

IBM Network Printers
IBM InfoPrint 20
IBM InfoPrint 32



IPDS and SCS Technical Reference

Note

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

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About This Book

The *IBM Network Printers: IPDS and SCS Technical Reference* provides technical reference information about how Network Printers support the IPDS data stream.

Audience

This publication is intended for the system programmers, application programmers, and systems engineers who are familiar with data streams and are writing or modifying programs to operate the IBM network printers with IPDS and SCS data streams.

Conventions Used

The following typeface conventions are used in this publication.

Table 1. *Typographic Conventions*

| Typographic Convention | Meaning |
|-------------------------------|--|
| <i>clearable warnings</i> | Italics are used for variables |
| -duplex <i>boolean</i> | Plain italics and lowercase are used for options and switches for either commands or variables |
| [. . .] | Items in brackets [.....] indicate optional parameters. (Do not type the brackets when you enter the command.) |
| < > | Identifies a control code character, such as <CR> for carriage return, or a special identifier. |
| < | Indicates that the current line of code is a continuation of the previous line. |

Terminology

Network Printers

In the manual, the term *network printers* refers to the Network Printer 12, Network Printer 17, InfoPrint 20, InfoPrint 32, and the Network Printer 24.

Paper Input and Output Receptacles

Input receptacles are called trays. Output receptacles are called stackers or bins.

Related Publications

Each network printer ships with setup documentation and a CD-ROM which includes the entire printer library for viewing and printing. The following books may be of particular interest:

- *IBM Network Printers: PCL and PostScript Technical Reference*, S544-5344
- *IBM Network Printers: IPDS and SCS Technical Reference*, S544-5312
- *IBM Network Printers: Twinax/Coax Configuration Guide*, G544-5241

In addition, this book refers to the following non-IBM publications:

- PostScript Language Reference Manual, second edition, by Adobe Systems, Inc.
- PCL 5 Printer Language Technical Reference Manual by Hewlett-Packard, Inc.
- PCL 5 Comparison Guide by Hewlett-Packard, Inc.
- Printer Job Language Technical Reference Manual by Hewlett-Packard, Inc.

Chapter 1. Introduction

This chapter introduces the Intelligent Printer Data Stream (IPDS) and describes some of the capabilities of IPDS when used with the Network Printers (with an IPDS feature).

About IPDS

IPDS lets you print pages containing an unlimited mix of different types of data: high-quality text, images, vector graphics, and bar codes.

You can send IPDS data to printers attached to the IBM Application System/400 (AS/400) intelligent work stations, local area networks, IBM 3270-family controllers, Twinax (5270), Token-ring (UTP, STP/4 & 16 Mbps), Ethernet (10base-T & 10base2), and spooled systems. In some of these environments, you can create applications to directly control IPDS printers such as this printer. For more information about IPDS as a component of printing subsystems, refer to *Intelligent Printer Data Stream Reference*.

IBM provides a variety of host software products with components that generate IPDS commands for this printer or other IPDS printers. These software products vary in their use of IPDS functions. Some of the software products available are:

- Graphical Data Display Manager (GDDM) Release 2.3 or higher
- OS/400 Version 2.1 or higher
- Print Service Facility (PSF/VM) Release 2.1.1 or higher
- Print Service Facility (PSF/MVS) Release 2.1.0 or higher
- Print Service Facility (PSF/VSE) Release 2.2.1 or higher
- Print Service Facility (PSF/400) Release 3.1 or higher
- Print Service Facility (PSF/2) Release 1.0 or higher
- Print Service Facility (PSF/6000) Release 1.2 or higher
- OfficeVision/400 Version 2.2 or higher
- Business Graphics Unit (BGU)
- Control Language (CL) and Data Description Specifications (DDS)
- OS/400 Graphics
- AFP Utilities/400 Version 2.2 or higher

These software utilities accept a variety of input data streams from a wide assortment of applications and transform this data to IPDS. Examples of such applications are:

- DisplayWrite System 370 (DW/370) Version 2
- Document Composition Facility (DCF), including GML/Script, in the VM and MVS environments.
 - Overlay Generation Language (VM and MVS)
 - Print Services Access Facility (VM and MVS)
 - Page Printer Formatting Aid (VM and MVS).

Note: The capabilities of the printer depend on the host software and the IPDS functions that the software enables.

Capabilities of IPDS

A printer controlled by IPDS has a number of advantages over conventional printers. With IPDS you can:

- Use the printer's all-points-addressable printing to print text, graphics, images, or bar codes at any point on a page or that is within the printers printable area.
- Print text in a variety of type styles and switch fonts within a printed page.
- Use both images and vector graphics (explained later in this chapter) to print line drawings, pie charts, bar charts, graphics, logos, tables, and signatures.
- Combine text with images and graphics on the same page (creating what is known as a *composite document*).
- Electronically store and later print forms and letterheads that are always printed in the same predetermined type style.
- Electronically store and later print text where the type style printed is the same as that used in the rest of the text.
- Print any of 16 different kinds of bar codes in many sizes and with a number of variations.
- Print either portrait (upright, letter orientation) or landscape (printing "on the side", with the page wider than it is tall).
- Print on either one side or both sides of the paper (with duplex option).

Printing a Letter

IPDS lets you print a letter in just one step. In conventional printing (Figure 1), you must load letterhead paper into your printer, print the text of your letter, and then manually sign the letter.

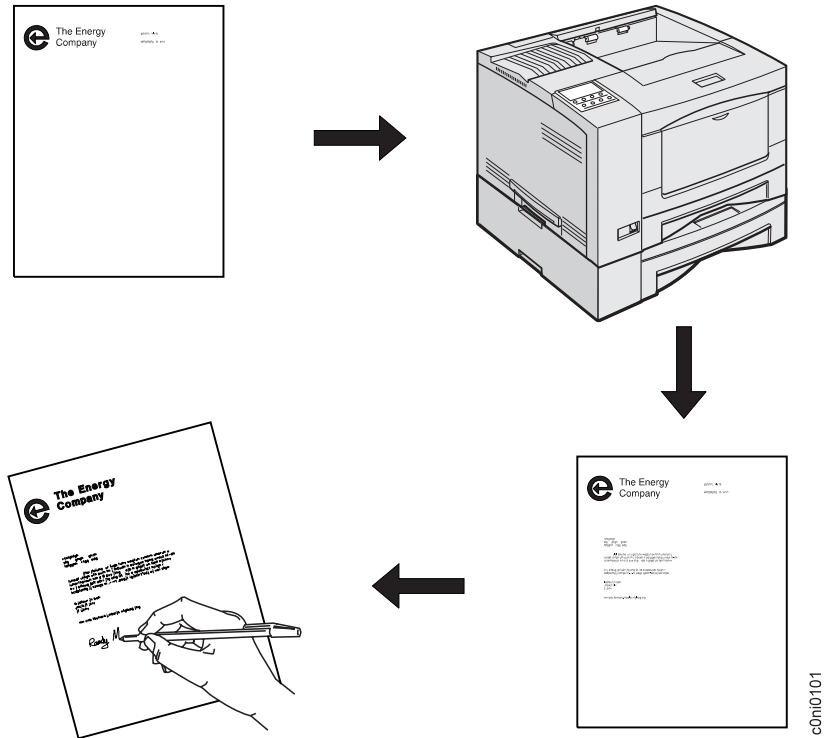


Figure 1. Conventional Letter Preparation

Using IPDS (Figure 2), you can temporarily store your letterhead and signature in the printer's memory and then merge the letterhead, text, and signature with additional data to form a complete letter. You can also include graphics, such as a line chart or bar chart, in your letter, creating a composite document.

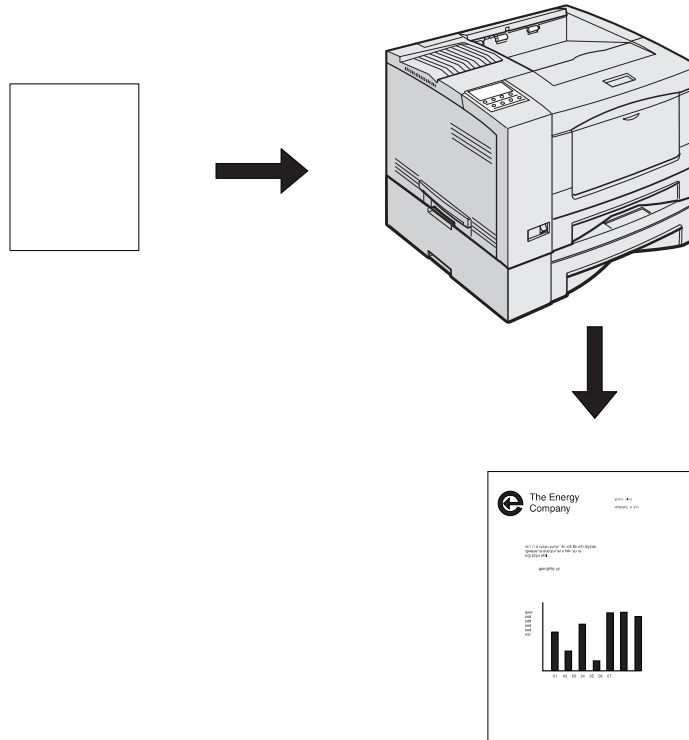


Figure 2. IPDS Letter Preparation

An IPDS-driven printer offers flexibility. For example, you can highlight a list of items by printing the list in a different type style from the rest of the text; or you can print your letterhead in one font and your text in another font.

You can electronically store your letterhead so it is always printed in the same type style. This printing concept is discussed in “Using Overlays”.

You can store your printed signature block so it is printed in the type style used in the rest of the letter or memo. That way the signature block’s type style matches the letter in which it appears, no matter how many different fonts you use for different kinds of letters. This printing concept is discussed in “Using Page Segments” on page 5.

You can include bar charts or line graphs in your letter. Such graphic material can be generated through either the Image function or the Graphics function. See “Using Images and Graphics” on page 6.

Using Overlays

Overlays are stored constructs (text, graphics, images, and bar codes), often in complex configurations, with all the instructions needed to print. An overlay always prints in the type style used when it was stored and can be positioned anywhere on the page.

Overlays are useful for letterheads and for forms, as shown below in Figure 3.

Electronically Stored Form Overlay

| | | | | | |
|----------------------------------|----------------|----------|-----------|----------------|----------|
| POWER ANY TOWN AMERICA | | | | | |
| Name-Service Address | | | | Service Period | |
| | | | | From | 10/02/85 |
| | | | | To | 11/01/85 |
| Account No. | | | | | |
| Rate | Meter Readings | | Mult. | K.W.H. Used | Amount |
| | Present | Previous | | | |
| | | | | | |
| City | | State | Franchise | Total Tax | |
| | | | | | |
| | | | | | 64.35 |

Variable Page Data

| | | | | | |
|---|------|------|----|-------|-------|
| John Jones 1225 Stone Street Ant Town, State 65432 | | | | | |
| 0130-7817-2 | | | | | |
| 10 | 1054 | 1944 | 10 | 1:100 | 61.85 |
| | | | | 2.27 | .12 |
| | | | | | 64.35 |



Finished Product

| | | | | | |
|---|----------------|----------|-------------|----------------|----------|
| POWER ANY TOWN AMERICA | | | | | |
| Name-Service Address | | | | Service Period | |
| John Jones 1225 Stone Street Ant Town, State 65432 | | | | From | 10/02/85 |
| | | | | To | 11/01/85 |
| Account No. | | | 0130-7817-2 | | |
| Rate | Meter Readings | | Mult. | K.W.H. Used | Amount |
| | Present | Previous | | | |
| 10 | 1054 | 1944 | 10 | 1:100 | 61.85 |
| City | | State | Franchise | Total Tax | |
| | | 2.27 | .12 | 2.49 | |
| | | | | | 64.35 |

Figure 3. Using Overlays

Using Page Segments

Page segments are similar to overlays, except that the construct is stored without specific instructions for type styles and position on the page. Page segments are printed in the type style in use at print time. You can place a page segment anywhere on the page.

One way to use a page segment is as text under a signature, as shown in Figure 4.

c0ni0103

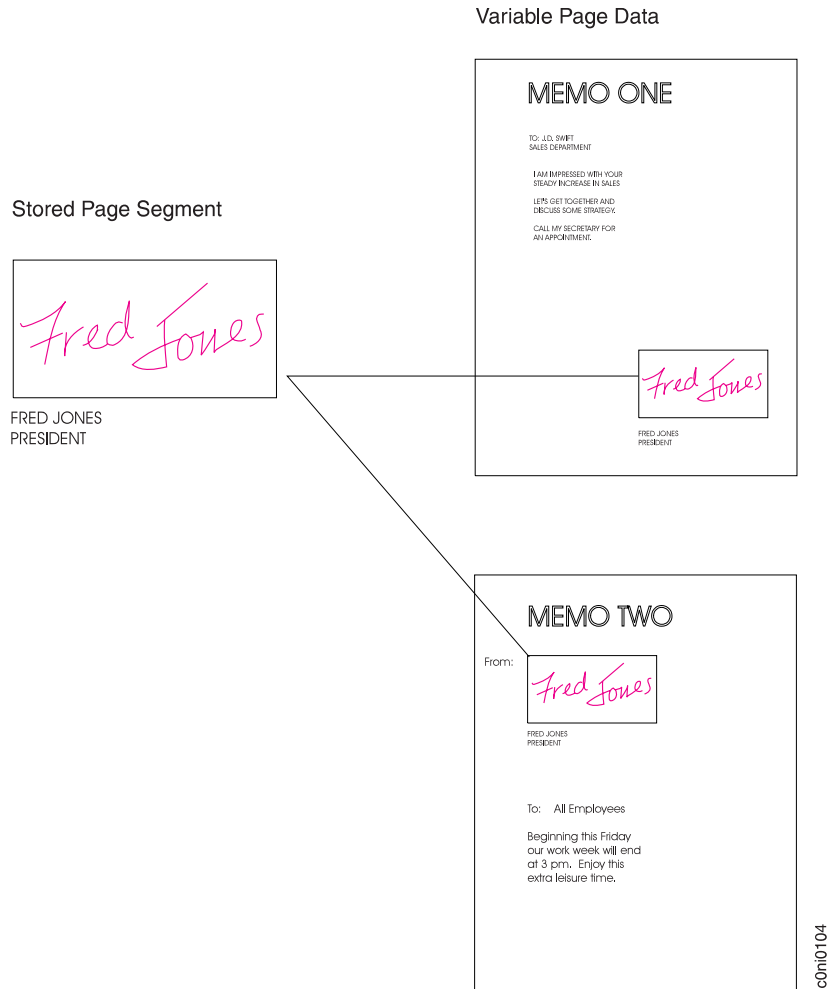


Figure 4. Using Page Segments

Using Images and Graphics

Graphic material—charts, engineering drawings, and line drawings—can be sent to the printer as IM Images, IO Images, or Graphics.

In all-points-addressable printing by the printer, a page can consist of 300 points per inch, 7.8 million printable points, each one of which is individually addressable. These addressable points are called *picture elements* or *pels*.

IM and IO Images

Images are figures on the page created by explicitly specifying each pel in the figure. There is one bit of image data per pel, so a large quantity of data is needed to create an image.

IM images are uncompressed raster data images. A raster pattern is composed of a series of pels arranged in scan lines.

IO images are compressed or uncompressed raster data images. Compression generally reduces the amount of data sent to the printer and should significantly

save transmission time. IO images may be arbitrarily scaled and corrected for resolution differences between the scanner and the printer.

Graphics

Graphics are line drawings created from separate lines, arcs, and markers. With vector graphics, only control information such as the end points of a line are sent to the printer. This process lets you create complex figures with a minimum of data.

For details on graphics commands, see *IBM Data Stream and Object Architectures Graphics Object Content Architecture (GOCA) Reference*, SC31-6804. For details on IO image commands, see *IBM Data Stream and Object Architectures Image Object Content Architecture (IOCA) Reference*, SC31-6805.

Using Bar Codes

Bar code data is encoded information that is recognized by optical scanning devices. The printer can print the bar code types shown in Figure 5 on page 8 in many sizes and variations, such as with or without the human-readable characters.



Figure 5. Bar Codes from the printer (IPDS)

Printing in Duplex Mode

The printer can print on one or both sides of the paper. All of the printer's IPDS capabilities are provided in either mode.

Duplex printing is controlled through the IPDS Load Copy Control (LCC) command.

Chapter 2. IPDS Overview

The Intelligent Printer Data Stream (IPDS) is a structured field data stream designed to manage and control All Points Addressable (APA) printers. APA is a printing concept that allows users to position text, images, graphics, and overlays at any defined point on a printed page.

IPDS allows both data and commands to be streamed to the printer via channels, controllers or any type of networking link which supports the transparent transmission of data to print processes that are resident in the device.

Commands within the data stream also allow the "Host" process to control the media handling capabilities of the device, select source drawers, jog output and other operations dealing with paper. In addition, the commands provide the means for managing the down-loading of fonts and other stored resources such as overlays and page segments that are required at presentation time to construct the printed page. Finally, the commands provide the means for returning error information and performing recovery actions. The source IPDS architecture document is the *Intelligent Printer Data Stream Reference*.

Network Printers support the following IPDS Architecture command sets.

- Device Control (DC1)
- Text (TX1 with PTOCA PT1 and PTOCA PT2)
- IM Image (IM1 with IMD1)
- IO Image (IO1 with IOCA FS10 + 8-bit Grayscale via halftoning)
- Graphics (GR1 with GOCA DR/2V0)
- Page Segments (PS1)
- Overlay (OL1)
- Loaded Font (LF1)
- Bar Code (BC1 with BCD1)

IPDS Operating States

If the host sends a command inappropriate for the printer state, the printer returns an error code identifying the error and follows Exception Handling Control processing.

Home State

The following actions can force the printer to home state, regardless of the current state of the printer:

1. The Set Home State (SHS) command
2. The Execute Order Anystate--Discard Buffered Data (XOA/DBD) command
3. The printer's transmission of a NACK to the host
4. The Arctic link-level Clear command
5. Any non-IPDS print order in NDS (New Display System)
6. An NDS Reset order
7. An NDS System Status Available No Mode order

All these actions will also force the printer to an IPDS command boundary if it is not already on one. To interpret SHS or XOA/DBD, the printer and the host must already be in agreement as to where the IPDS command boundaries are.

Deactivation of fonts with the DF command occurs in Home State.

Overlay State

Overlays can be nested to a depth of 6 as indicated in the STM Overlay Command-Set Vector (Table 34 on page 56).

Font State

An operating state for down-loading single byte Coded Font patterns.

IPDS Command Format

All IPDS commands are encoded in the following pattern:

Table 2. IPDS Command Format

| Data Area | Value | Description | Error Code |
|------------------|-------------------|--------------------|-------------------|
| Byte 0-1 | X'0005' - X'7FFF' | LENGTH | X'0202..02' |

Table 2. IPDS Command Format (continued)

| Data Area | Value | Description | Error Code |
|-----------|---|---|-------------|
| Byte 2-3 | X'D603' X'D60F' X'D61D' X'D61F' X'D62D' X'D62E' X'D62F' X'D633' X'D63D' X'D63E' X'D63F' X'D64D' X'D64E' X'D64F' X'D65D' X'D65F' X'D66D' X'D66F' X'D67D' X'D67F' X'D680' X'D681' X'D684' X'D685' X'D68F' X'D697' X'D69F' X'D6AF' X'D6BF' X'D6CF' X'D6DF' X'D6E4' X'D6EF' | COMMAND No Operation Load Font Index Load Equivalence Load Font Control Write Text Activate Resource Load Font Execute Order Anystate Write Image Control Write Image Control 2 Load Font Equivalence Write Image Write Image 2 Deactivate Font End Begin Page Segment Logical Page Position Deactivate Page Segment Include Overlay Include Page Segment Write Bar Code Control Write Bar Code Write Graphics Control Write Graphics Execute Order Homestate Set Home State Load Copy Control Begin Page End Page Logical Page Descriptor Begin Overlay Sense Type and Model Deactivate Overlay | X'8001..00' |
| Byte 4 | Bit 0 0/1 Bit 1 0/1 Bit 2 0/1 Bit 3-6 000 Bit 7 0/1 | FLAGS (Active when Bit value = 1) Acknowledgement Required (ARQ) Correlation Number Present Acknowledgement Continuation Reserved Persistent NACK (DSC non-SNA ONLY) (Otherwise Reserved) | X'0204..02' |
| Byte 5-6 | X'0000'-X'FFFF' | CORRELATION ID | |
| Byte 7 | | DATA - The specific operands, parameters and/or data fields as appropriate for the given command. | |

Reserved Bytes

Throughout the command descriptions in the following chapters, some data fields, bytes, and bits are specified as *reserved*.

When the description for a reserved field, byte, or bit specifies “should be zero,” the printer does not check the contents of the bytes or bits. The reserved data should be set to zero, because they could be defined in future changes to the printer. However, non zero values do not cause an error and are ignored by the printer.

When the description for a reserved field, byte, or bit specifies it “must be zero,” the printer checks the contents of the bytes or bits and will return error status to the host if the field contains a non zero value.

Flag Byte

Bit 7 is the Persistent NACK bit for 3270 Non-SNA DSC (Data Stream Compatability) Mode NACKs. This bit has no meaning in other attachment environments. Valid values for the Acknowledge Reply Flag byte are described in the *Intelligent Printer Data Stream Reference*.

Correlation ID (CID)

The correlation ID (CID) is an identifier of a specific instance of an IPDS command. It is used to correlate errors with the command that generated them.

It is not possible to correlate all errors with particular IPDS commands. Mechanism errors (for example, out of paper position checks and unpopulated character positions in resident fonts) are never correlated. Therefore, it is possible for some NACKs to be returned without correlation numbers even if all downstream commands had correlation numbers.

Error Processing

Network Printers support Page Continuation Action error processing. See *Intelligent Printer Data Stream Reference* for details.

The printer stops if there is a probability that it is not parsing commands correctly. This means that, regardless of the setting of the Exception Handling Control (EHC) the printer will stop processing, send a NACK, and enter home state immediately if one of the following conditions occurs:

1. The command length is less than 5 (No correlation number present).
2. The command length is less than 7 (Correlation number present).
3. The command length is greater than 32767.
4. The command does not have X'D6' as the first byte of the command code.
5. The command does have X'D6' as the first byte but is otherwise unrecognized.
6. A resource download is interrupted, resulting in a purge of the partial resource object.

The maximum number of queued asynchronous and synchronous errors are as followed.

- One for ARCTIC and NDS DSC mode
- Seven for NDS LU1 mode
- Seven for TCP/IP mode

Intervention required and equipment check exception types will be reported for NDS and TCP/IP interface type.

Exception Highlight Support

If a position exception occurs and the “position-check highlight” flag (XOA-EHC byte 2, bit 6) is on (B'1'), or if a Page Continuation Action (PCA) is taken for a position check, the approximate location of each unique occurrence of the position check will be highlighted with a Print-Error-Marker (PEM). Other exceptions detected in page state, or a derivative of page state, or when printing a medium overlay, which have a PCA defined, are also indicated by a PEM when the PCA is taken.

A PEM is a distinguishing mark which is placed in close proximity to the area on the page where the exception has occurred.

- The PEM for Position Check processing is a solid rectangular mark, placed in close proximity to the area on the page where the exception occurred. For the exception detected, the associated code (ie. 08C100) will be located at the top of the logical page, starting in the left hand corner.
- The PEM for PCA processing is a hollow rectangular mark enclosing a +, placed in close proximity to the area on the page where the exception has occurred, if the location can be accurately specified. For the exception detected, the associated code (ie. 040B00) will be located at the top of the logical page, starting in the left hand corner.
- Multiple exception code highlighting is limited to only the codes that will fit across the top of the logical page (10).
- PEM Size: 600 Pel (80 by 80)

If error exception handling is set to allow printing of an undefined character, the undefined character will appear as:

- A Space if it is unprintable.
- The Character itself if printable.

Page and Copy Counters

Page and Copy Counter information is reported using the 18-byte counter format described in *Intelligent Printer Data Stream Reference*, section “Acknowledge Reply”. The following counters are supported:

- Received Page
- Committed Page
- Committed Copy
- Stacked Page
- Stacked Copy

For Action Code 22, counters are adjusted as follows:

- Received Page - Mapped to Stacked Page
- Committed Page - Mapped to Stacked Page
- Committed Copy - Mapped to Stacked Copy
- Stacked Page Counter - Last value
- Stacked Copy Counter - Last Value

Data Types

Network Printers support four different types of data that may be used to create an output page. These are: text, graphics, images, and bar codes. The printed page can include any combination of these data types.

Blocks of graphics, bar code or image data are presented as a single unit to the printer. The printer enters the appropriate “Block” State (graphics block, image block, bar code block) to create the entire data group for that block of data.

Page segments and *Overlays* are any combinations of text, graphics, bar codes and images. The printer can store these segments and overlays for later use as the page is created.

Text

Presentation Text is the data type used to present lines of character information on a logical page.

The information to be presented is represented as a string of graphic character IDs and X'2B' control sequences that are sent to the printer in the Write Text command (See “Write Text” on page 79). The initial conditions governing the presentation of the data are established via control parameters that are sent to the printer in the Logical Page Description command (See “Logical Page Descriptor” on page 51).

The source architecture document for Text is *Presentation Text Object Content Architecture Reference*.

Image

Image is the data type used to present rectangular arrays of raster data in an Image block area on a page. This data may have been created originally by a scanning process or generated by a computer program.

Network Printers support the IM Image Function Set (see “Chapter 6. IM Image Command Set” on page 89). and the IO Image Function Set (See “Chapter 7. IO Image Command Set” on page 91) The IM Image Function Set has a syntax and functional content that is based on AFPDS image arrays and cells. The IO Image Function Set has a syntax and functional content based on the IOCA architecture for image data (see *Image Object Content Architecture Reference*).

The raster data to be presented is represented as a sequence of scan lines ‘m’ lines deep by ‘n’ picture elements (pels) wide. In IO image data, there may be more than one bit per pel if the image data is grayscale encoded. The format of the data and the recording algorithms used to encode the image array are sent to the printer as control parameters of the Write Image Control 2 command that prepares the printer for processing image data. The data itself is sent in the Write Image 2 command.

Graphics

Graphics is the data type used to present line art picture drawings in a graphics block area on a page.

The information to be presented is represented by a sequence of primitive drawing orders that are used by the device to construct arcs, lines, fillets, character strings, markers and other elements that define the drawing. These primitive orders, in turn, are grouped into one or more drawing segments that are executed to present the picture.

The Write Graphics Control command (See “Chapter 8. Graphics Command Set” on page 97) is sent to the printer to establish the clipping window control parameters and initial drawing conditions to be used in presenting the picture data. The picture segments are sent to the printer as data in zero or more Write Graphics commands of the architecture.

The graphics drawing orders are summarized in “Drawing Orders” on page 101. The source architecture document for graphics data is the *Graphics Object Content Architecture Reference*.

Bar Code

Bar Code is the data type used to present machine-scannable bar code symbols in a bar code block area on a page.

The Write Bar Code Control command (See “Chapter 9. Bar Code Command Set” on page 109) is sent to the printer to establish the bar code pattern parameters to be used in presentation. Data for the bar code symbols is sent to the printer in zero or more Write Bar Code commands.

Coordinate System

Xm, Ym Coordinate System (Medium Presentation Space)

The Xm, Ym coordinate system is the medium presentation space coordinate system. The origin of this system ($X_m=0$, $Y_m=0$) can be set by the IPDS XOH Set Media Origin command to any of the four corners of the media. If this command is not sent to the printer the origin is the top-left corner (viewed from the center). In this case, positive Xm values begin at the origin and increase along the top edge from left to right. Positive Ym values begin at the origin and increase along the left side from top to bottom. Top is defined as the short edge which leads into the printer. See *Intelligent Printer Data Stream Reference* for a description of the Xm, Ym Coordinate System and default media origin for envelopes.

Xp, Yp Coordinate System (Logical Page Presentation Space)

Identifying the Size of the Logical Page or Overlay

The size of the logical page or overlay presentation space is set during a printer initialization using the “IPDS Initialization Defaults” on page 21 or by the host program when it sends a Logical Page Descriptor command.

Overlays are logical pages and are handled as such by the printer with the following special considerations:

1. Overlays are positioned in relationship to the logical page presentation space origin ($X_p=0$, $Y_p=0$) when they are merged with the Include Overlay command.

2. Overlays are positioned in relationship to the origin of the medium presentation space ($X_m=0$, $Y_m=0$) when they are merged with the Merge Overlay keyword in a copy control record.

I, B Coordinates System (Text)

The +I and +B directions for the logical page or overlay are specified in degrees of rotation in relationship to the +Xp direction on the logical page.

The printer sets the +I and +B directions during the initialization through the "IPDS Initialization Defaults" on page 21. The host program can change the +I and +B directions through the Logical Page Descriptor command (See *Intelligent Printer Data Stream Reference*).

The host program can also change the +I and +B directions as it builds a page or overlay through text controls in the print data sent by a Write Text command (See "Write Text" on page 79).

Note: Setting the orientations of the +I and +B axes also implicitly sets their origins as one of the four corners of the logical page or overlay.

Other Text Positioning Terms

Some other terms that relate to text positioning and fonts include:

Text Orientation

The combination of the *inline sequence direction* (the direction which characters are added to a line) and the *baseline sequence direction* (the direction which lines are added to a page or overlay) identify the text orientation for a page. The inline sequence direction can be 0, 90, 180 or 270 degrees. Network Printers support baseline sequence directions that are always rotated plus or minus 90 degrees from the inline sequence direction. Therefore, there are eight text orientations for printing pages or overlays.

Printing Baseline

An imaginary line that extends across the page or overlay in the positive inline sequence direction (+I), between pels, and beginning from the baseline sequence printing coordinate (Bc). (Sometimes shown as *baseline* as in the font terms baseline offset and baseline extent.)

In languages with a right to left or left to right reading order (for example, English), the printing baseline is the imaginary line on which the main body of the character appears to rest. Descenders (the "tails" of lower case g, j, p, q, and y characters) usually extend below the printing baseline.

In languages with a top to bottom reading order (for example, Kanji), the printing baseline is an imaginary vertical line that passes through the center of the character.

Each font index record contains a Font Inline Sequence field. The field value specifies a relationship between the inline sequence direction and the font rotation (the character pattern rotation for the font). The printer uses the font index record to

identify how to place characters on the printing baseline for a page or overlay. The characters are placed in the combination of the inline sequence direction (the printing direction) and the font rotation.

The Baseline Offset value is another field in the font index record. This value locates the printing baseline relationship to a specified character box reference edge.

Notation Conventions

Some field values (or ranges of values) are specified assuming a unit of measure of 14400 L-units per 10 inches (5670 L-units per 10 centimeters). To determine supported values for a unit of measure of 2400 L-units per 10 inches (945 L-units per 10 centimeters) use the following steps.

1. Convert the specified value from hex (2's complement) to decimal.
2. Divide the + or - decimal number by 6
3. Round to the nearest integer
4. Convert the + or - decimal value back to hex (2's complement).

For example, if the specified value is X'8000' the following steps would be performed.

1. 8000(H) = -32768(D)
2. -32768/6 = -5461.333
3. -5461(D) = EAAB(H)

Chapter 3. Summary of IPDS Commands

This chapter lists the IPDS commands that can be used with the printer. For more information about how to use these commands, see the *Intelligent Printer Data Stream Reference*

Printer commands listed on the following pages are the valid values as identified in *Intelligent Printer Data Stream Reference* unless otherwise noted. Where the IPDS architecture allows choices, those choices are indicated.

IPDS Initialization Defaults

When you set the printer power switch to the On (I) position, various IPDS data stream parameters are set to their *initialization default* values. These values are used for control parameters when:

- The command stream specifies that the printer default should be used,
- No explicit values are specified in the command stream sent to the printer, or
- Previously transmitted values are lost and initial machine settings are reestablished at POR time.

These values remain in effect until overridden by specific data stream commands from the host application program. The following list of values remain in effect until explicitly overridden by the following IPDS commands:

- Load Copy Control
- Load Font Equivalence
- Logical Page Descriptor
- Logical Page Position
- XOA Exception Handling Control
- XOH Select Input Media Source
- XOH Set Media Origin
- XOH Set Media Size
- Text Control Sequences (STO, SIM, SIA, SBI, SCFL, STC, DIR, and DBR)

The following table shows the initialization defaults:

| Description | Default Value |
|--|--|
| L-Units Base Value | X'00' (10 inches) |
| L-Units per Base | X'3840' (14400 per 10 inches) |
| Input Media Source | Determined by Operator Panel, Forms Device Setting |
| Media Origin | X'00' (top-left) |
| Width of the Physical Page | Derived from X-Extent of Medium Presentation Space |
| Length of the Physical Page | Derived from Y-Extent of Medium Presentation Space |
| Width of the Logical Page in L-Units (X _p -Extent) | Derived from X-Extent of Medium Presentation Space |
| Length of the Logical Page in L-Units (Y _p -Extent) | Derived from Y-Extent of Medium Presentation Space |
| Ordered Data Flags | X'00' (Unordered page, block, and text flags) |
| Inline Sequence | X'0000' (0 degrees) |

| Description | Default Value |
|--|--|
| Baseline Sequence | X'2D00' (90 degrees) |
| Initial I Print Coordinate | X'0000' |
| Initial B Print Coordinate | X'00C0'(192 L-Units below the logical page origin) Note: Text printing on the first line requires the Current B Text Position to be large enough to accommodate the height of the current font. |
| X _m -Coordinate page origin | X'000000' Logical page X-displacement from the physical page origin (0 in) |
| Y _m -Coordinate page origin | X'000000' Logical page Y-displacement from the physical page origin (0 in) |
| Initial Inline Margin in L-Units | X'0000' |
| Inter-character Adjustment | X'0000' |
| Baseline Increment | X'00F0' (240 L-Units) |
| Text Color | Black |
| Code Page ID | From configuration settings. |
| Font Type | Font selection from configuration settings. Note: The default font may be changed to another font which supports the selected Code Page. For printer generated bar codes with human readable information (HRI), the default font is OCR-B (UPC and EAN bar code types) or OCR-A (other bar code types with HRI). |
| Exception Handling Control | X'C10101' Report undefined characters, position checks, and all other exceptions. Do not take Alternate Exception Action. Terminate, print page, and go to home state. No highlighting of position checks. |
| Number of Copy Groups | X'01' |
| X-Extent of Medium Presentation Space | Determined by Configuration |
| Y-Extent of Medium Presentation Space | Determined by Configuration |
| X Coordinate (logical page origin) | X'0000' |
| Y Coordinate (logical page origin) | X'0000' |
| X _p -Extent of Logical Page | Derived from X-Extent of Medium Presentation Space |
| Y _p -Extent of Logical Page | Derived from Y-Extent of Medium Presentation Space |
| Code Page Global ID (CPGID) | Determined by Configuration |
| Font Global ID (FGID) | Determined by Configuration |
| Font Width (FW) | Determined by Configuration |
| Copy Group Definition Length | X'04' (The Default Copy Group definition is four bytes long.) |
| Number of Identical Copies | X'01' (The printer prints one copy of each page.) |
| Keyword Entry | X'C100' (The printer prints simplex, no text suppression, no overlays.) |

Page Printer Initialization Sequence

Before printing begins, the host may determine characteristics of the printer and its resources and may specify certain parameters related to subsequent printing. Following is a typical sequence of initialization commands.

