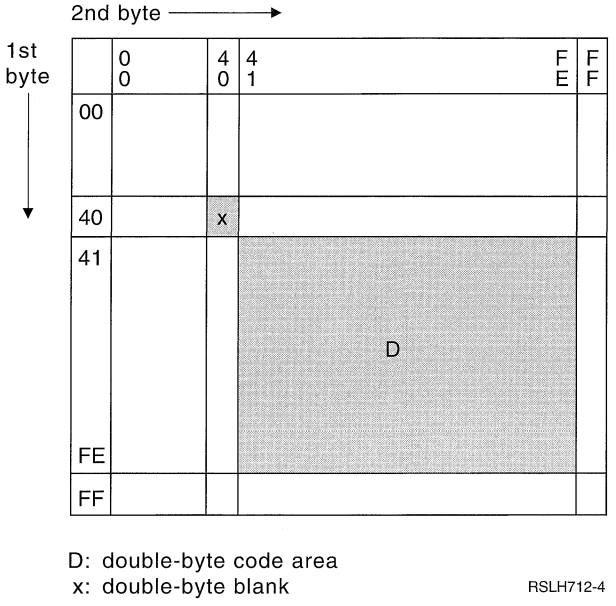


Figure F-1. IBM-Host Code Scheme

By assigning the values hex 41 to hex FE in the first and second bytes as the DBCS character codes, the codes can be grouped in wards with 192 code points in each ward. For example, the code group with the first byte starting with hex 42 is called *ward 42*. Ward 42 has the same alphanumeric characters as those in a corresponding single-byte EBCDIC code page, but with double-byte codes. For example, the character *A* is represented in single-byte EBCDIC code as hex C1 and in IBM-host code as hex 42C1.

The AS/400 system supports the following double-byte character sets:

- IBM Japanese Character Set
- IBM Korean Character Set
- IBM Simplified Chinese Character Set
- IBM Traditional Chinese Character Set

The following tables show the code ranges for each character set and the number of characters supported in each character set.

Table F-1. IBM Japanese Character Set

Wards	Content	Number of Characters
40	Space in 4040	1
41 to 44	Non-Kanji characters • Greek, Russian, Roman numeric (Ward 41) • Alphanumeric and related symbols (Ward 42) • Katakana, Hiragana, and special symbols (Ward 43-44)	549
45 to 55	Basic Kanji characters	3226
56 to 68	Extended Kanji characters	3487
69 to 7F	User-defined characters	Up to 4370
80 to FE	Reserved	
Total number of IBM-defined characters: 7263		

Table F-2. IBM Korean Character Set

Wards	Content	Number of Characters
40	Space in 4040	1
41 to 46	Non-Hangeul/Hanja characters (Latin alphabet, Greek, Roman, Japanese Kana, numeric, special symbols)	939
47 to 4F	Reserved	
50 to 6C	Hanja characters	5265
6D to 83	Reserved	
84 to D3	Hangeul characters (Jamo included)	2672
D4 to DD	User-defined characters	Up to 1880
DE to FE	Reserved	
Total number of IBM-defined characters: 8877		

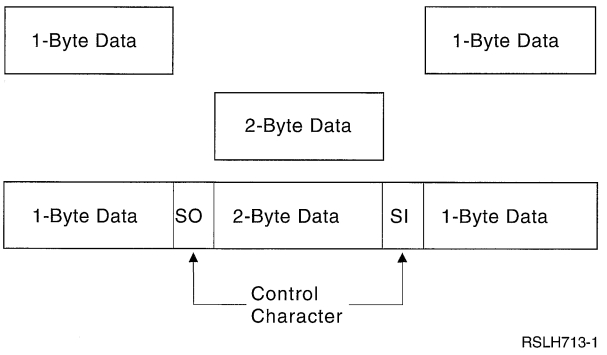
Table F-3. IBM Simplified Chinese Character Set		
Wards	**Content**	**Number of Characters**
40	Space in 4040	1
41 to 47	Non-Chinese characters (Latin alphabet, Greek, Russian, Japanese Kana, numeric, special symbols)	712
48 to 6F	Chinese characters: Level 1 and Level 2	3755 and 3008
70 to 75	Reserved	
76 to 7F	User-defined characters	Up to 1880
80 to FE	Reserved	
Total number of IBM-defined characters: 7476		

Table F-4. IBM Traditional Chinese Character Set		
Wards	**Content**	**Number of Characters**
40	Space in 4040	1
41 to 46	Non-Chinese characters (Latin alphabet, Greek, Roman, Japanese Kana, numeric, special symbols)	674
47 to 4B	Reserved	
4C to 68	Primary Chinese characters	5401
69 to 91	Secondary Chinese characters	7652
92 to CF	Reserved	
D0 to DD	User-defined characters	Up to 2632
DE to FE	Reserved	
Total number of IBM-defined characters: 13728		

This code scheme applies to the AS/400 system, System/36, and System/38, as well as the System/370* system. A different DBCS code scheme, called the IBM Personal Computer DBCS code scheme, is used on the Personal System/55. For details of the IBM Personal Computer DBCS code scheme, refer to IBM PS/55 publications.

Shift-Control Characters

When the IBM-host code scheme is used, the system sometimes uses shift-control characters to identify the beginning and end of a string of double-byte characters. The shift-out (SO) character, hex 0E, indicates the beginning of a double-byte character string. The shift-in (SI) character, hex 0F, indicates the end of a double-byte character string.



Each shift-control character occupies the same amount of space as one alphanumeric character. By contrast, double-byte characters occupy the same amount of space as two alphanumeric characters.

Printer files created with DEVTYPE(*AFPDS) do not have to use SO and SI. Instead the user may change to a DBCS font. The IPDS printer recognizes that the font is DBCS, and processes the user data accordingly.

Invalid Double-Byte Code and Undefined Double-Byte Code

Invalid double-byte code has a double-byte code value that is not in the valid double-byte code range. Figure F-1 on page F-2 shows valid double-byte code ranges. This is in contrast to undefined double-byte code where the double-byte code is valid, but no graphic symbol has been defined for the code.

Using Double-Byte Data

This section tells you where you can use double-byte data and discusses the limitations to its use.

Where You Can Use

You can use double-byte data in the following ways:

- As data in files:
  - Data in database files.
  - Data entered in input-capable and data displayed in output-capable fields of display files.
  - Data printed in output-capable fields in printer files.
  - Data used as literals in display files and printer files.
- As the text of messages.
- As the text of object descriptions.
- As literals and constants, and as data to be processed by high-level language programs.

Double-byte data can be displayed only at DBCS display stations and printed only on DBCS printers. Double-byte data can be written onto diskettes and tape, as well as onto disk storage.

Where You Cannot Use

You cannot use double-byte data in the following ways:

- As AS/400 object names.
- As command names or variable names in control language (CL) and other high-level languages.
- As displayed or printed output on alphanumeric work stations.

Double-Byte Character Size

When displayed or printed, double-byte characters are twice as wide as alphanumeric characters.

Consider the width of double-byte characters when you calculate the length of a double-byte data field because field lengths are usually identified as the number of alphanumeric character positions used. For more information on calculating the length of fields containing double-byte data, refer to the *DDS Reference*.

Processing Double-Byte Characters

Due to the large number of double-byte characters, the system needs more information to identify each double-byte character than is needed to identify each alphanumeric character.

There are two types of double-byte characters: basic and extended. These characters are usually processed by the device on which the characters are displayed or printed.

Note: This does not apply to IPDS printers that support DBCS data. For IPDS printers, all characters printed are downloaded from the AS/400 system.

Basic Characters

A DBCS device can process basic double-byte characters without any assistance from the system. The device knows about the graphic characters because they are stored in the device. The number of double-byte characters that are stored in the device varies with the language supported and the storage size of the device. A DBCS device can display or print basic characters without using the extended character processing function of the operating system.

Extended Characters

When processing extended characters, the device requires the assistance of the system. The system must tell the device what the character looks like before the device can display or print the character. Extended characters are stored in a DBCS font table, not in the DBCS device. When displaying or printing extended characters, the device receives them from the DBCS font table under control of the operating system.

Extended character processing is a function of the operating system that is required to make characters stored in a DBCS font table available to a DBCS device.

To request extended character processing, specify the double-byte extended character parameter, IGCEXNCHR(*YES), on the file creation command when you create a display (CRTDSPF command) or printer file (CRTPRTF command) that processes double-byte data. Because IGCEXNCHR(*YES) is the default value, the

system automatically processes extended characters unless you instruct it otherwise. You can change this file attribute by using a change file (CHGDSPF or CHGPRTF) or override file (OVRDSPF or OVRPRTF) command. For example, to override the display file DBCSDSPF so that extended characters are processed, enter:

```
OVRDSPF DSPF(DBCSDSPF) IGCEXNCHR(*YES)
```

Notes:

1. The system ignores the IGCEXNCHR parameter when processing alphanumeric files.
2. When you use the Japanese 5583 Printer to print extended characters, you must use the Kanji print function of the Advanced DBCS Printer Support licensed program. Refer to *AS/400 Utilities: Kanji Print Function User's Guide and Reference*, SH18-2179, for how to use this utility.

What Happens When Extended Characters Are Not Processed

When extended characters are not processed:

- Basic double-byte characters are displayed and printed.
- On displays, the system displays the undefined character where it would otherwise display extended characters.
- On printed output, the system prints the undefined character where it would otherwise print extended characters.
- The extended characters, though not displayed or printed, are stored correctly in the system.