- Sense Type and Model (STM) with ARQ
- XOH Obtain Printer Characteristics (OPC) with ARQ
- Set Home State (SHS)
- Logical Page Descriptor (LPD)
- Logical Page Position (LPP)
- Load Copy Control (LCC)
- Load Font Equivalence (LFE) with ARQ

Chapter 4. Device Control Command Set

The Device Control commands shown in this section can help set up the printing environment: how the page is to be printed, what device controls are needed, and how to handle printer acknowledgements.

The following Device Control commands are described in this section:

- Acknowledgement Reply
- Activate Resource
- Begin Page
- Deactivate Font
- End
- End Page
- Load Copy Control
- Load Font Equivalence
- Logical Page Descriptor
- Logical Page Position
- No Operation
- Sense Type and Model
- Set Home State
- Execute Order Anystate (XOA)
- Execute Order Homestate (XOH)

Acknowledgement Reply

The Acknowledge Reply returns device status, sense data, and other information the host program requests. The printer sends an acknowledgement when it finds either of the following:

1. A datastream or device error that requires the printer to return a negative acknowledgement (NACK).
2. The Acknowledgement Required (ARQ) flag bit in the command the printer receives is set to 1.

The Acknowledge Reply is returned to the host in the standard IPDS command format although it goes from the printer to the host. See *Intelligent Printer Data Stream Reference* for details.

The following table lists Bit Codes for IPDS command stream flags for Acknowledgement Reply

Table 3. Bit Codes and their Meanings

| Bit Code | Meaning |
|----------|---|
| Bit 0 | Reserved |
| Bit 1 | Correlation Number Present |
| Bit 2 | Acknowledgement Continuation |
| Bits 3-6 | Reserved |
| Bit 7 | The Persistent NACK bit is for Non-SNA DSC Mode NACKs only. This bit has no meaning in other attachment environments. |

Notes:

1. When a command is received with Bit 1 set, the Acknowledgement Reply will be returned with this bit set, indicating that a two byte "Correlation Number" follows. The Correlation Number, a two byte identifier, is returned if available for:
 - a. Synchronous NACKs
 - b. Response to information request commands
 - c. Acknowledgement requested (Flag byte bit 0 = 1)
2. The Special Data area of the Acknowledgement Reply contains:
 - a. Error sense bytes when reporting an exception.
 - b. Response to the following information request commands:
 - 1) Sense Type and Model
 - 2) XOH Obtain Printer Characteristics
 - 3) XOA Request Resource List

Table 4. Acknowledgement Reply X'D6FF'

| Data Area | Value | Description | Error Code |
|-------------|---|--|------------|
| Byte 0 | X'40' X'41' X'44' X'46' X'C0' | ACKNOWLEDGEMENT TYPE: A one byte field that identifies the type of acknowledgement record and contents (if any) of the Special Data area. None Sense Type and Model Request Resource List Obtain Printer Characteristics Sense Bytes | |
| Bytes 1-2 | X'0000' - X'FFFF' | Received Page Counter* *Incremented when the End Page processing is completed. | |
| Bytes 3-4 | X'0000'-X'FFFF' | Committed Page Counter* *Incremented by the number of pages on a sheet when the sheet is released to the Print Subsystem. | |
| Bytes 5-6 | X'0000'-X'FFFF' | Committed Copy Counter * *Incremented by the number of pages on a sheet when the sheet is released to the Print Subsystem. | |
| Bytes 7-8 | X'0000'-X'FFFF' | Operator Viewing Page Counter* *Incremented by the number of pages on a sheet when the last copy of the sheet is stacked. | |
| Bytes 9-10 | X'0000'-X'FFFF' | Operator Viewing Copy Counter * *Incremented by the number of pages on a sheet when the sheet is stacked. | |
| Bytes 11-12 | X'0000'-X'FFFF' | Jam Recovery Page Counter* *Incremented by the number of pages on a sheet when the last copy of the sheet is stacked. | |

Table 4. Acknowledgement Reply X'D6FF' (continued)

| Data Area | Value | Description | Error Code |
|-------------|-----------------|---|------------|
| Bytes 13-14 | X'0000'-X'FFFF' | Jam Recovery Copy Counter * *Incremented by the number of pages on a sheet when the sheet is stacked. | |
| Bytes 15-16 | X'0000'-X'FFFF' | Stacked Page Counter* *Incremented by the number of pages on a sheet when the last copy of the sheet is stacked. | |
| Bytes 17-18 | X'0000'-X'FFFF' | Stacked Copy counter * *Incremented by the number of pages on a sheet when the sheet is stacked. | |
| Bytes 19-n | | SPECIAL DATA AREA: This area contains zero or more bytes of additional data as requested by the host program defined by the Acknowledgement Type. | |

Page and Copy Counter Maintenance

The following is a description of how the page and copy counters are incremented and maintained for network printers.

- Received Page Counter: Incremented when the End Page processing is completed.
- Committed Page Counter: Incremented by the number of pages on a sheet when the last copy of the sheet is released to the print subsystem.
- Committed Copy Counter: Incremented by the number of pages on a sheet when the sheet is released to the print subsystem.
- Operator Viewing Page Counter: Incremented by the number of pages on a sheet when the last copy of the sheet is stacked.
- Operator Viewing Copy Counter: Incremented by the number of pages on a sheet when the sheet is stacked.
- Jam Recovery Page Counter: Incremented by the number of pages on a sheet when the last copy of the sheet is stacked.
- Jam Recovery Copy Counter: Incremented by the number of pages on a sheet when the sheet is stacked.
- Stacked Page Counter: Incremented by the number of pages on a sheet when the last copy of the sheet is stacked.
- Stacked Copy Counter: Incremented by the number of pages on a sheet when the sheet is stacked.

Activate Resource

This command maps a 2 byte Host Assigned ID (HAID) (and 2 byte Font Inline Sequence) to a resident Resource ID of the format specified in the Resource ID Format parameter (Byte 6). The Resource ID formats which are supported by Network Printers may be determined using the XOH OPC command (See "XOH Obtain Printer Characteristics" on page 62).

An AR mapping (i.e. HAID to Resource ID mapping) remains in effect until:

- an XOH Erase Residual Font Data command or Deactivate Font (See “Deactivate Font” on page 30) command is received (the mapping is removed and font deactivated)
- the printer performs an IML (the mapping is removed)

If a Deactivate Font command is received for a single byte font, the font identified by the HAID is deactivated (i.e. made unavailable for use by the host), but all other current font mappings remain in effect until one of the actions described in the preceding paragraph occurs. If a Deactivate Font command is received which specifies all single byte fonts, all font mappings are removed as those fonts are deactivated.

A maximum of 256 Activate Resource ID mappings may be received. Additional mappings will be ignored.

Note: IPDS architecture describes the mapping and activation of resident resources as two conceptually separate processes. Network Printers, however, implement mapping and activation as one inseparable process. Un-map and de-activate are also inseparable operations. Thus, a Deactivate Font command, directed at a mapped and activated resident font, both un-maps and de-activates the specified font(s).

Table 5. Activate Resource X'D62E'

| Data Area | Value | Description | Error Code |
|--------------|--------------------|---|-------------|
| Bytes 0-1 | X'0002' X'000C' | ENTRY LENGTH Null entry Specifying without an equivalence | X'028F..01' |
| | X'0014' | Valid for RT=X'01' or X'08' with RIDF=X'03' | |
| | X'00B8' | Valid for RT=X'01' or X'08' with RIDF=X'06' | |
| Byte 2 | X'01' | RESOURCE TYPE (RT) Single byte LF1 coded font | X'028F..01' |
| | X'08' | Single byte font index | |
| Bytes 3-4 | X'0001'-X'7EFF' | HOST ASSIGNED ID | X'028F..01' |
| Byte 5 | | Ignored (Section Identifier) | |
| Byte 6 | X'03' X'06' | RESOURCE ID FORMAT (RIDF) IBM Registered Global Resource ID parts MVS host unalterable remote font environment | X'028F..01' |
| | | | |
| Bytes 7 - 8 | X'0000' | FONT INLINE SEQUENCE 0 Degrees | X'028F..01' |
| | X'2D00' | 90 Degrees | |
| | X'5A00' | 180 Degrees | |
| | X'8700' | 270 Degrees | |
| Bytes 9 - 10 | X'0000' | Reserved | |

Table 5. Activate Resource X'D62E' (continued)

| Data Area | Value | Description | Error Code |
|--|--|--|-------------|
| Byte 11 | Bit 0 0 Bit 1 0 Bit 2 0 Bit 3 0/1 Bits 4-7 0 | RESOURCE CLASS FLAGS Public/Private (Resource Capture) Retired Ignored (Reset) AR NACK Enabled Reserved | |
| Bytes 12 - n | | RESOURCE ID | X'028F..01' |
| Note: Zero or more additional entries, analogous to bytes 0 - n above | | | |

Resource ID example with RIDF = GRID

Table 6. AR Resource ID (RIDF = X'03')

| Data Area | Value | Description | Error Code |
|-------------|---|---|-------------|
| Bytes 12-13 | X'0000' X'0001' - X'FFFE' X'FFFF' | GRAPHIC CHARACTER SET GLOBAL ID No value supplied GCSGID All characters with assigned code points in the associated code page | X'028F..02' |
| Bytes 14-15 | X'0000' X'0001' - X'FFFE' X'FFFF' | CODE PAGE GLOBAL ID No value supplied CPGID Default Code Page (Configuration Settings) | X'028F..02' |
| Bytes 16-17 | X'0000' X'0001' - X'FFFE' X'FFFF' | FONT GLOBAL ID No value supplied FGID Default FGID (Configuration Settings) | X'028F..02' |
| Bytes 18-19 | X'0000' X'0001' - X'FFFE' X'FFFF' | FONT WIDTH No value supplied FW Default FW (Configuration Settings) | X'028F..02' |

Resource ID example with RIDF = MVS Host Unalterable Remote Font Environment

Table 7. AR Resource ID (RIDF = X'06')

| Data Area | Value | Description | Error Code |
|-------------|---|---|-------------|
| Bytes 12-13 | | Ignored (CRC) | |
| Bytes 14-21 | | Ignored (MVS Host System ID) | |
| Bytes 22-27 | | Ignored (VOLSER of Host library) | |
| Bytes 28-71 | | Ignored (DSNAME of Host library) | |
| Bytes 72-77 | | Ignored (Date Stamp) | |
| Bytes 78-85 | | Ignored (Time Stamp) | |
| Bytes 86-93 | | Ignored (Host Library Member Name) | |
| Bytes 94-95 | X'0000' X'0001' - X'FFFE' X'FFFF' | GRAPHIC CHARACTER SET GLOBAL ID No value supplied GCSGID All characters with assigned code points in the associated code page | X'028F..02' |

Table 7. AR Resource ID (RIDF = X'06') (continued)

| Data Area | Value | Description | Error Code |
|---------------|---|---|-------------|
| Bytes 96-97 | X'0000' X'0001' - X'FFFE' X'FFFF' | CODE PAGE GLOBAL ID No value supplied CPGID Default Code Page (Configuration Settings) | X'028F..02' |
| Bytes 98-99 | | Ignored (CRC) | |
| Bytes 100-107 | | Ignored (MVS Host System ID) | |
| Bytes 108-113 | | Ignored (VOLSER of Host library) | |
| Bytes 114-157 | | Ignored (DSNAME of Host library) | |
| Bytes 158-163 | | Ignored (Date Stamp) | |
| Bytes 164-171 | | Ignored (Time Stamp) | |
| Bytes 172-179 | | Ignored (Host Library Member Name) | |
| Bytes 180-181 | X'0000' X'0001' - X'FFFE' X'FFFF' | FONT GLOBAL ID No value supplied FGID Default FGID (Configuration Settings) | X'028F..02' |
| Bytes 182-183 | X'0000' X'0001' - X'FFFE' X'FFFF' | FONT WIDTH No value supplied FW Default FW (Configuration Settings) | X'028F..02' |

Begin Page

This command is only valid in home state and causes the printer to enter page state. See the *Intelligent Printer Data Stream Reference* for details.

Note: At Begin Page processing time a test for media source and destination compatibility will be performed. If it is determined that the processing of this page with the media source and media destination specified is incompatible an exception X'0237..04' will be reported. An example of this occurrence would be a media source containing legal size media and a media destination that cannot accept legal size media (ie. media destination is mailbox unit on the Network Printer 17 printer).

Deactivate Font

The Deactivate Font command carries one to six bytes of data used by the host to deactivate one or more coded fonts or coded font indexes.

Table 8. Deactivate Font X'D64F'

| Data Area | Value | Description | Error Code |
|-----------|--|---|----------------------------|
| Byte 0 | X'11' X'12' X'1E' X'1F' | DEACTIVATION TYPE Deactivate one single byte LF1 Coded Font and related indexes Deactivate one single byte font index Deactivate all single byte LF1 Coded Fonts and all indexes Deactivate all single byte LF1 Coded Fonts and all indexes (same as above) | X'0217..02' |
| Bytes 1-2 | X'0001' - X'7EFF' | HOST ASSIGNED ID (Deactivation Types X'11' and X'12') | X'0214..02' X'0215..02' |
| Byte 3 | X'00' | SECTION ID Single byte font | |
| Bytes 4-5 | X'0000' X'2D00' X'5A00' X'8700' | FONT INLINE SEQUENCE (Deactivation Type X'12') 0 deg. 90 deg. 180 deg. 270 deg. | X'0240..02' |

End

The End command is the ending control for a series of Write Image, Write Image 2, Write Graphics, Write Bar Code, Load Code Page, or Load Font commands. This command marks either the end of an image object, a graphics object, a bar code object, or the end of a downloaded font sequence. See the Intelligent Printer Data Stream Reference, S544-3417, for more details.

End Page

The End Page (EP) command causes the printer to return to home state from page state, page segment state, or overlay state and thus marks the end of a page, a page segment, or an overlay. The EP command is an implicit command to schedule that page for printing if the command is being used to exit page state; all data for that page is available to the printer. Zero or more data bytes can be transmitted but are ignored. See the Intelligent Printer Data Stream Reference, S544-3417, for more details.

Load Copy Control

A copy control record 2 to 32760 bytes long specifies how the printer is to modify and print logical pages in one or more copy subgroup definitions. A maximum of 128 copy subgroups is supported. Each copy subgroup definition can be from 2 to 254 bytes long (divisible by 2). The maximum number of key-words that the host program can specify in a copy subgroup definition is:

- X'80nn' specify 1 time
- X'90nn' specify 1 time
- X'91nn' specify 1 time
- X'C1nn' specify 1 time
- X'C2nn' specify 1 time
- X'D1nn' specify 1 to 126 times
- X'E1nn' specify 1 to 126 times

A maximum of 64 medium overlays are allowed in one copy subgroup.

Notes:

1. Actual tray capacity is determined by media weight.
2. Duplicate page copies may be printed after recovery from a paper jam when an LCC command has requested multiple copies.

Table 9. Network Printer 12 Load Copy Control X'D69F'

| Data Area | Value | Description | Error Code |
|-----------|---------------|---------------------------------|-------------|
| Byte 0 | X'02' - X'FE' | COPY SUBGROUP DEFINITION LENGTH | |
| Byte 1 | X'01' - X'FF' | NUMBER OF IDENTICAL COPIES | X'0231..01' |

Table 9. Network Printer 12 Load Copy Control X'D69F' (continued)

| Data Area | Value | Description | Error Code |
|-------------------|----------------------------------|--|-------------|
| Bytes 2-n | | COPY MODIFICATION KEYWORDS | X'0232..01' |
| | X'8000' | Media Source CUT SHEET Tray 1 (250) | X'02C2..02' |
| | X'8001' | CUT SHEET Tray 2 (500) | X'02C8..01' |
| | X'8040' | ENVELOPE Tray (60) The Envelope Tray is Mutually Exclusive of Cut Sheet Tray 2 | X'50F8..nn' |
| | X'8063' | MANUAL Tray (80) | |
| | X'80FF' | DEFAULT (Customer Configurable) | |
| | X'9000' | Media Destination (Byte Pairs) Output Tray 1 (Face Down) (250) | X'0236..01' |
| | X'9101' | | X'0237..03' |
| | X'9000' | Output Tray 2 (Face Up) (20) | X'0237..04' |
| | X'9102' | | X'02C1..01' |
| | | | X'02C3..01' |
| | X'C100' | Simplex Printing | X'02C0..01' |
| | | | X'02C2..01' |
| | X'C101' | Normal Duplex Printing (Ym-Axis) | X'02C0..01' |
| | | X'02C2..01' | |
| X'C102' | Tumble Duplex Printing (Xm-Axis) | X'0298..01' | |
| | | X'0239..01' | |
| X'C201' | 1-up Partitioning | X'0237..01' | |
| | | X'02C0..02' | |
| | | X'02C0..03' | |
| | | X'02C0..04' | |
| | | X'02C0..05' | |
| X'D101' - X'D1FF' | Suppression | X'0290..01' | |
| | | X'0238..01' | |
| X'E101' - X'E1FE' | Medium Overlay | | |

Table 10. Network Printer 17 Load Copy Control X'D69F'

| Data Area | Value | Description | Error Code |
|-----------|---------------|---------------------------------|-------------|
| Byte 0 | X'02' - X'FE' | COPY SUBGROUP DEFINITION LENGTH | |
| Byte 1 | X'01' - X'FF' | NUMBER OF IDENTICAL COPIES | X'0231..01' |

Table 10. Network Printer 17 Load Copy Control X'D69F' (continued)

| Data Area | Value | Description | Error Code |
|-------------------|---|---|-------------|
| Bytes 2-n | | COPY MODIFICATION KEYWORDS | X'0232..01' |
| | | Media Source | |
| | X'8000' | CUT SHEET Tray 1 (250) | X'02C2..02' |
| | X'8001' | CUT SHEET Tray 2 (500) | X'02C8..01' |
| | X'8002' | CUT SHEET Tray 3 (500) | X'50F8..nn' |
| | X'8040' | ENVELOPE Tray (75) | |
| | X'8063' | MANUAL Tray (100) | |
| | X'80FF' | DEFAULT (Customer Configurable) | |
| | | Media Destination (Byte Pairs) | |
| | X'9000' | High Order Byte is Always 00 | X'0236..01' |
| | | | X'0237..03' |
| | X'9101' | Output Tray 1 (Face Down) (250) | X'0237..04' |
| | X'9102' | Output Tray 2 (Face Down) (500) | X'02C1..01' |
| | | Tray 2 is Mutually Exclusive of the Mailbox Output Unit | X'02C3..01' |
| | X'9103' | Mailbox Output Tray 1 (Face Down) (45) | |
| | X'9104' | Mailbox Output Tray 2 (Face Down) (45) | |
| | X'9105' | Mailbox Output Tray 3 (Face Down) (45) | |
| | X'9106' | Mailbox Output Tray 4 (Face Down) (45) | |
| | X'9107' | Mailbox Output Tray 5 (Face Down) (45) | |
| | X'9108' | Mailbox Output Tray 6 (Face Down) (45) | |
| X'9109' | Mailbox Output Tray 7 (Face Down) (45) | | |
| X'910A' | Mailbox Output Tray 8 (Face Down) (45) | | |
| X'910B' | Mailbox Output Tray 9 (Face Down) (45) | | |
| X'910C' | Mailbox Output Tray 10 (Face Down) (45) | | |
| X'C100' | Simplex Printing | X'02C0..01' | |
| | | X'02C2..01' | |
| X'C101' | Normal Duplex Printing (Ym-Axis) | X'02C0..01' | |
| | | X'02C2..01' | |
| X'C102' | Tumble Duplex Printing (Xm-Axis) | X'0298..01' | |
| | | X'0239..01' | |
| X'C201' | 1-up Partitioning | X'0237..01' | |
| | | X'02C0..02' | |
| | | X'02C0..03' | |
| | | X'02C0..04' | |
| | | X'02C0..05' | |
| X'D101' - X'D1FF' | Suppression | X'0290..01' | |
| | | X'0238..01' | |
| X'E101' - X'E1FE' | Medium Overlay | | |

Table 11. InfoPrint 20 Load Copy Control X'D69F'

| Data Area | Value | Description | Error Code |
|-----------|---------------|---------------------------------|-------------|
| Byte 0 | X'02' - X'FE' | COPY SUBGROUP DEFINITION LENGTH | |
| Byte 1 | X'01' - X'FF' | NUMBER OF IDENTICAL COPIES | X'0231..01' |

Table 11. InfoPrint 20 Load Copy Control X'D69F' (continued)

| Data Area | Value | Description | Error Code |
|-------------------|----------------------------------|---|---|
| Bytes 2-n | | COPY MODIFICATION KEYWORDS | X'0232..01' |
| | | Media Source (See notes at end of this section.) | |
| | X'8000' | CUT SHEET Tray 1 (500) | X'02C2..02' |
| | X'8001' | CUT SHEET Tray 2 (500) (2000) | X'02C8..01' |
| | X'8002' | CUT SHEET Tray 3 (500) (2000) | X'50F8..nn' |
| | X'8040' | ENVELOPE Tray 1 (75) | |
| | X'8041' | ENVELOPE Tray 2 (75) | |
| | X'8042' | ENVELOPE Tray 3 (75) | |
| | X'8063' | MANUAL Tray (150) | |
| | X'80FF' | DEFAULT (Customer Configurable) | |
| | | Media Destination (Byte Pairs) | |
| | X'9000' | High Order Byte is Always 00 | X'0236..01' X'0237..03' |
| | X'9101' | Output Tray 1 (Face Down) (500) | X'0237..04' X'02C1..01' X'02C3..01' |
| | X'C100' | Simplex Printing | X'02C0..01' X'02C2..01' |
| | X'C101' | Normal Duplex Printing (Ym-Axis) | X'02C0..01' X'02C2..01' |
| X'C102' | Tumble Duplex Printing (Xm-Axis) | X'0298..01' X'0239..01' | |
| X'C201' | 1-up Partitioning | X'0237..01' X'02C0..02' X'02C0..03' X'02C0..04' X'02C0..05' | |
| X'D101' - X'D1FF' | Suppression | X'0290..01' X'0238..01' | |
| X'E101' - X'E1FE' | Medium Overlay | | |

Table 12. Network Printer 24 Load Copy Control X'D69F'

| Data Area | Value | Description | Error Code |
|-----------|---------------|---------------------------------|-------------|
| Byte 0 | X'02' - X'FE' | COPY SUBGROUP DEFINITION LENGTH | |
| Byte 1 | X'01' - X'FF' | NUMBER OF IDENTICAL COPIES | X'0231..01' |

Table 12. Network Printer 24 Load Copy Control X'D69F' (continued)

| Data Area | Value | Description | Error Code |
|-------------------|--|---|-------------|
| Bytes 2-n | | COPY MODIFICATION KEYWORDS | X'0232..01' |
| | | Media Source | |
| | X'8000' | CUT SHEET Tray 1 (500) | X'02C2..02' |
| | X'8001' | CUT SHEET Tray 2 (500) | X'02C8..01' |
| | X'8002' | CUT SHEET Tray 3 (2000) | X'50F8..nn' |
| | X'8040' | ENVELOPE Tray (100) | |
| | X'8063' | MANUAL Tray (100) | |
| | X'80FF' | DEFAULT (Customer Configurable) | |
| | | Media Destination (Byte Pairs) | |
| | X'9000' | High Order Byte is Always 00 | X'0236..01' |
| | | | X'0237..03' |
| | X'9101' | Output Tray 1 (Face Down) (500) | X'0237..04' |
| | X'9102' | Output Tray 2 (Face Up) (100) | X'02C1..01' |
| | | Tray 2 is Mutually Exclusive of the High Capacity Output Finisher | X'02C3..01' |
| | | | X'027C..0A' |
| | X'9103' | Finisher Output Tray 1 (Face Down) (600) | |
| | X'9104' | Finisher Output Tray 2 (Face Down) (700) | |
| | X'9105' | Finisher Output Tray 3 (Face Down) (700) | |
| | X'9106' | Finisher Output Tray 1 (Face Up) (600) | |
| | X'9107' | Finisher Output Tray 2 (Face Up) (700) | |
| X'9108' | Finisher Output Tray 3 (Face Up) (700) | | |
| X'9109' | High Capacity Output (Linked Trays, Face Down, 2000) | | |
| X'C100' | Simplex Printing | X'02C0..01' | |
| | | X'02C2..01' | |
| X'C101' | Normal Duplex Printing (Ym-Axis) | X'02C0..01' | |
| | | X'02C2..01' | |
| X'C102' | Tumble Duplex Printing (Xm-Axis) | X'0298..01' | |
| | | X'0239..01' | |
| X'C201' | 1-up Partitioning | X'0237..01' | |
| | | X'02C0..02' | |
| | | X'02C0..03' | |
| | | X'02C0..04' | |
| | | X'02C0..05' | |
| X'D101' - X'D1FF' | Suppression | X'0290..01' | |
| | | X'0238..01' | |
| X'E101' - X'E1FE' | Medium Overlay | | |

Table 13. InfoPrint 32 Load Copy Control X'D69F'

| Data Area | Value | Description | Error Code |
|-----------|---------------|---------------------------------|-------------|
| Byte 0 | X'02' - X'FE' | COPY SUBGROUP DEFINITION LENGTH | |
| Byte 1 | X'01' - X'FF' | NUMBER OF IDENTICAL COPIES | X'0231..01' |

Table 13. InfoPrint 32 Load Copy Control X'D69F' (continued)

| Data Area | Value | Description | Error Code |
|-------------------|-------------------|--|---|
| Bytes 2-n | | COPY MODIFICATION KEYWORDS | X'0232..01' |
| | | Media Source (See notes that follow.) | |
| | X'8000' | CUT SHEET Tray 1 (500) | X'02C2..02' |
| | X'8001' | CUT SHEET Tray 2 (500) | X'02C8..01' |
| | X'8002' | CUT SHEET Tray 3 (500) (2500-Sheet Input 1) | X'50F8..nn' |
| | X'8003' | CUT SHEET Tray 4 (1000) (2500-Sheet Input 2) | |
| | X'8004' | CUT SHEET Tray 5 (1000) (2500-Sheet Input 3) | |
| | X'8040' | ENVELOPE Tray 1 (50) | |
| | X'8063' | AUXILIARY Tray (50) | |
| | X'80FF' | DEFAULT (Customer Configurable) | |
| | | Media Destintation (Byte Pairs) | |
| | X'9000' | High Order Byte is Always 00 | X'0236..01' X'0237..03' |
| | X'9101' | Output Bin 1 (Face Down) (500) | X'0237..04' |
| | X'9102' | Output Bin 2 (Face Up) (200) | X'02C1..01' |
| | X'9103' | Finisher Output Bin 1 (Face Down) (670) | X'02C3..01' |
| | X'9104' | Finisher Output Bin 2 (Face Down) (670) | |
| | X'9105' | Finisher Output Bin 3 (Face Down) (670) | |
| | X'9106' | Finisher High Capacity Output (Linked Trays) (Face Down) (2000) | |
| | X'C100' | Simplex Printing | X'02C0..01' X'02C2..01' |
| | X'C101' | Normal Duplex Printing (Ym-Axis) | X'02C0..01' X'02C2..01' |
| | X'C102' | Tumble Duplex Printing (Xm-Axis) | X'0298..01' X'0239..01' |
| | X'C201' | 1-up Partitioning | X'0237..01' X'02C0..02' X'02C0..03' X'02C0..04' X'02C0..05' |
| | X'D101' - X'D1FF' | Suppression | X'0290..01' X'0238..01' |
| X'E101' - X'E1FE' | Medium Overlay | | |

Media Source and Destination Support Matrices

The following tables are provided to document the Media Source and Destination support for Network Printers. This information is provided to ensure better overall understanding of the media handling characteristics of Network Printers. For more details on the actual X and Y media extents see "Printable Area Self Defining Field" on page 62.

Network Printer 12 Media Source and Destination Support Matrices

Table 14. Network Printer 12 SOURCE Media Configurations and Capabilities

| MEDIA | Tray 1 (Capacity: 250) | Tray 2 (Capacity: 500) | Auxiliary Tray (Capacity: 80) | Envelope Tray (Capacity: 60) | Duplex Supported | Lead Feed Edge |
|----------------------------------|------------------------------|------------------------------|--|---------------------------------------|---------------------|-------------------|
| Paper | | | | | | |
| Statement (8.5 in x 5.5 in) | | | Yes | | | top |
| Executive (7.25 in x 10.5 in) | Yes | | Yes | | | top |
| Letter (8.5 in x 11 in) | Yes | Yes | Yes | | Yes | top |
| Folio (8.5 in x 13 in) | Yes | Yes | Yes | | Yes | top |
| Legal (8.5 in x 14 in) | Yes | Yes | Yes | | Yes | top |
| Ledger (11 in x 17 in) | | | | | | |
| A6 (105 x 148.5 mm) | | | Yes | | | top |
| A5 (148.5 x 210 mm) | | | Yes | | | top |
| B5 (ISO) (176 x 250 mm) | | | Yes | | | top |
| B5 (JIS) (182 x 257 mm) | Yes | | Yes | | | top |
| A4 (210 x 297 mm) | Yes | Yes | Yes | | Yes | top |
| B4 (257 x 364 mm) | | | | | | |
| A3 (297 x 420 mm) | | | | | | |
| Envelopes | | | | | | |
| Monarch (3.875 in x 7.5 in) | | | Yes | Yes | | left |
| COM10 (4.125 in x 9.5 in) | | | Yes | Yes | | left |
| DL (110 x 220 mm) | | | Yes | Yes | | left |
| C5 (162 x 229 mm) | | | Yes | Yes | | left |
| B5 (176 x 250 mm) | | | | | | |

Table 15. Network Printer 12 DESTINATION Media Configurations and Capabilities

| MEDIA | Output Tray 1 (Capacity: 250) | Output Tray 2 (Capacity: 20) | Duplex Supported |
|--------------|----------------------------------|---------------------------------|------------------|
| Paper | | | |

Table 15. Network Printer 12 DESTINATION Media Configurations and Capabilities (continued)

| MEDIA | Output Tray 1 (Capacity: 250) | Output Tray 2 (Capacity: 20) | Duplex Supported |
|----------------------------------|--------------------------------------|-------------------------------------|-------------------------|
| Statement (8.5 in x 5.5 in) | Yes | Yes | |
| Executive (7.25 in x 10.5 in) | Yes | Yes | |
| Letter (8.5 in x 11 in) | Yes | Yes | Yes |
| Folio (8.5 in x 13 in) | Yes | Yes | Yes |
| Legal (8.5 in x 14 in) | Yes | Yes | Yes |
| Ledger (11 in x 17 in) | | | |
| A6 (105 x 148.5 mm) | Yes | Yes | |
| A5 (148.5 x 210 mm) | Yes | Yes | |
| B5 (ISO) (176 x 250 mm) | Yes | Yes | |
| B5 (JIS) (182 x 257 mm) | Yes | Yes | |
| A4 (210 x 297 mm) | Yes | Yes | Yes |
| B4 (257 x 364 mm) | | | |
| A3 (297 x 420 mm) | | | |
| Envelopes | | | |
| Monarch (3.875 in x 7.5 in) | Yes | Yes | |
| COM10 (4.125 in x 9.5 in) | Yes | Yes | |
| DL (110 x 220 mm) | Yes | Yes | |
| C5 (162 x 229 mm) | Yes | Yes | |
| B5 (176 x 250 mm) | | | |

Network Printer 17 Media Source and Destination Support Matrices

Table 16. Network Printer 17 SOURCE Media Configurations and Capabilities

| MEDIA | Cutsheet Tray 1 (Capacity: 250) | Cutsheet Tray 2 (Capacity: 500) | Cutsheet Tray 3 (Capacity: 500) | Manual Feed Tray (Capacity: 100) | Envelope Tray (Capacity: 75) | Duplex Supported | Lead Feed Edge |
|--------------|--|--|--|---|-------------------------------------|-------------------------|-----------------------|
| Paper | | | | | | | |

Table 16. Network Printer 17 SOURCE Media Configurations and Capabilities (continued)

| MEDIA | Cutsheet Tray 1 (Capacity: 250) | Cutsheet Tray 2 (Capacity: 500) | Cutsheet Tray 3 (Capacity: 500) | Manual Feed Tray (Capacity: 100) | Envelope Tray (Capacity: 75) | Duplex Supported | Lead Feed Edge |
|----------------------------------|--|--|--|---|---|-------------------------|-----------------------|
| Statement (8.5 in x 5.5 in) | | | | Yes | | | top |
| Executive (7.25 in x 10.5 in) | Yes | | | Yes | | | top |
| Letter (8.5 in x 11 in) | Yes | Yes | Yes | Yes | | Yes | top |
| Folio (8.5 in x 13 in) | Yes | Yes | Yes | Yes | | Yes | top |
| Legal (8.5 in x 14 in) | Yes | Yes | Yes | Yes | | Yes | top |
| Ledger (11 in x 17 in) | | | | | | | |
| A6 (105 x 148.5 mm) | | | | Yes | | | top |
| A5 (148.5 x 210 mm) | | | | Yes | | | top |
| B5 (ISO) (176 x 250 mm) | | | | Yes | | | top |
| B5 (JIS) (182 x 257 mm) | Yes | | | Yes | | | top |
| A4 (210 x 297 mm) | Yes | Yes | Yes | Yes | | Yes | top |
| B4 (257 x 364 mm) | | | | | | | |
| A3 (297 x 420 mm) | | | | | | | |
| Envelopes | | | | | | | |
| Monarch (3.875 in x 7.5 in) | | | | Yes | Yes | | left |
| COM10 (4.125 in x 9.5 in) | | | | Yes | Yes | | left |
| DL (110 x 220 mm) | | | | Yes | Yes | | left |
| C5 (162 x 229 mm) | | | | Yes | Yes | | left |
| B5 (176 x 250 mm) | | | | | | | |

Table 17. Network Printer 17 DESTINATION Media Configurations and Capabilities

| MEDIA | Output Tray 1 (Capacity: 250) | Output Tray 2 (Capacity: 500) | Mailbox Output Trays (Capacity: 10@45) | Duplex Supported |
|--------------------------------|--|--|---|-------------------------|
| Paper | | | | |
| Statement (8.5 in x 5.5 in) | Yes | Yes | | |

Table 17. Network Printer 17 DESTINATION Media Configurations and Capabilities (continued)

| MEDIA | Output Tray 1 (Capacity: 250) | Output Tray 2 (Capacity: 500) | Mailbox Output Trays (Capacity: 10@45) | Duplex Supported |
|----------------------------------|--|--|---|-------------------------|
| Executive (7.25 in x 10.5 in) | Yes | Yes | | |
| Letter (8.5 in x 11 in) | Yes | Yes | Yes | Yes |
| Folio (8.5 in x 13 in) | Yes | Yes | | Yes |
| Legal (8.5 in x 14 in) | Yes | Yes | | Yes |
| Ledger (11 in x 17 in) | | | | |
| A6 (105 x 148.5 mm) | Yes | Yes | | |
| A5 (148.5 x 210 mm) | Yes | Yes | | |
| B5 (ISO) (176 x 250 mm) | Yes | Yes | | |
| B5 (JIS) (182 x 257 mm) | Yes | Yes | | |
| A4 (210 x 297 mm) | Yes | Yes | Yes | Yes |
| B4 (257 x 364 mm) | | | | |
| A3 (297 x 420 mm) | | | | |
| Envelopes | | | | |
| Monarch (3.875 in x 7.5 in) | Yes | Yes | | |
| COM10 (4.125 in x 9.5 in) | Yes | Yes | | |
| DL (110 x 220 mm) | Yes | Yes | | |
| C5 (162 x 229 mm) | Yes | Yes | | |
| B5 (176 x 250 mm) | | | | |

InfoPrint 20 Media Source and Destination Support Matrices

Table 18. InfoPrint 20 SOURCE Media Configurations and Capabilities

| MEDIA | Letter Cassette (US IML) (Capacity: 500) | Letter Cassette (E/J IML) (Capacity: 500) | Ledger Cassette (US IML) (Capacity: 500) | Letter Cassette (E/J IML) (Capacity: 500) | High Capacity Feeder (Cap: 2000) | Manual Feed Tray (Capacity: 150) | Envelope Tray (Capacity: 75) |
|--------------|---|--|---|--|---|---|---|
| Paper | | | | | | | |

Table 18. InfoPrint 20 SOURCE Media Configurations and Capabilities (continued)

| MEDIA | Letter Cassette (US IML) (Capacity: 500) | Letter Cassette (E/J IML) (Capacity: 500) | Ledger Cassette (US IML) (Capacity: 500) | Letter Cassette (E/J IML) (Capacity: 500) | High Capacity Feeder (Cap: 2000) | Manual Feed Tray (Capacity: 150) | Envelope Tray (Capacity: 75) |
|---|---|--|---|--|---|---|-------------------------------------|
| Statement (8.5 in x 5.5 in) | Simplex LEF | | Simplex LEF | | | Simplex LEF | |
| Executive (7.25 in x 10.5 in) | Simplex LEF | | Simplex LEF | | | Simplex LEF | |
| Letter (8.5 in x 11 in) | Duplex LEF/SEF | Duplex LEF | Duplex LEF/SEF | Duplex LEF | Duplex LEF | Duplex LEF/SEF | |
| Folio (8.5 in x 13 in) | | | Duplex SEF | Duplex SEF | | Duplex SEF | |
| Legal (8.5 in x 14 in) | | | Duplex SEF | Duplex SEF | | Duplex SEF | |
| Ledger (11 in x 17 in) | | | Duplex SEF | Duplex SEF | | Duplex SEF | |
| Japan Official Postcard (Hagaki) (100 x 148 mm) | | | | | | Simplex SEF | |
| A6 (105 x 148.5 mm) | | | | | | | |
| A5 (148.5 x 210 mm) | | Simplex LEF | | Simplex LEF | | Simplex LEF | |
| B5 (ISO) (176 x 250 mm) | | | | | | | |
| B5 (JIS) (182 x 257 mm) | | Simplex LEF | | Simplex LEF | | Simplex LEF | |
| A4 (210 x 297 mm) | Duplex LEF | Duplex LEF/SEF | Duplex LEF | Duplex LEF/SEF | Duplex LEF | Duplex LEF/SEF | |
| B4 (257 x 364 mm) | | | Duplex SEF | Duplex SEF | | Duplex SEF | |
| A3 (297 x 420 mm) | | | Duplex SEF | Duplex SEF | | Duplex SEF | |
| Universal (88 x 148 mm to 330 x 508 mm) | | | | | | Simplex SEF Portrait (Note 4) | |
| Envelopes | | | | | | | |
| Monarch (3.875 in x 7.5 in) | | | | | | Simplex SEF (UNI-ENV) | Simplex SEF |
| COM10 (4.125 in x 9.5 in) | | | | | | Simplex SEF (UNI-ENV) | Simplex SEF |
| DL (110 x 220 mm) | | | | | | Simplex SEF (UNI-ENV) | Simplex SEF |

Table 18. InfoPrint 20 SOURCE Media Configurations and Capabilities (continued)

| MEDIA | Letter Cassette (US IML) (Capacity: 500) | Letter Cassette (E/J IML) (Capacity: 500) | Ledger Cassette (US IML) (Capacity: 500) | Letter Cassette (E/J IML) (Capacity: 500) | High Capacity Feeder (Cap: 2000) | Manual Feed Tray (Capacity: 150) | Envelope Tray (Capacity: 75) |
|---|---|--|---|--|---|---|-------------------------------------|
| C5 (162 x 229 mm) | | | | | | Simplex SEF (UNI-ENV) | Simplex SEF |
| B5 (176 x 250 mm) | | | | | | | |
| Universal (Env) (88 x 148 mm to 330 x 508 mm) | | | | | | Simplex SEF Portrait | |
| Transparencies and Labels | | | | | | | |
| Letter (8.5 in x 11 in) | | | | | | Simplex LEF/SEF | |
| A4 (210 x 297 mm) | | | | | | Simplex LEF/SEF | |

Notes:

1. US and E/J (Europe/Japan) IML columns indicate paper sizes that the Letter and Legal cassettes will support based on the IML Cold Reset (Letter or A4).
2. SEF (Short-Edge Feed) and LEF (Long-Edge Feed) parameters are reported by the paper cassettes and the High-Cap Feeder along with paper size. This information is not reported back to the host or application, and is provided here for clarification of the InfoPrint 20 paper-handling capabilities.
3. The Manual tray supports a range of variable paper sizes with a granularity of either 1 mm or 0.1 inches.
4. Duplexing of Universal Paper (variable paper size) is enabled, however some small sizes may jam or exhibit registration problems due to print engine limitations.

Table 19. InfoPrint 20 DESTINATION Media Configurations and Capabilities

| MEDIA | Output Tray 1 (Capacity: 500) | Offset Stacking |
|---|--------------------------------------|------------------------|
| Paper | | |
| Statement (8.5 in x 5.5 in) | Yes | Yes |
| Executive (7.25 in x 10.5 in) | Yes | Yes |
| Letter (8.5 in x 11 in) | Yes | Yes |
| Folio (8.5 in x 13 in) | Yes | Yes |
| Legal (8.5 in x 14 in) | Yes | Yes |
| Ledger (11 in x 17 in) | Yes | Yes |
| Japan Official Postcard (Hagaki) (100 x 148 mm) | Yes | Yes |

Table 19. InfoPrint 20 DESTINATION Media Configurations and Capabilities (continued)

| MEDIA | Output Tray 1 (Capacity: 500) | Offset Stacking |
|---|-------------------------------|---|
| A6 (105 x 148.5 mm) | | |
| A5 (148.5 x 210 mm) | Yes | Yes |
| B5 (ISO) (176 x 250 mm) | | |
| B5 (JIS) (182 x 257 mm) | Yes | Yes |
| A4 (210 x 297 mm) | Yes | Yes |
| B4 (257 x 364 mm) | Yes | Yes |
| A3 (297 x 420 mm) | Yes | Yes |
| Universal (88 x 148 to 330 x 508 mm) | Yes | Yes Note: Universal sizes (also called variable paper sizes or custom form sizes) support offsetting only for IPDS and only when the paper width is less than 297 mm. |
| Envelopes | | |
| Monarch (3.875 in x 7.5 in) | Yes | Yes |
| COM10 (4.125 in x 9.5 in) | Yes | Yes |
| DL (110 x 220 mm) | Yes | Yes |
| C5 (162 x 229 mm) | Yes | Yes |
| B5 (176 x 250 mm) | | |
| Universal (88 x 148 to 330 x 508 mm) | Yes | Yes Note: Universal sizes (also called variable paper sizes or custom form sizes) support offsetting only for IPDS and only when the paper width is less than 297 mm. |
| Transparencies and Labels | | |
| Letter (8.5 in x 11 in) | Yes | Yes |
| A4 (210 x 297 mm) | Yes | Yes |

Network Printer 24 Media Source and Destination Support Matrices

Table 20. Network Printer 24 SOURCE Media Configurations and Capabilities

| MEDIA | Cutsheet Tray 1 (Capacity: 500) | Cutsheet Tray 2 (Capacity: 500) | Cutsheet Tray 3 (Capacity: 2000) | Manual Feed Tray (Capacity: 100) | Envelope Tray (Capacity: 100) | Duplex Supported | Lead Feed Edge |
|----------------------------------|--|--|---|---|--|-------------------------|-----------------------|
| Paper | | | | | | | |
| Statement (8.5 in x 5.5 in) | | | | Yes | | | top |
| Executive (7.25 in x 10.5 in) | | | | Yes | | Yes | top |
| Letter (8.5 in x 11 in) | Yes | Yes | Yes | Yes | | Yes | left |
| Folio (8.5 in x 13 in) | | | | Yes | | | top |
| Legal (8.5 in x 14 in) | Yes | Yes | Yes | Yes | | Yes | top |
| Ledger (11 in x 17 in) | | Yes | Yes | Yes | | Yes | top |
| A6 (105 x 148.5 mm) | | | | | | | |
| A5 (148.5 x 210 mm) | | | | Yes | | Yes | top |
| B5 (ISO) (176 x 250 mm) | | | | Yes | | Yes | top |
| B5 (JIS) (182 x 257 mm) | | | | Yes | | Yes | top |
| A4 (210 x 297 mm) | Yes | Yes | Yes | Yes | | Yes | left |
| B4 (257 x 364 mm) | Yes | Yes | Yes | Yes | | Yes | top |
| A3 (297 x 420 mm) | | Yes | Yes | Yes | | Yes | top |
| Envelopes | | | | | | | |
| Monarch (3.875 in x 7.5 in) | | | | Yes | Yes | | left |
| COM10 (4.125 in x 9.5 in) | | | | Yes | Yes | | left |
| DL (110 x 220 mm) | | | | Yes | Yes | | left |
| C5 (162 x 229 mm) | | | | Yes | Yes | | left |
| B5 (176 x 250 mm) | | | | Yes | Yes | | left |

Table 21. Network Printer 24 DESTINATION Media Configurations and Capabilities

| MEDIA | Output Tray 1 (Capacity: 500) | Output Tray 2 (Capacity: 100) | Finisher Output Trays (Capacity: 3 @ 600/700/700 or 1 @ 2000) | Duplex Supported |
|----------------------------------|--|--|--|-------------------------|
| Paper | | | | |
| Statement (8.5 in x 5.5 in) | Yes | Yes | Yes | |
| Executive (7.25 in x 10.5 in) | Yes | Yes | Yes | Yes |
| Letter (8.5 in x 11 in) | Yes | Yes | Yes | Yes |
| Folio (8.5 in x 13 in) | Yes | Yes | Yes | |
| Legal (8.5 in x 14 in) | Yes | Yes | Yes | Yes |
| Ledger (11 in x 17 in) | Yes | Yes | Yes | Yes |
| A6 (105 x 148.5 mm) | | | | |
| A5 (148.5 x 210 mm) | Yes | Yes | Yes | Yes |
| B5 (ISO) (176 x 250 mm) | Yes | Yes | Yes | Yes |
| B5 (JIS) (182 x 257 mm) | Yes | Yes | Yes | Yes |
| A4 (210 x 297 mm) | Yes | Yes | Yes | Yes |
| B4 (257 x 364 mm) | Yes | Yes | Yes | Yes |
| A3 (297 x 420 mm) | Yes | Yes | Yes | Yes |
| Envelopes | | | | |
| Monarch (3.875 in x 7.5 in) | Yes | Yes | Yes (Face Up) | |
| COM10 (4.125 in x 9.5 in) | Yes | Yes | Yes (Face Up) | |
| DL (110 x 220 mm) | Yes | Yes | Yes (Face Up) | |
| C5 (162 x 229 mm) | Yes | Yes | Yes (Face Up) | |
| B5 (176 x 250 mm) | Yes | Yes | Yes (Face Up) | |

InfoPrint 32 Media Source and Destination Support Matrices

Table 22. InfoPrint 32 SOURCE Media Configurations and Capabilities

| MEDIA | Tray 1 (Capacity: 500) | Tray 2 (Capacity: 500) | Tray 3 (2500-Sheet Input 1) (Cap:1000) | Tray 4 (2500-Sheet Input 2) (Cap:1000) | Tray 5 (2500-Sheet Input 3) (Cap:1000) | Auxiliary Tray (Capacity:50) (Note 4) | Envelope Feeder (Cap:50) |
|---|---------------------------------------|---------------------------------------|---|---|---|--|---|
| Paper | | | | | | | |
| Statement (8.5 in x 5.5 in) | Duplex LEF | | | | | Simplex LEF/SEF | |
| Executive (7.25 in x 10.5 in) | Duplex LEF | Duplex LEF | Duplex LEF | Duplex LEF | Duplex LEF | Simplex LEF | |
| Letter (8.5 in x 11 in) | Duplex LEF/SEF | Duplex LEF/SEF | Duplex LEF/SEF | Duplex LEF | Duplex LEF | Simplex LEF/SEF | |
| Folio (8.5 in x 13 in) | Duplex SEF | Duplex SEF | Duplex SEF | | | Simplex SEF | |
| Legal (8.5 in x 14 in) | Duplex SEF | Duplex SEF | Duplex SEF | | | Simplex SEF | |
| Ledger (11 in x 17 in) | Duplex SEF | Duplex SEF | Duplex SEF | | | Simplex SEF | |
| Japan Official Postcard (Hagaki) (100 x 148 mm) | | | | | | Simplex SEF | |
| A6 (105 x 148.5 mm) | | | | | | | |
| A5 (148.5 x 210 mm) | Duplex LEF | | | | | Simplex LEF/SEF | |
| B5 (ISO) (176 x 250 mm) | | | | | | | |
| B5 (JIS) (182 x 257 mm) (E/J IML) | Duplex LEF/SEF | Duplex LEF/SEF | Duplex LEF/SEF | Duplex LEF | Duplex LEF | Simplex LEF/SEF | |
| A4 (210 x 297 mm) | Duplex LEF/SEF | Duplex LEF/SEF | Duplex LEF/SEF | Duplex LEF | Duplex LEF | Simplex LEF/SEF | |
| B4 (257 x 364 mm) (E/J IML) | Duplex SEF | Duplex SEF | Duplex SEF | | | Simplex SEF | |
| A3 (297 x 420 mm) | Duplex SEF | Duplex SEF | Duplex SEF | | | Simplex SEF | |
| Universal (100 x 148 mm to 297 x 431.8 mm) | | | | | | Simplex SEF Portrait (Note 5) | |
| Envelopes | | | | | | | |
| Monarch (3.875 in x 7.5 in) | | | | | | Simplex LEF | Simplex LEF |
| COM10 (4.125 in x 9.5 in) | | | | | | Simplex LEF | Simplex LEF |
| DL (110 x 220 mm) | | | | | | Simplex LEF | Simplex LEF |
| C5 (162 x 229 mm) | | | | | | Simplex LEF | Simplex LEF |

Table 22. InfoPrint 32 SOURCE Media Configurations and Capabilities (continued)

| MEDIA | Tray 1 (Capacity: 500) | Tray 2 (Capacity: 500) | Tray 3 (2500-Sheet Input 1) (Cap:1000) | Tray 4 (2500-Sheet Input 2) (Cap:1000) | Tray 5 (2500-Sheet Input 3) (Cap:1000) | Auxiliary Tray (Capacity:50) (Note 4) | Envelope Feeder (Cap:50) |
|--|---------------------------------------|---------------------------------------|---|---|---|--|---|
| B5 (176 x 250 mm) | | | | | | | |
| Universal (Env) (100 x 148 mm to 215.9 x 245 mm) | | | | | | | Simplex LEF |
| Transparencies and Labels | | | | | | | |
| Letter (8.5 in x 11 in) | Simplex LEF/SEF | Simplex LEF/SEF | | | | Simplex LEF/SEF | |
| A4 (210 x 297 mm) | Simplex LEF/SEF | Simplex LEF/SEF | | | | Simplex LEF/SEF | |

Notes:

1. US and E/J (Europe/Japan) IML indicate paper sizes supported based on the IML Cold Reset (Letter or A4).
2. SEF (Short-Edge Feed) and LEF (Long-Edge Feed) parameters are reported by the paper cassettes and the 2500-Sheet Input along with paper size. This information is not reported back to the host or application, and is provided here for clarification of the InfoPrint 32 paper-handling capabilities.
3. The auxiliary tray supports a range of variable paper sizes with a granularity of either 1 mm or 0.1 inches.
4. Duplexing is supported from the auxiliary tray for the same paper sizes as Tray 1. Paper is fed through the paper path one sheet at a time, though multiple sheets can be stacked in the destination tray. Duplex jobs printed from the Manual Tray will result in reduced printer performance.
5. Duplexing of Universal Paper (variable paper size) is enabled, however some small sizes may jam or exhibit registration problems due to print engine limitations.

Table 23. InfoPrint 32 DESTINATION Media Configurations and Capabilities

| MEDIA | Face-Down Output Bin (Capacity: 500) | Face-Up Output Bin (Capacity: 200) | Upper Bin (2000-Sheet Finisher) (Cap:670) | Middle Bin (2000-Sheet Finisher) (Cap:670) | Lower Bin (2000-Sheet Finisher) (Cap:670) | Offest Stacking |
|----------------------------------|---|---|--|---|--|----------------------------|
| Paper | | | | | | |
| Statement (8.5 in x 5.5 in) | Yes | Yes | Yes (LEF only) | Yes (LEF only) | Yes (LEF only) | |
| Executive (7.25 in x 10.5 in) | Yes | Yes | Yes | Yes | Yes | |
| Letter (8.5 in x 11 in) | Yes | Yes | Yes | Yes | Yes | Yes |
| Folio (8.5 in x 13 in) | Yes | Yes | Yes | Yes | Yes | Yes |
| Legal (8.5 in x 14 in) | Yes | Yes | Yes | Yes | Yes | Yes |
| Ledger (11 in x 17 in) | Yes | Yes | Yes | Yes | Yes | Yes |

Table 23. InfoPrint 32 DESTINATION Media Configurations and Capabilities (continued)

| MEDIA | Face-Down Output Bin (Capacity: 500) | Face-Up Output Bin (Capacity: 200) | Upper Bin (2000-Sheet Finisher) (Cap:670) | Middle Bin (2000-Sheet Finisher) (Cap:670) | Lower Bin (2000-Sheet Finisher) (Cap:670) | Offset Stacking |
|--|---|---|--|---|--|------------------------|
| Japan Official Postcard (Hagaki) (100 x 148 mm) | Yes | Yes | | | | |
| A6 (105 x 148.5 mm) | | | | | | |
| A5 (148.5 x 210 mm) | Yes | Yes | Yes (LEF only) | Yes (LEF only) | Yes (LEF only) | |
| B5 (ISO) (176 x 250 mm) | | | | | | |
| B5 (JIS) (182 x 257 mm) | Yes | Yes | Yes | Yes | Yes | |
| A4 (210 x 297 mm) | Yes | Yes | Yes | Yes | Yes | Yes |
| B4 (257 x 364 mm) | Yes | Yes | Yes | Yes | Yes | |
| A3 (297 x 420 mm) | Yes | Yes | Yes | Yes | Yes | Yes |
| Universal (100 x 148 mm to 297 x 431.8 mm) | Yes | Yes | | | | |
| Envelopes | | | | | | |
| Monarch (3.875 in x 7.5 in) | Yes | Yes | | | | |
| COM10 (4.125 in x 9.5 in) | Yes | Yes | | | | |
| DL (110 x 220 mm) | Yes | Yes | | | | |
| C5 (162 x 229 mm) | Yes | Yes | | | | |
| B5 (176 x 250 mm) | | | | | | |
| Universal (Env) (100 x 148 mm to 215.9 x 245 mm) | Yes | Yes | | | | |
| Transparencies and Labels | | | | | | |
| Letter (8.5 in x 11 in) | Yes | Yes | Yes | Yes | Yes | Yes |
| A4 (210 x 297 mm) | Yes | Yes | Yes | Yes | Yes | Yes |

Load Font Equivalence

The font equivalence record is a list of 0 to 254 font equivalence entries (each entry is 16 bytes). The font equivalence record permits the host program to equate a Local-Font ID (specified in text control “Set Coded Font Local” on page 84, graphics order “Set Character Set” on page 102 or Write Bar Code Control “Bar Code Data Descriptor” on page 110) with:

- Font Host Assigned ID (HAID)
- The Font Inline Sequence or character rotation table to be used when processing characters
- Global Resource ID (GRID) for resident fonts. The GRID is made up of the following components:

GCSGID Graphic Character Set Global ID

CPGID Code Page Global ID

FGID Font Global ID

FW Font width in 1/1440 inch units.

If a GRID is specified in bytes 5-12, the entry is requesting the activation of a coded font and assigning a HAID to it. Network Printers will use the information provided in the GRID to locate the component parts of the coded font.

The set of supported GCSGID/CPGID/FGID/FW (GRID) combinations is described in “Chapter 14. Code Page and Font Identification” on page 143 and is available to the host PSF by means of the XOA-RRL command. For typographic and scalable fonts, a Font Width (FW) must be specified in order to uniquely select a point size, unless FW=0 or X’FFFF’, in which case the op panel CPI setting is used.

Exception X’021D..02’ is reported back if a non-zero GRID is requested with parts that are not supported in the printer, except in the case of GCSGID subset substitution or LFE Bold Attribute substitution.

Note: *4028-type font substitution is provided as an operator panel feature. It is independent of the Device emulation mode setting (native or 4028). Default is No Font Substitution.

Table 24. Load Font Equivalence X’D63F’

| Data Area | Value | Description | Error Code |
|-------------|--|--|----------------------------|
| Byte 0 | X’00’ - X’FE’ X’FF’ | LOCAL-FONT ID Reserved | X’0219..02’ X’0218..02’ |
| Bytes 1-2 | X’0001’ - X’7EFF’ | FONT HOST ASSIGNED ID | X’0218..02’ X’021F..02’ |
| Bytes 3 - 4 | X’0000’ X’2D00’ X’5A00’ X’8700’ | FONT INLINE SEQUENCE 0 Degrees 90 Degrees 180 Degrees 270 Degrees | X’0247..02’ |
| Bytes 5 - 6 | X’0000’ X’0001’ - X’FFFE’ X’FFFF’ | GCSGID No value assigned (Note 2) Graphic Character Set Global ID All characters with assigned code points in the associated code page | |

Table 24. Load Font Equivalence X'D63F' (continued)

| Data Area | Value | Description | Error Code |
|---------------|---|---|-------------|
| Bytes 7 - 8 | X'0000' X'0001' - X'FFFE' X'FFFF' | CPGID No value assigned (Note 2) Code Page Global ID Printer Default (Configuration Setting) | X'021D..02' |
| Bytes 9 - 10 | X'0000' X'0001' - X'FFFE' X'FFFF' | FGID No value assigned (Note 2) Font Global ID Printer Default (Configuration Setting) | X'021D..02' |
| Bytes 11 - 12 | X'0000' X'0001' - X'7FFF' X'FFFF' | FW No value assigned (Note 2) Font Width (Ignored for Fixed Pitch Fonts) Printer Default as specified by Configuration Settings | |
| Byte 13; | X'00' | Reserved | |
| Byte 14 | Bit 0 0/1 Bits 1-2 00 Bit 3 0/1 Bit 4 0/1 Bit 5 0/1 Bit 6 0/1 Bit 7 0/1 | FONT ATTRIBUTES (Note 3) Ignored (Symbol Sets) Reserved Ignored (Double High) Ignored (Italics) Ignored (Double Strike) Bold = 1 Ignored (Double Wide) | |
| Byte 15 | X'00' | Reserved | |
| Bytes 16-n | | Additional LFE ENTRIES | X'023A..02' |

Notes:

- For LF1 coded fonts, FIS specifies the font index table for character rotation.
- Global Resource IDs (bytes 5-12) apply to printer resident fonts only. If these fields are all X'0000', then an activation is not done. If GCSGID and/or FW are 0 or X'FFFF':
 - CPGID (non-zero) defines the CPGID/GCSGID
 - FGID (non-zero) defines the FGID/FW (Non-Typographic)
 - FGID (non-zero) and op panel CPI defines the FGID/FW (Typographic)
- When the chosen font and attribute combination is restricted by a licensing agreement the font attributes may be executed by substitution or other means. If an appropriate font is not available, the attribute may not occur. Also, with font substitution, the available characteristics may change. Combinations of attributes may not be available. Font attributes will not be applied to host downloaded fonts.

Logical Page Descriptor

Before the printer can present a page of data it must know the following:

- the units in which distances have been measured
- the boundaries of the logical page
- initialization values for control parameters (Margins, Line spacing...)

The controls established in a Logical Page Descriptor command remain in effect until the next Logical Page Descriptor is received unless superseded by explicit

controls in other commands (see “Write Text” on page 79). In any case, the latest LPD control values are restored with each Begin Page or Begin Overlay command.

The LPD command is valid with 24, 28, 34, 36, 38, 40, 41 or 43 bytes. Network Printers accepts the LPD command using any of these valid lengths.

Table 25. Logical Page Descriptor X'D6CF'

| Data Area | Value | Description | Error Code |
|--|---|--|-------------|
| Byte 0 | X'00' X'01' | UNIT-BASE (Measurement Units) 10 inches 10 centimeters | X'0264..02' |
| Byte 1 | | Reserved | |
| Bytes 2-3 | X'3840' X'1626' X'0960' X'03B1' | Xp AND I L-units PER UNIT-BASE 14400 L-units per 10 inches 5670 L-units per 10 centimeters 2400 L-units per 10 inches 945 L-units per 10 centimeters | X'0260..02' |
| Bytes 4-5 | X'3840' X'1626' X'0960' X'03B1' | Yp AND B L-units PER UNIT-BASE 14400 L-units per 10 inches 5670 L-units per 10 centimeters 2400 L-units per 10 inches 945 L-Units per 10 centimeters | X'0261..02' |
| Byte 6 | | Reserved | |
| Bytes 7-9 | X'000001' - X'007FFF' | Xp-EXTENT OF LOGICAL PAGE (Width) See “Notation Conventions” on page 19 | X'0262..02' |
| Byte 10 | | Reserved | |
| Bytes 11-13 | X'000001' - X'007FFF' | Yp-EXTENT OF LOGICAL PAGE (Height) See “Notation Conventions” on page 19 | X'0263..02' |
| Byte 14 | | Reserved | |
| Byte 15 | | Ignored (Ordered Data) | |
| Bytes 16-23 | | Reserved | |
| Bytes 24-25 | X'0000' X'2D00' X'5A00' X'8700' X'FFFF' | I-AXIS ORIENTATION 0 Degrees 90 Degrees 180 Degrees 270 Degrees Printer Default | X'0268..02' |
| Bytes 26-27 | X'0000' X'2D00' X'5A00' X'8700' X'FFFF' | B-AXIS ORIENTATION 0 Degrees 90 Degrees 180 Degrees 270 Degrees Printer Default | X'0269..02' |
| Note: See “Set Text Orientation” on page 86 for valid combinations of I-axis and B-axis orientations. | | | |
| Bytes 28-29 | X'0000' - X'7FFF' | INITIAL I PRINT COORDINATE See “Notation Conventions” on page 19 | X'026A..02' |
| Bytes 30-31 | X'0000' - X'7FFF' | INITIAL B PRINT COORDINATE See “Notation Conventions” on page 19 | X'026B..02' |
| Bytes 32-33 | X'0000' - X'7FFF' X'FFFF' | INLINE MARGIN See “Notation Conventions” on page 19 Printer Default | X'0210..01' |

Table 25. Logical Page Descriptor X'D6CF' (continued)

| Data Area | Value | Description | Error Code |
|-------------|--|--|-------------|
| Bytes 34-35 | X'0000' - X'7FFF' X'FFFF' | INTERCHARACTER ADJUSTMENT (+) See "Notation Conventions" on page 19 Printer Default | X'0212..01' |
| Bytes 36-37 | | Reserved | |
| Bytes 38-39 | X'0000' - X'7FFF' X'FFFF' | BASELINE INCREMENT See "Notation Conventions" on page 19 Printer Default | X'0211..01' |
| Byte 40 | X'00' - X'FE' X'FF' | LOCAL FONT ID Printer Default | |
| Bytes 41-42 | X'0000' X'0008' X'FF00' X'FF07' X'FF08' X'FFFF' | TEXT COLOR Printer Default (Black) Black Printer Default (Black) Printer Default (Black) Color of Medium Printer Default (Black) | X'0258..03' |

Logical Page Position

This command defines the position on the physical sheet of paper where the logical page is to be placed.

Table 26. Logical Page Position X'D66D'

| Data Area | Value | Description | Error Code |
|-----------|-----------------------|---|----------------------------|
| Byte 0 | X'00' | RESERVED | |
| Bytes 1-3 | X'FF8000' - X'007FFF' | Xm OFFSET of the LOGICAL PAGE ORIGIN in L-Units See "Notation Conventions" on page 19 | X'02A4..01' X'02AD..01' |
| Byte 4 | X'00' | PAGE PLACEMENT Default placement | |
| Bytes 5-7 | X'FF8000' - X'007FFF' | Ym OFFSET of the LOGICAL PAGE ORIGIN in L-Units See "Notation Conventions" on page 19 | X'02A5..01' X'02AD..01' |
| Bytes 8-9 | X'0000' | PAGE ORIENTATION 0 Degrees | |

Sense Type and Model

Causes the printer to place into the Special Data Area of the Acknowledge Reply (See "Acknowledgement Reply" on page 25) a record containing type and model information and the functions the printer supports.

This command is effectively a NOP if the ARQ bit is NOT ON in the command header.

Table 27. Sense Type and Model X'D6E4'

| Special Data Area | Value | Description |
|-------------------|-------|-----------------------|
| Byte 0 | X'FF' | System/370 convention |

Table 27. Sense Type and Model X'D6E4' (continued)

| Special Data Area | Value | Description |
|-------------------|--|--|
| Bytes 1-2 | X'4312' X'4317' X'4320' X'4324' X'4332' X'4028' | Product Code Network Printer 12 (4312) Network Printer 17 (4317) InfoPrint 20 (4320) Network Printer 24 (4324) InfoPrint 32 (4332) 4028 Emulation (4028) |
| Byte 3 | X'00' X'00' X'12' | Model Network Printers 4028 Emulation (Simplex) 4028 Emulation (Duplex) |
| Bytes 4-5 | X'0000' | Reserved |

Table 28. Device-Control Command Set

| Special Data Area | Value | Description |
|-------------------|---------|--|
| Bytes 0-1 | X'003C' | VECTOR LENGTH |
| Bytes 2-3 | X'C4C3' | DEVICE CONTROL Command-Set ID |
| Bytes 4-5 | X'FF10' | DC1 Subset ID |
| Bytes 6-7 | X'6001' | MULTIPLE COPY and COPY-SUBGROUP support in LCC |
| Bytes 8-9 | X'6002' | Media-source-selection support in LCC |
| Bytes 10-11 | X'6003' | Media-destination_selection support in LCC |
| Bytes 12-13 | X'702E' | ACTIVATE RESOURCE Command support |
| Bytes 14-15 | X'8008' | XOA Order MARK FORM |
| Bytes 16-17 | X'800A' | XOA Order ALTERNATE OFFSET STACKER |
| Bytes 18-19 | X'80F2' | XOA Order DISCARD BUFFERED DATA |
| Bytes 20-21 | X'80F4' | XOA Order REQUEST RESOURCE LIST |
| Bytes 22-23 | X'80F6' | XOA Order EXCEPTION HANDLING CONTROL |
| Bytes 24-25 | X'9001' | XOH Order PRINT BUFFERED DATA |
| Bytes 26-27 | X'9003' | XOH Order SPECIFY GROUP OPERATION |
| Bytes 28-29 | X'9004' | XOH Order DEFINE GROUP BOUNDARY |
| Bytes 30-31 | X'9005' | XOH Order ERASE RESIDUAL PRINT DATA |
| Bytes 32-33 | X'9007' | XOH Order ERASE RESIDUAL FONT DATA |
| Bytes 34-35 | X'900D' | XOH Order STACK RECEIVED PAGES |
| Bytes 36-37 | X'9013' | XOH Order EJECT to FRONT FACING |
| Bytes 38-39 | X'9015' | XOH Order SELECT INPUT MEDIA SOURCE |
| Bytes 40-41 | X'9016' | XOH Order SET MEDIA ORIGIN |
| Bytes 42-43 | X'9017' | XOH Order SET MEDIA SIZE |
| Bytes 44-45 | X'90F3' | XOH Order OBTAIN PRINTER CHARACTERISTICS |
| Bytes 46-47 | X'90F5' | XOH Order PAGE COUNTERS CONTROL |
| Bytes 48-49 | X'F001' | END PERSISTENT NACK Without Leaving IPDS |
| Bytes 50-51 | X'F201' | ACTIVATION (AR) FAILED NACK SUPPORTED |

Table 28. Device-Control Command Set (continued)

| Special Data Area | Value | Description |
|-------------------|--------------------|---|
| Bytes 52-53 | X'F601' | POSITION CHECK HIGHLIGHTING SUPPORT in XOA EHC |
| Bytes 54-55 | X'F602' | INDEPENDENT EXCEPTION PAGE PRINT in XOA-EHC Note: Independent Exception Page Print is only present in Native mode, not 4028 Emulation mode. |
| Bytes 56-57 | X'F701' X'F801' | SIMPLEX 1-UP supported in LCC SIMPLEX and DUPLEX 1-UP supported in LCC |
| Bytes 58-59 | X'FF01' | POSITION EXCEPTION SENSE FORMAT (1) |

Note: Independent Exception Page Print is only supported in Native mode by the network printers.