Device File Support

The following sections describe DBCS device files and special considerations for working with DBCS device files. Data description specifications (DDS), a language used to describe files, can be used with DBCS device files. For information about using DDS, refer to the *DDS Reference* manual.

What a DBCS File Is

A *DBCS file* is a file that contains double-byte data or is used to process double-byte data. Other files are called *alphanumeric files*.

The following types of device files can be DBCS files:

- Display
- Printer
- Tape
- Diskette
- ICF

When to Indicate a DBCS File

You should indicate that a file is DBCS in any of the following situations:

- The file receives input, or displays or prints output, that has double-byte characters.
- The file contains double-byte literals.

- The file has double-byte literals in the DDS that are used in the file at processing time (such as constant fields and error messages).
- The DDS of the file includes DBCS keywords. See the *DDS Reference* for information on these keywords.
- The file stores double-byte data (database files).

How to Indicate a DBCS File

You must indicate that a device file is a DBCS file in order for the system to process double-byte data properly. You can do this in one of the following ways:

- Through DDS
  - DDS provides fields of the following data types.
    - DBCS-Only Field (Type J)

      DBCS-only fields display and accept only double-byte characters. Double-byte characters are always enclosed in shift-out and shift-in characters that have to be paired.

    - Open Field (Type O)

      Open fields display and accept both single-byte and double-byte characters. Double-byte characters are enclosed in shift-out and shift-in characters that have to be paired.

    - Either Field (Type E)

      Either fields display and accept *either* single-byte or double-byte characters, but not *both*. Double-byte characters are enclosed in shift-out and shift-in character pairs.

    - Graphic Field (Type G)

      Graphic fields display and accept only double-byte characters. The double byte characters are *not* enclosed in shift-out and shift-in pairs.
  - In printer files, by defining fields with DBCS-graphic data type (Type G).
  - In printer and ICF files, by defining fields with DBCS open data type (type O).
  - In display files, by defining fields with DBCS-only data type (type J), either data type (type E), or open data type (type O).
  - By using a double-byte literal that is used with the file at processing time, such as literals specified with the Default (DFT) and Error Message (ERRMSG) DDS keywords.

    Note: You may also use double-byte literals as text and comments in a file, such as with the DDS keyword TEXT. However, the system does not consider a file, whose only DBCS attribute is that it has double-byte comments, to be a DBCS file.
  - By specifying the Alternative Data Type (IGCALTTYP) DDS keyword in display and printer files. This keyword lets you use display and printer files with both alphanumeric and double-byte applications. When you put the IGCALTTYP keyword into effect, you can use double-byte data with the file.

    Put the IGCALTTYP keyword into effect by creating, changing, or overriding display and printer files with the IGCDTA(*YES) value. You can put the

IGCALTTYP keyword into effect for display and printer files by specifying IGCDTA(*YES) on the following device file commands:

- Create Display File (CRTDSPF)
- Create Printer File (CRTPRTF)
- Change Display File (CHGDSPF)
- Change Printer File (CHGPRTF)
- Override with Display File (OVRDSPF)
- Override with Printer File (OVRPRTF)

When you specify IGCDTA(*NO), the IGCALTTYP keyword is not in effect and you can use only alphanumeric data with the file. Changing or overriding the file to put the IGCALTTYP keyword into effect does not change the DDS of the file.

Except when using the IGCALTTYP function, you do not need to specify IGCDTA(*YES) on the file creation command if you have already specified DBCS functions in the DDS. Instead, specify IGCDTA(*YES) when the file has DBCS functions that are not indicated in the DDS. For example, specify IGCDTA(*YES) on the file creation command if the file is intended to contain double-byte data.

- By specifying IGCDTA(*YES) on the following device file creation commands:
  - Create Diskette File (CRTDKTF)
  - Create Display File (CRTDSPF)
  - Create Printer File (CRTPRTF)
  - Create Tape File (CRTTAPF)
- By specifying IGCDTA(*YES) on the following database file creation commands:
  - Create Physical File (CRTPF)
  - Create Source Physical File (CRTSRCPF)

Note: DBCS-graphic data type fields are supported for externally-described (DDS) printer files only. For program-described printer files, the application program must enclose the DBCS-graphic data type fields with the appropriate shift-out and shift-in characters.

Improperly Indicated DBCS Files

If you do not properly indicate that a file is a DBCS file, one of the following happens:

- For printer files, printer data management assumes the output data to the printer does not contain double-byte data. The end result depends on the type of printer the data is printed on and the status of the replace unprintable character parameter for the printer file you are using.

  If the replace-unprintable-character option is selected, printer data management interprets shift-control characters as unprintable characters and replaces them with blanks. The double-byte data itself is interpreted as alphanumeric data, and the printer attempts to print it as such. The printed double-byte data does not make sense.

  If the replace-unprintable-character option is not selected and the printer is an alphanumeric printer, the double-byte data, including the control characters, is sent as-is to the printer. On most alphanumeric printers, the shift-control characters are not supported, and an error occurs at the printer.

If the replace-unprintable-character option is not selected and the printer is a DBCS printer, the double-byte data is printed with the exception of extended characters. Because the file was not indicated as a DBCS file, the system does not perform extended character processing. The extended characters are printed with the symbol for undefined double-byte characters.

- For display files, display data management assumes that the output data to the display does not contain double-byte data. The end result depends on whether the display is an alphanumeric or DBCS display.

  If the display is an alphanumeric display, the double-byte data is interpreted as alphanumeric data. The shift-control characters appear as blanks. The displayed double-byte data does not make sense.

  If the display is a DBCS display, the double-byte data is displayed with the exception of extended characters. The system does not perform extended character processing on the data. Therefore, extended characters are displayed with the symbol for undefined double-byte characters.

- The system does not recognize literals with DBCS text as double-byte literals if the source file is not specified as a DBCS file.

Making Printer Files Capable of DBCS

In many cases, printer files are used by the system to produce data that will eventually be printed or displayed. In these cases, the data is first placed into a spooled file using one of the IBM-supplied printer files. The data is then taken from the spooled file and is displayed or printed based on the request of the user.

When the data involved contains double-byte characters, the printer file that is used to place the data into the spooled file must be capable of processing double-byte data. A printer file is capable of processing double-byte data when *YES is specified on the IGCDTA parameter for the file. In most cases, the system recognizes the occurrence of double-byte data and takes appropriate measures to ensure the printer file that is used is capable of processing double-byte data.

In some cases, however, the system cannot recognize the occurrence of double-byte data and may attempt to use a printer file that is not capable of processing double-byte data. If this occurs, the output at the display or printer may not be readable. This can happen when object descriptions containing double-byte characters are to be displayed or printed on an alphanumeric device.

To ensure that you receive correct results when you display or print double-byte characters, some recommendations should be followed. Action is required on your part if you have a single-byte national language installed as a secondary language. Printer files that are received as part of the DBCS version of a product are always capable of processing DBCS data.

The following recommended actions should be performed after the product or feature has been installed:

1. If all printers and display devices attached to your system are DBCS-capable, you can enable all printer files for double-byte data. For IBM-supplied printer files that are received as part of a single-byte secondary language feature, you can enable all printer files by issuing the following command:

   ```
   CHGPRTF FILE(*ALL/*ALL) IGCDTA(*YES)
   ```

After this command has been completed, all printer files in all libraries will be enabled for double-byte data. The change will be a permanent change.

2. If all printer and display devices attached to your system are not DBCS-capable, it is recommended that you do not enable all IBM-supplied printer files.

   Instead, use the library search capabilities of the system to control which printer files will be used for any particular job. When the potential exists that double-byte data will be encountered, the library list for the job should be such that the printer files that are DBCS-enabled will be found first in the library list. Conversely, if only single-byte data is expected to be encountered, the library list should be set up so the printer files that are not enabled for DBCS will be found first. In this way, the printer file capabilities will match the type of data that will be processed. The decision as to what type of printer file to use is made on the basis of what type of data will be processed. The device that will be used to actually display or print the data may also influence this decision.

   In some cases it may be desirable to make the printer file only temporarily DBCS-capable instead of making a permanent change. For a specific job, you can make this temporary change by using the OVRPRTF command.

   To temporarily enable a specific printer file, you can use the following command:

   ```
   OVRPRTF FILE(filename) IGCDTA(*YES)
   ```

   where `filename` is the name of the printer file you want to enable.

Printer Support

You should be familiar with both the "Device File Support" on page F-7 and DDS for DBCS printer files before reading this section.

Special DBCS Printer Functions

The DBCS printers offer the following functions:

- Character rotation
- Character expansion
- Condensed printing
- Shift-control character printing

Character Rotation

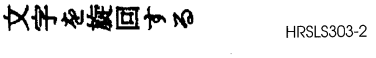
The DBCS printers can rotate double-byte characters 90 degrees counterclockwise before printing so that the printed output can be read vertically.

For example, the character rotation function takes characters as shown:

文字を旋回する

HRSLS302-2

and rotates them so that you can read the printed characters vertically:



HRSLS303-2

Specify character rotation with the IGCCHRRTT parameter on the Create Printer File (CRTPRTF), Change Printer File (CHGPRTF), and Override with Printer File (OVRPRTF) commands, or with the IGCCHRRTT keyword in the DDS for the file you are printing. This function rotates only double-byte characters. It does not rotate alphanumeric characters.

Character Expansion (SCS DBCS Printers Only)

The DBCS printers can expand characters to twice their normal width or their normal height. Specify the character expansion with the DDS character size (CHRSIZ) keyword. For example, if you specify the value CHRSIZ(2 1), the following characters:

文字を横倍角にする HRSLS304-2

are printed twice as wide, but the height remains the same.

文字を横倍角にする HRSLS305-2

To print twice as wide and twice as high, you would specify CHRSIZE (2 2).

Condensed Printing (SCS DBCS Printers Only)

The DBCS printers can print 20 double-byte characters per 3 inches so that more double-byte characters fit on a printed line. For example, the following characters shown:

文 字 の 密 度 を 変 更 す る HRSLS306-2

when condensed, are printed as:

文字の密度を変更する HRSLS307-2

Specify condensed character printing with the IGCCPI parameter on the CRTPRTF, CHGPRTF, and OVRPRTF commands.

Defining a Line (SCS DBCS Printers Only)

The record-level define line (DFNLIN) keyword in DDS can be used to draw a horizontal or vertical line (also known as a grid line). A horizontal line is drawn at the bottom of the character spaces. A vertical line is drawn on the left edge of the character spaces. You can draw horizontal lines and vertical lines to form boxes on the printed output.

The DFNLIN keyword is valid for SCS printers.

The maximum number of lines that can be printed at one time is 200. The maximum number of active vertical lines (vertical lines currently being printed on the page) is 150. More than 200 DFNLIN keywords may be used per page if all the define lines from the previous records have been printed.

Output considerations at run time:

- Spacing and skipping are processed before the DFNLIN keyword. If you space or skip past the start of a line, that line will be truncated (or not printed if the end of the line is passed also).
- A horizontal line cannot extend over a page boundary. A horizontal or vertical line cannot be started over a page boundary.
- The start line value specified on the DFNLIN keyword cannot be larger than the page length value specified on the PAGESIZE parameter on the printer.
- The start position value specified on the DFNLIN keyword cannot be larger than the page width value specified on the PAGESIZE parameter.
- The sum of the length and the start line value for a vertical line (specified on the DFNLIN keyword) cannot be larger than the page length specified on the PAGESIZE parameter.
- The sum of the length and the start position value for a horizontal line (specified on the DFNLIN keyword) cannot be larger than the page width specified on the PAGESIZE parameter.

A diagnostic message is sent whenever the PAGESIZE and DFNLIN values together cannot correctly process a request.

The following is an example of using DFNLIN to produce lines in a table:

社員番号	氏　名
010001	山田一郎
010002	日本一郎

HRSLS308-2

Shift-Control Character Printing

The DBCS printers can print shift-control characters in one of the following ways:

- Suppress the shift-control characters so that these characters do not occupy any space on printed output.
- Print one blank in the space occupied by each shift-control character.
- Print two blanks in the space occupied by the shift-in character and suppress the shift-out character.

Specify how to print shift-control characters on the DBCS printers with the IGCSOSI parameter on the CRTPRTF, CHGPRTF, and OVRPRTF commands.

For data printed using the DBCS-graphic data type with an externally described printer file, shift-out/shift-in processing is not used. Instead, the shift control characters added to the DBCS data do not occupy any space on the printed output.

Double-Byte Character Printing Considerations

When you print double-byte data, consider the following:

- Extended character printing
- Condensed printing
- Unprintable double-byte characters
- Double-byte characters in an alphanumeric field
- Spanned lines
- Spanned pages
- Use of the Print key
- End-of-forms on the 5553 Printer
- Double-byte characters printed on alphanumeric printers

Extended Character Printing

Specify extended character processing to make sure that extended characters are processed. Otherwise, the system prints only basic double-byte characters. See "Processing Double-Byte Characters" on page F-6 for instructions on specifying extended character processing and for information on the effects of such processing.

Condensed Printing

When specifying condensed printing on DBCS printers (by specifying IGCCPI(*CONDENSED) on the CRTPRTF, CHGPRTF, or OVRPRTF command), consider the following:

- Specify the page width in alphanumeric print positions with the CPI parameter. Although the record to be printed may contain 88 double-byte characters (which would use 176 print positions in normal printing) and the page width is 132 print positions, the double-byte data should print properly in condensed mode.
- For program-described printer files, data might not be printed in the proper position on the page. The system does not perform boundary alignment for alphanumeric data in printed records. When double-byte and alphanumeric data are printed on the same line, the printer begins printing alphanumeric data in the first space following the double-byte data. As a result, characters might not be printed on the proper position on the page.
- For DDS files, the printer begins printing alphanumeric data in the first position following the double-byte data, when double-byte and alphanumeric characters are mixed in a field defined with data type O (double-byte-capable). As a result, data might not be printed on the proper position on the page. This situation does not arise when the field contains only double-byte data or when alphanumeric data is printed in a field defined with an alphanumeric data type.

Selecting the Appropriate Page Width

Page width is specified as the second value of the PAGESIZE parameter on the CRTPRTF, CHGPRTF, or OVRPRTF commands. The correct page width depends on the printer being used and the characters per inch (CPI) specified for the printer file.

When describing printer files used with printers configured as a 5553 Printer, select a page size in the range based on characters per inch:

CPI	Page-Width Range
10	1 through 136
12	1 through 163

13.3	1 through 181
15	1 through 204
18	1 through 244
20	1 through 272

Choose one of the following (depending on the CPI selected) when describing printer files used with printers configured as a 5583 Printer:

CPI	Page-Width Range
10	1 through 132
12	1 through 158
13.3	1 through 176
15	1 through 198
18	1 through 236
20	1 through 264

Unprintable Double-Byte Characters

A double-byte character is considered unprintable if its double-byte code is not in the valid range or if its double-byte code is valid but does not have a character image defined.

You can specify that the system replace unprintable double-byte characters by specifying the replace unprintable character parameter (RPLUNPRT(*YES)) on the CRTPRTF, CHGPRTF, or OVRPRTF command, but you cannot choose the replacement character.

Although you cannot choose the replacement character for unprintable double-byte characters, you can choose the replacement character for unprintable alphanumeric characters. To improve system performance, select a blank ( ) as the replacement character for unprintable alphanumeric characters.

When the system finds an unprintable double-byte character during printing, the following happens:

- If you specify RPLUNPRT(*YES), the system does not send a message when it finds unprintable characters. Instead, the system prints unprintable extended characters as either the double-byte underline (__) when you specify extended character processing, or as an undefined character when you do not specify extended character processing.

  For Japanese printers, the default symbol used is: 

  For Chinese and Korean printers, the default symbol used is the underscore.

  The system prints unprintable basic double-byte characters as double-byte blanks.

- If you specify RPLUNPRT(*NO), the system sends an inquiry message when it finds unprintable characters. You have the following options:
  - Hold the spooled file.
  - Continue printing where the unprintable character was encountered. If you continue printing, the system sends the inquiry message that you just received. It is sent each time the system finds an unprintable character, regardless of your response to the first message.

- Continue printing by specifying a page number where printing should continue. When the system finds subsequent unprintable characters, it processes the characters as if the file were specified with RPLUNPRT(*YES). See the item in this list about RPLUNPRT(*YES) for a description of how the system processes these characters.

If the system finds invalid double-byte code, it stops processing double-byte extended characters and prints them as the undefined character.

Double-Byte Data in an Alphanumeric Field

If you try to print double-byte data in a field that is described in DDS as alphanumeric, the system interprets the data as alphanumeric. What happens depends on whether the printer being used is an alphanumeric or DBCS printer, and on the status of the replace-unprintable-characters option. This condition is a special case described under "Improperly Indicated DBCS Files" on page F-9.

Spanned Lines

If a printed line of double-byte data exceeds its specified page width (line length), the system tries to continue printing the data. To do this, the system ignores the FOLD parameter on the CRTPRTF, CHGPRTF, and OVRPRTF commands. As a result, the system might not print the double-byte data as you expected and the following occurs:

- If a record to be printed exceeds the page width, the printer **wraps** the data (continues printing the record on the next line). Because the system is not aware that the data is wrapped, the system does not skip lines and start new pages properly. A new page might start in the middle of a record.
- The printer does not split double-byte characters when there is not enough room at the end of a line and a field of double-byte data is continued on a second printed line, even if you specified the CHRSIZ keyword. Instead, the system leaves a blank space on the first line where the character would have been printed and continues printing the complete character on the next line.

Spanned Pages (SCS DBCS Printers Only)

If data from a printed DBCS field spans to a second page, the system inserts a shift-in character at the beginning of each printed page of double-byte data, shifting the data out of DBCS mode. The printed data that follows does not make sense unless the data on the second page begins with a shift-out character.

To avoid this problem, break double-byte data fields that might span pages into several smaller fields.

Using the Print Key

If you want to print a display containing double-byte data by pressing the Print key, make sure that the associated display file or printer file is a DBCS file. If neither is a DBCS file, the display will not print properly.

One way to make sure that either the display or printer file is a DBCS file is to override the file using the OVRDSPF or the OVRPRTF command. For example, to override the system-supplied default printer file (the printer file used to print displays that are printed by pressing the Print key), enter:

```
OVRPRTF FILE(QSYSPRT) IGCDTA(*YES)
```

Notes:

1. If you do not plan to use double-byte data, do not change the printer file QSYSPRT to a DBCS file with a CHGPRTF command. This printer file is used to print a variety of system data, including alphanumeric data. A system performance degradation results if QSYSPRT is a DBCS file and it is processing only alphanumeric data.
2. If the Print key is used to print the image of a display containing DBCS-graphic data type fields, the system inserts shift-out and shift-in (SO/SI) characters around the graphic data. Depending on the IGCSOSI printer file value, the SO/SI characters could print as blanks, causing the printed alignment to be different from what was displayed.