Table 29. Presentation Text Command Set

| Special Data Area | Value | Description |
|-------------------|---------|--|
| Bytes 0-1 | X'000C' | VECTOR LENGTH |
| Bytes 2-3 | X'D7E3' | PRESENTATION TEXT Command Set - TX1 Subset |
| Bytes 4-5 | X'FF20' | PT2 Data |
| Bytes 6-7 | X'1001' | UNORDERED TEXT |
| Bytes 8-9 | X'4022' | COLOR of MEDIUM SUPPORTED LIMITED SIMULATED COLOR SUPPORTED |
| Bytes 10-11 | X'50FF' | 8 TEXT ORIENTATIONS supported |

Table 30. IM Image Command Set

| Special Data Area | Value | Description |
|-------------------|---------|--|
| Bytes 0-1 | X'000C' | VECTOR LENGTH |
| Bytes 2-3 | X'C9D4' | IM IMAGE Command Set - IM1 Subset |
| Bytes 4-5 | X'FF10' | IMD1 Data |
| Bytes 6-7 | X'1001' | UNORDERED IMAGE BLOCKS |
| Bytes 8-9 | X'4022' | COLOR of MEDIUM SUPPORTED LIMITED SIMULATED COLOR SUPPORTED |
| Bytes 10-11 | X'A004' | ALL 4 ORIENTATIONS Supported |

Table 31. IO Image Command Set

| Special Data Area | Value | Description |
|-------------------|---------|--|
| Bytes 0-1 | X'001A' | VECTOR LENGTH |
| Bytes 2-3 | X'C9D6' | IO Image Command Set |
| Bytes 4-5 | X'FF10' | IO/1 Level |
| Bytes 6-7 | X'1001' | Unordered Image Blocks |
| Bytes 8-9 | X'4022' | COLOR of MEDIUM SUPPORTED LIMITED SIMULATED COLOR SUPPORTED |
| Bytes 10-11 | X'5001' | MMR Compression algorithm supported |

Table 31. IO Image Command Set (continued)

| Special Data Area | Value | Description |
|-------------------|---------|--|
| Bytes 12-13 | X'5003' | Uncompressed Image supported |
| Bytes 14-15 | X'5006' | RL4 Compression supported |
| Bytes 16-17 | X'5081' | G3 Facsimile Coding Scheme (CCITT G3MR) |
| Bytes 18-19 | X'5082' | G4 Facsimile Coding Scheme (CCITT G4MMR) |
| Bytes 20-21 | X'5101' | Bit ordering supported |
| Bytes 22-23 | X'A004' | All four orientations supported |
| Bytes 24-25 | X'F300' | Replicate and Trim mapping supported |

Table 32. Graphics Command Set

| Special Data Area | Value | Description |
|-------------------|---------|--|
| Bytes 0-1 | X'000C' | VECTOR LENGTH |
| Bytes 2-3 | X'E5C7' | GRAPHICS Command Set - GR1 Subset |
| Bytes 4-5 | X'FF20' | DR/2V0 Data |
| Bytes 6-7 | X'1001' | UNORDERED GRAPHICS BLOCKS |
| Bytes 8-9 | X'4022' | COLOR of MEDIUM SUPPORTED LIMITED SIMULATED COLOR SUPPORTED |
| Bytes 10-11 | X'A004' | All 4 orientations supported |

Table 33. Page Segment Command Set

| Special Data Area | Value | Description |
|-------------------|---------|--------------------------|
| Bytes 0-1 | X'0006' | VECTOR LENGTH |
| Bytes 2-3 | X'D7E2' | PAGE SEGMENT Command Set |
| Bytes 4-5 | X'FF10' | PS1 Subset |

Table 34. Overlay Command Set

| Special Data Area | Value | Description |
|-------------------|---------|----------------------------|
| Bytes 0-1 | X'0008' | VECTOR LENGTH |
| Bytes 2-3 | X'D6D3' | OVERLAY Command Set |
| Bytes 4-5 | X'FF10' | OL1 Subset |
| Bytes 6-7 | X'1506' | OVERLAY NESTING = 6 Levels |

Table 35. Loaded Font Command Set (LF1)

| Special Data Area | Value | Description |
|-------------------|---------|--|
| Bytes 0-1 | X'000E' | VECTOR LENGTH |
| Bytes 2-3 | X'C3C6' | LOADED FONT Command Set |
| Bytes 4-5 | X'FF10' | LF1 subset - fully described font + font index |
| Bytes 6-7 | X'A004' | 4 CHARACTER ROTATIONS (LFI command) |
| Bytes 8-9 | X'B002' | LFI UNDERSCORE Width and Position USED |
| Bytes 10-11 | X'C005' | BOUNDED BOX RASTER FONT TECHNOLOGY |
| Bytes 12-13 | X'C101' | RELATIVE METRICS |

Table 36. Bar Code Command Set

| Special Data Area | Value | Description |
|-------------------|---------|--|
| Bytes 0-1 | X'000C' | VECTOR LENGTH |
| Bytes 2-3 | X'C2C3' | BAR CODE Command Set - BC1 Subset |
| Bytes 4-5 | X'FF10' | BCD1 Data |
| Bytes 6-7 | X'1001' | UNORDERED BAR CODE BLOCKS |
| Bytes 8-9 | X'4022' | COLOR of MEDIUM SUPPORTED LIMITED SIMULATED COLOR SUPPORTED |
| Bytes 10-11 | X'A004' | All four orientations supported |

Note: See “Bar Code Type and Modifier Description and Values” on page 112 for a list of Bar Code Types supported by the Network Printers.

Execute Order Any State (XOA)

This command identifies a set of subcommands which take effect immediately, regardless of the current printer operating state.

Each Execute Order Anystate command consists of a two-byte order code followed by zero or more bytes of parameters.

XOA Mark Form

The MF order causes the printer to place two rectangular blocks of job separation marks on the current or the next sheet. One block is printed on the leading edge of the sheet and one block is printed on the trailing edge of the sheet.

If the MF order is included in a page that is part of a Load Copy Control copy group (See “Load Copy Control” on page 32) all the copies of the page will have a job separator mark included.

Table 37. Mark Form

| Data Area | Value | Description | Error Code |
|-----------|---------|-------------|------------|
| Bytes 0-1 | X'0800' | MARK FORM | |

XOA Exception Handling Control

The Exception-Handling Control command allows the host to control how the printer reports and processes exceptions. A data-stream exception exists when the printer detects an invalid or unsupported command, control, or parameter value.

Table 38. Exception Handling Control

| Data Area | Value | Description | Error Code |
|-----------|---------|----------------------------------|------------|
| Bytes 0-1 | X'F600' | EXCEPTION HANDLING CONTROL (EHC) | |

Table 38. Exception Handling Control (continued)

| Data Area | Value | Description | Error Code |
|-----------|-------------|--|------------|
| Byte 2 | Bit 0 0 | EXCEPTION REPORTING Do not Report Undefined Character Check | |
| | Bit 0 1 | Report Undefined Character Check | |
| | Bit 1 0 | Do not Report Page Position Check | |
| | Bit 1 1 | Report Page Position Check | |
| | Bits 2-5 00 | Reserved | |
| | Bit 6 0 | Do not Highlight Position Checks | |
| | Bit 6 1 | Highlight Position Checks (08C1..00 and 0411..00) | |
| | Bit 7 0 | Do not Report All other Exceptions with AEA's | |
| Byte 3 | Bits 0-6 0 | ALTERNATE EXCEPTION ACTIONS Reserved | |
| | Bit 7 0 | Take AEA (if defined) | |
| | Bit 7 1 | Don't take AEA | |
| Byte 4 | Bits 0-5 0 | EXCEPTION PRESENTATION PROCESSING Reserved | |
| | Bit 6 0 | No Page Continuation | |
| | Bit 6 1 | Page Continuation Action <i>Independent Exception Page Print Supported</i> | |
| | Bit 7 0 | Discard Page | |
| | Bit 7 1 | Print to point of Exception (Process limits may apply) | |
| | | Note: Independent Exception Page Print is only present in Native mode, not 4028 Emulation mode. | |

XOA Request Resource List

This order causes the Resource List (see “Resource List Reply” on page 59) to be placed in the Special Data Area of the Acknowledge Reply (see “Acknowledgement Reply” on page 25) requested with this order. If the ARQ flag was not set for this XOA subcommand, it is treated as a NOP.

A Resource List Reply may consist of multiple entries. If the Resource List Reply contains an entry that does not fit in the space available in the Special Data Area of Acknowledge Reply, &prt will follow either the acknowledge continuation method or the RRL-continuation method, depending on the host, as described in *Intelligent Printer Data Stream Reference*.

Table 39. XOA Request Resource List

| Data Area | Value | Description | Error Code |
|--|-----------------|---|-------------|
| Bytes 0-1 | X'F400' | REQUEST RESOURCE LIST (RRL) | |
| Byte 2 | X'05' | QUERY TYPE | X'0291..02' |
| | X'00' or X'FF' | Resource Activation Status General Resource Status | |
| Bytes 3-4 | X'0000'-X'FFFF' | ENTRY CONTINUATION Indicator | |
| Byte 5 | X'03'-X'xx' | ENTRY LENGTH | X'0291..02' |
| Note: Network Printers do not support multiple-entry queries. Byte 5 indicates the length of the command. | | | |

Table 39. XOA Request Resource List (continued)

| Data Area | Value | Description | Error Code |
|-----------|--|---|-------------|
| Byte 6 | X'01' X'04' X'05' X'06' X'07' X'08' X'10' X'11' X'12' X'FF' | RESOURCE TYPE Single Byte Coded Fonts Page Segments Overlays Device Version Code Pages Font Character Sets Single-byte coded-font indexes Coded Fonts (treated as RT 01) Graphic Character Sets supported in a font character set Specific Code Pages All Resources | X'0291..02' |
| Byte 7 | X'00' X'03' | RESOURCE ID FORMAT Host-Assigned Resource ID IBM Registered Global Resource ID parts | X'0291..02' |
| Bytes 8-n | | RESOURCE IDENTIFIER | |

Notes:

1. Network Printers do not support multiple-entry queries. Byte 5 indicates the length of the entry.
2. If the entire resource list does not fit in the Special Data area of the Acknowledge Reply, continuation is necessary which Network Printers will indicate using the acknowledgement continuation bit in the flag byte of the Acknowledge Reply. If the host requests Acknowledgement continuation by sending a command with ARQ bit and the Continuation bit set, the printer will complete the RRL reply using Acknowledgement continuation. If the host requests RRL continuation (by sending an RRL command with non-zero value in bytes 3 and 4) the printer will use conventional RRL continuation to finish the reply. If the host requests both RRL and ACK continuation, the printer will default to RRL continuation.
3. Bytes 8 and 9 are ignored when the resource type is ALL
4. Exception ID 0291..02 in bytes 6 and 7 are for invalid values. If either value is unsupported, then the query is not understood and the reply is a single entry that sets the resource type to zero, echoes other values, and sets the resource size to zero (not present).

Resource List Reply

Table 40. Resource Reply List

| Data Area | Value | Description | Error Code |
|-----------|------------------------|-------------------------------------|------------|
| Byte 0 | X'FF' | UNORDERED LIST | |
| Byte 1 | X'01' X'04' - X'E1' | END of LIST LENGTH of this ENTRY | |

Table 40. Resource Reply List (continued)

| Data Area | Value | Description | Error Code |
|-----------|--|---|------------|
| Byte 2 | X'00' X'01' X'04' X'05' X'06' X'07' X'08' X'11' X'12' X'FF' | RESOURCE TYPE Resource Size=0. The queried Resource Type, ID Format, or ID is unknown, unsupported, or inconsistent Single Byte Coded Font Page Segment Overlay Device Version Code Pages Font Character Sets Single Byte Coded Font Index Graphic Character Sets supported in a font character set Specific Code Pages All Resources | |
| Byte 3 | X'01' X'03' | RESOURCE ID FORMAT IBM Registered Global Resource ID parts Host-Assigned Resource ID | |
| Byte 4 | X'00' X'01' | RESOURCE SIZE Indicator Resource not present Resource present | |
| Byte 5-6 | X'xxxx' | Resource ID | |

Notes:

1. Bytes 2-6 repeat for each resource type.
2. A query for a HARID that maps to a GCSGID/CPGID/FGID/FW combination which is not supported in the current configuration will result in a negative response (i.e. Reply Byte 4 = 0).
3. See "Chapter 14. Code Page and Font Identification" on page 143 for a description of the supported GCSGID/CPGID/FGID/FW combinations.

XOA Alternate Offset Stacker(AOS)

The AOS order command signals the printer to jog the current sheet. If copies of the current sheet are stacked in more than one media destination, the jogging will occur in each selected media destination, if the media destination supports offset stacking.

Table 41. Alternate Offset Stacker

| Data Area | Value | Description | Error Code |
|-----------|---------|--------------------------|------------|
| Bytes 0-1 | X'0A00' | Alternate Offset Stacker | |

Media Jogging Support Matrices

Table 42. Paper Jogging Support

| MEDIA | Network Printer 12 | Network Printer 17 | InfoPrint 20 | Network Printer 24 | InfoPrint 32 |
|-----------|--------------------|--------------------|--------------|--------------------|--------------|
| Statement | | | Yes | | |
| Executive | | | Yes | | |
| Letter | | Yes | Yes | Yes | Yes |
| Folio | | Yes | Yes | | Yes |
| Legal | | Yes | Yes | Yes | Yes |

Table 42. Paper Jogging Support (continued)

| MEDIA | Network Printer 12 | Network Printer 17 | InfoPrint 20 | Network Printer 24 | InfoPrint 32 |
|-----------|--------------------|--------------------|--------------|--------------------|--------------|
| Ledger | | | Yes | Yes | Yes |
| Hagaki | | | Yes | | |
| A6 | | | | | |
| A5 | | | Yes | | |
| B5 (ISO) | | | | | |
| B5 (JIS) | | Yes | Yes | Yes | |
| A4 | | | Yes | Yes | Yes |
| B4 | | | Yes | Yes | |
| A3 | | | Yes | | Yes |
| Universal | | | Yes | | |

Table 43. Envelope Jogging Support

| Printer | Monarch | COM10 | DL | C5 | B5 | Universal (Env) |
|--|---------|-------|-----|-----|----|-----------------|
| IP 20 | Yes | Yes | Yes | Yes | | Yes |
| No support for Envelope Jogging on other printers. | | | | | | |

Table 44. Transparency/Label Jogging Support

| Printer | Letter | A4 | Universal |
|--|--------|-----|-----------|
| IP 20 | Yes | Yes | |
| IP 32 | Yes | Yes | |
| No support for Transparency/Label Jogging on other printers. | | | |

Notes:

1. On the Network Printer 17 and the InfoPrint 32, jogging results in the jogged page and subsequent pages being offset.
2. On the InfoPrint 20, the Offsetter (jogger) is physically part of the optional Duplex unit. Both functions may be activated or de-activated independent of each other.
3. On the Network Printer 24:
 - a. Media jogging is only available if the finisher is installed.
 - b. Media jogging will result in only the next page (and all of its copies) being offset. Subsequent pages are stacked in the other (unjogged) position.
 - c. Media jogging is only supported for finisher face down output. If face up output and jogging are selected, face up output takes precedence.
 - d. The media jog and staple functions are mutually exclusive. If both are specified the staple request takes precedence.
4. On the InfoPrint 32:
 - a. Media jogging is only available for output trays 1, 3, 4, and 5.
 - b. Media jogging is only supported for face-down output. If face-up output and jogging are selected, face-up output takes precedence.
 - c. The media jog and staple functions are mutually exclusive. If both are specified the staple request takes precedence.

Execute Order Home State (XOH)

Each Execute Order Homestate command consists of a two-byte order code followed by zero or more bytes of parameters.

XOH Obtain Printer Characteristics

This order causes a set of device self-defined fields describing printer characteristics to be placed in the Special Data Area of the requested Acknowledgement Reply and is identified with an acknowledgement type of X'46'. **If the ARQ flag was not set on the XOH command containing this order, then this order is equivalent to a No Operation.**

Table 45. XOH Obtain Printer Characteristics

| Data Area | Value | Description | Error Code |
|-----------|---------|----------------|------------|
| Bytes 0-1 | X'F300' | OPC Order Code | |

Printable Area Self Defining Field

Notes:

1. The IBM Network Printers provide two (2) modes that determine the specification of the Xm Offset, Ym Offset, Xm Extent and Ym Extent of the Printable Area.
 - a. Restricted (No Print Border) (Guaranteed Print Legibility) (Default)
 - b. Unrestricted (Edge-to-Edge Addressability)
There is no edge-to-edge addressability for the Network Printer 24 printer.
2. The Xm Extent and Ym Extent of the Printable Area parameters documented in the following table are representative of the standard printer source media configuration. These extents can be modified as a result of receiving a XOH-SMO command, as described in "XOH Set Media Origin" on page 75.
3. Actual tray capacities are determined media weight. The capacities in the following table are the maximum allowable.

Table 46. Printable Area

| Special Data Area | Value | Description |
|-------------------|---------|---------------------------------------|
| Bytes 0-1 | X'0018' | LENGTH of this Self Defining Field |
| Bytes 2-3 | X'0001' | PRINTABLE AREA Self Defining Field ID |

Table 46. Printable Area (continued)

| Special Data Area | Value | Description |
|-------------------|---------------------------------|--|
| Byte 4 | X'00' | Network Printer 12 INPUT MEDIA SOURCE |
| | X'01' | CUT SHEET Tray 1 (250) |
| | X'40' | CUT SHEET Tray 2 (500) |
| | | ENVELOPE Tray (60) |
| | | Mutually Exclusive of Cut Sheet Tray 2 |
| | X'63' | MANUAL Tray (80) |
| | X'FF' | DEFAULT (Customer Configurable) |
| | | Network Printer 17 INPUT MEDIA SOURCE |
| | X'00' | CUT SHEET Tray 1 (250) |
| | X'01' | CUT SHEET Tray 2 (500) |
| | X'02' | CUT SHEET Tray 3 (500) |
| | X'40' | ENVELOPE Tray (75) |
| | X'63' | MANUAL Tray (100) |
| | X'FF' | DEFAULT (Customer Configurable) |
| | | InfoPrint 20 INPUT MEDIA SOURCE (see notes above) |
| | X'00' | CUT SHEET Tray 1 (500) |
| | X'01' | CUT SHEET Tray 2 (500) (2000) |
| | X'02' | CUT SHEET Tray 3 (500) (2000) |
| | X'40' | ENVELOPE Tray 1 (75) |
| | X'41' | ENVELOPE Tray 2 (75) |
| | X'42' | ENVELOPE Tray 3 (75) |
| | X'63' | MANUAL Tray (150) |
| | X'FF' | DEFAULT (Customer Configurable) |
| | | Network Printer 24 INPUT MEDIA SOURCE |
| | X'00' | CUT SHEET Tray 1 (500) |
| | X'01' | CUT SHEET Tray 2 (500) |
| | X'02' | CUT SHEET Tray 3 (2000) |
| | X'40' | ENVELOPE Tray (100) |
| | X'63' | MANUAL Tray (100) |
| | X'FF' | DEFAULT (Customer Configurable) |
| | | InfoPrint 32 INPUT MEDIA SOURCE (see notes above) |
| | X'00' | CUT SHEET Tray 1 (500) |
| | X'01' | CUT SHEET Tray 2 (500) |
| | X'02' | CUT SHEET Tray 3 (500) (2500-Sheet Input 1) |
| | X'03' | CUT SHEET Tray 4 (1000) (2500-Sheet Input 2) |
| | X'04' | CUT SHEET Tray 5 (1000) (2500-Sheet Input 3) |
| X'40' | ENVELOPE Feeder (50) | |
| X'63' | AUXILIARY Tray (50) | |
| X'FF' | DEFAULT (Customer Configurable) | |
| Byte 5 | X'00' | Reserved |
| Byte 6 | X'00' | UNIT BASE 10 inches |
| Byte 7 | X'00' | Reserved |
| Bytes 8-9 | X'3840' | L-units per UNIT BASE |
| Bytes 10-11 | X'0001' - X'xxxx' | WIDTH of the Medium Presentation Space in L-units (determined by configuration) |
| Bytes 12-13 | X'0001' - X'xxxx' | LENGTH of the Medium Presentation Space in L-units (determined by configuration) |
| Bytes 14-15 | X'00E3' | Xm OFFSET of the Printable Area in L-Units Restricted (NP 12, NP 17, IP 20, IP 32) (4 mm) |
| | X'00E3' | |
| | X'0000' | Unrestricted (NP 12, NP 17, IP 20, IP 32) (0 mm) |

Table 46. Printable Area (continued)

| Special Data Area | Value | Description |
|-------------------|--|---|
| Bytes 16-17 | X'00E3' | Ym OFFSET of the Printable Area in L-units Restricted (NP 12, NP 17, IP 20, IP 32) (4 mm) Restricted (NP 24) (4 mm) |
| | X'00E3' | |
| | X'0000' | Unrestricted (NP 12, NP 17, IP 20, IP 32) (0 mm) |
| Bytes 18-19 | | Xm EXTENT of the Printable Area in L-units (Restricted: No Print Border) |
| | | <i>Paper</i> |
| | X'1D2A' | Statement (NP 12, NP 17, IP 20, IP 32) (5.185 inches) |
| | X'1D2A' | Statement (NP 24) (5.185 inches) |
| | X'2702' | Executive (NP 12, NP 17, IP 20, IP 32) (6.935 inches) |
| | X'2702' | Executive (NP 24) (6.935 inches) |
| | X'2E0A' | Letter (NP 12, NP 17, IP 20, IP 32) (8.185 inches) |
| | X'2E0A' | Letter (NP 24) (8.185 inches) |
| | X'2E0A' | Folio (NP 12, NP 17, IP 20, IP 32) (8.185 inches) |
| | X'2E0A' | Folio (NP 24) (8.185 inches) |
| | X'2E0A' | Legal (NP 12, NP 17, IP 20, IP 32) (8.185 inches) |
| | X'2E0A' | Legal (NP 24) (8.185 inches) |
| | X'3C1A' | Ledger (IP 20, IP 32) (10.685 inches) |
| | X'3C1A' | Ledger (NP 24) (10.685 inches) |
| | X'1460' | Hagaki (IP 20, IP 32) (92 mm) |
| | X'157B' | A6 (NP 12, NP 17) (97 mm) |
| | X'1F1D' | A5 (NP 12, NP 17, IP 20, IP 32) (140.5 mm) |
| | X'1F1D' | A5 (NP 24) (140.5 mm) |
| | X'2534' | B5 (ISO) (NP 12, NP 17) (168 mm) |
| | X'2534' | B5 (ISO) (NP 24) (168 mm) |
| | X'2688' | B5 (JIS) (NP 12, NP 17, IP 20, IP 32) (174 mm) |
| | X'2688' | B5 (JIS) (NP 24) (174 mm) |
| | X'2CBC' | A4 (NP 12, NP 17, IP 20, IP 32) (202 mm) |
| | X'2CBC' | A4 (NP 24) (202 mm) |
| | X'3724' | B4 (IP 20, IP 32) (249 mm) |
| | X'3724' | B4 (NP 24) (249 mm) |
| | X'4000' | A3 (IP 20, IP 32) (289 mm) |
| | X'4000' | A3 (NP 24) (289 mm) |
| | X'11B7' - X'474F' | Universal (IP 20) (80 mm to 322 mm) |
| | X'1460' - X'4000' | Universal (IP 32) (92 mm to 289 mm) |
| | | <i>Envelopes</i> |
| | X'286A' | Monarch (NP 12, NP 17, IP 20, IP 32) (7.185 inches) |
| | X'286A' | Monarch (NP 24) (7.185 inches) |
| | X'33AA' | COM10 (NP 12, NP 17, IP 20, IP 32) (9.185 inches) |
| | X'33AA' | COM10 (NP 24) (9.185 inches) |
| X'2EF2' | DL (NP 12, NP 17, IP 20, IP 32) (212 mm) | |
| X'2EF2' | DL (NP 24) (212 mm) | |
| X'30F1' | C5 (NP 12, NP 17, IP 20, IP 32) (221 mm) | |
| X'30F1' | C5 (NP 24) (221 mm) | |
| X'3597' | B5 (NP 24) (242 mm) | |
| X'11B7' - X'474F' | Universal (IP 20) (80 mm to 322 mm) | |
| X'1460' - X'2CC3' | Universal (IP 32) (60 mm to 207.9 mm) | |
| | <i>Labels and Transparencies</i> | |
| X'2E0A | Letter (IP 20, IP 32) (8.185 inches) | |
| X'2CBC' | A4 (IP 20, IP 32) (202 mm) | |

Table 46. Printable Area (continued)

| Special Data Area | Value | Description |
|-------------------|----------------------------|---|
| Bytes 18-19 | | Xm EXTENT of the Printable Area in L-units (Unrestricted: Edge-to-Edge Addressability) |
| | | <i>Paper</i> |
| | X'1EF0' | Statement (NP 12, NP 17, IP 20, IP 32) (5.5 inches) |
| | X'28C8' | Executive (NP 12, NP 17, IP 20, IP 32) (7.25 inches) |
| | X'2FD0' | Letter (NP 12, NP 17, IP 20, IP 32) (8.5 inches) |
| | X'2FD0' | Folio (NP 12, NP 17, IP 20, IP 32) (8.5 inches) |
| | X'2FD0' | Legal (NP 12, NP 17, IP 20, IP 32) (8.5 inches) |
| | X'3DE0' | Ledger (IP 20, IP 32) (11 inches) |
| | X'1625' | Hagaki (IP 20, IP 32) (100 mm) |
| | X'1741' | A6 (NP 12, NP 17) (105 mm) |
| | X'20E3' | A5 (NP 12, NP 17, IP 20, IP 32) (148.5 mm) |
| | X'26FA' | B5 (ISO) (NP 12, NP 17) (176 mm) |
| | X'284E' | B5 (JIS) (NP 12, NP 17, IP 20, IP 32) (182 mm) |
| | X'2E82' | A4 (NP 12, NP 17, IP 20, IP 32) (210 mm) |
| | X'38EA' | B4 (IP 20, IP 32) (257 mm) |
| | X'41C6' | A3 (IP 20, IP 32) (297 mm) |
| | X'137C' - X'4914' | Universal (IP 20) (88 to 330 mm) |
| | X'1625' - X'41C6' | Universal (IP 32) (100 to 297.9 mm) |
| | | <i>Envelopes</i> |
| | X'2A30' | Monarch (NP 12, NP 17, IP 20, IP 32) (7.5 inches) |
| | X'3570' | COM10 (NP 12, NP 17, IP 20, IP 32) (9.5 inches) |
| | X'30B8' | DL (NP 12, NP 17, IP 20, IP 32) (220 mm) |
| | X'32B7' | C5 (NP 12, NP 17, IP 20, IP 32) (229 mm) |
| | X'137C' - X'4914' | Universal (IP 20) (88 to 330 mm) |
| | X'1625' - X'2FD0' | Universal (IP 32) (100 to 215.9 mm) |
| | | <i>Labels and Transparencies</i> |
| | X'2FD0' | Letter (IP 20, IP 32) (8.5 inches) |
| X'2E84' | A4 (IP 20, IP 32) (210 mm) | |

Table 46. Printable Area (continued)

| Special Data Area | Value | Description |
|-------------------|--|---|
| Bytes 20-21 | | Ym EXTENT of the Printable Area in L-units (Restricted: No Print Border) |
| | | <i>Paper</i> |
| | X'2E0A' | Statement (NP 12, NP 17, IP 20, IP 32) (8.185 inches) |
| | X'2E0A' | Statement (NP 24) (8.185 inches) |
| | X'394A' | Executive (NP 12, NP 17, IP 20, IP 32) (10.185 inches) |
| | X'394A' | Executive (NP 24) (10.185 inches) |
| | X'3C1A' | Letter (NP 12, NP 17, IP 20, IP 32) (10.685 inches) |
| | X'3C1A' | Letter (NP 24) (10.685 inches) |
| | X'475A' | Folio (NP 12, NP 17, IP 20, IP 32) (12.685 inches) |
| | X'475A' | Folio (NP 24) (12.685 inches) |
| | X'4CFA' | Legal (NP 12, NP 17, IP 20, IP 32) (13.685 inches) |
| | X'4CFA' | Legal (NP 24) (13.685 inches) |
| | X'5DDA' | Ledger (IP 20, IP 32) (16.685 inches) |
| | X'5DDA' | Ledger (NP 24) (16.685 inches) |
| | X'1F01' | Hagaki (IP 20, IP 32) (140 mm) |
| | X'1F1D' | A6 (NP 12, NP 17) (140.5 mm) |
| | X'2CBC' | A5 (NP 12, NP 17, IP 20, IP 32) (202 mm) |
| | X'2CBC' | A5 (NP 24) (202 mm) |
| | X'3597' | B5 (ISO) (NP 12, NP 17) (242 mm) |
| | X'3597' | B5 (ISO) (NP 24) (242 mm) |
| | X'3724' | B5 (JIS) (NP 12, NP 17, IP 20, IP 32) (249 mm) |
| | X'3724' | B5 (JIS) (NP 24) (249 mm) |
| | X'4000' | A4 (NP 12, NP 17, IP 20, IP 32) (289 mm) |
| | X'4000' | A4 (NP 24) (289 mm) |
| | X'4ED6' | B4 (IP 20, IP 32) (356 mm) |
| | X'4ED6' | B4 (NP 24) (356 mm) |
| | X'5B3D' | A3 (IP 20, IP 32) (412 mm) |
| | X'5B3D' | A3 (NP 24) (412 mm) |
| | X'1F01' - X'6EBA' | Universal (IP 20) (140 to 500 mm) |
| | X'1F01' - X'5DDA' | Universal (IP 32) (140 to 423.8 mm) |
| | | <i>Envelopes</i> |
| | X'1406' | Monarch (NP 12, NP 17, IP 20, IP 32) (3.560 inches) |
| | X'1406' | Monarch (NP 24) (3.560 inches) |
| | X'156E' | COM10 (NP 12, NP 17, IP 20, IP 32) (3.810 inches) |
| | X'156E' | COM10 (NP 24) (3.810 inches) |
| | X'1696' | DL (NP 12, NP 17, IP 20, IP 32) (102 mm) |
| X'1696' | DL (NP 24) (102 mm) | |
| X'221A' | C5 (NP 12, NP 17, IP 20, IP 32) (154 mm) | |
| X'221A' | C5 (NP 24) (154 mm) | |
| X'2534' | B5 (NP 24) (168 mm) | |
| X'1F01' - X'6EBA' | Universal (IP 20) (140 to 500 mm) | |
| X'1F01' - X'347C' | Universal (IP 32) (140 to 237 mm) | |
| | <i>Transparencies and Labels</i> | |
| X'3C1A' | Letter (IP 20, IP 32) (10.685 inches) | |
| X'4000' | A4 (IP 20, IP 32) (289 mm) | |

Table 46. Printable Area (continued)

| Special Data Area | Value | Description | |
|-------------------|---|---|---|
| Bytes 20-21 | | Ym EXTENT of the Printable Area in L-units (Unrestricted: Edge-to-Edge Addressability) | |
| | | <i>Paper</i> | |
| | X'2FD0' | Statement (NP 12, NP 17, IP 20, IP 32) (8.5 inches) | |
| | X'3B10' | Executive (NP 12, NP 17, IP 20, IP 32) (10.5 inches) | |
| | X'3DE0' | Letter (NP 12, NP 17, IP 20, IP 32) (11 inches) | |
| | X'4920' | Folio (NP 12, NP 17, IP 20, IP 32) (13 inches) | |
| | X'4EC0' | Legal (NP 12, NP 17, IP 20, IP 32) (14 inches) | |
| | X'5FA0' | Ledger (IP 20, IP 32) (17 inches) | |
| | X'20C7' | Hagaki (IP 20, IP 32) (148 mm) | |
| | X'20E3' | A6 (NP 12, NP 17) (148.5 mm) | |
| | X'2E82' | A5 (NP 12, NP 17, IP 20, IP 32) (210 mm) | |
| | X'375D' | B5 (ISO) (NP 12, NP 17) (250 mm) | |
| | X'38EA' | B5 (JIS) (NP 12, NP 17, IP 20, IP 32) (257 mm) | |
| | X'41C6' | A4 (NP 12, NP 17, IP 20, IP 32) (297 mm) | |
| | X'509C' | B4 (IP 20, IP 32) (364 mm) | |
| | X'5D03' | A3 (IP 20, IP 32) (420 mm) | |
| | X'20C6' - X'7080' | Universal (IP 20) (148 to 508 mm) | |
| X'20C6' - X'5FA0' | Universal (IP 32) (148 to 431.8 mm) | | |
| | <i>Envelopes</i> | | |
| X'15CC' | Monarch (NP 12, NP 17, IP 20, IP 32) (3.875 inches) | | |
| X'1734' | COM10 (NP 12, NP 17, IP 20, IP 32) (4.125 inches) | | |
| X'185C' | DL (NP 12, NP 17, IP 20, IP 32) (110 mm) | | |
| X'23E0' | C5 (NP 12, NP 17, IP 20, IP 32) (162 mm) | | |
| X'20C6' - X'7080' | Universal (IP 20) (148 to 508 mm) | | |
| X'20C6' - X'3641' | Universal (IP 32) (148 to 245 mm) | | |
| | <i>Transparencies and Labels</i> | | |
| X'3DE0' | Letter (IP 20, IP 32) (11 inches) | | |
| X'41C6' | A4 (IP 20, IP 32) (297 mm) | | |
| Bytes 22-23 | | INPUT MEDIA SOURCE CHARACTERISTICS | |
| | Bit 0 | 0/1 | 0 = No Duplex; 1 = Duplex |
| | Bits 1-2 | 10 | 10 = Cut Sheet |
| | Bit 3 | 1 | 0 = Tray Not Available; 1 = Tray Available |
| | Bit 4 | 0 | 0 = Reserved |
| | Bit 5 | 0/1 | 0 = No Envelopes; 1 = Auto or Manual Envelope Feature |
| | Bit 6 | 0/1 | 0 = Auto Media Feed; 1 = Manual Media Feed |
| | Bits 7-15 | all 0 | Reserved |

Notes:

1. In the OPC Acknowledgement Reply, the Printable Area SDF repeats for every installed Media Source. Therefore, since Network Printers are capable of supporting multiple installed input trays, multiple Printable Area SDF's may be returned in a single XOH-OPC Acknowledgement Reply.
2. The Input Media Source Characteristics (Bit 0), of the Printable Area SDF indicates the duplexability of a given media source. Refer to "Media Source and Destination Support Matrices" on page 37, for specific details on media duplexability for the Network Printers printers.