Refer to the *Data Management Guide* for more information on overrides.

5553 Printer End-of-Forms

If you send the ignore (I) reply to the end-of-forms message that you receive when using continuous forms on the 5553 Printer, and if the printer has already printed within 2-1/2 inches of the bottom of the page, the system might not start printing subsequent pages where expected.

To avoid this problem, do the following when you receive the end-of-forms message:

1. Remove the current form from the tractor feed.
2. Insert new forms.
3. Align the first form to the first line.
4. Press the CANCEL button on the printer.
5. Press the SELECT button on the printer.
6. Respond to the end-of-forms message:
   a. For spooled files, specify the page on which you want to continue printing when you enter a response to the message. Determine which page to continue printing as follows:
      1) If no data was printed on the last 2-1/2 inches of the last form, enter the number of the next page to be printed.
      2) If data was printed on the last 2-1/2 inches of the last form, enter the number of the last page printed. Reprinting the page ensures that all of the data is printed.

      Use the Work with Writer (WRKWTR) command to find out approximately which page was last printed. The WRKWTR command displays the number of pages that the writer has currently printed.
   b. For direct printer output, enter RETRY to reprint the last page printed. This ensures that all of the data is printed.

Effects of Printing Double-Byte Data on Alphanumeric Printers

Printing DBCS output on an alphanumeric printer can result in degradation of system performance.

In addition, the following occurs using printer files that are indicated to be DBCS-capable through DDS or with the IGCDTA parameter:

- For direct printer output, the system prints the file and sends a diagnostic message describing the situation to your program message queue.

  Instead of printing double-byte data, the system prints double-byte characters as underscores (__) and prints shift-control characters as blanks ( ). Although the system does not print the individual double-byte characters, they are correctly stored in the system.

- For spooled printer output, the system sends an inquiry message to the message queue named on the Start Printer Writer (STRPRTWTR) command. This message lets you do the following:
  - Continue printing. When you continue printing, the system prints the file but does not print double-byte characters within it. Instead, the system prints double-byte characters as underscores (__) and prints shift-control characters as blanks ( ). Although the system does not print the individual double-byte characters, they are correctly stored in the system.
  - Hold the spooled file so that you can transfer it to an output queue used only for DBCS output. See Chapter 3, "Spool Support" for instructions on transferring a spooled file.
  - Cancel printing altogether.

Spool Support

Create separate output queues for double-byte and alphanumeric data. This may improve throughput (the rate at which the system processes work) because the system can process alphanumeric data more quickly than it can process double-byte data.

See the *Work Management Guide* for detailed information about creating output queues.

Applying Overrides in Printing

When starting a job, consider adding the OVRPRTF command to the initial program of the job:

```
OVRPRTF FILE(QSYSPRT) IGCDTA(*YES)
```

Override the printer file (QSYSPRT) to make it capable of printing double-byte data and to ensure that DBCS output printed as the result of pressing the Print key is printed properly. Refer to the *Data Management Guide* for more information on overrides.

Appendix G. Feedback Area Layouts

This chapter contains general-use programming interface and associated guidance information

Tables in this section describe the open and I/O feedback areas associated with any opened printer file. The following information is presented for each item in these feedback areas:

- Offset, which is the number of bytes from the start of the feedback area to the location of each item
- Data type
- Length, which is given in number of bytes
- Contents, which is the description of the item and the valid values for it

The support provided by the high-level language you are using determines how to access this information and how the data types are represented. See your high-level language manual for more information.

Note: The tables in this appendix are relevant only to device file type of printer. For a complete description of all file types (printer, diskette, displays, tape, database, ICF, and inline) see the *Data Management Guide*.

Open Feedback Area for Printer

The **open data path** (ODP) contains information about the merged file attributes and information returned by input or output operations. The ODP only exists while the file is open.

The **open feedback area** is the part of the open data path (ODP) that contains general information about the file after it has been opened. It also contains file-specific information, depending on the file type, plus information about each device defined for the file. This information is set during open processing and may be updated as other operations are performed.

Table G-1 (Page 1 of 3). Open Feedback Area

Offset	Data Type	Length in Bytes	Contents
0	Character	2	Open data path (ODP) type: DS Printer file not being spooled, display, tape, ICF, save, or diskette file not being spooled. SP Printer or diskette file being spooled or inline data file.
2	Character	10	Name of the file being opened. If the ODP type is DS, this is the name of the device file or save file. If the ODP type is SP, this is the name of the device file or the inline data file.
12	Character	10	Name of the library containing the file.
22	Character	10	Name of the spooled file. The name of a database file containing the spooled input or output records.
32	Character	10	Name of the library in which the spooled file is located.
42	Binary	2	Spooled file number.
44	Binary	2	Maximum record length.
46	Character	2	Reserved.

Table G-1 (Page 2 of 3). Open Feedback Area

Offset	Data Type	Length in Bytes	Contents
48	Character	10	Member name: • If ODP type SP, the member name in the file named at offset 22.
58	Binary	4	Reserved.
62	Binary	4	Reserved.
66	Binary	2	File type: 1 Display 2 Printer 4 Diskette 5 Tape 9 Save 10 DDM 11 ICF 20 Inline data 21 Database
68	Character	3	Reserved.
71	Binary	2	Number of lines on a printed page.
73	Binary	2	Number of positions on a printed line.
75	Binary	4	Not applicable to printer.
79	Character	2	Not applicable to printer.
81	Character	1	Not applicable to printer.
82	Character	1	Not applicable to printer.
83	Character	10	Reserved.
93	Character	10	Reserved.
103	Binary	2	Not applicable to printer.
105	Binary	2	Maximum number of records that can be read or written in a block when using blocked record I/O.
107	Binary	2	Overflow line number.
109	Binary	2	Blocked record I/O record increment. Number of bytes that must be added to the start of each record in a block to address the next record in the block.
111	Binary	4	Reserved.
115	Character	1	Miscellaneous flags. Bit 1: Reserved. Bit 2: File shareable 0 File was not opened shareable. 1 File was opened shareable (SHARE(*YES)). Bits 3-5: Not applicable to printer. Bit 6: Field-level descriptions 0 File does not contain field-level descriptions. 1 File contains field-level descriptions. Bit 7: DBCS-capable file 0 File is not DBCS-capable. 1 File is DBCS-capable. Bit 8: Not applicable to printer.
116	Character	10	Not applicable to printer.
126	Binary	2	File open count. If the file has not been opened shareable, this field contains a 1. If the file has been opened shareable, this field contains the number of programs currently attached to this file.

Table G-1 (Page 3 of 3). Open Feedback Area

Offset	Data Type	Length in Bytes	Contents
128	Binary	2	Reserved.
130	Binary	2	Not applicable to printer.
132	Character	1	Miscellaneous flags. Bits 1-4: Not applicable to printer. Bit 5: Separate indicator area 0 Indicators are in the I/O buffer of the program. 1 Indicators are not in the I/O buffer of the program. The DDS keyword, INDARA, was used when the file was created. Bit 6: User buffers 0 System creates I/O buffers for the program. 1 User program supplies I/O buffers. Bits 7-8: Reserved.
133	Character	2	Open identifier. The value is unique for a full (not shared) open operation of a file. It allows you to match this file to an entry on the associated data queue.
135	Binary	2	The field value is the maximum record format length, including both data and file-specific information such as: first-character forms control, option indicators, response indicators, source sequence numbers, and program-to-system data. If the value is zero, then use the field at offset 44.
137	Character	9	Reserved.
146	Binary	2	Number of devices defined for this ODP. For printers this always has a value of 1.
148	Character		Device name definition list. See "Device Definition List" on page G-3 for a description of this array.

Device Definition List

The device definition list part of the open feedback area is an array structure. Each entry in the array contains information about each device or communications session attached to the file. The number of entries in this array is determined by the number at offset 146 of the open feedback area. The device definition list begins at offset 148 of the open feedback area. The offsets shown for it are from the start of the device definition list rather than the start of the open feedback area.

Table G-2 (Page 1 of 2). Device Definition List

Offset	Data Type	Length in Bytes	Contents
0	Character	10	Program device name. For printer or diskette files being spooled, the value is *N. For database files, the value is DATABASE. For save files, the value is *NONE. For ICF files, the value is the name of the program device from the ADDICFDEVE or OVRICFDEVE command. For all other files, the value is the name of the device description.
10	Character	50	Reserved.
60	Character	10	Device description name. For printer or diskette files being spooled, the value is *N. For save files, the value is *NONE. For all other files, the value is the name of the device description.

Table G-2 (Page 2 of 2). Device Definition List

Offset	Data Type	Length in Bytes	Contents
70	Character	1	Device class. hex 01 Display hex 02 Printer hex 04 Diskette hex 05 Tape hex 09 Save hex 0B ICF
71	Character	1	Device type. hex 02 5256 Printer hex 0C 5224/5225 printers hex 0F 5219 Printer hex 10 5583 Printer (DBCS) hex 11 (DBCS) 5553 Printer hex 14 3270 Printer hex 21 4234 (SCS) Printer hex 22 3812 (SCS) Printer hex 23 4214 Printer hex 24 4224 (IPDS) Printer hex 25 4245 Printer hex 29 5262 Printer hex 30 3812 (IPDS) Printer hex 31 4234 (IPDS) Printer hex 32 IPDS printer, model unknown hex 55 6252 (SCS) Printer hex 57 4230 (IPDS) Printer
72	Binary	2	Not applicable to printer.
74	Binary	2	Not applicable to printer.
76	Character	2	Not applicable to printer.
78	Character	1	Not applicable to printer.
79	Character	1	Not applicable to printer.
80	Character	50	Reserved.

I/O Feedback Area

The results of I/O operations are communicated to the program using OS/400 messages and I/O feedback information. The I/O feedback area is updated for every I/O operation unless your program is using blocked record I/O. In that case, the feedback area is updated only when a block of records written. Some of the information reflects the last record in the block. Other information, such as the count of I/O operations, reflects the number of operations on blocks of records and not the number of records. See your high-level language manual to determine if your program uses blocked record I/O.

The I/O feedback area consists of two parts: a common area and a file-dependent area. The file-dependent area varies by the file type. This guide discusses device file type of printers only.

Common I/O Feedback Area

Table G-3 (Page 1 of 2). Common I/O Feedback Area

Offset	Data Type	Length in Bytes	Contents
0	Binary	2	Offset to file-dependent feedback area.
2	Binary	4	Write operation count. Updated only when a write operation completes successfully. For blocked record I/O operations, this count is the number of blocks, not the number of records.
6	Binary	4	Read operation count. Not applicable to printers.
10	Binary	4	Write-read operation count. Not applicable to printers.
14	Binary	4	Other operation count. Number of successful operations other than write, read, or write-read. Updated only when the operation completes successfully. This count includes force-end-of-data.
18	Character	1	Reserved.
19	Character	1	Current operation. hex 05 Write or write block hex 09 Force-end-of-data
20	Character	10	Name of the record format just processed, which is either: • Specified on the I/O request, or • Determined by default or format selection processing
30	Character	2	Device class: Byte 1: hex 00 Database hex 01 Display hex 02 Printer hex 04 Diskette hex 05 Tape hex 09 Save hex 0B ICF Byte 2 (if byte 1 is 02 for printer): hex 02 5256 Printer hex 0C 5224/5225 printers hex 0F 5219 Printer hex 10 5583 Printer (DBCS) hex 11 5553 Printer (DBCS) hex 14 3270 Printer hex 21 4234 (SCS) Printer hex 22 3812 (SCS) Printer hex 23 4214 Printer hex 24 4224 (IPDS) Printer hex 25 4245 Printer hex 29 5262 Printer hex 30 3812 (IPDS) Printer hex 31 4234 (IPDS) Printer hex 32 IPDS printer, model unknown hex 55 6252 (SCS) Printer hex 57 4230 (IPDS) Printer
32	Character	10	Device name. The name of the device for which the operation just completed. Supplied only for printer, display, tape, diskette, and ICF files. For printer files being spooled, the value is *N. For printer files not being spooled, the value is the device description name.
42	Binary	4	Not applicable to printer.
46	Character	80	Reserved.
126	Binary	2	Not applicable to printer.

Table G-3 (Page 2 of 2). Common I/O Feedback Area

Offset	Data Type	Length in Bytes	Contents
128	Binary	2	For printers, the field value is the record format length, including first-character forms control, option indicators, source sequence numbers, and program-to-system data. If the value is zero, use the field at offset 42.
130	Character	2	Reserved.
132	Binary	4	Not applicable to printer.
136	Character	8	Reserved.

I/O Feedback Area for Printer Files

Table G-4. I/O Feedback Area for Printer Files

Offset	Data Type	Length in Bytes	Contents
0	Binary	2	Current line number in a page.
2	Binary	4	Current page count.
6	Character	28	Reserved.
34	Character	2	Major return code. 00 Operation completed successfully 80 Permanent system or file error 81 Permanent device error 82 Open operation failed 83 Recoverable device error occurred
36	Character	2	Minor return code.

Appendix H. Using DDS with High-Level Languages (HLL)

This appendix contains examples of DDS used with COBOL and RPG. Two different DDS are used with each programming language.

One DDS uses row/column as the positioning method for the data being acted on. The other DDS uses absolute positioning as its positioning method. When absolute positioning is used in DDS, all other objects (page segments, boxes, rotated text) must use absolute positioning.

Data Description Specifications (DDS)

Figure H-1 and Figure H-2 show the DDS source for:

- Row/column method of positioning
- Absolute method of positioning

DDS Coding Example Using the Row/column Method of Positioning

The row/column method of positioning means specifying where the data starts printing (how many rows down and how many columns in).

The following figure shows DDS coding using the row/column method of positioning.

```
000100911101                R LABEL
000200911101                  NAME          25A  O  8 10
000300911101                  ADDR1         25A  O  9 10
000400911101                  CITY          15A  O 10 10
000500911101                  STATE          2A  O 10 27
000600911101                  ZIPCD          5S 0O 10 30BARCODE(POSTNET *HRITOP)
000700911101                                    13  5'Made in the USA'
000800911101                                        TXTRTT(270)
000900911101                                        FONT(5687 (*POINTSIZE 6))
```

Figure H-1. DDS Source Using Row/Column Method of Positioning

For example, at row 10 column 30, a bar code is printed.

DDS Coding Example Using the Absolute Method of Positioning

Absolute positioning means being able to start printing at any point on a piece of paper by specifying that point.

Use of absolute positioning requires the Advanced Function Printing data stream (AFPDS). This is obtained on the AS/400 system by specifying *AFPDS on the device type (DEVTYPE) parameter of the printer file.

Inches or centimeters are the measurement methods available. You choose the measurement method by specifying *INCH or *CENT on the unit of measure (UOM) parameter of the printer file.

The following figure shows DDS coding using the absolute method of positioning.

```
000100911101               R LABEL                        PAGSEG(LOGO 1.5 1)
000200911101                                              BOX(1 1 5 4 *MEDIUM)
000300911101                                              BOX(1.5 4 2 4.5 *NARROW)
000400911101                 NAME          25A  O         POSITION(1.3 1.6)
000500911101                 ADDR1         25A  O         POSITION(1.5 1.6)
000600911101                 CITY          15A  O         POSITION(1.7 1.6)
000700911101                 STATE          2A  O         POSITION(1.7 2.7)
000800911101                 ZIPCD          5S 00         POSITION(1.7 3)
000900911101                                              BARCODE(POSTNET *HRITOP)
f01000911101                 TEXT          20A  O         TXTRTT(270)
000800911101                                              POSITION(1.9 .25)
001100911101                                              FONT(5687 (*POINTSIZE 6))
```

Figure H-2. DDS Source Using Absolute Positioning

In this example, a page segment called LOGO is specified to start printing at 1.5 units down and 1 unit in. The TEXT record (Made in the USA) is supplied by the application program. The UOM parameter value (*INCH or *CM) of the printer file determines which unit of measurement is used.

COBOL and RPG Source Code

Following are two figures that contain the COBOL and RPG source code that produces (along with the previously discussed DDS source) the examples in the next section.