Image and Coded Font Resolution Self Defining Field

Table 47. Image and Coded Font Resolution Self Defining Field

| Special Data Area | Value | Description |
|-------------------|---------|---|
| Bytes 0-1 | X'000A' | LENGTH of this Self Defining Field |
| Bytes 2-3 | X'0003' | IMAGE and CODED FONT RESOLUTION Self Defining Field |
| Byte 4 | X'00' | UNIT BASE 10 inches |
| Byte 5 | X'00' | Reserved |
| Bytes 6-7 | X'0BB8' | X PELS per Unit Base (3000 pels/10 inches) |
| Bytes 8-9 | X'0BB8' | Y PELS per Unit Base (3000 pels/10 inches) |

Storage Pools Self Defining Field

Table 48. Storage Pools

| Special Data Area | Value | Description |
|-------------------|--|---|
| Bytes 0-1 | X'002D' | LENGTH of this Self Defining Field |
| Bytes 2-3 | X'0004' | STORAGE POOLS Self Defining Field |
| Byte 4 | X'29' | LENGTH of each Storage Pool Self Defining Field |
| Byte 5 | X'01' | Triplet ID |
| Byte 6 | X'00' | STORAGE POOL ID |
| Bytes 7-10 | X'200000' X'400000' X'800000' X'C00000' | EMPTY SIZE of Storage Pool (Bytes) 2 Megabytes (MB) when 8 to 16 MB Installed 4 MB when 16 to 24 MB Installed 8 MB when 24 to 32 MB Installed 12 MB when greater than 32 MB Installed |
| Bytes 11-14 | X'00000000' | Reserved |
| Bytes 15-16 | X'0011' | PAGE GRAPHICS Data |
| Bytes 17-18 | X'0012' | PAGE IMAGE Data |
| Bytes 19-20 | X'0013' | PAGE TEXT Data |
| Bytes 21-22 | X'0014' | PAGE BAR CODE Data |
| Bytes 23-24 | X'0021' | OVERLAY GRAPHICS Data |
| Bytes 25-26 | X'0022' | OVERLAY IMAGE Data |
| Bytes 27-28 | X'0023' | OVERLAY TEXT Data |
| Bytes 29-30 | X'0024' | OVERLAY BAR CODE Data |
| Bytes 31-32 | X'0031' | PAGE SEGMENT GRAPHICS Data |
| Bytes 33-34 | X'0032' | PAGE SEGMENT IMAGE Data |
| Bytes 35-36 | X'0033' | PAGE SEGMENT TEXT Data |
| Bytes 37-38 | X'0034' | PAGE SEGMENT BAR CODE Data |
| Bytes 39-40 | X'0040' | Single-Byte CODED FONT Index Tables |
| Bytes 41-42 | X'0041' | Single-Byte CODED FONT Descriptors |
| Bytes 43-44 | X'0042' | Single-Byte CODED FONT Patterns |

Color Support Self Defining Field

Table 49. Color Support Self Defining Field

| Special Data Area | Value | Description |
|-------------------|---------|------------------------------------|
| Bytes 0-1 | X'0006' | LENGTH of this Self Defining Field |
| Bytes 2-3 | X'0005' | COLOR SUPPORT Self Defining Field |
| Bytes 4-5 | X'0008' | BLACK |

Installed Features Self Defining Field

Since Network Printers are capable of supporting multiple features, multiple configuration combinations are possible. All installable features for Network Printers are described below.

Table 50. Network Printer 12 Installed Features

| Special Data Area | Value | Description |
|-------------------|---------|--|
| Bytes 0-1 | X'000A' | LENGTH of this Self Defining Field |
| Bytes 2-3 | X'0006' | INSTALLED FEATURES Self Defining Field |
| Bytes 4-5 | X'0100' | DUPLEX |
| Bytes 6-7 | X'0300' | CUT SHEET Output |
| Bytes 8-9 | X'0700' | ENVELOPES |

Table 51. Network Printer 17, Network Printer 24, InfoPrint 20, and InfoPrint 32 Installed Features

| Special Data Area | Value | Description |
|-------------------|---------|--|
| Bytes 0-1 | X'000C' | LENGTH of this Self Defining Field |
| Bytes 2-3 | X'0006' | INSTALLED FEATURES Self Defining Field |
| Bytes 4-5 | X'0100' | DUPLEX |
| Bytes 6-7 | X'0300' | CUT SHEET Output |
| Bytes 8-9 | X'0600' | OFFSET STACKER |
| Bytes 10-11 | X'0700' | ENVELOPES |

Available Features Self Defining Field

Since Network Printers are capable of supporting multiple features, multiple configuration combinations are possible. All available features for Network Printers are described below.

Table 52. Network Printer 12 Available Features

| Special Data Area | Value | Description |
|-------------------|---------|--|
| Bytes 0-1 | X'000A' | LENGTH of this Self Defining Field |
| Bytes 2-3 | X'0007' | AVAILABLE FEATURES Self Defining Field |
| Bytes 4-5 | X'0100' | DUPLEX |
| Bytes 6-7 | X'0300' | CUT SHEET Output |
| Bytes 8-9 | X'0700' | ENVELOPES |

Table 53. Network Printer 17, Network Printer 24, InfoPrint 20, and InfoPrint 32 Available Features

| Special Data Area | Value | Description |
|-------------------|---------|--|
| Bytes 0-1 | X'000C' | LENGTH of this Self Defining Field |
| Bytes 2-3 | X'0007' | AVAILABLE FEATURES Self Defining Field |
| Bytes 4-5 | X'0100' | DUPLEX |
| Bytes 6-7 | X'0300' | CUT SHEET Output |
| Bytes 8-9 | X'0600' | OFFSET STACKER |
| Bytes 10-11 | X'0700' | ENVELOPES |

RRL Resource Type and ID Format Self Defining Field

Table 54. RRL Resource Type and ID Format

| Special Data Area | Value | Description |
|--|---------|---|
| Bytes 0-1 | X'001C' | LENGTH of this Self Defining Field |
| Bytes 2-3 | X'000A' | RRL RESOURCE TYPE Self Defining Field |
| Note: RRL query combinations that receive a non-zero Resource Type reply (See "XOA Request Resource List" on page 58) | | |
| Bytes 4-5 | X'0100' | Single-Byte Coded Fonts as Host Assigned Resource ID |
| Bytes 6-7 | X'0103' | Single-Byte Coded Fonts as IBM Global Resource ID |
| Bytes 8-9 | X'0400' | Page Segments as Host Assigned Resource ID |
| Bytes 10-11 | X'0500' | Overlays as Host Assigned Resource ID |
| Bytes 12-13 | X'0603' | Device Version Code Pages as IBM Global Resource ID |
| Bytes 14-15 | X'0703' | Font Character Set as IBM Global Resource ID |
| Bytes 16-17 | X'0800' | Single-Byte Coded Font Index as Host Assigned Resource ID |
| Bytes 18-19 | X'1000' | Coded Fonts as Host Assigned Resource ID (treated as X'0100') |
| Bytes 20-21 | X'1003' | Coded Fonts as IBM Global Resource ID (treated as X'0103') |
| Bytes 22-23 | X'1103' | Graphic Character Sets/Subsets as IBM Global Resource ID |
| Bytes 24-25 | X'1203' | Specific Code Pages as IBM Global Resource ID |
| Bytes 26-27 | X'FF00' | All Resources as Host Assigned Resource ID |

Activate Resource RT and ID Format Self Defining Field

Table 55. Activate Resource RT and ID Format

| Special Data Area | Value | Description |
|--|---------|--------------------------------------|
| Bytes 0-1 | X'000C' | LENGTH of this Self Defining Field |
| Bytes 2-3 | X'000B' | AR RESOURCE TYPE Self Defining Field |
| Note: RRL query combinations that receive a non-zero Resource Type reply (See "XOA Request Resource List" on page 58) | | |

Table 55. Activate Resource RT and ID Format (continued)

| Special Data Area | Value | Description |
|-------------------|---------|---|
| Bytes 4-5 | X'0103' | Single-Byte LF1 Coded Fonts with IBM Global Resource IDs |
| Bytes 6-7 | X'0106' | Single-Byte LF1 Coded Fonts with MVS Host Unalterable Remote Font Environment |
| Bytes 8-9 | X'0803' | Single-Byte LF1 Coded Font Index with IBM Global Resource IDs |
| Bytes 10-11 | X'0806' | Single-Byte LF1 Coded Fonts Index with MVS Host Unalterable Remote Font Environment |

Bar Code Type Self Defining Field ID

Table 56. Bar Code Type Self Defining Field ID

| Special Data Area | Value | Description |
|-------------------|---------|--|
| Bytes 0-1 | X'0008' | LENGTH of this Self Defining Field |
| Bytes 2-3 | X'000E' | BAR CODE TYPE Self Defining Field |
| Byte 4 | X'0D' | CODABAR Modifier Byte Options X'01' and X'02' |
| Byte 5 | X'11' | CODE 128 Modifier Byte Options X'01' and X'02' |
| Byte 6 | X'18' | POSTNET Modifier Byte Options X'00' - X'03' |

Note: See “Bar Code Type and Modifier Description and Values” on page 112 for all Bar-Codes supported by Network Printers.

Media-Destinations Self_Defining Field

Table 57. Network Printer 12 Media-Destinations Self_Defining Field ID

| Special Data Area | Value | Description |
|-------------------|---------|-------------------------------------|
| Bytes 0-1 | X'000A' | LENGTH of this Self Defining Field |
| Bytes 2-3 | X'0010' | Media-Destinations self-defining ID |
| Bytes 4-5 | X'0001' | Default media-destination ID |
| Bytes 6-7 | X'0001' | Output Tray 1 (First) |
| Bytes 8-9 | X'0002' | Output Tray 2 (Last) |

Table 58. Network Printer 17 Media-Destinations Self_Defining Field ID

| Special Data Area | Value | Description |
|-------------------|--------------------|-------------------------------------|
| Bytes 0-1 | X'000A' or X'000E' | LENGTH of this Self Defining Field |
| Bytes 2-3 | X'0010' | Media-Destinations self-defining ID |
| Bytes 4-5 | X'0001' | Default media-destination ID |

Table 58. Network Printer 17 Media-Destinations Self_Defining Field ID (continued)

| Special Data Area | Value | Description |
|-------------------|--|---|
| Byte 6-n | X'0001' X'0002' X'0001' X'0001' X'0003' X'000C' | RANGES OF MEDIA DESTINATION IDs Output Tray 1 (First) Output Tray 2 (Last) OR Output Tray 1 (First) Output Tray 1 (Last) Mailbox Output Tray 1 (First) Mailbox Output Tray 10 (Last) |

Table 59. InfoPrint 20 Media-Destinations Self_Defining Field ID

| Special Data Area | Value | Description |
|-------------------|---------|-------------------------------------|
| Bytes 0-1 | X'000A' | LENGTH of this Self Defining Field |
| Bytes 2-3 | X'0010' | Media-Destinations self-defining ID |
| Bytes 4-5 | X'0001' | Default media-destination ID |
| Bytes 6-7 | X'0001' | Output Tray 1 (First) |
| Bytes 8-9 | X'0001' | Output Tray 1 (Last) |

Table 60. Network Printer 24 Media-Destinations Self_Defining Field ID

| Special Data Area | Value | Description |
|-------------------|--|--|
| Bytes 0-1 | X'000A'or X'000E' | LENGTH of this Self Defining Field |
| Bytes 2-3 | X'0010' | Media-Destinations self-defining ID |
| Bytes 4-5 | X'0001' | Default media-destination ID |
| Byte 6-n | X'0001' X'0002' X'0001' X'0001' X'0003' X'0009' | RANGES OF MEDIA DESTINATION IDs Output Tray 1 (First) Output Tray 2 (Last) OR Output Tray 1 (First) Output Tray 1 (Last) Output Tray 3 (First) Output Tray 9 (Last) |

Table 61. InfoPrint 32 Media-Destinations Self_Defining Field ID

| Special Data Area | Value | Description |
|-------------------|--|---|
| Bytes 0-1 | X'000A' | LENGTH of this Self Defining Field |
| Bytes 2-3 | X'0010' | Media-Destinations self-defining ID |
| Bytes 4-5 | X'0001' | Default media-destination ID |
| Byte 6-9 | X'0001' X'0002' X'0001' X'0006' | RANGES OF MEDIA DESTINATION IDs Output Tray 1 (First) Output Tray 2 (Last) OR Output Tray 1 (First) Output Tray 6 (Last) |

Supported Group Operations Self Defining Field ID

Table 62. IBM Network Printers (No Finisher) Supported Group Operations SDF ID

| Special Data Area | Value | Description |
|-------------------|---------|--|
| Bytes 0-1 | X'0005' | LENGTH of this Self Defining Field |
| Bytes 2-3 | X'0012' | SUPPORTED GROUP OPERATIONS Self Defining Field |
| Byte 4 | X'01' | Keep group together as a print unit |

Table 63. Network Printer 24 (Finisher) Supported Group Operations SDF ID

| Special Data Area | Value | Description |
|-------------------|---------|--|
| Bytes 0-1 | X'0006' | LENGTH of this Self Defining Field |
| Bytes 2-3 | X'0012' | SUPPORTED GROUP OPERATIONS Self Defining Field |
| Byte 4 | X'01' | Keep group together as a print unit |
| Byte 5 | X'04' | Finish |

Product Identifier Self Defining Field ID

Table 64. Product Identifier Self Defining Field ID

| Special Data Area | Value | Description |
|-------------------|---|--|
| Bytes 0-1 | X'003C' | LENGTH of this Self Defining Field |
| Bytes 2-3 | X'0013' | PRODUCT IDENTIFIER Self Defining Field ID |
| Byte 4 | X'38' | LENGTH of Self Defining Product ID Parameter |
| Bytes 5-6 | X'0001' | Network Printers PRODUCT IDENTIFIER Parameter ID |
| Bytes 7-12 | X'F0F0F4F3F1F2' X'F0F0F4F3F1F7' X'F0F0F4F3F2F0' X'F0F0F4F3F2F4' X'F0F0F4F3F3F2' | DEVICE TYPE Network Printer 12 (4312) Network Printer 17 (4317) InfoPrint 20 (4320) Network Printer 24 (4324) InfoPrint 32 (4332) |
| Bytes 13-15 | X'F0F0F0' | MODEL NUMBER No Unique Model Numbers |
| Bytes 16-18 | X'C9C2D4' | IBM MANUFACTURER |
| Bytes 19-20 | X'0000' | PLANT |
| Bytes 21-32 | 12 Bytes | SEQUENCE NUMBER NP 12, NP 17, NP 24: All Binary Zeros IP 20 and IP 32: the printer serial number |
| Bytes 33-34 | X'0000' | TAG |
| Bytes 35-43 | 9 Bytes | EC LEVEL (F0F0F0F0F0F0F0F0) |
| Bytes 44-59 | 16 Bytes | All Binary Zeros |

Finishing Operations Self Defining Field ID

Table 65. Network Printer 24 and InfoPrint 32 Product Identifier Self Defining Field ID

| Special Data Area | Value | Description |
|-------------------|---------|--|
| Bytes 0-1 | X'0006' | LENGTH of this Self Defining Field |
| Bytes 2-3 | X'0018' | FINISHING OPERATIONS Self Defining Field |
| Byte 4 | X'01' | Corner Staple |
| Byte 5 | X'03' | Edge Stitch |

XOH Select Input Media Source

This order selects the input media source and, indirectly, the input media, for subsequent physical sheets.

The set of valid values differs according to which forms module configuration is installed and selected by the operator. Since Network Printers are capable of supporting multiple installed input bins, multiple configuration combinations are possible. All input media sources for Network Printers are described below.

When the number of installed input bins changes, the printer is POR'd and initial machine settings are established. When the bin configuration changes exception X'0101..00' is reported to the host.

Note: Actual tray capacities are determined by media weight. The capacities indicated in the table are the maximum allowable.

Table 66. XOH Select Input Media Source for Network Printer 12

| Data Area | Value | Description | Error Code |
|-----------|---|--|-------------|
| Byte 0-1 | X'1500' | SELECT INPUT MEDIA SOURCE | |
| Byte 2 | X'00' X'01' X'40' X'63' X'FF' | INPUT MEDIA SOURCE CUT SHEET Tray 1 (250) CUT SHEET Tray 2 (500) ENVELOPE Tray (60) Mutually Exclusive of Cut Sheet Tray 2 MANUAL Tray (80) Printer Default Tray | X'02C8..01' |

Table 67. XOH Select Input Media Source for Network Printer 17

| Data Area | Value | Description | Error Code |
|-----------|--|---|-------------|
| Byte 0-1 | X'1500' | SELECT INPUT MEDIA SOURCE | |
| Byte 2 | X'00' X'01' X'02' X'40' X'63' X'FF' | INPUT MEDIA SOURCE CUT SHEET Tray 1 (250) CUT SHEET Tray 2 (500) CUT SHEET Tray 3 (500) ENVELOPE Tray (75) MANUAL Tray (100) Printer Default Tray | X'02C8..01' |

Table 68. XOH Select Input Media Source for InfoPrint 20

| Data Area | Value | Description | Error Code |
|-----------|---------|---------------------------|------------|
| Byte 0-1 | X'1500' | SELECT INPUT MEDIA SOURCE | |

Table 68. XOH Select Input Media Source for InfoPrint 20 (continued)

| Data Area | Value | Description | Error Code |
|-----------|-------|-------------------------------|-------------|
| Byte 2 | | INPUT MEDIA SOURCE | X'02C8..01' |
| | X'00' | CUT SHEET Tray 1 (500) | |
| | X'01' | CUT SHEET Tray 2 (500) (2000) | |
| | X'02' | CUT SHEET Tray 3 (500) (2000) | |
| | X'40' | ENVELOPE Tray 1 (75) | |
| | X'41' | ENVELOPE Tray 2 (75) | |
| | X'42' | ENVELOPE Tray 3 (75) | |
| | X'63' | MANUAL Tray (150) | |
| | X'FF' | Printer Default Tray | |

Table 69. XOH Select Input Media Source for Network Printer 24

| Data Area | Value | Description | Error Code |
|-----------|---------|---------------------------|-------------|
| Byte 0-1 | X'1500' | SELECT INPUT MEDIA SOURCE | |
| Byte 2 | | INPUT MEDIA SOURCE | X'02C8..01' |
| | X'00' | CUT SHEET Tray 1 (500) | |
| | X'01' | CUT SHEET Tray 2 (500) | |
| | X'02' | CUT SHEET Tray 3 (2000) | |
| | X'40' | ENVELOPE Tray (100) | |
| | X'63' | MANUAL Tray (100) | |
| | X'FF' | Printer Default Tray | |

Table 70. XOH Select Input Media Source for InfoPrint 32

| Data Area | Value | Description | Error Code |
|-----------|---------|--|-------------|
| Byte 0-1 | X'1500' | SELECT INPUT MEDIA SOURCE | |
| Byte 2 | | INPUT MEDIA SOURCE | X'02C8..01' |
| | X'00' | CUT SHEET Tray 1 (500) | |
| | X'01' | CUT SHEET Tray 2 (500) | |
| | X'02' | CUT SHEET Tray 3 (500) (2500-Sheet Input 1) | |
| | X'03' | CUT SHEET Tray 4 (1000) (2500-Sheet Input 2) | |
| | X'04' | CUT SHEET Tray 5 (1000) (2500-Sheet Input 3) | |
| | X'40' | ENVELOPE Feeder (50) | |
| | X'63' | AUXILIARY Tray (50) | |
| | X'FF' | Printer Default Tray | |

XOH Set Media Origin

The XOH Set Media Origin (SMO) command specifies the origin of the media. This order takes effect on the next-received page. The media origin will not change until either another XOH-SMO command is processed or the printer is reinitialized.

Table 71. XOH Set Media Size

| Data Area | Value | Description | Error Code |
|-----------|---------|---|-------------|
| Byte 0-1 | X'1600' | SET MEDIA ORIGIN | |
| Byte 2 | | MEDIA ORIGIN | X'026F..02' |
| | X'00' | Top-left corner | |
| | X'01' | Top-right corner | |
| | X'02' | (Bottom-left corner if back side of duplex sheet) | |
| | X'03' | Bottom-right corner | |
| | | Bottom-left corner | |
| | | (Top-right corner if back side of duplex sheet) | |

XOH Set Media Size

This order specifies SIZE of the physical medium.

Table 72. XOH Set Media Size

| Data Area | Value | Description | Error Code |
|-----------|--|---|-------------|
| Byte 0-1 | X'1700' | SET MEDIA SIZE | |
| Byte 2 | X'00' X'01' | UNIT BASE (Measurement Units) 10 inches 10 centimeters | X'0274..02' |
| Bytes 3-4 | X'3840' X'1626' X'0960' X'03B1' | L-Units per UNIT BASE 14400 L-Units/10 inches 5670 L-Units/10 centimeters 2400 L-Units/10 inches 945 L-Units/10 centimeters | X'0270..02' |
| Bytes 5-6 | X'0001' - X'7FFF' X'FFFF' | Xm EXTENT of MEDIUM See "Notation Conventions" on page 19 Printer Default (OP Panel Setting or Tray sensors) | X'0272..02' |
| Bytes 7-8 | X'0001' - X'7FFF' X'FFFF' | Ym EXTENT of MEDIUM See "Notation Conventions" on page 19 Printer Default (OP Panel Setting or Tray sensors) | X'0273..02' |

XOH Page Counter Control

The XOH Page Counter Control (PCC) command provides a counter synchronization function that should only be used to recover from an exception or after a XOA Discard Buffer Data command.

Table 73. XOH Page Counter Control

| Data Area | Value | Description | Error Code |
|-----------|----------------|--|------------|
| Bytes 0-1 | X'F500' | OPC Order Code | |
| Byte 2 | X'00' X'01' | Do Nothing (default) Synchronize Counters | |

XOH Define Group Boundary

This order initiates or terminates a grouping of pages. When a grouping of pages is initiated the page that next increments the received page counter is the first sheet in the designated group.

Table 74. XOH Define Group Boundary

| Data Area | Value | Description | Error Code |
|-----------|----------------|-----------------------------------|---|
| Bytes 0-1 | X'0400' | Define Group Boundary | X'018F..00' X'0277..01' X'0278..01' X'027A..01' X'027B..01' |
| Byte 2 | X'00' X'01' | Initiate Group Terminate Group | |
| Byte 3 | X'00' - X'FF' | Group Level | |

Table 74. XOH Define Group Boundary (continued)

| Data Area | Value | Description | Error Code |
|------------------------|-----------------------------------|--|----------------------------|
| Bytes 4-end of command | See specific triplet description. | X'00' Group ID triplet X'6E' Group information triplet X'85' Finishing Operation triplet | X'027C..01' X'027C..02' |

Finishing Operation Triplet

The Finishing Operation triplet specifies a specific finishing operation to be applied to a collection of sheets. The finishing operation is only supported for the InfoPrint 32 printer. Only the staple and stitching operations are supported.

Table 75. XOH DGB Finishing Operation Triplet

| Data Area | Value | Description | Error Code |
|-----------|---|--|----------------------------|
| Byte 0 | X'09' | LENGTH | X'027A..01' X'027B..01' |
| Byte 1 | X'85' | Finishing Triplet ID | |
| Byte 2 | X'01' X'03' | OPERATION TYPE Corner Staple Edge Staple | X'27C..03' X'27C..09' |
| Bytes 3-4 | X'0000' | Reserved | |
| Byte 5 | X'01' X'02' X'03' X'FF' X'02' X'03' X'FF' | REFERENCE CORNER Top-right corner (SEF only) Top-left corner Bottom-left corner Device default corner (top left corner) REFERENCE EDGE Top edge (SEF only) Left edge (LEF only) Device default edge (top edge-SEF, left edge-LEF) | X'027C..04' |
| Byte 6 | X'00' | FINISHING OPERATION COUNT Device Default Number, Default Position | X'27C..05' X'27C..07' |
| Byte 7-8 | X'FFFF' | FINISHING OPERATION AXIS OFFSET Device Default Axis Offset | X'027C..06' |

Table 76. InfoPrint 32 Staple Paper Support

| Paper | Supported? |
|-----------|------------|
| Statement | Yes |
| Executive | Yes |
| Letter | Yes |
| Folio | Yes |
| Legal | Yes |
| Ledger | Yes |
| Hagaki | No |

Table 76. InfoPrint 32 Staple Paper Support (continued)

| Paper | Supported? |
|-----------|------------|
| A6 | Yes |
| A5 | Yes |
| B5 (ISO) | No |
| B5 (JIS) | Yes |
| A4 | Yes |
| B4 | Yes |
| A3 | Yes |
| Universal | No |

Notes:

1. The printer must know about the finishing operation before the first page of a group is received. The printer will ignore finishing operation triplets on the XOH DGB command that terminates the group.
2. Media stapling is only available when the finisher feature is installed.
3. Media stapling is only supported for output bins 3, 4, or 5. If a job requests face-up output and stapling, face-up output takes precedence.
4. The media jog and staple functions are mutually exclusive. If both are specified the staple request takes precedence.
5. A single sheet can not be stapled. If a job specifies only one sheet for finishing, stapling will not occur.
6. Stapled or stiched job groups may contain only a single media size.
7. The finisher can only accomodate 50 sheets for stapling in a group. If a job specifies more than 50 sheets for finishing, stapling will not occur.

XOH Specify Group Operation

This order indicates to an attached printer, pre-processor, or post-processor that the specified processing option is to be performed upon subsequent boundary groups of the group level identified in this command.

Table 77. XOH Specify Group Operation

| Data Area | Value | Description | Error Code |
|-----------|-------------------------------|--|------------|
| Byte 0-1 | X'0300' | Define Group Boundary | |
| Byte 2 | X'00'-X'FF' X'01' X/04' | Operation Identifier Keep group together as a print unit Finish (InfoPrint 32 with finisher) | |
| Bytes 3 | X'00'-X'FF' | Group Level | |

Note: The SGO Identifier (Byte 2) X'01' is the only supported operation by Network Printers. All other identifiers are accepted, although no specific processing will occur.

Chapter 5. Presentation Text Command Set

Table 78. Presentation Text Commands

| Name | Command | Sub-command | Where to Look |
|------------------|---------|-------------|-------------------------------|
| Load Equivalence | X'D61D' | | "Load Equivalence" on page 79 |
| Write Text | X'D62D' | | "Write Text" on page 79 |

Load Equivalence

This command permits text-suppression values imbedded in text data stored within the printer to be referenced externally using different values. For example, the Internal Suppression value of X'02' may be referenced externally on a Load Copy Control as a X'06' provided that an appropriate Load Equivalence command was previously received.

If more than 127 LE entries are specified, exception X'0202..02' is reported.

Table 79. Load Equivalence X'D61D'

| Data Area | Value | Description | Error Code |
|-------------|-------------------|--|----------------------------|
| Bytes 0-1 | X'0100' | MAPPING TYPE Suppression Mapping | X'02C6..02' |
| Bytes 2-3 | X'0001' - X'00FF' | INTERNAL VALUE from BS..ES Pair | X'02C1..02' X'02C8..02' |
| Bytes 4-5 | X'0001' - X'007F' | EXTERNAL VALUE from LCC | X'02C8..02' |
| Bytes 6-509 | | Zero or more additional entries analogous to Bytes 2-5 | |

Write Text

In this Write Text description, references made to pages also apply to overlays and page segments.

The print data is a string of 1-byte code points. The printer uses the code point to identify the character metrics obtained from:

- Load Font Index (See "Load Font Index" on page 120)
- Load Font Control (See "Load Font Index" on page 120)
- Font Local ID (See "Load Font Equivalence" on page 50) or
- Resident Font Data

to determine the character raster pattern.

When the printer processes a Begin Page, it uses the values from the existing Logical Page Descriptor (See "Logical Page Descriptor" on page 51) or Initialization Default (See "IPDS Initialization Defaults" on page 21) until it processes one of the following text control sequences

- Draw B-Axis Rule
- Draw I-Axis Rule
- Set Baseline Increment

- Set Coded Font Local
- Set Inline Margin
- Set Intercharacter Adjustment
- Set Text Color
- Set Text Orientation
- Set Variable Space Character Increment
- Temporary Baseline Move

The text control sequence value supersedes the Logical Page Descriptor or Initialization Default value and it remains in effect until it is changed by another text control sequence, or End Page is received.

For a complete description of the following text control sequences see the *Presentation Text Object Content Architecture Reference* and the *Intelligent Printer Data Stream Reference*.

Absolute Move Baseline

Absolute Move Baseline Control Sequence moves the baseline coordinate relative to the I-axis of the Presentation Text Space.

Table 80. Absolute Move Baseline

| Data Area | Value | Description | Error Code |
|-----------|-------------------|---|-------------|
| Bytes 0-1 | X'2BD3' | TEXT CONTROL Sequence | |
| Byte 2 | X'04' | LENGTH | X'021E..01' |
| Byte 3 | X'D2' X'D3' | ABSOLUTE MOVE BASELINE Unchained Chained | |
| Bytes 4-5 | X'0000' - X'7FFF' | DISPLACEMENT (Bc) See "Notation Conventions" on page 19 | X'0213..01' |

Absolute Move Inline

Absolute Move Inline Control Sequence moves an inline coordinate position relative to the B-axis of the Presentation Text Space.

Table 81. Absolute Move Inline

| Data Area | Value | Description | Error Code |
|-----------|-------------------|---|-------------|
| Bytes 0-1 | X'2BD3' | TEXT CONTROL Escape Sequence | |
| Byte 2 | X'04' | LENGTH | X'021E..01' |
| Byte 3 | X'C6' X'C7' | ABSOLUTE MOVE INLINE Unchained Chained | |
| Bytes 4-5 | X'0000' - X'7FFF' | DISPLACEMENT (Ic) See "Notation Conventions" on page 19 | X'0214..01' |

Begin Line

Begin Line Control Sequence begins a new line.

Table 82. Begin Line

| Data Area | Value | Description | Error Code |
|-----------|----------------|------------------------------------|-------------|
| Bytes 0-1 | X'2BD3' | TEXT CONTROL Escape Sequence | |
| Byte 2 | X'02' | LENGTH | X'021E..01' |
| Byte 3 | X'D8' X'D9' | BEGIN LINE Unchained Chained | |

Begin Suppression

Begin Suppression Control Sequence marks the beginning of a string of presentation text that may be suppressed from the visible output.

Table 83. Begin Suppression

| Data Area | Value | Description | Error Code |
|-----------|----------------|---|-------------|
| Bytes 0-1 | X'2BD3' | TEXT CONTROL Escape Sequence | |
| Byte 2 | X'03' | LENGTH | X'021E..01' |
| Byte 3 | X'F2' X'F3' | BEGIN SUPPRESSION Unchained Chained | |
| Byte 4 | X'01' - X'FF' | SUPPRESSION ID | X'0298..01' |

Draw B-Axis Rule

Draw B-axis Rule Control Sequence draws a rule in the b-direction.

Table 84. Draw B-Axis Rule

| Data Area | Value | Description | Error Code |
|-----------|------------------------------|---|-------------|
| Bytes 0-1 | X'2BD3' | TEXT CONTROL Escape Sequence | |
| Byte 2 | X'04' or X'07' | LENGTH | X'021E..01' |
| Byte 3 | X'E6' X'E7' | DRAW B-AXIS RULE Unchained Chained | |
| Bytes 4-5 | X'8000' - X'7FFF' | LENGTH (Bl) See "Notation Conventions" on page 19 | |
| Bytes 6-7 | X'8000' - X'7FFF' X'FFFF' | WIDTH (Bw) Printer Default 24/1440 inch | |
| Byte 8 | | IGNORED | |

Draw I-Axis Rule

Draw I-axis Rule Control Sequence draws a rule in the i-direction.

Table 85. Draw I-Axis Rule

| Data Area | Value | Description | Error Code |
|-----------|----------------|------------------------------|-------------|
| Bytes 0-1 | X'2BD3' | TEXT CONTROL Escape Sequence | |
| Byte 2 | X'04' or X'07' | LENGTH | X'021E..01' |

Table 85. Draw I-Axis Rule (continued)

| Data Area | Value | Description | Error Code |
|-----------|------------------------------|---|------------|
| Byte 3 | X'E4' X'E5' | DRAW I-AXIS RULE Unchained Chained | |
| Bytes 4-5 | X'8000' - X'7FFF' | LENGTH (ll) See "Notation Conventions" on page 19 | |
| Bytes 6-7 | X'8000' - X'7FFF' X'FFFF' | WIDTH (lw) Printer Default 24/1440 inch | |
| Byte 8 | | IGNORED | |

End Suppression

End Suppression Control Sequence marks the end of a string of presentation text that may be suppressed from the visible output.

Table 86. End Suppression

| Data Area | Value | Description | Error Code |
|-----------|----------------|---|---|
| Bytes 0-1 | X'2BD3' | TEXT CONTROL Escape Sequence | |
| Byte 2 | X'03' | LENGTH | X'021E..01' |
| Byte 3 | X'F4' X'F5' | END SUPPRESSION Unchained Chained | |
| Byte 4 | X'01' - X'FF' | SUPPRESSION ID | X'0202..01' X'0204..01' X'0298..01' |

No Operation

No Operation Control Sequence has no effect on presentation.

Table 87. No Operation

| Data Area | Value | Description | Error Code |
|-------------|----------------|--------------------------------------|-------------|
| Bytes 0-1 | X'2BD3' | TEXT CONTROL Escape Sequence | |
| Byte 2 | X'02' - X'FF' | LENGTH | X'021E..01' |
| Byte 3 | X'F8' X'F9' | NO OPERATION Unchained Chained | |
| Bytes 4-255 | | DATA (Ignored) | |

Overstrike

The Overstrike control identifies text that is to be overstruck with a specified character.

Table 88. Overstrike

| Data Area | Value | Description | Error Code |
|-----------|---------|------------------------------|-------------|
| Bytes 0-1 | X'2BD3' | TEXT CONTROL Escape Sequence | |
| Byte 2 | X'05' | LENGTH | X'021E..01' |

Table 88. Overstrike (continued)

| Data Area | Value | Description | Error Code |
|-----------|--|--|------------|
| Byte 3 | X'72' X'73' | OVERSTRIKE Unchained Chained | |
| Byte 4 | Bits 0-3 Bit 4 0 Bit 4 1 Bit 5 0 Bit 5 1 Bit 6 0 Bit 6 1 Bit 7 0 Bit 7 1 | BYPASS IDENTIFIERS Reserved Overstrike white space from RMI Bypass white space from RMI Overstrike white space from AMI Bypass white space from AMI Overstrike white space from Space or Variable Space Character Bypass white space from Space or Variable Space Character BYPASS Treat Bits 0-6 according to their set values NO BYPASS Treat Bits 0-6 as if their values are set to zero | |
| Byte 5 | | IGNORED | |
| Byte 6 | X'00' - X'FF' | OVERSTRIKE CHARACTER | |

Relative Move Baseline

Relative Move Baseline Control Sequence moves a baseline coordinate relative to the current baseline coordinate position.

Table 89. Relative Move Baseline

| Data Area | Value | Description | Error Code |
|-----------|-------------------|--|-------------|
| Bytes 0-1 | X'2BD3' | TEXT CONTROL Escape Sequence | |
| Byte 2 | X'04' | LENGTH | X'021E..01' |
| Byte 3 | X'D4' X'D5' | RELATIVE MOVE BASELINE Unchained Chained | |
| Bytes 4-5 | X'8000' - X'7FFF' | INCREMENT (Br) See "Notation Conventions" on page 19 | |

Relative Move Inline

Relative Move Inline Control Sequence moves the inline coordinate of the presentation position relative to the current inline position.