The following figure contains the COBOL source.

```
 STMT SEQNBR -A 1 B..+....2....+....3....+....4....+....5....+....6....+....7..IDENTFCN  S  COPYNAME   CHG DATE
    1  000100 IDENTIFICATION DIVISION.                                                              10/20/91
    2  000200 PROGRAM-ID.   CBLLBL.                                                                 10/20/91
    3  000300 ENVIRONMENT DIVISION.                                                                 10/20/91
    4  000400 INPUT-OUTPUT SECTION.                                                                 10/20/91
    5  000500 FILE-CONTROL.                                                                         10/20/91
    6  000600     SELECT PRINTER-FILE                                                               10/20/91
    7  000700         ASSIGN TO FORMATFILE-LABELS.                                                  10/23/91
    8  000800     SELECT VENDOR-FILE                                                                10/20/91
    9  000900         ASSIGN TO DATABASE-VENDORS.                                                   10/20/91
   10  001000 DATA DIVISION.                                                                        10/20/91
   11  001100 FILE SECTION.                                                                         10/20/91
   12  001200 FD  PRINTER-FILE                                                                      10/20/91
   13  001300     DATA RECORD IS PRINT-REC.                                                         10/23/91
   14  001400 01  PRINT-REC.                                                                       10/23/91
   15  001500     COPY DDS-ALL-FORMATS-O OF LABELS.                                                 10/23/91
   16 +000001       05  LABELS-RECORD PIC X(72).                                  <-ALL-FMTS
      +000002* OUTPUT FORMAT;LABEL      FROM FILE LABELS     OF LIBRARY SGAFP    <-ALL-FMTS
      +000003*                                                                   <-ALL-FMTS
   17 +000004       05  LABEL-O       REDEFINES LABELS-RECORD.                   <-ALL-FMTS
   18 +000005           06 NAME                 PIC X(25).                       <-ALL-FMTS
   19 +000006           06 ADDR1                PIC X(25).                       <-ALL-FMTS
   20 +000007           06 CITY                 PIC X(15).                       <-ALL-FMTS
   21 +000008           06 STATE                PIC X(2).                        <-ALL-FMTS
   22 +000009           06 ZIPCD                PIC S9(5).                       <-ALL-FMTS
   23  001600 FD  VENDOR-FILE                                                                       10/23/91
   24  001700     DATA RECORD IS VENDOR-REC.                                                        10/23/91
   25  001800 01  VENDOR-REC.                                                                      10/23/91
   26  001900     COPY DDS-ALL-FORMATS-I OF VENDORS.                                                10/23/91
   27 +000001       05  VENDORS-RECORD PIC X(82).                                 <-ALL-FMTS
      +000002*    I-O FORMAT;VNDMSTR    FROM FILE VENDORS    OF LIBRARY SGAFP    <-ALL-FMTS
      +000003*                          VENDMAST DB FORMAT                       <-ALL-FMTS
   28 +000004       05  VNDMSTR       REDEFINES VENDORS-RECORD.                  <-ALL-FMTS
   29 +000005           06 VNDNBR               PIC S9(5)        COMP-3.         <-ALL-FMTS
      +000006*                         VENDOR NUMBER                            <-ALL-FMTS
   30 +000007           06 NAME                 PIC X(25).                       <-ALL-FMTS
      +000008*                         NAME                                     <-ALL-FMTS
   31 +000009           06 ADDR1                PIC X(25).                       <-ALL-FMTS
      +000010*                         ADDRESS LINE 1                           <-ALL-FMTS
   32 +000011           06 CITY                 PIC X(15).                       <-ALL-FMTS
      +000012*                         CITY                                     <-ALL-FMTS
   33 +000013           06 STATE                PIC X(2).                        <-ALL-FMTS
      +000014*                         STATE                                    <-ALL-FMTS
   34 +000015           06 ZIPCD                PIC S9(5)        COMP-3.         <-ALL-FMTS
      +000016*                         ZIP CODE                                 <-ALL-FMTS
   35 +000017           06 VNDCLS               PIC S9(2)        COMP-3.         <-ALL-FMTS
      +000018*                         VENDOR CLASS                             <-ALL-FMTS
   36 +000019           06 VNDSTS               PIC X(1).                        <-ALL-FMTS
      +000020*                         A=ACTIVE, D=DELETE, S=SUSPEND            <-ALL-FMTS
   37 +000021           06 BALOWE               PIC S9(7)V9(2)   COMP-3.         <-ALL-FMTS
      +000022*                         BALANCE OWED                             <-ALL-FMTS
   38 +000023           06 SRVRTG               PIC X(1).                        <-ALL-FMTS
      +000024*                         G=GOOD, A=AVERAGE, B=BAD, P=PREFERRED    <-ALL-FMTS
   39  002000 WORKING-STORAGE SECTION.                                                              10/20/91
   40  002100 77  EOF-FLAG                PIC X.                                                   10/23/91
   41  002200     88  NOT-END-OF-FILE             VALUE " ".                                       10/23/91
5738CB1 V2R1M0  910524           AS/400 COBOL Source            SGAFP/CBLLBL         RCHASA12  10/24/91 10:18:16     Page    3
 STMT SEQNBR -A 1 B..+....2....+....3....+....4....+....5....+....6....+....7..IDENTFCN  S  COPYNAME   CHG DATE
   42  002300     88  END-OF-FILE                 VALUE "1".                                       10/23/91
       002400                                                                                       10/23/91
   43  002500 PROCEDURE DIVISION.                                                                   10/23/91
       002600 MAIN-PARA.                                                                            10/23/91
   44  002700     OPEN INPUT VENDOR-FILE                                                            10/23/91
       002800          OUTPUT PRINTER-FILE.                                                         10/23/91
   45  002900     PERFORM PRINT-LABELS UNTIL END-OF-FILE.                                           10/23/91
   46  003000     CLOSE VENDOR-FILE, PRINTER-FILE.                                                  10/23/91
       003100     GOBACK.                                                                           10/23/91
       003200                                                                                       10/23/91
   47  003300 PRINT-LABELS.                                                                         10/23/91
   48  003400     READ VENDOR-FILE                                                                  10/23/91
   49  003500         AT END SET END-OF-FILE TO TRUE.                                               10/23/91
   50  003600     IF NOT-END-OF-FILE                                                                10/23/91
   51  003700         MOVE CORRESPONDING VNDMSTR TO LABEL-O                                         10/23/91
               *       ** CORRESPONDING items for statement 51:
               *       **     NAME
               *       **     ADDR1
               *       **     CITY
               *       **     STATE
               *       **     ZIPCD
               *       ** End of CORRESPONDING items for statement 51
   52  003800          WRITE PRINT-REC FORMAT IS "LABEL".                                           10/23/91
                         * * * * *  E N D  O F  S O U R C E  * * * * *
```

Figure H-3. COBOL Source for DDS Example

The following figure contains the RPG source.

```
SEQUENCE                                                                IND   DO   LAST       PAGE   PROGRAM
NUMBER   *...1....+....2....+....3....+....4....+....5....+....6....+....7...*  USE   NUM  UPDATE     LINE   ID
                    S o u r c e   L i s t i n g
         H                                                                                    *****
     100 FVENDORS IF  E           K        DISK                                             10/24/91
          RECORD FORMAT(S):  LIBRARY SGAFP FILE VENDORS.
                    EXTERNAL FORMAT VNDMSTR RPG NAME VNDMSTR
     200 FLABELS  O   E                    PRINTER                                          08/25/91
          RECORD FORMAT(S):  LIBRARY SGAFP FILE LABELS.
                    EXTERNAL FORMAT LABEL RPG NAME LABEL
A000000   INPUT  FIELDS FOR RECORD VNDMSTR FILE VENDORS FORMAT VNDMSTR.
A000000         VENDMAST DB FORMAT
A000001                                    P   1   30VNDNBR              VENDOR NUMBER
A000002                                        4   28 NAME               NAME
A000003                                       29   53 ADDR1              ADDRESS LINE 1
A000004                                       54   68 CITY               CITY
A000005                                       69   70 STATE              STATE
A000006                                    P  71   730ZIPCD              ZIP CODE
A000007                                    P  74   750VNDCLS             VENDOR CLASS
A000008                                       76   76 VNDSTS             A=ACTIVE, D=DELETE, S=SUSPEND
A000009                                    P  77   812BALOWE             BALANCE OWED
A000010                                       82   82 SRVRTG             G=GOOD, A=AVERAGE, B=BAD, P=PREFERRED
     300 C                    READ VENDORS                50                   3         10/24/91
     400 C           *IN50    DOWNE*ON                                            B001   08/25/91
     500 C                    WRITELABEL                                           001   08/25/91
     600 C                    READ VENDORS                50                   3   001   10/24/91
     700 C                    ENDDO                                                E001   08/25/91
     800 C                    SETON                     LR                  1            08/25/91
B000000   OUTPUT FIELDS FOR RECORD LABEL FILE LABELS FORMAT LABEL.
B000001                           NAME      25  CHAR   25
B000002                           ADDR1     50  CHAR   25
B000003                           CITY      65  CHAR   15
B000004                           STATE     67  CHAR    2
B000005                           ZIPCD     72  ZONE  5,0
         * * * * *  E N D   O F   S O U R C E   * * * * *
```

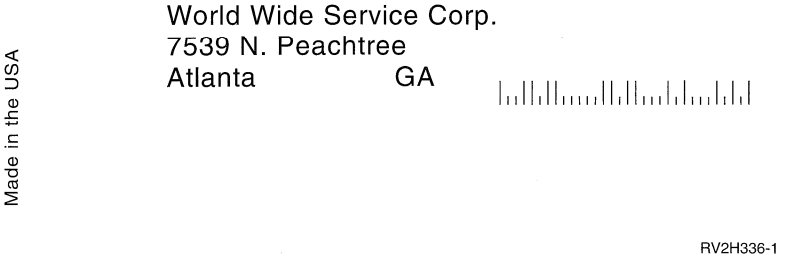
Figure H-4. RPG Source for DDS Example

Example Output from the DDS, COBOL, and RPG Source

The following examples show the type of output you can get using DDS in conjunction with the absolute and row/column positioning methods.

Example 1: DDS and Row/Column Positioning

The following example shows the output achieved using the row/column positioning method.



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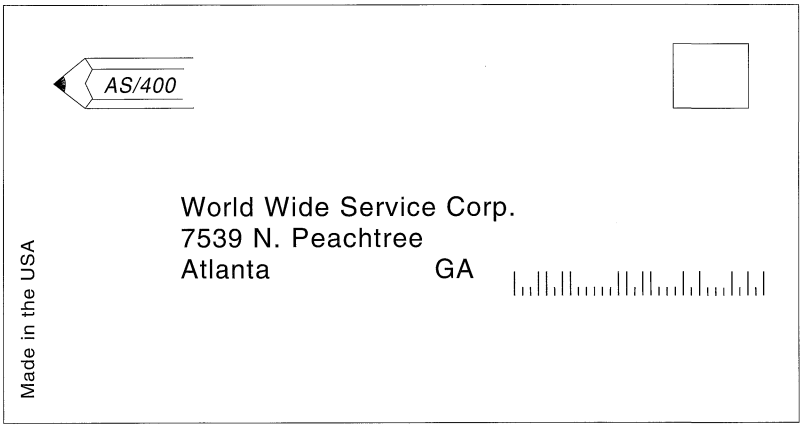
Example 2: DDS and Absolute Positioning

This example highlights the additional function absolute positioning provides by using boxes (indicating where the stamp goes) and page segments (the pencil-type logo).



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Appendix I. What Does a Font Look Like?

Did you ever wonder what a font looks like before using it in an application? This appendix contains instructions and source code that allow you to print an FGID, font character set, or coded font and see what it looks like. The source code provided is data description specifications (DDS), which can be used with the following high-level languages:

- C
- COBOL
- Pascal
- RPG

To print the FGID, font character set, or coded font you want to see, edit the DDS source and insert the correct identifier or name.

Notes:

1. These sample programs work only with printers configured as AFP(*YES).
2. See Appendix D, "Working with Fonts, Font Character Sets, Code Pages, CHRIDs, and Coded Fonts" on page D-1 for the names of FGIDs, font character sets, and coded fonts.

Getting Started

Follow the instructions in the list below. If you need assistance with any of the CL commands, use the F4 (Prompt) key and then press the Help key on any of the parameters.

1. Create a library to contain the objects needed to print the font samples. In this example, the library is named FONTSAMPLE.

   ```
   CRTLIB FONTSAMPLE
   ```

2. Add FONTSAMPLE to your library list.

   ```
   ADDLIBLE FONTSAMPLE
   ```

3. Create a source physical file in FONTSAMPLE to contain your source code. In this example the source file is named SOURCE.

   ```
   CRTSRCPF FONTSAMPLE/SOURCE
   ```

4. Add a member named FONT to that physical file. This member is used for entering the source code for the printer file.

   ```
   ADDPFM FILE(FONTSAMPLE/SOURCE) MBR(FONT)
   ```

5. Edit the member FONT with the source entry utility (SEU).

   ```
   STRSEU SRCFILE(FONTSAMPLE/SOURCE) SRCMBR(FONT) TYPE(PRTF)
   ```

   Type the DDS source code (shown in "DDS Source Code" on page I-3) for the printer file. When you are done, press F3 to exit.

6. Create the printer file from the DDS source you just typed in.

   ```
   CRTPRTF FILE(FONTSAMPLE/FONT) SRCFILE(FONTSAMPLE/SOURCE) SRCMBR(FONT)
   DEVTYPE(*AFPDS)
   ```

7. Choose the high-level language you will be using to produce printed output. The compiler for the high-level language you choose must be installed on your system. Samples are given for C, RPG, Pascal, and COBOL. Add a member to the physical file SOURCE. Use one of the following names depending on which language you choose:

   - CCODE for the C language
   - COBOLCODE for the COBOL language
   - PASCODE for the Pascal language
   - RPGCODE for the RPG language

   ```
   ADDPFM FILE(FONTSAMPLE/SOURCE) MBR(CCODE, COBOLCODE, PASCODE, or RPGCODE)
   ```

8. Edit the member (CCODE, COBOLCODE, PASCODE, or RPGCODE) with source entry utility (SEU). Type in the command that corresponds to the high-level language you are using. Then, type the program source (listed below these instructions) for one of the languages.

   C: `STRSEU SRCFILE(FONTSAMPLE/SOURCE) SRCMBR(CCODE) TYPE(C)`

   RPG: `STRSEU SRCFILE(FONTSAMPLE/SOURCE) SRCMBR(RPGCODE) TYPE(RPG)`

   Pascal: `STRSEU SRCFILE(FONTSAMPLE/SOURCE) SRCMBR(PASCODE) TYPE(PAS)`

   COBOL: `STRSEU SRCFILE(FONTSAMPLE/SOURCE) SRCMBR(COBOLCODE) TYPE(CBL)`

   When you are done, press F3 to exit.

9. Create the program, using the command below that corresponds to the language you chose.

   C:
   ```
   CRTCPGM PGM(FONTSAMPLE/CPGM) SRCFILE(FONTSAMPLE/SOURCE)
   SRCMBR(CCODE)
   ```

   RPG:
   ```
   CRTRPGPGM PGM(FONTSAMPLE/RPGPGM) SRCFILE(FONTSAMPLE/SOURCE
   SRCMBR(RPGCODE)
   ```

   Pascal:
   ```
   CRTPASPGM PGM(FONTSAMPLE/PASPGM) SRCFILE(FONTSAMPLE/SOURCE)
   SRCMBR(PASCODE) LANGLVL(*SYSTEM)
   ```

   COBOL:
   ```
   CRTCBLPGM PGM(FONTSAMPLE/CBLPGM) SRCFILE(FONTSAMPLE/SOURCE)
   SRCMBR(COBOLCODE)
   ```

10. Call the program that corresponds to the language you chose:

    C: `Call CPGM`

    RPG: `Call RPGPGM`

    Pascal: `Call PASPGM`

    COBOL: `Call CBLPGM`

11. The output from the program is sent to a spooled file named FONT. You cannot view the spooled file until it prints.

DDS Source Code

```
  5738PW1 V2R2M0  920615                SEU SOURCE LISTING
02/09/93 13:56:16                PAGE    1
  SOURCE FILE . . . . . .  FONTSAMPLE/SOURCE
  MEMBER  . . . . . . . .  FONT
  SEQNBR*...+... 1 ...+... 2 ...+... 3 ...+... 4 ...+... 5 ...+... 6 ...+... 7
...+... 8 ...+... 9 ...+... 0
    100                R REC1
    200                                          6 10FONT(5)
    300                                              'Rhetoric Orator FGID 5'
    400                                          8 10FNTCHRSET(QFNT01/C0T055B0 +
    500                                                        QFNT01/T1V10037)
    600                                              'Sonoran Serif 12 Pt +
    700                                               Font Char Set C0T055B0'
    800                                         10 10CDEFNT(QFNTCPL/X0BIR1)
    900                                              'Book Italic 10 Pt +
   1000                                               CODED FONT X0BIR1'
   1100       *  Above is the source for DDS and the fontsample program
                                 * * * *  E N D  O F  S O U R C E  * * * *
```

C Source Code

```
  5738PW1 V2R2M0  920615                SEU SOURCE LISTING
  SOURCE FILE . . . . . .  FONTSAMPLE/SOURCE
  MEMBER  . . . . . . . .  CCODE
  SEQNBR*...+... 1 ...+... 2 ...+... 3 ...+... 4 ...+... 5 ...+... 6 ...+... 7
...+... 8 ...+... 9 ...+... 0
    100 #include <stdio.h>
    200 #include <xxasio.h>
    300 main()
    400 {
    500 FILE            *outfile;
    600
    700 outfile = fopen("font","wb type=record");
    800 QXXFORMAT(outfile, "REC1      ");
    900 fwrite("",0,0,outfile);
   1000 }
                                 * * * *  E N D  O F  S O U R C E  * * * *
```

Pascal Source Code

```
  5738PW1 V2R2M0  920615                SEU SOURCE LISTING
  SOURCE FILE . . . . . .  FONTSAMPLE/SOURCE
  MEMBER  . . . . . . . .  PASCODE
  SEQNBR*...+... 1 ...+... 2 ...+... 3 ...+... 4 ...+... 5 ...+... 6 ...+... 7
...+... 8 ...+... 9 ...+... 0
    100 program print (input, output);
    200 var
    300   format:   BINDINGTYPE;
    400   prtfile:  FILE OF char;
    500 begin
    600   REWRITE(prtfile, 'file(font) COMMIT(*NO) FILETYPE(*PRTF)');
    700   format.options := 'format(rec1)';
    800   BIND(prtfile, format);
    900   put(prtfile);
   1000 end.
                              * * * *  E N D  O F  S O U R C E  * * * *
```

RPG Source Code

```
  5738PW1 V2R2M0  920615                SEU SOURCE LISTING
  SOURCE FILE . . . . . .  FONTSAMPLE/SOURCE
  MEMBER  . . . . . . . .  RPGCODE
  SEQNBR*...+... 1 ...+... 2 ...+... 3 ...+... 4 ...+... 5 ...+... 6 ...+... 7
...+... 8 ...+... 9 ...+... 0
    100      FFONT   O   E                    PRINTER
    200      C                    WRITEREC1
    300      C                    SETON                     LR
                              * * * *  E N D  O F  S O U R C E  * * * *
```

COBOL Source Code

```
  5738PW1 V2R2M0  920615                SEU SOURCE LISTING
  SOURCE FILE . . . . . .  FONTSAMPLE/SOURCE
  MEMBER  . . . . . . . .  COBOLCODE
  SEQNBR*...+... 1 ...+... 2 ...+... 3 ...+... 4 ...+... 5 ...+... 6 ...+... 7
...+... 8 ...+... 9 ...+... 0
     100 100010 IDENTIFICATION DIVISION.
     200
     300 100020 PROGRAM-ID. PRINTLBL.
     400
     500 100030 ENVIRONMENT DIVISION.
     600
     700 100040 INPUT-OUTPUT SECTION.
     800
     900 100050 FILE-CONTROL.
    1000
    1100 100060     SELECT PRINTER-FILE
    1200
    1300 100070         ASSIGN TO FORMATFILE-FONT.
    1400
    1500 100080 DATA DIVISION.
    1600
    1700 100090 FILE SECTION.
    1800
    1900 100100 FD PRINTER-FILE
    2000
    2100 100110    DATA RECORD IS REC1.
    2200
    2300 100120 01 REC1.
    2400
    2500 100130    COPY DDS-ALL-FORMATS OF FONT.
    2600
    2700 100140 PROCEDURE DIVISION.
    2800
    2900 100150 MAIN-PARA.
    3000
    3100 100160     OPEN OUTPUT PRINTER-FILE.
    3200
    3300 100170     WRITE REC1 FORMAT IS "REC1".
    3400
    3500 100180     CLOSE PRINTER-FILE.
    3600
                                * * * *  E N D  O F  S O U R C E  * * * *
```

Bibliography

The following is a list of manuals that provide additional information about topics described or referred to in this manual. The manuals in this bibliography are listed with their full title and order number, but when referred to in text, a shortened version of the title is used.

- *About Type: Guide for Type Users (Current Release)*, G544-3122.
  Short Title: None.

  This publication introduces the use of typography in designing and printing documents with special emphasis using Advanced Function Printing fonts and printing systems.

- *About Type: Samples of 240-Pel Digitized Type*, G544-3644.
  Short Title: None.

  This manual provides type samples of 240-pel fonts.