Table 90. Relative Move Inline

| Data Area | Value | Description | Error Code |
|-----------|-------------------|--|-------------|
| Bytes 0-1 | X'2BD3' | TEXT CONTROL Sequence | |
| Byte 2 | X'04' | LENGTH | X'021E..01' |
| Byte 3 | X'C8' X'C9' | RELATIVE MOVE INLINE Unchained Chained | |
| Bytes 4-5 | X'8000' - X'7FFF' | INCREMENT (Ir) See "Notation Conventions" on page 19 | |

Repeat String

Repeat String Control Sequence contains a string of coded graphic characters that is repeated on the current line.

Table 91. Repeat String

| Data Area | Value | Description | Error Code |
|-----------|-------------------|---------------------------------------|-------------|
| Bytes 0-1 | X'2BD3' | TEXT CONTROL Sequence | |
| Byte 2 | X'04' - X'FF' | LENGTH | X'021E..01' |
| Byte 3 | X'EE' X'EF' | REPEAT STRING Unchained Chained | |
| Bytes 4-5 | X'0000' - X'7FFF' | REPEAT LENGTH (RL) | X0219..01' |
| Bytes 6-n | | REPEAT DATA | X021F..01' |

Set Baseline Increment

Set Baseline Increment Control Sequence specifies the distance to be added to the current baseline coordinate when a Begin Line control sequence is executed.

Table 92. Set Baseline Increment

| Data Area | Value | Description | Error Code |
|-----------|----------------------------------|---|-------------|
| Bytes 0-1 | X'2BD3' | TEXT CONTROL Sequence | |
| Byte 2 | X'04' | LENGTH | X'021E..01' |
| Byte 3 | X'D0' X'D1' | SET BASELINE INCREMENT Unchained Chained | |
| Bytes 4-5 | X'8000' - X'7FFF' X'FFFF' | INCREMENT (Bi) See "Notation Conventions" on page 19 Use LPD value. If no LPD is received, use printer default | |

Set Coded Font Local

Set Coded Font Local Control Sequence specifies the character attributes to be used and invokes a coded font.

Table 93. Set Coded Font Local

| Data Area | Value | Description | Error Code |
|-----------|------------------------|---|----------------------------|
| Bytes 0-1 | X'2BD3' | TEXT CONTROL Sequence | |
| Byte 2 | X'03' | LENGTH | X'021E..01' |
| Byte 3 | X'F0' X'F1' | SET CODED FONT LOCAL Unchained Chained | |
| Byte 4 | X'01' - X'FE' X'FF' | LOCAL FONT ID Use LPD value. If no LPD is received, use printer default | X'0218..02' X'023F..02' |

Set Inline Margin

Set Inline Margin Control Sequence specifies position of an inline margin.

Table 94. Set Inline Margin

| Data Area | Value | Description | Error Code |
|-----------|----------------------------------|--|-------------|
| Bytes 0-1 | X'2BD3' | TEXT CONTROL Sequence | |
| Byte 2 | X'04' | LENGTH | X'021E..01' |
| Byte 3 | X'C0' X'C1' | SET INLINE MARGIN Unchained Chained | |
| Bytes 4-5 | X'0000' - X'7FFF' X'FFFF' | DISPLACEMENT (Ia) See "Notation Conventions" on page 19 Use LPD value. If no LPD is received, use printer default | X'0210..01' |

Set Intercharacter Adjustment

Set Intercharacter Adjustment Control Sequence specifies additional increment or decrement between graphic characters.

Table 95. Set Intercharacter Adjustment

| Data Area | Value | Description | Error Code |
|-----------|----------------------------------|---|-------------|
| Bytes 0-1 | X'2BD3' | TEXT CONTROL Sequence | |
| Byte 2 | X'04' or X'05' | LENGTH | X'021E..01' |
| Byte 3 | X'C2' X'C3' | SET INTERCHARACTER ADJUSTMENT Unchained Chained | |
| Bytes 4-5 | X'0000' - X'7FFF' X'FFFF' | ADJUSTMENT (ica) See "Notation Conventions" on page 19 Use LPD value. If no LPD is received, use printer default | X'0212..01' |
| Byte 6 | X'00' X'01' X'FF' | DIRECTION Increment Direction Decrement Direction Same as X'00' | X'0212..01' |

Set Text Color

The Set Text Color control specifies the foreground color attribute that selects the color for subsequent text characters.

Table 96. Set Text Color

| Data Area | Value | Description | Error Code |
|-----------|----------------|--|-------------|
| Bytes 0-1 | X'2BD3' | TEXT CONTROL Sequence | |
| Byte 2 | X'04' or X'05' | LENGTH | X'021E..01' |
| Byte 3 | X'74' X'75' | SET TEXT COLOR Unchained Chained | |

Table 96. Set Text Color (continued)

| Data Area | Value | Description | Error Code |
|-----------|---|--|-------------|
| Bytes 4-5 | X'0000' X'0001'-X'0007' X'0008' X'0009'-X'0010' X'FF00' X'FF01'-X'FF06' X'FF07' X'FF08' X'FFFF' | COLOR Printer Default (Black) Limited Simulated Color Support (Black) Black Limited Simulated Color Support (Black) Printer Default (Black) Limited Simulated Color Support (Black) Printer Default (Black) Color of Medium Use LPD color value | X'0258..03' |
| Byte 6 | X'00' - X'01' X'FF' | PRECISION Same as X'00' | X'0258..03' |

Set Text Orientation

Set Text Orientation Control Sequence establishes i-direction and b-direction for the following presentation text.

Table 97. Set Text Orientation

| Data Area | Value | Description | Error Code |
|-----------|---|---|-------------|
| Bytes 0-1 | X'2BD3' | TEXT CONTROL Sequence | |
| Byte 2 | X'06' | LENGTH | X'021E..01' |
| Byte 3 | X'F6' X'F7' | SET TEXT ORIENTATION Unchained Chained | |
| Bytes 4-5 | X'0000' X'2D00' X'5A00' X'8700' X'FFFF' | I-AXIS ORIENTATION 0 Degree (+X direction) 90 Degree (+Y direction) 180 Degree (-X direction) 270 Degree (-Y direction) Use LPD value. If no LPD is received, use printer default | X'020F..01' |
| Bytes 6-7 | X'0000' X'2D00' X'5A00' X'8700' X'FFFF' | B-AXIS ORIENTATION 0 Degree (+X direction) 90 Degree (+Y direction) 180 Degree (-X direction) 270 Degree (-Y direction) Use LPD value. If no LPD is received, use printer default | X'020F..01' |

The permitted combinations are those where the difference between the I-axis orientation and the B-axis orientation are 90 deg.

| | |
|-------------------|--------------------|
| INLINE-DIRECTION | BASELINE-DIRECTION |
| 0 deg. rotation | 90 deg. rotation |
| 0 deg. rotation | 270 deg. rotation |
| 90 deg. rotation | 180 deg. rotation |
| 90 deg. rotation | 0 deg. rotation |
| 180 deg. rotation | 270 deg. rotation |
| 180 deg. rotation | 90 deg. rotation |
| 270 deg. rotation | 180 deg. rotation |
| 270 deg. rotation | 0 deg. rotation |

Set Variable Space Character Increment

Set Variable Space Character Increment Control Sequence specifies the increment of a Variable Space Character.

Table 98. Set Variable Space Character Increment

| Data Area | Value | Description | Error Code |
|-----------|----------------------------------|---|-------------|
| Bytes 0-1 | X'2BD3' | TEXT CONTROL Sequence | |
| Byte 2 | X'04' | LENGTH | X'021E..01' |
| Byte 3 | X'C4' X'C5' | SET VARIABLE SPACE CHARACTER INCREMENT Unchained Chained | |
| Bytes 4-5 | X'0000' - X'7FFF' X'FFFF' | INCREMENT (vsi) See "Notation Conventions" on page 19 Default Variable Space Increment for Current Font | X'0217..01' |

Temporary Baseline Move

The Temporary Baseline Move Control Sequence is used to change the position of the sequential baseline without change to the established baseline.

Table 99. Temporary Baseline Move

| Data Area | Value | Description | Error Code |
|-----------|---|--|-------------|
| Bytes 0-1 | X'2BD3' | TEXT CONTROL Sequence | |
| Byte 2 | X'03' or X'06' | LENGTH | X'021E..01' |
| Byte 3 | X'78' X'79' | TEMPORARY MOVE BASELINE Unchained Chained | |
| Byte 4 | X'00' X'01' X'02' X'03' X'FF' | DIRECTION Baseline is Unchanged Return to Established Baseline Shift Baseline away from I-axis (Subscript) Shift Baseline toward I-axis (Superscript) Same as X'00' | X'0298..03' |
| Byte 5 | X'00' X'01' X'FF' | PRECISION Accurate placement and character representation is required using the current font. A substitute font with characteristics identical to the current font may be used to simulate baseline shift (superscript/subscript). Network Printers accepts this value but treats it as X'00'. Same as X'00' | X'0298..03 |
| Bytes 6-7 | X'0000' - X'7FFF' X'FFFF' | TEMPORARY BASELINE INCREMENT See "Notation Conventions" on page 19 Half the current baseline increment | X'0298..03' |

Transparent Data

Transparent Data Control Sequence contains a sequence of coded characters that are presented without a scan for embedded control sequences.

Table 100. Transparent Data

| Data Area | Value | Description | Error Code |
|-------------|----------------|--|-------------|
| Bytes 0-1 | X'2BD3' | TEXT CONTROL Sequence | |
| Byte 2 | X'02' - X'FF' | LENGTH | X'021E..01' |
| Byte 3 | X'DA' X'DB' | TRANSPARENT DATA Unchained Chained | |
| Bytes 4-255 | | CHARACTER STRING | |

Underscore

The Underscore control sequence identifies text that is to be underscored.

Table 101. Underscore

| Data Area | Value | Description | Error Code |
|-----------|---|---|-------------|
| Bytes 0-1 | X'2BD3' | TEXT CONTROL Sequence | |
| Byte 2 | X'03' | LENGTH | X'021E..01' |
| Byte 3 | X'76' X'77' | UNDERSCORE Unchained Chained | |
| Byte 4 | Bits 0-3 Bit 4 0 Bit 4 1 Bit 5 0 Bit 5 1 Bit 6 0 Bit 6 1 Bit 7 0 Bit 7 1 X'FF' | BYPASS IDENTIFIERS Reserved Underscore white space from Relative Move Inline Bypass white space from Relative Move Inline Underscore white space from Absolute Move Inline Bypass white space from Absolute Move Inline Underscore white space from Space or Variable Space Character Bypass white space from Space or Variable Space Character BYPASS Treat Bits 0-6 according to their set values NO BYPASS Treat Bits 0-6 as if their values are set to zero NO BYPASS in EFFECT | |

Chapter 6. IM Image Command Set

IM Image Commands

Table 102. IM Image Commands

| Name | Command | Sub-command | Where to Look |
|---------------------|---------|-------------|----------------------------------|
| Write Image Control | X'D63D' | | "Write Image Control" on page 89 |
| Write Image | X'D64D' | | "Write Image" on page 90 |

Write Image Control

The Write Image Control command is the first command in the sequence to send raster image data to the printer. The command contains fields to define the input, scale, and image placement parameters. Several Write Image commands may be required to a complete raster image.

Table 103. Write Image Control

| Data Area | Value | Description | Error Code |
|-------------|---|---|----------------------------|
| Bytes 0-1 | X'0001' - X'7FFF' | Pels per scan line in the output image | X'0242..01' X'0243..01' |
| Bytes 2-3 | X'0001' - X'7FFF' | Number of scan lines in the output image | X'0244..01' X'0245..01' |
| Bytes 4-5 | X'0001' - X'7FFF' | Pels per scan line in the input image | X'0242..01' X'0243..01' |
| Bytes 6-7 | X'0001' - X'7FFF' | Number of scan lines in the input image | X'0244..01' X'0245..01' |
| Byte 8 | X'00' | Uncompressed input image | X'0246..01' |
| Byte 9 | X'00' | One bit per pel in the input image format | X'0246..01' |
| Byte 10 | X'01' X'02' | PEL MAGNIFICATION FACTOR No Magnification Factor Magnification Factor of 2 | X'0247..01' |
| Byte 11 | X'01' X'02' | SCAN LINE MAGNIFICATION FACTOR No Magnification Factor Magnification Factor of 2 | X'0247..01' |
| Bytes 12-13 | X'0000' X'2D00' X'5A00' X'8700' | SCAN LINE DIRECTION 0 Degrees 90 Degrees 180 Degrees 270 Degrees | X'0248..01' |
| Bytes 14-15 | X'0000' X'2D00' X'5A00' X'8700' | SCAN LINE SEQUENCE DIRECTION 0 Degrees 90 Degrees 180 Degrees 270 Degrees | X'0249..01' |
| Byte 16 | X'00' X'20' X'40' X'60' X'A0' | REFERENCE COORDINATE SYSTEM Absolute I, Absolute B Absolute I, Relative B Relative I, Absolute B Relative I, Relative B Xp, Yp | X'024A..01' |

Table 103. Write Image Control (continued)

| Data Area | Value | Description | Error Code |
|-------------|--|---|-------------|
| Bytes 17-19 | X'FF8000' - X'007FFF' | Xp, l or l offset coordinate of the IM image block origin | X'024A..01' |
| Bytes 20 | X'00' | Reserved | |
| Bytes 21-23 | X'FF8000' - X'007FFF' | Yp, B or B offset coordinate of the IM image block origin | X'024A..01' |
| Bytes 24-25 | X'0000' X'0001'-X'0007' X'0008' X'0010' X'FF00' X'FF01'-X'FF06' X'FF07' X'FF08' | IMAGE COLOR Printer Default (Black) Limited Simulated Color Support (Black) Black Limited Simulated Color Support (Black) Printer Default (Black) Limited Simulated Color Support (Black) Printer Default (Black) Color of Medium | X'0253..01' |

Write Image

The data is a binary representation of the raster image. In the binary data, a 1-bit represents a colored pel and a 0-bit represents a pel left unchanged in the page map. In other words, if a pel is set black by another block on the page (for example, text), it will not be reset to white if it is written with a 0-bit in the image block. Several Write Image commands may be required to a complete raster image.

An error occurs if the host program sends the End command and the total number of bytes of image data is a different number than specified in the image control record.

Table 104. Write Image X'D64D'

| Data Area | Value | Description | Error Code |
|-------------|-------|---------------------|---|
| Bytes 0-End | | Binary RASTER IMAGE | X'026A..01' X'026B..01' X'0264..01' |

Chapter 7. IO Image Command Set

Table 105. IO Image Commands

| Name | Command | Sub-command | Where to Look |
|-----------------------------------|---------|-------------|--|
| Write Image Control 2 | X'D63E' | | "Write Image Control 2" on page 91 |
| Image Area Position | | X'AC6B' | "Image Area Position" on page 92 |
| Image Output Control | | X'A66B' | "Image Output Control" on page 92 |
| Image Data Descriptor | | X'A6FB' | "Image Data Descriptor" on page 93 |
| Write Image 2 | X'D64E' | | "Write Image 2" on page 94 |
| Begin Segment | | X'70' | "Begin Segment" on page 94 |
| Begin Image Content | | X'91' | "Begin Image Content" on page 94 |
| Image Size Parameter | | X'94' | "Image Size Parameter" on page 94 |
| Image Encoding Parameter | | X'95' | "Image Encoding Parameter" on page 95 |
| Image Data Element Size Parameter | | X'96' | "Image Data Element Size Parameter" on page 95 |
| Image Look Up Table ID Parameter | | X'97' | "Image Look-up Table ID Parameter" on page 96 |
| Image Data | | X'FE92' | "Image Data" on page 96 |
| End Image Content | | X'93' | "End Image Content" on page 96 |
| End Segment | | X'71' | <i>Image Object Content Architecture Reference</i> |

Write Image Control 2

The Write Image Control 2 data consists of three consecutive structured fields:

- Image Area Position Control (IAP)
- Image Output Control (IOC)
- Image Data Descriptor (IDD)

The Write Image Control 2 command and the command sequence that follows defines the image presentation block area on the current page. The parameters of this command define the size, placement and orientation of the image block and establish the parameters required to interpret the image segments.

Positive acknowledgement of image commands in Overlay State or Page Segment State means that the command or command sequence has been accepted for processing, but does not imply that its parameters have been checked in any way.

Image Area Position

This data structured field specifies the position and orientation of the image output area relative to a reference coordinate system. It is a REQUIRED data field in the Write Image Control 2 command.

Table 106. Image Area Position

| Data Area | Value | Description | Error Code |
|------------|---|--|-------------|
| Bytes 0-1 | X'000B' - X'xxxx' | LENGTH of Image Area Position | X'0202..05' |
| Bytes 2-3 | X'AC6B' | STRUCTURED FIELD ID | X'020B..05' |
| Bytes 4-5 | X'8000' - X'7FFF' | Image Object Area Origin Xp, I, or I-offset Coordinate Position See "Notation Conventions" on page 19 | |
| Bytes 6-7 | X'8000' - X'7FFF' | Image Object Area Origin Yp, B, or B-offset Coordinate Position See "Notation Conventions" on page 19 | |
| Bytes 8-9 | X'0000' X'2D00' X'5A00' X'8700' | ORIENTATION OF IMAGE BLOCK 0 degrees 90 degrees 180 degrees 270 degrees | X'0203..05' |
| Byte 10 | X'00' X'20' X'40' X'60' X'A0' | COORDINATE REFERENCE SYSTEM Absolute I, absolute B Absolute I, relative B Relative I, absolute B Relative I, relative B Page Xp, Yp | X'0204..05' |
| Bytes 11-n | | Ignored | |

Image Output Control

This data structured field specifies the mapping option for the image object. It is an ELECTIVE data field in the Write Image Control 2 command. If this field is omitted, the printer will use the following default values:

Mapping option = X'30' (Position and Trim)

X, Y Offset = 0.

X, Y Extent = Image Presentation Space extent defined by the Image Data Descriptor structured field.

Table 107. Image Output Control

| Data Area | Value | Description | Error Code |
|-----------|-------------------|--|-------------|
| Bytes 0-1 | X'0010' - X'xxxx' | LENGTH of Image Output Control | X'0202..05' |
| Bytes 2-3 | X'A66B' | Structured Field ID | X'020B..05' |
| Byte 4 | X'00' X'01' | UNIT BASE (Measurement Units) 10 Inches 10 Centimeters | X'0205..05' |
| Bytes 5-6 | X'0001'-X'7FFF' | L-units per UNIT BASE | X'0206..05' |

Table 107. Image Output Control (continued)

| Data Area | Value | Description | Error Code |
|-------------|--|--|-------------|
| Bytes 7-8 | X'0001'-X'7FFF' X'FFFF' | X extent of IO image block in L-units for Page, Overlay and Page Segment (see "Notation Conventions" on page 19 Use Load Page Descriptor Value | X'0207..05' |
| Bytes 9-10 | X'0001'-X'7FFF' X'FFFF' | Y extent of IO image block in L-units for Page, Overlay and Page (see "Notation Conventions" on page 19 Use Load Page Descriptor Value | X'0207..05' |
| Byte 11 | X'10' X'20' X'30' X'41' X'42' X'50' | MAPPING CONTROL OPTION Scale to fit Center and trim Position and trim Point to pel Point to pel with double dot Replicate and Trim | X'0208..05' |
| Bytes 12-13 | X'8000'-X'7FFF' | X OFFSET L-units See "Notation Conventions" on page 19 | X'0209..05' |
| Bytes 14-15 | X'8000'-X'7FFF' | Y OFFSET L-units See "Notation Conventions" on page 19 | X'0209..05' |
| Bytes 16-n | | Ignored | |

Note: The Replicate and Trim Mapping Control option is supported only when the IPDS Menu PRINT MODE item is set to ENH (Enhanced 600 dpi).

Image Data Descriptor

This is a REQUIRED data structured field in the Write Image Control 2 command. It specifies parameters that define the image presentation space size and resolution.

Table 108. Image Data Descriptor

| Data Area | Value | Description | Error Code |
|-------------|-------------------|---|-------------|
| Bytes 0-1 | X'000F' - X'xxxx' | LENGTH of Image Data Descriptor | X'0202..05' |
| Bytes 2-3 | X'A6FB' | STRUCTURED FIELD ID | X'020B..05' |
| Bytes 4-5 | X'0000' | Reserved | |
| Byte 6 | X'00' X'01' | UNIT BASE (Measurement Units) 10 Inches 10 Centimeters | X'0205..05' |
| Bytes 7-8 | X'0001'-X'7FFF' | X image points per unit base | X'0206..05' |
| Bytes 9-10 | X'0001'-X'7FFF' | Y image points per unit base | X'0206..05' |
| Bytes 11-12 | X'0001'-X'7FFF' | X EXTENT of image presentation space (in image points) See "Notation Conventions" on page 19 | X'0207..05' |
| Bytes 13-14 | X'0001'-X'7FFF' | Y EXTENT of image presentation space (in image points) See "Notation Conventions" on page 19 | X'0207..05' |

Table 108. Image Data Descriptor (continued)

| Data Area | Value | Description | Error Code |
|--------------|-----------------|--|------------|
| Bytes 15-end | X'0000' | Set Bilevel Image Color SDF Color Support Printer Default (Black) | |
| | X'0001'-X'0006' | Limited Simulated Color Support (Black) | |
| | X'0008' | Black | |
| | X'0010' | Limited Simulated Color Support (Black) | |
| | X'FF00' | Printer Default (Black) | |
| | X'FF01'-X'FF06' | Limited Simulated Color Support (Black) | |
| | X'FF07' | Printer Default (Black) | |
| | X'FF08' | Color of Medium | |
| | X'FFFF' | Printer Default (Black) | |

Note: Refer to the *Intelligent Printer Data Stream Reference* and the *Image Object Content Architecture Reference* for specifics on the Set Bilevel Image Color SDF format.

Write Image 2

The image segment is processed as it is received by the printer and is not retained or stored as a named image segment.

Write Image 2 command carries the IO image data within a hierarchical sequence of self-defining fields. See the *Intelligent Printer Data Stream Reference* and the *Image Object Content Architecture Reference*.

Begin Segment

Table 109. Begin Segment

| Data Area | Value | Description | Error Code |
|-----------|-------------|---------------|-------------|
| Byte 0 | X'70' | Begin Segment | X'0570..0F' |
| Byte 1 | X'00'-X'FF' | Length | |

Begin Image Content

Table 110. Begin Image Content

| Data Area | Value | Description | Error Code |
|-----------|-------------|----------------------|-------------|
| Byte 0 | X'91' | Begin Image Content | X'0591..0F' |
| Byte 1 | X'01'-X'FF' | Length | X'0500..03' |
| Byte 2 | X'FF' | Format Specification | X'0500..04' |

Image Size Parameter

The Image Size Parameter specifies the size of the image defined within the image segment. Mapping of the image into the image presentation space (See "Image Data Descriptor" on page 93) is on a 1 image point to 1 image point basis (one image point of an IO-Image segment is mapped to one image point of the image presentation space).

Table 111. Image Size Parameter

| Data Area | Value | Description | Error Code |
|------------|-------------------------|--|--|
| Byte 0 | X'94' | IMAGE SIZE | X'0594..0F' |
| Byte 1 | X'09'-X'FF' | LENGTH of the following bytes | X'0500..03' |
| Byte 2 | X'00' X'01' X'02' | UNIT BASE (Measurement Units) 10 Inches 10 Centimeters Logical (resolution ratio) | |
| Bytes 3-4 | X'0000' - X'7FFF' | X image points per unit base | |
| Bytes 5-6 | X'0000' - X'7FFF' | Y image points per unit base | |
| Bytes 7-8 | X'0000'-X'7FFF' | X extent of the image in image points | X'0500..04' X'0594..11' X'0595..11' X'05A9..02' |
| Bytes 9-10 | X'0000'-X'7FFF' | Y extent of the image in image points | X'0500..04' X'05A9..02' |

Image Encoding Parameter

Table 112. Image Encoding Parameter

| Data Area | Value | Description | Error Code |
|-----------|---|--|----------------------------|
| Byte 0 | X'95' | IMAGE ENCODING | X'0595..0F' |
| Byte 1 | X'02'-X'FF' | LENGTH of the following bytes | X'0500..03' |
| Byte 2 | X'01' X'03' X'06' X'81' X'82' | COMPRESSION ALGORITHM IBM MMR compression No compression RL4 compression G3 MR (CCITT T.4 G3 facsimile 2-D) G4 MMR (CCITT T.6 G4 facsimile 2-D) | X'0595..10' X'0595..11' |
| Byte 3 | X'01' | RECORDING ALGORITHM RIDIC (Recording Image Data Inline Code) | X'0595..10' |
| Byte 4 | X'00' X'01' | BIT ORDER within each image data byte Left-to-Right Right-to-Left | |

Image Data Element Size Parameter

Table 113. Image Data Element Size Parameter

| Data Area | Value | Description | Error Code |
|-----------|----------------|---|---|
| Byte 0 | X'96' | IMAGE DATA ELEMENT SIZE | X'0596..0F' |
| Byte 1 | X'01'-X'FF' | LENGTH of the following bytes | X'0500..03' |
| Byte 2 | X'01' X'08' | NUMBER of BITS per PEL 1 bit per pel 8 bits per pel | X'0596..10' X'0500..04' X'0596..11' |

If 1 is specified, the image is binary, with 1-bits representing black pels and 0-bits representing pels unchanged in the page map. If the image is uncompressed, each raster scan in the image data must be padded so that it is an integral number of bytes.

If 8 is specified, the image is gray scale. Each image byte is considered to be a value 0 to 255, where 0 is maximum black, 255 is no black at all, and the values in between are shades of gray.

The printer implements 8 bit per pel images by halftoning. Halftoning significantly degrades image detail. For that reason, resolutions of gray scale data greater than 120 pels per inch are not recommended except for draft printing purposes.

If 8 is specified, the Image Compression, if specified with the Image Encoding command, must be uncompressed. This error is detected when the first Image Data command is received.

Image Look-up Table ID Parameter

Table 114. Image Look-up Table ID Parameter

| Data Area | Value | Description | Error Code |
|-----------|-------------|----------------------------------|-------------|
| Byte 0 | X'97' | Image Look-up Table ID Parameter | X'0597..0F' |
| Byte 1 | X'01'-X'FF' | LENGTH of the following bytes | X'0500..03' |
| Byte 2 | X'00' | Look up table ID | X'0597..10' |

Image Data

Table 115. Image Data

| Data Area | Value | Description | Error Code |
|-------------|-----------------|-------------|----------------------------|
| Bytes 0-1 | X'FE92' | Image Data | X'0592..0F' |
| Bytes 2-3 | X'0001'-X'FFFF' | Length | X'0500..03' X'0594..01' |
| Bytes 4-end | X'x...x' | Image Data | |

End Image Content

Table 116. End Image Content

| Data Area | Value | Description | Error Code |
|-----------|-------------|-------------------|-------------|
| Byte 0 | X'93' | End Image Content | X'0593..0F' |
| Byte 1 | X'00'-X'FF' | Length | |

End Segment

Table 117. End Segment

| Data Area | Value | Description | Error Code |
|-----------|-------------|-------------|-------------|
| Byte 0 | X'71' | End Segment | X'0571..0F' |
| Byte 1 | X'00'-X'FF' | Length | |

Chapter 8. Graphics Command Set

The base reference for graphic drawing orders is the *Graphics Object Content Architecture Reference*.

Table 118. Graphics Commands

| Name | Command | Sub-command | Where to Look |
|--------------------------|---------|-------------|--|
| Write Graphics Control | X'D684' | | "Write Graphics Control" on page 97 |
| Graphics Area Position | | X'AC6B' | "Graphics Area Position" on page 97 |
| Graphics Output Control | | X'A66B' | "Graphics Output Control" on page 98 |
| Graphics Data Descriptor | | X'A6BB' | "Graphics Data Descriptor" on page 98 |
| Write Graphics | X'D685' | | "Write Graphics" on page 100 |
| Begin Segment Introducer | | X'70' | "Begin Segment Introducer" on page 101 |

Write Graphics Control

Graphics Area Position

Table 119. Graphics Area Position

| Data Area | Value | Description | Error Code |
|-----------|---|--|-------------|
| Bytes 0-1 | X'000B'-X'xxxx' | LENGTH of Graphics Area Position | X'0202..05' |
| Bytes 2-3 | X'AC6B' | Structured Field ID. | X'020B..05' |
| Bytes 4-5 | X'8000'-X'7FFF' | GRAPHICS BLOCK ORIGIN Xp, I, or I-offset Coordinate Position. See "Notation Conventions" on page 19 | |
| Byte 6-7 | X'8000'-X'7FFF' | GRAPHICS BLOCK ORIGIN Yp, B, or B-offset Coordinate Position. See "Notation Conventions" on page 19 | |
| Bytes 8-9 | X'0000' X'2D00' X'5A00' X'8700' | ORIENTATION of Graphic Block 0 Degrees 90 Degrees 180 Degrees 270 Degrees | X'0203..05' |
| Byte 10 | X'00' X'20' X'40' X'60' X'A0' | COORDINATE REFERENCE SYSTEM Absolute I, Absolute B Absolute I, Relative B Relative I, Absolute B Relative I, Relative B Page Xp, Yp | X'0204..05' |
| Byte 11-n | | Ignored | |

Graphics Output Control

Table 120. Graphics Output Control

| Data Area | Value | Description | Error Code |
|------------|------------------------------|--|-------------|
| Byte 0-1 | X'0010'-X'xxxx' | LENGTH of Graphics Output Control (GOC) | X'0202..05' |
| Byte 2-3 | X'A66B' | STRUCTURED FIELD ID | X'020B..05' |
| Byte 4 | X'00' X'01' | UNIT BASE (Measurement Units) 10 Inches 10 Centimeters | X'0205..05' |
| Byte 5-6 | X'0001' - X'7FFF' | L-Units per UNIT BASE | X'0206..05' |
| Byte 7-8 | X'0001' - X'7FFF' X'FFFF' | X EXTENT of GRAPHICS BLOCK in L-units See "Notation Conventions" on page 19 Use Load Page Descriptor Value | X'0207..05' |
| Byte 9-10 | X'0001' - X'7FFF' X'FFFF' | Y EXTENT of GRAPHICS BLOCK in L-units See "Notation Conventions" on page 19 Use Load Page Descriptor Value | X'0207..05' |
| Byte 11 | X'10' X'20' X'30' | MAPPING Control Option Scale to Fit Center and Trim Position and Trim | X'0208..05' |
| Byte 12-13 | X'8000' - X'7FFF' | X OFFSET L-units. See "Notation Conventions" on page 19 | X'0209..05' |
| Byte 14-15 | X'8000' - X'7FFF' | Y OFFSET L-units. See "Notation Conventions" on page 19 | X'0209..05' |
| Byte 16-n | | Ignored | |

Note: The Graphics Output Control Self Defining Field is optional and may be omitted from the WGC command. If the GOC is omitted Network Printers use the following:

- Mapping Control Option X'30' (Position and Trim)
- X Offset = 0
- Y Offset = 0
- Graphics Block size equals the Graphics Presentation Space Window size which is defined in the Graphics Data Descriptor (GDD) Self Defining Field (See "Graphics Data Descriptor" on page 98).

Graphics Data Descriptor

Table 121. Graphics Data Descriptor

| Data Area | Value | Description | Error Code |
|-----------|-------------------|--|-------------|
| Bytes 0-1 | X'001C'-X'xxxx' | LENGTH of Graphics Data Descriptor (GDD) | X'0202..05' |
| Bytes 2-3 | X'A6BB' | STRUCTURED FIELD ID | X'020B..05' |
| | | | |
| Byte 4 | X'00' X'01' | UNIT BASE (Measurement Units) 10 Inches 10 Centimeters | X'0205..05' |
| Byte 5 | X'00' | Reserved | |
| Bytes 6-7 | X'0001' - X'7FFF' | Xg UNITS per UNIT BASE | X'0206..05' |
| Bytes 8-9 | X'0001' - X'7FFF' | Yg UNITS per UNIT BASE $Yg = Xg$ | X'0206..05' |

Table 121. Graphics Data Descriptor (continued)

| Data Area | Value | Description | Error Code |
|-------------|-----------------|--|------------|
| Bytes 10-13 | X'00000000' | Reserved | |
| Bytes 14-15 | X'8000'-X'7FFF' | Xg LEFT LIMIT of Graphic Presentation Space Window. See "Notation Conventions" on page 19 | |
| Bytes 16-17 | X'8000'-X'7FFF' | Xg RIGHT LIMIT of Graphic Presentation Space Window. See "Notation Conventions" on page 19 | |
| Bytes 18-19 | X'8000'-X'7FFF' | Yg TOP LIMIT of Graphic Presentation Space Window. See "Notation Conventions" on page 19 | |
| Bytes 20-21 | X'8000'-X'7FFF' | Yg BOTTOM LIMIT of Graphic Presentation Space Window. See "Notation Conventions" on page 19 | |
| Bytes 22-27 | X'000000000000' | Reserved | |
| Bytes 28-n | | INITIAL GRAPHICS DEFAULTS. See "GDD Initial Graphics Defaults Self Describing Instructions" on page 99 | |

GDD Initial Graphics Defaults Self Describing Instructions

Table 122. GDD Initial Graphics Defaults Self Describing Instructions

| Data Area | Value | Description | Error Code |
|-----------|--|--|----------------------------|
| Byte 0 | X'21' | SET CURRENT DEFAULTS | X'0300..21' |
| Byte 1 | X'04'-X'FF' | LENGTH of Data | X'0300..03' |
| Byte 2 | X'00' X'01' X'02' X'03' X'04' X'0B' | SET Byte Drawing Attributes Line Attributes Character Attributes Marker Attributes Pattern Attributes Arc Parameters | X'0300..02' |
| Byte 3-4 | | MASK Bytes. See "Graphics Drawing Order Defaults and Masks" on page 99 for explanation | X'0300..03' |
| Byte 5 | X'0F' X'8F' | DEFAULT Byte Use Standard Default Use the following Data Bytes | X'0300..02' X'0300..03' |
| Byte 6-n | | Data bytes | X'0300..21' |

Note: See "Drawing Orders" on page 101 for valid drawing order defaults.

Graphics Drawing Order Defaults and Masks

Table 123. Graphics Drawing Order Defaults and Masks

| Set Byte | Mask Bit | Description |
|----------|----------------|--|
| X'00' | 0 1-15 | DRAWING ATTRIBUTES Color Reserved |
| X'01' | 0 1 2-15 | LINE ATTRIBUTES Line Type Line Width Reserved |

Table 123. Graphics Drawing Order Defaults and Masks (continued)

| Set Byte | Mask Bit | Description |
|----------|------------------------------------|---|
| X'02' | 0 1 2 3 4 5 6-15 | CHARACTER ATTRIBUTES Angle X, Y Character Cell Size CW, CH Direction Precision Character Set Shear X, Y Reserved |
| X'03' | 0-2 3 4 5-6 7 8-15 | MARKER ATTRIBUTES Reserved Precision Marker Set Reserved Marker Symbol Reserved |
| X'04' | 0-6 7 8-15 | PATTERN ATTRIBUTES Reserved Pattern Symbol Reserved |
| X'0B' | 0 1 2 3 4-15 | ARC PARAMETERS P Value R Value Q Value S Value Reserved |

Write Graphics

Write Graphics Defaults

The following defaults will be used if not previously defined by "Graphics Drawing Order Defaults and Masks" on page 99. The current value of an attribute is taken into account when the drawing order is received.