- *About Type: Technical Reference for 240-Pel Digitized Type*, S544-3516.
  Short Title: None.

  This manual provides information about the names, content and size of the character sets, code pages and coded fonts in the font licensed programs used in printing on 240-pel dots-per-inch (240-pel) non-impact printers supported by Advanced Function Printing (AFP) software.

- *About Type: Typographic Primer for Digitized Type*, G544-3183.
  Short Title: None.

  This publication introduces typographic concepts to show the reader how to create effective printed material with style and emphasis, and to illustrate how much value type characters from IBM's typographic fonts can add to business messages. This is primarily a marketing tool.

- *Advanced Function Printing Utilities/400 User's Guide and Reference*, SH18-2416.
  Short Title: *AFP Utilities User's Guide and Reference.*

  This guide describes the major elements of the IBM Advanced Function Printing Utilities/400 (Program 5738-AF1), a licensed program that provides utilities that work together to reduce the cost of printing text and images on paper when using advanced function printing (AFP) on the AS/400 system.

  The AFP Utilities include the following:

  - Overlay Utility
  - Print Format Utility
  - Resource Management Utility

- *Application Development Tools: Advanced Printer Function Guide*, SC09-1361.
  Short Title: *APF Guide.*

  This guide provides information about using the AS/400 Application Development Tools advanced printer function (APF) to create and maintain tailored forms. Using the printing capabilities available on the 5224 and 5225 printers, forms can look preprinted and use a variety of special fonts.

  This manual explains how to design the layout of a form, specify fields where special characteristics are to be applied, design those special characteristics, produce blank copies of a form, and merge spooled data with an already-defined form.

- *Business Graphics Utility User's Guide and Reference*, SC09-1408.
  Short Title: *BGU User's Guide and Reference.*

  This guide provides information about using the AS/400 Business Graphics Utility (BGU) to create various types of charts. It is divided into two sections: the first section includes several exercises that familiarize the user with the functions of BGU, and the second section contains reference material.

- *Communications: Operating System/400* Communications Configuration Reference*, SC41-0001.
  Short Title: *OS/400* Communications Configuration Reference.*

  Using this manual, the user can configure the communications functions available with OS/400. It provides general configuration information, including detailed descriptions of network interface, line, controller, device, mode, and class-of-service descriptions, configuration lists, and connection lists.

- *Transmission Control Protocol/Internet Protocol Guide*, SC41-9875.
  Short Title: *TCP/IP Guide.*

  This guide contains information on configuring and using the Transmission Control Protocol/Internet Protocol (TCP/IP) and writing programs to the TCP/IP application program interface.

- *Data Description Specifications Reference*, SC41-9620.
  Short Title: *DDS Reference*

  This manual provides detailed descriptions of the entries and keywords needed to describe database files (both logical and physical) and certain device files (for displays, printers, and intersystem communications function (ICF)) external to the user's programs.

- *Data Management Guide*, SC41-9658.

Short Title: *Data Management Guide*.

This guide provides information about using files in application programs. This manual includes information on the following topics:

- Fundamental structure and concepts of data management support on the system
- Overrides and file redirection (temporarily making changes of files when an application program is run)
- Copying files by using system commands to copy data from one place to another
- Tailoring a system using double-byte data

- *Device Configuration Guide*, SC41-8106.
  Short Title: *Device Configuration Guide.*

  This guide provides information on how to do an initial local hardware configuration and how to change that configuration. This manual also contains conceptual information about device configuration and planning information for device configuration on the 9406, 9404, and 9402 system units.

  This manual includes additional information such as configuration terminology for lines, controllers, and devices. It also includes information on automatic configuration, how to do an initial configuration, how to change a configuration to suit the system, how to do local configuration including configuring ASCII devices, and unique double-byte character set (DBCS) configuration information (as a separate appendix). Information about local, twinaxial, ASCII work station controllers, modems, and the devices that attach to these local workstation controllers is also included as well as forms for local work station attachment diagrams.

- *Graphic Object Content Architecture*, SC31-6804.
  Short Title: None

  This manual explains the architecture of graphic objects for IPDS-capable devices.

- *IBM Enhanced 5250 Emulation Program User's Guide*, G570-2221.
  Short Title: None

  This guide explains how to work with the IBM Enhanced 5250 Emulation Program.

- *IBM Print Services Facility/2: Distributed Print Function Network Configuration Guide for OS/400*, S544-3823.
  Short Title: None.

  This guide explains how to configure the distributed print function and its associated hardware for use with Advanced Function Printing (AFP) on the AS/400 system.

- *IBM Print Services Facility/2: Getting Started*, S544-3767.
  Short Title: None.

  This manual explains how to plan for installation, install, and manage PSF/2 in any host system environment that supports PSF/2.

- *IBM Remote 5250 Emulation Program User's Guide*, G570-2203.
  Short Title: None.

  This guide explains how to work with the IBM Remote 5250 Emulation Program.

- *IBM Remote PrintManager User's Guide and Installation Guide*, S544-3439.
  Short Title: None.

  This manual explains how to install and configure the Remote PrintManager product for use with advanced function printing (AFP) on the AS/400 system.

- *IBM's Guide for Using PMF With Type*, S544-3648.
  Short Title: None.

  This publication describes how to use fonts with PMF in MVS and VM. It was originally published as two separate books - one for each environment.

  This manual could help you in communicating with System/370 sites in transferring AFP resources to an AS/400 system.

- *New User's Guide*, SC41-8211.
  Short Title: *New User's Guide.*

  This guide provides beginner information about how to sign on and off; send and receive messages; respond to keyboard error messages; use function keys; use display, command, and help information; and control and manage jobs.

- *PC Support/400: DOS and OS/2 Technical Reference*, SC41-8091.
  Short Title: *PC Support/400 Technical Reference for DOS and OS/2.*

  This manual provides technical information about the PC Support programs for all versions of PC Support.

- *PC Support/400: DOS Installation and Administration Guide*, SC41-0006
  Short Title: *PC Support/400 DOS Installation and Administration Guide.*

  This guide provides information for planning and installing PC Support, and configuring and diagnosing problems for individual PC Support users. This manual is intended for users with personal computers using the DOS operating system.

- *PC Support/400: DOS User's Guide*, SC41-8199.
  Short Title: *PC Support/400 User's Guide for DOS.*

  This guide provides concepts and examples of how to use the PC Support functions with DOS. It

assumes that the PC Support product is already installed and set up. This manual is intended for users with personal computers using the DOS operating system.

- *PC Support/400: OS/2 Installation and Administration Guide*, SC41-0007
  Short Title: *PC Support/400 OS/2 Installation and Administration Guide*.

  This guide provides information for planning and installing PC Support, and configuring and diagnosing problems for individual PC Support users. This manual is intended for users with personal computers using the OS/2 operating system.

- *PC Support/400: OS/2 User's Guide*, SC41-8200.
  Short Title: *PC Support/400 User's Guide for OS/2*.

  This guide provides concepts and examples of how to use the PC Support functions with the OS/2 program. It assumes that the PC Support product is already installed and set up. This manual is intended for users with personal computers using the OS/2 operating system.

- *Programming: Control Language Reference*, SC41-0030.
  Short Title: *CL Reference*.

  This manual describes the AS/400 control language (CL) and its OS/400 commands. Each command description includes a syntax diagram; descriptions of parameters, default values, and keywords; and at least one example.

- *Programming: GDDM Programming Guide*, SC41-0536.
  Short Title: *GDDM Programming Guide*.

  This guide provides information about using OS/400 graphical data display manager (GDDM) to write graphics application programs. GDDM allows you to add color and pictures to your application programs. This guide includes example programs and information to help you understand how the product fits into data processing systems.

- *Programming: Work Management Guide*, SC41-8078.
  Short Title: *Work Management Guide*.

  This guide provides information about how to create and change a work management environment. Other topics include a description of tuning the system, collecting performance data including information on record formats and contents of the data being collected, working with system values to control or change the overall operation of the system, and a description of how to gather data to determine who is using the system and what resources are being used.

- *System Operator's Guide*, SC41-8082.
  Short Title: *Operator's Guide*.

  This guide provides information about how to use the system unit control panel and console, send and receive messages, respond to error messages, start and stop the system, and do system tasks such as working with:

  - Jobs
  - Printing
  - Security
  - Backup and recovery
  - Messages
  - Tapes and diskettes
  - Online education
  - Program temporary fixes (PTFs)
  - Problems

  Also included are sections on setting up your AS/400 system and keeping your system running smoothly.

- *Systems Application Architecture* Common Programming Interface PrintManager Reference*, S544-3698.
  Short Title: *SAA* CPI PrintManager Reference*.

  This manual provides information the user needs to develop AS/400-based print applications that will place print options and data on an output queue. These applications will be portable to other SAA environments with minimum modification. The print jobs produced by these applications can be printed in other SAA environments when the proper distributed-print components are present.

Index

Special Characters

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Customer Satisfaction Feedback

Application System/400
Guide to Programming
for Printing
Version 2

Publication No. SC41-8194-02

Overall, how would you rate this manual?

	Very Satisfied	Satisfied	Dissatis-fied	Very Dissatis-fied
Overall satisfaction				

How satisfied are you that the information in this manual is:

Accurate				
Complete				
Easy to find				
Easy to understand				
Well organized				
Applicable to your tasks				
THANK YOU!				

Please tell us how we can improve this manual:

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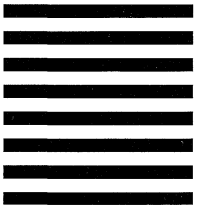

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