Table 124. Write Graphics Defaults

| Description | Value |
|---------------------|----------------|
| Color | Black |
| Line Type | Solid |
| Line Width | Normal (4 pel) |
| Character Cell | 10 CPI |
| Character Set | Courier 10 |
| Character Angle | No Rotation |
| Character Direction | Left to Right |
| Marker Symbol | Cross |
| Pattern Symbol | Solid Shading |
| Current Position | X,Y = 0,0 |
| Arc Parameters | P=Q=1; R=S=0 |
| Foreground Mix | Overpaint |

Table 124. Write Graphics Defaults (continued)

| Description | Value |
|---------------------|-------------------------|
| Background Mix | Leave Alone |
| Character Precision | Character Precision |
| Marker Precision | Character Precision |
| Marker Symbol Set | Resident Set in Printer |

Begin Segment Introducer

Table 125. Begin Segment Introducer

| Data Area | Value | Description | Error Code |
|------------|---|---|----------------------------|
| Byte 0 | X'70' | BEGIN SEGMENT code | |
| Byte 1 | X'0C' | LENGTH of the following parameters | X'0370..C1' |
| Byte 2-5 | | SEGMENT ID (Ignored) | |
| Byte 6 | X'00' | Reserved | |
| Byte 7 | Bits 0-2 00 Bit 3 0/1 Bit 4 0 Bits 5-6 00 11 Bit 7 0 | FLAGS Reserved No Prolog (0); Prolog (1) Reserved New Segment (reinitialize graphics defaults) Append Segment (do not reinitialize defaults) Reserved | X'0370..01' X'0370..82' |
| Byte 8-9 | X'0000'-X'FFFF' | Length of this segment (SEGLen) | |
| Byte 10-13 | X'00000000' | Reserved | |
| Byte 14-n | | See "Drawing Orders" on page 101 | |

Drawing Orders

Network Printers support all DR2 Drawing Orders and valid data values as defined in the *Intelligent Printer Data Stream Reference*. The following are those Drawing Orders which define specific data values.

Set Background Mix:

Table 126. Set Background Mix

| Data Area | Value | Description | Error Code |
|-----------|----------------|--|----------------------------|
| Byte 0 | X'0D' | Order code | |
| Byte 1 | X'00' X'05' | BACKGROUND MIX ATTRIBUTE Drawing default Leave Alone | X'0300..04' X'0300..0E' |

Set Character Angle:

Table 127. Set Character Angle

| Data Area | Value | Description | Error Code |
|-----------|-------------------|---------------|-------------|
| Byte 0 | X'34' | Order code | |
| Byte 1 | X'04' | Length | X'0300..03' |
| Byte 2-3 | X'8000' - X'7FFF' | Xg COORDINATE | X'0334..00' |
| Byte 4-5 | X'8000' - X'7FFF' | Yg COORDINATE | X'0334..00' |

- If Xg = 0 and Yg = 0 then the character angle is 0 degrees (default)
- If Xg > 0 and Yg = 0 then the character angle is 0 degrees
- If Xg = 0 and Yg > 0 then the character angle is 90 degrees
- If Xg < 0 and Yg = 0 then the character angle is 180 degrees
- If Xg = 0 and Yg < 0 then the character angle is 270 degrees

Note: Exception X'0334..00' applies when both Xg and Yg are non-zero values.

Set Character Precision:

Table 128. Set Character Precision

| Data Area | Value | Description | Error Code |
|-----------|-------------------------|--|----------------------------|
| Byte 0 | X'39' | Order code | |
| Byte 1 | X'00' X'01' X'02' | PRECISION TYPE Current default String Precision Character Precision | X'0300..04' X'0300..0E' |

Set Character Set:

Table 129. Set Character Set

| Data Area | Value | Description | Error Code |
|-----------|---------------------------------|--|-------------|
| Byte 0 | X'38' | Order code | |
| Byte 1 | X'00' X'01' - X'FE' X'FF' | LOCAL CHARACTER SET ID Current default Local ID for Character Set Printer Default | X'03C3..00' |

Set Color:

Table 130. Set Color

| Data Area | Value | Description | Error Code |
|-----------|-------------------------------|--|-------------|
| Byte 0 | X'0A' | Order code | |
| Byte 1 | X'00' X'01'-X'07' X'08' | COLOR Current default Limited Simulated Color Support (Patterns or Black) Color of Medium | X'0300..04' |

Set Extended Color:

Table 131. Set Extended Color

| Data Area | Value | Description | Error Code |
|-----------|---|---|-------------|
| Byte 0 | X'26' | Order code | |
| Byte 1 | X'02' | Length | X'0300..03' |
| Byte 2 | X'0000' X'0001'-X'0007' X'0008' X'0009'-X'0010' X'FF00' X'FF01'-X'FF06' X'FF07' X'FF08' X'FFFF' | EXTENDED COLOR Current default Limited Simulated Color Support (Patterns or Black) Black Limited Simulated Color Support (Patterns or Black) Current default Limited Simulated Color Support (Patterns or Black) Current default (Black) Color of Medium Printer default (Black) | X'0300..04' |

Set Line Type:

Table 132. Set Line Type

| Data Area | Value | Description | Error Code |
|-----------|---|---|----------------------------|
| Byte 0 | X'18' | Order code | |
| Byte 1 | X'00' X'01' X'02' X'03' X'04' X'05' X'06' X'07' X'08' | LINE TYPE Current default Dotted Line Short Dashed Line Dashed and Dotted Line Double Dotted Line Long Dashed Line Dashed Double Dotted Line Solid Line Invisible Line | X'0300..04' X'0300..0E' |

Set Fractional Line Width (4028 Emulation Mode):

Table 133. Set Fractional Line Width (4028 Emulation Mode)

| Data Area | Value | Description | Error Code |
|-----------|--|--|----------------------------|
| Byte 0 | X'11' | Order code | |
| Byte 1 | X'02' | Length | X'0300..03' |
| Bytes 2-3 | X'0000' X'0001' - X'00FF' X'0100' - X'017F' X'0180' - X'01FF' X'0200' - X'0F7F' X'0F80' - X'FFFF' | FRACTIONAL LINE WIDTH Current default 2 Pel Wide 4 Pels Wide 6 Pels Wide 8-60 Pels Wide 62 Pels Wide | X'0300..04' X'0300..0E' |

Set Fractional Line Width (Native Mode):

Table 134. Set Fractional Line Width (Native Mode)

| Data Area | Value | Description | Error Code |
|-----------|--|---|----------------------------|
| Byte 0 | X'11' | Order code | |
| Byte 1 | X'02' | Length | X'0300..03' |
| Bytes 2-3 | X'0000' X'0001' - X'007F' X'0080' - X'00BF' X'00C0' - X'00FF' X'0100' - X'013F' X'013F' - X'017F' X'0180' - X'01BF' X'01C0' - X'01FF' X'0200' - X'0F7F' X'0F80' - X'FFFF' | FRACTIONAL LINE WIDTH Current default 1 Pel Wide 2 Pels Wide 3 Pels Wide 4 Pel Wide 5 Pels Wide 6 Pels Wide 7 Pels Wide 8-60 Pels Wide 62 Pels Wide | X'0300..04' X'0300..0E' |

Set Line Width:

Table 135. Set Line Width

| Data Area | Value | Description | Error Code |
|-----------|-------|-------------|------------|
| Byte 0 | X'19' | Order code | |

Table 135. Set Line Width (continued)

| Data Area | Value | Description | Error Code |
|-----------|---|--|----------------------------|
| Byte 1 | X'00' X'01' - X'0F' X'10' - X'FF' | LINE WIDTH Current default 2-58 Pels Wide (4 pel increments) 62 Pels Wide | X'0300..04' X'0300..0E' |

Set Marker Precision:

Table 136. Set Marker Precision

| Data Area | Value | Description | Error Code |
|-----------|-------------------------|--|----------------------------|
| Byte 0 | X'3B' | Order code | |
| Byte 1 | X'00' X'01' X'02' | MARKER PRECISION Drawing default Character Precision Stroke Precision | X'0300..04' X'0300..0E' |

Set Mix:

Table 137. Set Mix

| Data Area | Value | Description | Error Code |
|-----------|----------------|---|----------------------------|
| Byte 0 | X'0C' | Order code | |
| Byte 1 | X'00' X'02' | MIX ATTRIBUTE Drawing default Overpaint | X'0300..04' X'0300..0E' |

Set Pattern Set:

Table 138. Set Pattern Set

| Data Area | Value | Description | Error Code |
|-----------|-------|----------------|-------------|
| Byte 0 | X'08' | Order code | |
| Byte 1 | X'00' | PATTERN SET ID | X'0368..03' |

Set Pattern Symbol:

Table 139. Set Pattern Symbol

| Data Area | Value | Description | Error Code |
|-----------|---|--|-------------|
| Byte 0 | X'28' | Order code | |
| Byte 1 | X'00' X'01' - X'08' X'09' X'0A' X'0B' X'0C' X'0D' X'0E' X'0F' X'10' X'40' | PATTERN SYMBOL ID Use Current default Decreasing Density Vertical Lines Horizontal Lines Diagonal Lines 1 (Bot L/Top R) Diagonal Lines 2 (Bot L/Top R) Diagonal Lines 1 (Top L/Bot R) Diagonal Lines 2 (Top L/Bot R) No Shading Solid Shading Blank | X'0368..04' |

Prolog Drawing Orders

Within a prolog, only the following orders are valid:

Table 140. Prolog Drawing Orders

| Code | Drawing Order |
|-------|---------------------------|
| X'00' | No Operation |
| X'01' | Comment |
| X'04' | Segment Characteristics |
| X'08' | Set Pattern Set |
| X'0A' | Set Color (graphics) |
| X'0C' | Set Mix |
| X'0D' | Set Background Mix |
| X'11' | Set Fractional Line Width |
| X'18' | Set Line Type |
| X'19' | Set Line Width |
| X'21' | Set Current Position |
| X'22' | Set Arc Parameters |
| X'26' | Set Extended Color |
| X'28' | Set Pattern Symbol |
| X'29' | Set Marker Symbol |
| X'33' | Set Character Cell |
| X'34' | Set Character Angle |
| X'38' | Set Character Set |
| X'39' | Set Character Precision |
| X'3A' | Set Character Direction |
| X'3B' | Set Marker Precision |
| X'3C' | Set Marker Set |
| X'43' | Set Pick Identifier |

Drawing Order Summary

Zero or more drawing orders follow each Begin Segment Introducer. These drawing orders either specify graphics to be printed or assign drawing attributes.

Given below is a list of the drawing orders supported by the Network Printers. Please refer to the AFP GOCA Reference, S544-5498, for complete descriptions of all GOCA drawing orders.

Table 141. Summary of the Graphics Drawing Orders

| Code | Drawing Order | Length |
|-------|--------------------------------------|---------|
| X'68' | Begin Area | 2 |
| X'D1' | Begin Image | 12 |
| X'91' | Begin Image at Current Position | 8 |
| X'C3' | Character String | 6 - 257 |
| X'83' | Character String at Current Position | 2 - 257 |

Table 141. Summary of the Graphics Drawing Orders (continued)

| Code | Drawing Order | Length |
|-------|---|---------|
| X'01' | Comment | 2 - 257 |
| X'60' | End Area | 2 - 257 |
| X'93' | End Image | 2 - 257 |
| X'3E' | End Prolog | 2 |
| X'71' | End Segment (treated like a No Operation command) | 2 |
| X'C5' | Fillet | 6 - 254 |
| X'85' | Fillet at Current Position | 2 - 254 |
| X'C7' | Full Arc | 8 |
| X'87' | Full Arc at Current Position | 4 |
| X'92' | Image Data | 2 - 257 |
| X'C1' | Line | 6 - 254 |
| X'81' | Line at Current Position | 2 - 254 |
| X'C2' | Marker | 6 - 254 |
| X'82' | Marker at Current Position | 2 - 254 |
| X'00' | No Operation | 1 |
| X'E1' | Relative Line | 6 - 256 |
| X'A1' | Relative Line at Current Position | 2 - 256 |
| X'04' | Segment Characteristics (treated like a No Operation command) | 2 - 257 |
| X'22' | Set Arc Parameters | 10 |
| X'OD' | Set Background Mix | 2 |
| X'34' | Set Character Angle | 6 |
| X'33' | Set Character Cell | 6 or 10 |
| X'3A' | Set Character Direction | 2 |
| X'39' | Set Character Precision | 2 |
| X'38' | Set Character Set | 2 |
| X'35' | Set Character Shear | 6 |
| X'0A' | Set Color | 2 |
| X'21' | Set Current Position | 6 |
| X'26' | Set Extended Color | 4 |
| X'11' | Set Fractional Line Width | 4 |
| X'18' | Set Line Type | 2 |
| X'19' | Set Line Width | 2 |
| X'37' | Set Marker Cell | 6 |
| X'3B' | Set Marker Precision | 2 |
| X'3C' | Set Marker Set | 2 |
| X'29' | Set Marker Symbol | 2 |
| X'0C' | Set Mix | 2 |
| X'08' | Set Pattern Set | 2 |
| X'28' | Set Pattern Symbol | 2 |

Table 141. Summary of the Graphics Drawing Orders (continued)

| Code | Drawing Order | Length |
|-------------|---|---------------|
| X'43' | Set Pick Identifier (treated like a No Operation command) | 6 |

Chapter 9. Bar Code Command Set

The base reference for Bar Code commands is the Bar Code Object Content Architecture Reference.

Table 142. Bar Code Commands

| Name | Command | Sub-command | Where to Look |
|--------------------------|---------|-------------|--|
| Write Bar Code Control | X'D680' | | "Write Bar Code Control" on page 109 |
| Bar Code Area Position | | X'AC6B' | "Bar Code Area Position" on page 109 |
| Bar Code Output Control | | X'A66B' | "Bar Code Output Control" on page 109 |
| Bar Code Data Descriptor | | X'A6EB' | "Bar Code Data Descriptor" on page 110 |
| Write Bar Code | X'D681' | | "Write Bar Code" on page 113 |

Write Bar Code Control

Bar Code Area Position

Table 143. Bar Code Area Position

| Data Area | Value | Description | Error Code |
|--------------|---|---|-------------|
| Byte 0-1 | X'000B'-X'xxxx' | LENGTH of Bar Code Area Position (BCAP) | X'0202..05' |
| Byte 2-3 | X'AC6B' | STRUCTURED FIELD ID | X'020B..05' |
| Byte 4-5 | X'8000'-X'7FFF' | Bar Code BLOCK ORIGIN X _p , I, or I-OFFSET coordinate position (in 1440ths) | X'0411..00' |
| Byte 6-7 | X'8000'-X'7FFF' | Bar Code BLOCK ORIGIN Y _p , B, or B-OFFSET coordinate position (in 1440ths) | X'0411..00' |
| Byte 8-9 | X'0000' X'2D00' X'5A00' X'8700' | ORIENTATION OF Bar Code BLOCK 0 degrees 90 degrees 180 degrees 270 degrees | X'0203..05' |
| Byte 10 | X'00' X'20' X'40' X'60' X'A0' | COORDINATE REFERENCE SYSTEM Absolute I, Absolute B Absolute I, Relative B Relative I, Absolute B Relative I, Relative B Page X _p , Y _p | X'0204..05' |
| Byte 11-n :c | Ignored | | |

Bar Code Output Control

Table 144. Bar Code Output Control

| Data Area | Value | Description | Error Code |
|-----------|-----------------|--|-------------|
| Byte 0-1 | X'0010'-X'xxxx' | LENGTH of Bar Code Output Control (BCOC) | X'0202..05' |
| Byte 2-3 | X'A66B' | STRUCTURED FIELD ID | X'020B..05' |

Table 144. Bar Code Output Control (continued)

| Data Area | Value | Description | Error Code |
|------------|------------------------------|--|-------------|
| Byte 4 | X'00' X'01' | UNIT BASE (Measurement Units) 10 Inches 10 Centimeters | X'0205..05' |
| Byte 5-6 | X'0001' - X'7FFF' | L-Units per UNIT BASE | X'0206..05' |
| Byte 7-8 | X'0001' - X'7FFF' X'FFFF' | X EXTENT of Bar Code BLOCK in L-units See "Notation Conventions" on page 19 Use Load Page Descriptor Value | X'0207..05' |
| Byte 9-10 | X'0001' - X'7FFF' X'FFFF' | Y EXTENT of Bar Code BLOCK in L-units See "Notation Conventions" on page 19 Use Load Page Descriptor Value | X'0207..05' |
| Byte 11 | X'30' | MAPPING CONTROL OPTION (Position) | X'0208..05' |
| Byte 12-13 | X'8000' - X'7FFF' | X OFFSET L-units See "Notation Conventions" on page 19 | X'0209..05' |
| Byte 14-15 | X'8000' - X'7FFF' | Y OFFSET L-units See "Notation Conventions" on page 19 | X'0209..05' |
| Byte 16-n | | Ignored | |

Bar Code Data Descriptor

Table 145. Bar Code Data Descriptor

| Data Area | Value | Description | Error Code |
|-------------|------------------------------|--|-------------|
| Byte 0-1 | X'001B'-X'xxxx' | LENGTH of Bar Code Data Descriptor (BCDD) | X'0202..05' |
| Byte 2-3 | X'A6EB' | STRUCTURED FIELD ID | X'020B..05' |
| Byte 4 | X'00' X'01' | UNIT BASE (Measurement Units) 10 Inches 10 Centimeters | X'0205..05' |
| Byte 5 | X'00' | Reserved | |
| Byte 6-7 | X'0001' - X'7FFF' | Xbc Units per UNIT BASE | X'0206..05' |
| Byte 8-9 | X'0001' - X'7FFF' | Ybc Units per UNIT BASE | X'0206..05' |
| Byte 10-11 | X'0001' - X'7FFF' X'FFFF' | X EXTENT of Bar Code Presentation Space in L-units. See "Notation Conventions" on page 19 Use BCOC X EXTENT | X'0207..05' |
| Byte 12-13 | X'0001' - X'7FFF' X'FFFF' | Y EXTENT of Bar Code Presentation Space in L-units. See "Notation Conventions" on page 19 Use BCOC Y EXTENT | X'0207..05' |
| Bytes 14-15 | X'0000' | Reserved | |
| Byte 16 | | BAR CODE TYPE See "Bar Code Type and Modifier Description and Values" on page 112 | X'0403..00' |
| Byte 17 | | BAR CODE MODIFIER See "Bar Code Type and Modifier Description and Values" on page 112 | X'040B..00' |
| Byte 18 | X'01' - X'FE' X'FF' | FONT LOCAL ID Default Font Local ID (Note 1) | X'0404..00' |

Table 145. Bar Code Data Descriptor (continued)

| Data Area | Value | Description | Error Code |
|-------------|---|---|-------------|
| Byte 19-20 | X'0000' X'0001'-X'0007' X'0008' X'0009'-X'0010' X'FF00' X'FF01'-X'FF06' X'FF07' X'FF08' X'FFFF' | BAR CODE COLOR Printer Default (BLACK) Limited Simulated Color Support (Black) Black Limited Simulated Color Support (Black) Printer Default (Black) Limited Simulated Color Support (Black) Printer Default (Black) Color of Medium Printer Default (Black) | X'0405..00' |
| Byte 21 | X'07' - X'38' X'FF' | UNIT MODULE WIDTH Default (0.013 Inches) | X'0406..00' |
| Byte 22-23 | X'0001' - X'7FFF' X'FFFF' | ELEMENT HEIGHT in L-units See "Notation Conventions" on page 19 Printer Default as specified by Bar Code Type in Byte 16 | X'0407..00' |
| Byte 24 | X'01'-X'FF' | Height multiplier | X'0408..00' |
| Bytes 25-26 | X'0000' X'0002' X'0003' X'0014' to X'001E' X'00C8' to X'012C' X'FFFF' | WIDE-TO-NARROW RATIO (WE NE) Not Applicable Note 2 2:1 3:1 2.0:1 - 3.0:1 2.00:1 - 3.00:1 Printer Default as specified by Bar Code Type (Byte 16) Note 3 | X'0409..00' |
| Byte 27-end | | Ignored | |

Notes:

1. The Font Local ID specified in BCDD Byte 18 should be OCR-A, OCR-B or Code 128 dependent on the Bar Code Type specified in BCDD Byte 16. The default Font Local ID and Bar Code Type relationships are as follows:

Table 146. Bar Code Default Font ID

| OCR-A | OCR-B |
|--------------------|--------------------|
| Code 128 | UPC-A |
| Code 3 of 9 | UPC-E |
| MSI | UPC 2-Digit Add-on |
| 2 of 5 Industrial | UPC 5-Digit Add-on |
| 2 of 5 Matrix | EAN-8 |
| 2 of 5 Interleaved | EAN-13 |
| Codabar | EAN 2-Digit Add-on |
| | EAN 5-Digit Add-on |

2. Wide-to-Narrow Ratio (BCDD Bytes 25-26) is only valid for the following Bar Code Types:

- X'01'** 3 of 9
- X'02'** MSI
- X'0A'** 2 of 5 Industrial
- X'0B'** 2 of 5 Matrix
- X'0C'** Interleaved 2 of 5
- X'0D'** Codabar

3. Default wide-to-narrow ratio for Codabar, Code 3 of 9, and the 2-of-5 types is dictated by the lowest unit module width that results in a readable bar code. The default wide-to-narrow ratio for MSI is 2:1 unless it can't be printed with the selected unit module width.

Bar Code Type and Modifier Description and Values

Table 147. Bar Code Type and Modifier Description and Values

| Byte 16 Value | Bar Code Type | Byte 17 Value | Description |
|---------------|--|---------------|--|
| X'01' | 3 of 9 Code, AIM USS-39 | X'01' | Print Bar Code with no Printer-Generated Check Character |
| | | X'02' | Generate Check Character and Print with Bar Code |
| X'02' | MSI | X'01' | Print Bar Code with no Printer-Generated Check Character |
| | | X'02' | Print Bar Code with IBM Modulus 10 Check Digit Generated by Printer and Put at End of Data |
| | | X'03' | First check digit IBM Modulus 10 |
| | | X'04' | First check digit NCR Modulus 11. Check digit equals remainder. Check digit of 10 equals error. |
| | | X'05' | First check digit IBM Modulus 11. Check digit equals remainder. Check digit of 10 equals error. |
| | | X'06' | First check digit NCR Modulus 11. Check digit equals 11 minus remainder. Check digit of 10 equals zero. |
| | | X'07' | First check digit IBM Modulus 11. Check digit equals 11 minus remainder. Check digit of 10 equals error. |
| | | X'08' | First check digit NCR Modulus 11. Check digit equals 11 minus remainder. Check digit of 10 equals error. |
| | | X'09' | First check digit IBM Modulus 11. Check digit equals 11 minus remainder. Check digit of 10 equals error. |
| X'03' | UPC/CGPC Version A | X'00' | Generate check digit and Print standard symbol |
| X'05' | UPC/CGPC Version E | X'00' | Print bar code. Six digits are encoded. |
| X'06' | UPC 2-Character Supplemental (Periodicals) | X'00' | Print the 2 supplemental digits (bar/space pattern and HRI) |
| X'07' | UPC 5-Character Supplemental (Paperbacks) | X'00' | Print the 5 supplemental digits (bar/space pattern and HRI) |
| X'08' | EAN-8 (JAN Short) | X'00' | Print bar code symbol. Input variable data is 7 digits (2 flag and 5 article ID digits). |
| X'09' | EAN-13 (JAN Standard) | X'00' | Print bar code symbol. Input variable data is 12 digits (2 flag and 10 article ID digits). |
| X'0A' | 2 of 5 Industrial | X'01' | Print bar code with no printer-generated check character |
| | | X'02' | Generate check character and print with bar code |
| X'0B' | 2 of 5 Matrix | X'01' | Print bar code with no printer-generated check character |
| | | X'02' | Generate check character and print with bar code |

Table 147. Bar Code Type and Modifier Description and Values (continued)

| Byte 16 Value | Bar Code Type | Byte 17 Value | Description |
|---------------|---|---------------|--|
| X'0C' | Interleaved 2 of 5, AIM USS-I 2/5 | X'01' | Print bar code with no printer-generated check character |
| | | X'02' | Generate check character and print with bar code |
| X'0D' | Codabar, 2 of 7 Code, AIM USS-Codabar | X'01' | Print bar code with no printer-generated check character |
| | | X'02' | Generate check character and print with bar code |
| X'11' | Code 128, AIM USS-128 | X'02' | Generate check character and print with bar code |
| X'16' | EAN 2 Digit Add-on | X'00' | Print the 2 digit add-on (bar/space pattern and HRI) |
| X'17' | EAN 5 Digit Add-on | X'00' | Print the 5 digit add-on (bar/space pattern and HRI) |
| X'18' | POSTNET | X'00' | USPS Specification Print 5 digit POSTNET 'Zip Code' bar code with leading frame bar and trailing correction digit and frame. |
| | | X'01' | Print 9 digit POSTNET 'Zip + 4' bar code with leading frame bar and trailing correction digit and frame. |
| | | X'02' | Print 11 digit POSTNET 'ABC' bar code with leading frame bar and trailing correction digit and frame. |
| | | X'03' | Print variable length data POSTNET bar code with leading frame bar and trailing correction digit and frame. Data length checking is not performed with modifier X'03'. |
| X'1A' | RM4SCC (Royal Mail 4 State Customer Code) | X'00' | Variable Length Data. Printer will generate Start bit, Checksum Character and Stop bit. Checksum algorithm is performed on the data characters only. User is responsible for 2 mm quiet zone (all around) and proper sequencing of the Postal Code data (including International Prefix, Outward Code, Inward Code and Delivery Point Suffix). |

Write Bar Code

Table 148. Write Bar Code

| Data Area | Value | Description | Error Code | |
|-----------|-------------------|---|-------------|--|
| Byte 0 | FLAGS | | X'0410..00' | |
| | Bit 0 | 0 | | HRI PRINTING Print HRI |
| | | 1 | | No HRI |
| | Bits 1-2 | 00 | | HRI LOCATION Printer Default (Below symbol) |
| 01 | | Below symbol (Except UPC/EAN with 2 or 5 digit add-on) | | |
| 10 | | Above symbol (UPC/EAN with 2 or 5 digit add-on only) | | |
| Bit 3 | 0 | START/STOP HRI for 3 of 9 Code (Asterisk) Do not print HRI for 3 of 9 Start/Stop pattern | | |
| | 1 | Print HRI for 3 of 9 Start/Stop pattern | | |
| | Bits 4-7 | RESERVED for 4224 (PC ASCII version) | | |
| Bits 5-6 | RESERVED (Ignore) | | | |

Table 148. Write Bar Code (continued)

| Data Area | Value | Description | Error Code |
|-------------|-------------------|---|-------------|
| Bytes 1-2 | X'0001' - X'7FFF' | X COORDINATE of the symbol ORIGIN See "Notation Conventions" on page 19 | X'040A..00' |
| Bytes 3-4 | X'0001' - X'7FFF' | Y COORDINATE of the symbol ORIGIN See "Notation Conventions" on page 19 | X'040A..00' |
| Bytes 5-End | | DATA to be bar encoded | X'040C..00' |

Chapter 10. Overlay Command Set

Table 149. Overlay Function Set Commands

| Name | Command | Sub-command | Where to Look |
|--------------------|---------|-------------|--|
| Begin Overlay | X'D6DF' | | <i>Intelligent Printer Data Stream Reference</i> |
| Deactivate Overlay | X'D6EF' | | <i>Intelligent Printer Data Stream Reference</i> |
| Include Overlay | X'D67D' | | <i>Intelligent Printer Data Stream Reference</i> |

Notes:

1. Network Printers do not support Secure Overlay (value X'01' in byte 2 of Include Overlay is not supported).
2. See "Notation Conventions" on page 19 regarding the notation convention for Include Overlay bytes 3-5 and 7-9.

Chapter 11. Page Segment Command Set

Table 150. Page Segment Function Set Commands

| Name | Command | Sub-command | Where to Look |
|-------------------------|---------|-------------|--|
| Begin Page Segment | X'D65F' | | <i>Intelligent Printer Data Stream Reference</i> |
| Deactivate Page Segment | X'D66F' | | <i>Intelligent Printer Data Stream Reference</i> |
| Include Page Segment | X'D67F' | | <i>Intelligent Printer Data Stream Reference</i> |

Chapter 12. Loaded Font Command Set

Table 151. Loaded Font Function Set Commands

| Name | Command | Sub-command | Where to Look |
|-------------------|---------|-------------|---------------------------------|
| Load Font | X'D62F' | | "Load Font" on page 119 |
| Load Font Control | X'D61F' | | "Load Font Control" on page 119 |
| Load Font Index | X'D60F' | | "Load Font Index" on page 120 |

Load Font

LF1 Format

When downloading a fully described font (LF1 format), the Load Font (LF) carries a series of character raster pattern bit strings. Consecutive Load Font commands are supported for downloading the LF1 font character patterns.

Table 152. Load Font X'D62F' (LF1 Example)

| Data Area | Value | Description | Error Code |
|-----------|---|--|----------------------------|
| Bytes 0-n | Any Value in conformance with LFC Font Byte Count | FONT DATA in LF1 FORMAT (Character Patterns) | X'022E..02' X'0232..02' |

Load Font Control

This command is 40 + (8 x n) bytes long, where n (4090 max) is the number of font characters that have associated raster patterns. The command contains font id, overall font characteristics, and the information needed to parse the font raster patterns. There is only one Load Font Control command for each font or font section. This command can only be issued in Home State and causes a transition to Font State.

Table 153. Load Font Control X'D61F'

| Data Area | Value | Description | Error Code |
|-----------|---|--|----------------------------|
| Bytes 0-1 | X'0001'-X'7EFF' | FONT HOST ASSIGNED ID | X'0218..02' X'0239..02' |
| Byte 2 | X'00' | SECTION ID Single byte fonts | X'0243..02' |
| Byte 3 | X'00' | Reserved (Font-index Format) | X'0221..02' |
| Byte 4 | X'05' | Pattern Data Format (bounded box) | X'0222..02' |
| Byte 5 | Bits 0-1 00 Bits 2-3 01 Bits 4-5 00 Bit 6 1 0 Bit 7 0 | FONT TYPE BITS Reserved FONT TYPE Single byte Reserved CHARACTER BOX SIZE Uniform size (see bytes 6-7) Individual size (see bytes 40-End) Reserved | X'0223..02' |
| Bytes 6-7 | X'0001' - X'7FFF' | UNIFORM or MAXIMUM CHARACTER BOX X SIZE | X'0226..02' |

Table 153. Load Font Control X'D61F' (continued)

| Data Area | Value | Description | Error Code |
|-------------|--------------------------------|---|-------------|
| Bytes 8-9 | X'0001' - X'7FFF' | UNIFORM or MAXIMUM CHARACTER BOX Y SIZE | X'0227..02' |
| Byte 10 | X'02' | UNIT BASE for L-units Relative units (relative metric technology) | X'021B..02' |
| Byte 11 | X'00' | Reserved | |
| Bytes 12-13 | X'03E8' | L-units per UNIT BASE in the X direction 1000 | X'022A..02' |
| Bytes 14-15 | X'03E8' | L-units per UNIT BASE in the Y direction 1000 | X'022B..02' |
| Bytes 16-17 | X'0000' | Reserved | |
| Bytes 18-20 | X'000001' - X'7FFFFFF' | FONT BYTE COUNT | X'021C..02' |
| Byte 21 | X'01' X'04' X'08' | CHARACTER DATA ALIGNMENT Starting address 1 byte aligned Starting address 4 byte aligned Starting address 8 byte aligned | X'022D..02' |
| Bytes 22-25 | X'00000000' | Reserved | |
| Byte 26 | X'00' | UNIT BASE for PEL-Units Ten inches | X'0287..02' |
| Byte 27 | X'00' | Reserved | |
| Bytes 28-29 | X'0BB8' | PEL-Units per UNIT BASE in the X direction | X'0288..02' |
| Bytes 30-31 | X'0BB8' | PEL-Units per UNIT BASE in the Y direction | X'0289..02' |
| Bytes 32-33 | X'0001' - X'7FFF' | RELATIVE METRIC MULTIPLYING FACTOR | X'028A..02' |
| Bytes 34-35 | X'0000' | Reserved | |
| Byte 36 | X'01' | STAGEABILITY Font is not stagable | X'0220..02' |
| Byte 37 | Bit 0 Bits 1-7 0000000 | INTENDED USE FLAGS 0 Not intended for MICR printing 1 Intended for MICR printing(ignored) Reserved | |
| Bytes 38-39 | X'0000' | Reserved | |
| Bytes 40-n | | Zero or more CHARACTER PATTERN DESCRIPTORS in the following format | |
| + 0-1 bytes | X'0001' - X'7FFF' | CHARACTER BOX X SIZE | X'0226..02' |
| + 2-3 bytes | X'0001' - X'7FFF' | CHARACTER BOX Y SIZE | X'0227..02' |
| + 4-7 bytes | X'00000000' - X'007FFFFFFE' | CHARACTER PATTERN ADDRESS | X'023E..02' |

Load Font Index

This command is 32 + (256 x 16) (the (256 x 16) byte field is not always required) bytes long. It contains general information needed to print the patterns and a description of the characteristics of each of the 256 possible code points. Each font can have from one to four associated font indices. Each index is loaded by a separate Load Font Index command. This command can only be issued in Home State.

Table 154. Load Font Index X'D60F'

| Data Area | Value | Description | Error Code |
|---------------|---|--|----------------------------|
| Bytes 0-1 | X'0001'-X'7EFF' | FONT HOST ASSIGNED ID (HAID) | X'0218..02' |
| Byte 2 | X'00' | SECTION ID | X'0243..02' |
| Byte 3 | Bit 0 0 1 Bits 1-7 0000000 | FLAGS VARIABLE SPACE Disabled Enabled Reserved | |
| Bytes 4-5 | X'0000' X'2D00' X'5A00' X'8700' | FONT INLINE SEQUENCE 0 deg. 90 deg. 180 deg. 270 deg. | X'0240..02' X'0246..02' |
| Byte 6-7 | X'0000' | Reserved | |
| Byte 8-9 | X'8000' - X'7FFF' | UNIFORM or MAXIMUM BASELINE OFFSET | X'023C..02' |
| Byte 10-11 | X'8000' - X'7FFF' | UNIFORM or MAXIMUM CHARACTER INCREMENT | X'023C..02' |
| Byte 12-13 | X'0000' | Reserved | |
| Byte 14-15 | X'0000' - X'7FFF' | MAXIMUM BASELINE EXTENT | |
| Byte 16 | Bits 0-4 00000 Bit 5 1 0 Bit 6 1 0 Bit 7 1 0 | ORIENTATION FLAGS Reserved UNIFORM A-SPACE Bytes 18, 19 specify uniform value Bytes 18, 19 specify minimum value A-space for each character is in the character index entry UNIFORM BASELINE OFFSET Bytes 8, 9 specify uniform baseline offset Bytes 8, 9 specify minimum baseline offset (Baseline offset for each character is in the character index entry) UNIFORM CHARACTER INCREMENT Bytes 10, 11 specify uniform character increment Bytes 10, 11 specify minimum character increment (Character increment for each character is in the character index entry) | |
| Byte 17 | X'00' | Reserved | |
| Bytes 18-19 | X'8000' - X'7FFF' | UNIFORM or MINIMUM A-SPACE | X'023C..02' |
| Bytes 20-21 | X'0000' - X'FFFF' | VARIABLE SPACE CODE | |
| Bytes 22-23 | X'8000' - X'7FFF' | DEFAULT VARIABLE INCREMENT | |
| Bytes 24-25 | X'0000' X'0001' - X'7FFF' | RECOMMENDED UNDERSCORE WIDTH No recommendation Underscore width in L-units | X'023C..02' |
| Bytes 26-27 | X'8000' - X'7FFF' | RECOMMENDED UNDERSCORE POSITION (L-units) | |
| Bytes 28-31 | X'00000000' | Reserved | |
| Bytes 32-4127 | | 256 CHARACTER INDEX ENTRIES in the following format | |

Table 154. Load Font Index X'D60F' (continued)

| Data Area | Value | Description | Error Code |
|---------------|-------------------|--|-------------|
| + 0-1 bytes | X'0000' | CHARACTER FLAGS Defined, printing, incrementing | |
| | X'2000' | Defined, printing, non-incrementing | |
| | X'4000' | Defined, non-printing, incrementing | |
| | X'6000' | Defined, non-printing, non-incrementing | |
| | X'8000' | Undefined, printing, incrementing | |
| | X'A000' | Undefined, printing, non-incrementing | |
| | X'C000' | Undefined, non-printing, incrementing | |
| | X'E000' | Undefined, non-printing, non-incrementing | X'023C..02' |
| + 2-3 bytes | X'0000' - X'xxxx' | PATTERN INDEX | X'023C..02' |
| + 4-5 bytes | X'8000' - X'7FFF' | CHARACTER INCREMENT | |
| + 6-7 bytes | X'8000' - X'7FFF' | A-SPACE | |
| + 8-13 bytes | X'000000000000' | Reserved | X'023C..02' |
| + 14-15 bytes | X'8000' - X'7FFF' | BASELINE OFFSET | |

Chapter 13. Exception Reporting, Sense Data, and Recovery

This chapter supplies information about Acknowledge Reply, which the IPDS uses for exception reporting. The chapter begins with general information followed by tables of the exception-reporting codes for the printer. The tables contain details about the specific exceptions. The chapter concludes with a section on printer counter adjustments.

Note: When you have questions about codes from the printer, use this chapter instead of the exception-reporting chapter in the *Intelligent Printer Data Stream Reference*. Although the two chapters are similar, this chapter contains only those exception codes that the printer returns.

General Reply Rules

IPDS uses the Acknowledge Reply command to return both positive and negative replies to the host. Positive messages are Acknowledge Replies. The negative messages (exception messages) are NACKs and are sent as sense-byte information in the special data area. For more information about Acknowledge Replies, see “Chapter 4. Device Control Command Set” on page 25.

The following general rules apply to printer replies:

- The printer reports a data-stream exception with a NACK. Only one exception can be returned in each NACK.
- The printer sends an ACK or a NACK in response to an Acknowledgement Required (ARQ) flag. If there is an exception, the printer sends a NACK without receiving an ARQ.
- If the printer receives a command requesting an acknowledgement, it expects the host to wait for the acknowledgement before sending more commands.
- Any data received after an exception is reported is discarded until all queued NACKs have been either sent to the host or cleared by an appropriate link-level command.

An exception on a command can be reported before receiving the entire command data. When an Alternate Exception Action (AEA) or Page Continuation Action (PCA) is not to be taken, the next data received should be part of a new command. Otherwise, an 8001..00 exception may result. The printer might not discard the remaining bytes in a command with an error when reported.

Therefore, the next data received should be the start of a new command. As a result, begin the host data re-transmission only after a synchronizing command (such as XOH Print Buffered Data or XOA Discard Buffered Data) is successfully acknowledged.

A terminating condition causes the first NACK to be reported. The next NACK is reported when the next five bytes of data are received. This is usually an IPDS command header. Reporting a NACK discards all data currently received. The process of receiving five bytes and sending a NACK repeats until the NACK queue is exhausted or cleared by the appropriate link-level command.

- An ACK indicates that the data stream was checked and that commands were transformed into the printer’s internal command language, with the following exceptions:
 - Asynchronous-position exceptions and undefined character exceptions are not detected until print time.

- The data stream is not checked when IPDS is being saved for future use, as in overlays and page segments, and when more than one copy group is specified in a Load Copy Control (LCC) command.

An exception in an overlay or page segment is reported synchronously with the End Page (EP) command on the page it is used. An exception in a saved copy group is reported synchronously after the EP command; that is, in the next command after the EP.

- The XOA Exception-Handling Control (EHC) order tells the printer how to handle exceptions. More information about the EHC order follows.

Exception-Handling Control (EHC)

The EHC order lets you control the three exception-handling functions listed below. Brief descriptions of the functions follow this listing.

- **Exception Reporting.** You can record three types of exception conditions and related exception information and have them reported at specified times using NACKs.
- **Alternate Exception Actions (AEA).** You can specify whether the printer is to take Alternate Exception Actions (AEAs), which prescribe actions to take when the printer is given an IPDS command or parameters it does not support.
- **Exception-Presentation Processing.** The exception-presentation processing function has two parts:
 - **Page Continuation Actions (PCA).** You can specify whether to end or continue processing a page that has an exception.
 - **Exception Page Print.** You can specify whether the printer is to print or discard a page that was terminated.

Exception Reporting

Use the exception-reporting bits in the Exception-Handling Control (EHC) record to control the recording and reporting of three classes of exceptions:

- Undefined characters
- Position exceptions
- All other exceptions that have AEAs.

When you instruct the printer to record a given class of exception, it always records exceptions that fit in that class. If you instruct the printer not to record a given class of exception, the printer still records such exceptions if the printer was told not to take the AEA.

Classes of Data Stream Exceptions

All printer data stream exceptions are returned in 24 bytes of detailed sense information in the special data area of the NACK. The exception-code identifier consists of three bytes: 0, 1, and 19. Byte 0 specifies the exception class; bytes 1 and 19 identify the particular exception.

The six classes of data-stream exceptions are:

- Command Reject
- Intervention Required
- Equipment Check

- Data Check
- Specification Check
 - IO Images
 - Bar Codes
 - Graphics
 - General
- Conditions Requiring Host Notification.

See “Exception Classes” on page 128 for more information.

Sense Byte Information

The following list gives details of the information in each sense byte.

| Byte(s) | Description |
|----------------------|---|
| 0 | Defines the exception class for the specific exception, It is the first byte of each 3-byte exception ID. |
| 1 | Together with sense byte 19, byte 1 defines the specific exception within an exception class. It is the second byte of each 3-byte exception ID. |
| 2 | Contains exception-recovery action codes that specify the required actions for the exception conditions. For more information, see “Action Codes in Sense Byte 2”. |
| 3 | Reserved |
| 4 through 18 | Describe the specific cause in three separate formats: <ul style="list-style-type: none"> Format 0 Provides details about all data stream exceptions other than data check positioning exceptions. Format 2 Provides details about device exceptions, including intervention-required exceptions, equipment-check exceptions, and conditions requiring host notification. Format 7 Provides details about data check positioning exceptions. <p>For more information about formats, see “Formats 0, 1, and 2 for Sense Bytes 4-18 and 20-23” on page 126.</p> |
| 19 | Together with sense byte 1, byte 19 defines the specific exception within an exception class. It is the third byte of each 3-byte exception ID. |
| 20 through 23 | Contain additional information about the state of the printer when it senses an exception. |

Action Codes in Sense Byte 2

The action codes in sense byte 2 classify the exception to assist host-exception recovery and allow printing to continue. The action codes listed are the only ones returned by the printer.

| Action Code (in hex) | Exception-Recovery Action |
|---|--|
| 01 Data Stream Exception | A syntax error exists in the IPDS data stream. The specific recovery actions depend on the specific exception (sense bytes 0, 1, and 19 in the tables of printer exception codes) and host support requirements. Data stream exceptions occur on the page or resource just before the received page counter. |
| 08 Paper Jam | The printer detects a paper jam. Retransmit all pages and associated resources (overlays, page segments, and fonts) that have not passed the printer-defined jam recovery point. |
| 09 Data-Related Print Exception | A sheet cannot be printed because of something within the data stream. The data might be too complex, too dense, or the media source selected might be incompatible with the media destination selected. The printer has discarded all buffered pages and modified the page and copy counters. |
| 0C Resource Storage Exception | The printer cannot accept a page or resource (overlay, page segment, or font) because the storage area is full. Delete all resources not necessary to continue printing and retransmit the page in progress. If this action fails, the recovery action depends on host-support requirements. |
| 15 Cancel | The printer operator requests that the current job be canceled. Cancel the job containing the page at the host-defined canceling point. |
| 1A Re-drive Buffered Pages | The printer may not be in Ready State, may need paper or toner, or may have a full exit tray. Take the appropriate recovery action for the exception code and retransmit all pages and associated resources that have not been committed for printing, if any. |
| 1D Printer Characteristics Changed | At least one of the printer characteristics that is reported in the reply to an XOH OPC command has changed. The host should issue an XOH OPC command to obtain the new printer characteristics. |
| 1E Asynchronous Out-of-Storage Exception | A resource or a page that is not currently being received at the Received Page ID caused an out-of-storage exception. The printer has discarded all buffered pages and reset the page and copy counters. The page on which this exception was discovered will not print. The host must issue an XOH PBD to ensure that the page and copy counters are accurately adjusted. After the XOH PBD has returned an ACK, the page in error is the page just before the Committed Page Counter. Cancel the printed data containing the page just before the Committed Page ID. |
| 22 Printer Communications Inoperative | A printer condition exists from which the printer cannot recover without operator intervention. End the communication and the session. |

Formats 0, 1, and 2 for Sense Bytes 4-18 and 20-23

Sense bytes 4 through 18 and 20 through 23 describe the cause of each exception condition. (Sense byte 19 is byte 3 of the exception code.) These descriptions are presented in three separate formats, which are explained below.

Format 0

Format 0 provides detailed information for all data stream exceptions except data check positioning exceptions. This format applies to all data check, specification-check, and command-reject exceptions, except for exceptions X'08C1..00', X'020A..05', and X'0411..00'.

| Byte | Description |
|-------|---|
| 4 | Data exception, X'DE' |
| 5 | Format Identifier, X'00' |
| 6,7 | Count of occurrences of the exception (the printer provides an approximate count of occurrences of some exceptions) |
| 8,9 | ID of overlay that has an exception |
| 10,11 | ID of page segment that has an exception |
| 12,13 | Command in process when exception found |
| 14,15 | Object Identifier (other than overlay or page segment that has an exception, such as a font exception) |
| 16,17 | Identifies a part within an object that has the exception, such as "font" |
| 18 | Reserved |
| 20-23 | Page Identifier for the page that has the exception |

Format 1

Format 1 provides detailed information for both data check positioning exceptions. This format applies only to data check exceptions X'08C1..00', X'020A..05', and X'0411..00'.

| Byte | Description |
|-------|---|
| 4 | Data exception, X'DE' |
| 5 | Format Identifier, X'01' |
| 6, 7 | Count of occurrences of the exception (the printer provides an approximate count of occurrences of some exceptions) |
| 8, 18 | Reserved |
| 20-23 | Page Identifier for the page that has the exception |

Format 2

Format 2 provides detailed information for all device exceptions. This format applies to all intervention-required and equipment-check exceptions and for conditions requiring host notification.

| Byte | Description |
|------|------------------------------|
| 4 | System Reference Code, X'BF' |
| 5 | Format Identifier, X'02' |
| 6-23 | Reserved |

Exception-Reporting Codes

The following tables describe all printer exception codes that are returned to the host in the special data area of a NACK.

Each exception code is identified by three bytes: byte 0, byte 1, and byte 19. The first table lists the names of the exception classes which are returned in byte 0. The subsequent tables give detailed information about each of the groups listed in the first table.

Note: The printer provides an approximate count of occurrences for some exceptions.

Exception Classes

| Sense Byte 0 | Exception Class and Description |
|--------------|--|
| X'80' | Command Reject —the printer cannot recognize a received command. |
| X'50' | Equipment Check with Intervention Required —the printer detects a condition caused by hardware failure or hardware limitations, and manual intervention at the printer is required. |
| X'40' | Intervention Required —the printer detects a condition that requires manual intervention, such as “out of paper.” |
| X'20' | Reserved |
| X'10' | Equipment Check —the printer detects an equipment malfunction or hardware error. |
| X'08' | Data Check —the printer detects a position exception or an undefined character exception. |
| X'05' | Specification Check - IO Images —the printer detects an invalid or unsupported data value in an IO image command. |
| X'04' | Specification Check - Bar Codes —the printer detects an invalid or unsupported data value in a bar code command. |
| X'03' | Specification Check - Graphics —the printer detects an invalid or unsupported data value in a graphics command. |
| X'02' | Specification Check - General —the printer detects an invalid or unsupported data value in a received command. |
| X'01' | Conditions Requiring Host Notification —the printer detects a condition that requires action by the host. |

Tables of Printer Exception Codes

The following tables list specific exception classes and are arranged in three columns. The first column lists the 3-byte ID given in sense bytes 0, 1, and 19. The second column gives a description of each exception. The third column lists the action code given in sense byte 2.

Typically, when an exception has a defined AEA, the PCA is the AEA. Also, no PCA is taken when the command is received in Home state or Font state.

In each table, the exceptions are listed in ascending numeric order.

Note: The term *architecturally valid* refers to the range of values permitted by the IPDS architecture. An “invalid” value denotes one outside the range defined

by the architecture. “Supported” values are those that the printer accepts. Therefore, “unsupported” values may be valid by architecture but not in the printer implementation.

The IBM Network Printers support 24 Byte Sense data (See “Sense Type and Model” on page 53) The Network Printers support AEA and PCA error processing. See *Intelligent Printer Data Stream Reference* for details on Sense byte information and error processing.

The maximum number of queued asynchronous and synchronous errors is 1 for Twinax and Coax DSC mode and 7 for Coax LU1 mode and TCP/IP mode).

The cause of the exception and the Alternate Exception Action (AEA) are the same as specified in *Intelligent Printer Data Stream Reference* unless otherwise noted.

TCP/IP Sense Data

Intervention Required Sense Data

Table 155. Intervention Required Sense Data

| Exception ID | Description | Action Code |
|--------------|--------------------|-------------|
| X'4000..00' | Printer not ready | 03 |
| X'4001..00' | Out of paper | 03 |
| X'4002..00' | Output bin full | 03 |
| X'4004..00' | Out of toner | 03 |
| X'4031..00' | Paper Length Check | 03 |
| X'4033..00' | Paper Width Check | 03 |
| X'407C..00' | Out of Staples | 03 |
| X'407C..01' | Staple jam | 03 |

IPDS Exceptions Reported

Command Reject Exceptions

Table 156. Command Reject Exceptions

| Exception ID | Description | Action Code |
|--------------|-------------------------------|-------------|
| X'8001..00' | Invalid IPDS command code | 01 |
| X'8002..00' | Invalid IPDS command sequence | 01 |
| X'8004..00' | Data received after ARQ | 01 |
| X'80E0..00' | Invalid IPDS command length | 01 |

Equipment Check with Intervention Required

Table 157. Equipment Check with Intervention Required Exceptions

| Exception ID | Description | Action Code |
|--------------|--|-------------|
| 50F8..00 | Media Source X'nn' is not available (has been disabled). | 01 |

Intervention Required Exceptions

Table 158. Intervention Exceptions

| Exception ID | Description | Action Code |
|--------------|---|-------------|
| X'4000..00' | Printer is not ready: <ul style="list-style-type: none"> The printer is in a not-ready state. Alternate Exception Action: none. Page Continuation Action: none. | 1A |
| X'4001..00' | Printer is out of paper: <ul style="list-style-type: none"> The printer is out of paper, and paper was not added within specified amount of time. Alternate Exception Action: none. Page Continuation Action: none. | 1A |
| X'4002..00' | The printer's exit tray is full: <ul style="list-style-type: none"> The printer's exit tray is full and it was not emptied within a specified amount of time. Alternate Exception Action: none. Page Continuation Action: none. | 1A |
| X'4004..00' | Printer is out of toner: <ul style="list-style-type: none"> The printer is out of toner, and toner was not added within a specified amount of time. Alternate Exception Action: none. Page Continuation Action: none. | 1A |
| X'4031..00' | Paper Length Check <ul style="list-style-type: none"> The printer has detected a paper-length check, and it has not been corrected by the operator after a specified amount of time. Alternate Exception Action: none. Page Continuation Action: none. | 1A |
| X'4033..00' | Paper Width Check <ul style="list-style-type: none"> The printer has detected a paper-width check, and it has not been corrected by the operator after a specified amount of time. Alternate Exception Action: none. Page Continuation Action: none. | 1A |
| X'407C..00' | Out of Staples | 1A |
| X'407C..01' | Staple jam | 08 |
| X'40E5..00' | Paper jam recovery needed: <ul style="list-style-type: none"> A paper jam has occurred and has not been cleared within a specified amount of time. Any lost pages must be resent. Alternate Exception Action: none. Page Continuation Action: none. | 08 |
| X'40E8..nn' | Supported but not installed media source ID | 1A |

Equipment Check Exceptions

Table 159. Equipment Check Exceptions

| Exception ID | Description | Action Code |
|--------------|--|-------------|
| X'10F1..00' | Permanent hardware exception: <ul style="list-style-type: none"> • A permanent hardware failure exists. • The microcode detected either a logic exception from which the printer could not recover or a condition that should not have occurred. • Alternate Exception Action: none. • Page Continuation Action: none. | 22 |

Data Check Exceptions

Table 160. Data Check Exceptions

| Exception ID | Description | Action Code |
|--------------|--|-------------|
| X'0821..00' | Undefined character | 01 |
| X'0860..00' | Numeric representation precision check | 01 |
| X'08C1..00' | Position check | 01 |

IO-Image Specification Exceptions

Table 161. IO-Image Exceptions

| Exception ID | Description | Action Code |
|--------------|--|-------------|
| X'0500..01' | Invalid or unsupported IO Image SDF code | 01 |
| X'0500..03' | Invalid or unsupported IO Image SDF | 01 |
| X'0500..04' | Invalid IO Image SDF value | 01 |
| X'0570..0F' | IO Image Begin Segment out of sequence | 01 |
| X'0571..0F' | IO Image End Segment out of sequence | 01 |
| X'0591..0F' | IO Image Begin Image Content out of sequence | 01 |
| X'0592..0F' | IO Image Data SDF out of sequence | 01 |
| X'0593..0F' | IO Image End Image Content out of sequence | 01 |
| X'0594..01' | Inconsistent Image Size Parameter value and Image data | 01 |
| X'0594..0F' | IO Image Image Size Parameter missing or out of sequence | 01 |
| X'0594..11' | IO Image Image Size cannot be determined | 01 |
| X'0595..0F' | IO Image Image Encoding Parameter out of sequence | 01 |
| X'0595..10' | IO Image Image Encoding Parameter unsupported value | 01 |
| X'0595..11' | IO Image Decompression error | 01 |
| X'0596..0F' | IO Image Image Data Element Size Parameter out of sequence | 01 |
| X'0596..10' | IO Image Image Data Element Size Parameter unsupported value | 01 |
| X'0596..11' | IO Image Image Data Element Size Parameter and Image Encoding Parameter inconsistent | 01 |

Table 161. IO-Image Exceptions (continued)

| Exception ID | Description | Action Code |
|--------------|---|-------------|
| X'0597..0F' | IO Image Image Look Up Table ID Parameter out of sequence | 01 |
| X'0597..10' | IO Image Image Look Up Table ID Parameter unsupported value | 01 |
| X'05A9..02' | IO Image data outside the Image Presentation Space | 01 |

Bar Code Specification Exceptions

Table 162. Bar Code Exceptions

| Exception ID | Description | Action Code |
|--------------|---|-------------|
| X'0403..00' | Invalid or unsupported bar code type | 01 |
| X'0404..00' | Unsupported local-font ID or font not available | 01 |
| X'0405..00' | Invalid or unsupported bar code color | 01 |
| X'0406..00' | Invalid or unsupported module width | 01 |
| X'0407..00' | Invalid or unsupported element height | 01 |
| X'0408..00' | Invalid or unsupported height multiplier | 01 |
| X'0409..00' | Invalid or unsupported wide-to-narrow ratio | 01 |
| X'040A..00' | Invalid or unsupported symbol origin | 01 |
| X'040B..00' | Invalid or unsupported bar code modifier | 01 |
| X'040C..00' | Invalid or unsupported bar code data length | 01 |
| X'040E..00' | Check-digit calculation exception | 01 |
| X'0410..00' | Invalid or unsupported human-readable interpretation location | 01 |
| X'0411..00' | Attempt to print portion of symbol outside block or VPA | 01 |

Graphics Specification Exceptions

Table 163. Graphics Exceptions

| Exception ID | Description | Action Code |
|--------------|---|-------------|
| X'0300..01' | Unallocated or unsupported graphics order or command code | 01 |
| X'0300..02' | Reserved byte exception or invalid attribute set | 01 |
| X'0300..03' | Incorrect drawing order length | 01 |
| X'0300..04' | Invalid attribute value | 01 |
| X'0300..08' | Truncated order exception | 01 |
| X'0300..0C' | Segment prolog exception | 01 |
| X'0300..0E' | Unsupported attribute value | 01 |
| X'0300..21' | Invalid or unsupported default | 01 |
| X'0334..00' | Character angle value not supported | 01 |
| X'033E..00' | Invalid End Prolog | 01 |
| X'0360..00' | Area bracket exception | 01 |
| X'0368..00' | Begin Area received incorrectly | 01 |

Table 163. Graphics Exceptions (continued)

| Exception ID | Description | Action Code |
|--------------|---|-------------|
| X'0368..01' | Area truncated exception | 01 |
| X'0368..02' | Supported order invalid in area | 01 |
| X'0368..03' | Pattern Symbol Set not supported | 01 |
| X'0368..04' | Undefined pattern symbol | 01 |
| X'0370..01' | Unsupported Begin Segment Introducer segment flag | 01 |
| X'0370..82' | Invalid Begin Segment Introducer segment flag | 01 |
| X'0370..C1' | Invalid Begin Segment Introducer length | 01 |
| X'0370..C5' | Insufficient Segment Data | 01 |
| X'0392..00' | Graphics image order sequence exception | 01 |
| X'0392..01' | Image data discrepancy | 01 |
| X'0393..00' | Graphics image bracket exception | 01 |
| X'0393..01' | Incorrect number of Image Data drawing orders | 01 |
| X'03C2..00' | Marker Symbol Set not supported | 01 |
| X'03C2..01' | Undefined marker code | 01 |
| X'03C3..00' | Font not available | 01 |
| X'03C3..01' | Undefined graphics character code | 01 |
| X'03C6..01' | Arc drawing check | 01 |
| X'03D1..00' | Truncated graphics image exception | 01 |
| X'03D1..01' | Invalid order in graphics image | 01 |
| X'03D1..02' | Graphics image format not supported | 01 |
| X'03D1..03' | Image width greater than maximum supported | 01 |
| X'03D1..04' | Image height greater than maximum supported | 01 |
| X'03E1..00' | Relative line outside coordinate space | 01 |

General Specification Exceptions

Table 164. General Exceptions

| Exception ID | Description | Action Code |
|--------------|---|-------------|
| X'0200..01' | Embedded Control Sequence Code Exception | 01 |
| X'0202..01' | End Suppression (ESU) text-control exception | 01 |
| X'0202..02' | Invalid or unsupported IPDS command length | 01 |
| X'0202..05' | Invalid data self-defining-field length | 01 |
| X'0203..02' | IPDS Command Header Length too small | 01 |
| X'0203..05' | Invalid or unsupported block orientation | 01 |
| X'0204..01' | EP command encountered | 01 |
| X'0204..02' | Invalid use of Acknowledgement Continuation Bit | 01 |
| X'0204..05' | Invalid or unsupported area-position reference system | 01 |
| X'0205..01' | Invalid spanning sequence | 01 |
| X'0205..05' | Invalid or unsupported self-defining-field unit base | 01 |
| X'0206..01' | Invalid Begin Suppression (BSU) | 01 |

Table 164. General Exceptions (continued)

| Exception ID | Description | Action Code |
|--------------|--|-------------|
| X'0206..05' | Invalid or unsupported self-defining field L-units | 01 |
| X'0207..05' | Invalid or unsupported self-defining-field extents or Graphic Window values inconsistent | 01 |
| X'0208..05' | Invalid or unsupported mapping option | 01 |
| X'0209..05' | Invalid or unsupported axis offsets | 01 |
| X'020B..05' | Invalid self-defining-field identifier | 01 |
| X'020F..01' | Invalid or unsupported Set Text Orientation (STO) | 01 |
| X'0210..01' | Invalid or unsupported Set Inline Margin (SIM) | 01 |
| X'0211..01' | Invalid or unsupported Set Baseline increment (SBI) | 01 |
| X'0212..01' | Invalid or unsupported inter-character adjustment | 01 |
| X'0213..01' | Invalid or unsupported Absolute Move Baseline (AMB) | 01 |
| X'0214..01' | Invalid or unsupported Absolute Move Inline (AMI) | 01 |
| X'0214..02' | The font resource to be deactivated is not found | 01 |
| X'0215..01' | Invalid or unsupported Relative Move Inline (RMI) | 01 |
| X'0215..02' | Invalid or unsupported DF command font or font-section ID | 01 |
| X'0216..01' | Invalid or unsupported Relative Move Baseline (RMB) | 01 |
| X'0217..01' | Invalid or unsupported Set Variable-Space Increment (SVI) | 01 |
| X'0217..02' | Invalid or unsupported DF command deletion type | 01 |
| X'0218..02' | Invalid, unsupported, or unavailable font ID | 01 |
| X'0219..01' | Invalid or Unsupported value for Repeat String (RPS) repeat length | 01 |
| X'0219..02' | Multiple occurrences of the same LFE font-equivalence number | 01 |
| X'021B..02' | Invalid or unsupported Load Font Control unit base for L-units | 01 |
| X'021C..01' | Invalid escape sequence | 01 |
| X'021C..02' | Invalid LFC command byte-count value | 01 |
| X'021D..02' | Invalid or unsupported the Load Font Equivalence global font ID | 01 |
| X'021E..01' | Invalid WT text-control length | 01 |
| X'021F..01' | Repeat String (RPS) length exception | 01 |
| X'021F..02' | Mismatch of LFE command font Host-Assigned IDs | 01 |
| X'0220..02' | Invalid Load Font Control (Byte 36 value) | 01 |
| X'0221..02' | Invalid or unsupported Load Font Control font-index format | 01 |
| X'0222..02' | Invalid or unsupported Load Font Control data pattern format | 01 |
| X'0223..02' | Invalid or unsupported Load Font Control font-type bits | 01 |

Table 164. General Exceptions (continued)

| Exception ID | Description | Action Code |
|--------------|---|-------------|
| X'0226..02' | Invalid or unsupported LSS or LFC X-box size | 01 |
| X'0227..02' | Invalid or unsupported LSS or LFC Y-box size | 01 |
| X'022A..02' | Invalid or unsupported Load Font Control L-Units per unit base in the X-direction | 01 |
| X'022B..02' | Invalid or unsupported Load Font Control L-Units per unit base in the Y-direction | 01 |
| X'022D..02' | Invalid or unsupported Load Font Control character-data alignment | 01 |
| X'022E..02' | Insufficient font data received | 01 |
| X'0231..01' | Invalid or unsupported Load Copy Control number of copies | 01 |
| X'0232..01' | Invalid or unsupported Load Copy Control Keyword in copy-group entry | 01 |
| X'0232..02' | Excess font data received | 01 |
| X'0234..01' | Invalid or unsupported Load Copy Control entry-byte count | 01 |
| X'0236..01' | Invalid or unsupported Load Copy Control simplex/duplex parameter | 01 |
| X'0237..01' | Invalid or Unsupported LCC N-up Parameter | 01 |
| X'0237..03' | Invalid or Unsupported LCC Media Destination Parameter | 01 |
| X'0237..04' | Incompatible Media Source and Media Destination | 09 |
| X'0237..05' | Mixture of Media Source or Destination IDs in a duplex copy-subgroup pair | 01 |
| X'0238..01' | Maximum supported number of Overlays per LCC copy-group exceeded | 01 |
| X'0239..01' | Maximum supported number of Suppressions per LCC copy-group exceeded | 01 |
| X'0239..02' | Load Font Control font Host-Assigned ID already assigned | 01 |
| X'023A..02' | Maximum number of Fonts allowed by printer exceeded | 01 |
| X'023C..02' | Invalid or unsupported value within Load Font Index command | 01 |
| X'023E..02' | Invalid Load Font Control character-pattern address | 01 |
| X'023F..02' | STO-SCFL-LFE mismatch | 01 |
| X'0240..02' | Invalid or unsupported value for Font Inline Sequence | 01 |
| X'0242..01' | WIC pel count is less than the minimum required | 01 |
| X'0243..01' | WIC command pel count is greater than the maximum supported value | 01 |
| X'0244..01' | WIC command scan count is less than the minimum required | 01 |
| X'0245..01' | WIC command scan count is greater than the maximum supported value | 01 |

Table 164. General Exceptions (continued)

| Exception ID | Description | Action Code |
|--------------|--|-------------|
| X'0246..01' | Invalid WIC source image format | 01 |
| X'0246..02' | Invalid parameter for the Load Font Index command | 01 |
| X'0247..01' | Invalid or unsupported Write Image Control magnification factor | 01 |
| X'0247..02' | Invalid or unsupported Load Font Equivalence font-inline sequence | 01 |
| X'0248..01' | Invalid or unsupported Write Image Control scan-line direction | 01 |
| X'0249..01' | Invalid scan-line-sequence direction in the WIC command | 01 |
| X'024A..01' | Invalid or unsupported Write Image Control image block location | 01 |
| X'0253..01' | Invalid or unsupported Write Image Control image color | 01 |
| X'0258..03' | Invalid or unsupported text color | 01 |
| X'0260..02' | Invalid or unsupported Load Page Descriptor Xp and I L-units per unit base | 01 |
| X'0261..02' | Invalid L-Units (Yp) Value in the LPD command | 01 |
| X'0262..02' | Invalid or unsupported Load Page Descriptor Xp-extent | 01 |
| X'0263..02' | Invalid or unsupported Load Page Descriptor Yp-extent | 01 |
| X'0264..02' | Invalid or unsupported Load Page Descriptor unit base | 01 |
| X'0268..02' | Invalid or unsupported Load page Descriptor | 01 |
| X'0269..02' | Invalid baseline-sequence direction in the LPD command | 01 |
| X'026A..01' | Insufficient source image data | 01 |
| X'026A..02' | Invalid or unsupported LPD initial I print coordinate | 01 |
| X'026B..01' | Excess source image data received | 01 |
| X'026B..02' | Invalid or unsupported LPD initial B print coordinate | 01 |
| X'026F..02' | Invalid XOH-SMO Media Origin | 01 |
| X'0270..02' | Invalid or unsupported XOH Set Media Size L-units per unit base | 01 |
| X'0272..02' | Invalid or unsupported XOH Set Media Size Xm-extent | 01 |
| X'0273..02' | Invalid or unsupported XOH Set Media Size Ym-extent | 01 |
| X'0274..02' | Invalid or unsupported XOH Set Media Size unit base | 01 |
| X'0277..01' | Group Termination Exception | 01 |
| X'027A..01' | Invalid triplet length value in a group triplet | 01 |
| X'027B..01' | Incorrect number of triplet data bytes in a group triplet | 01 |
| X'027C..01' | Incompatible finishing operations | 01 |

Table 164. General Exceptions (continued)

| Exception ID | Description | Action Code |
|--------------|---|-------------|
| X'027C..02' | Too many or too few sheets for a finishing operation | 01 |
| X'027C..03' | Invalid or unsupported finishing operation type | 01 |
| X'027C..04' | Invalid or unsupported finishing operation reference corner and edge | 01 |
| X'027C..05' | Unsupported finishing operation count | 01 |
| X'027C..06' | Invalid or unsupported finishing operation axis offset | 01 |
| X'027C..07' | Invalid or unsupported number of finishing positions | 01 |
| X'027C..09' | Finishing operation incompatible with physical media or media destination | 06 |
| X'027C..0A' | Incompatible media destination change in a group to be finished | 06 |
| X'0280..02' | Invalid or unsupported rule width | 06 |
| X'0282..02' | Invalid or unsupported rule length | 01 |
| X'0285..01' | Invalid or unsupported Delete Overlay command overlay ID | 01 |
| X'0287..02' | Invalid or unsupported Load Font Control unit base for Pel-units | 01 |
| X'0288..02' | Invalid or unsupported Load Font Control Pel-units per unit base in the X-direction | 01 |
| X'0289..02' | Invalid or unsupported Load Font Control Pel-units per unit base in the Y-direction | 01 |
| X'028A..01' | Invalid or unsupported Delete Page Segment command page segment Host-Assigned ID | 01 |
| X'028A..02' | Invalid or unsupported Load Font Control Relative-Metric Multiplying Factor | 01 |
| X'028F..01' | Invalid or unsupported AR command parameter values | 01 |
| X'028F..02' | AR activation command failed | 01 |
| X'0290..01' | Invalid or unsupported Overlay ID | 01 |
| X'0291..01' | BO overlay ID already loaded | 01 |
| X'0291..02' | Invalid or unsupported XOA Request Resource list entry | 01 |
| X'0292..01' | Overlay ID not loaded | 01 |
| X'0293..01' | Recursive overlay invocation | 01 |
| X'0294..01' | Invalid or unsupported page segment Host-Assigned ID | 01 |
| X'0295..01' | Page segment Host-Assigned ID already loaded | 01 |
| X'0295..02' | Invalid or unsupported XOH Page Counters Control page-counter update | 01 |
| X'0296..01' | Page segment Host-Assigned ID not loaded | 01 |
| X'0297..01' | Overlay nesting limit exceeded | 01 |
| X'0298..01' | Invalid or unsupported suppression number | 01 |
| X'0298..03' | Invalid or unsupported Temporary Baseline Move text control | 01 |

Table 164. General Exceptions (continued)

| Exception ID | Description | Action Code |
|--------------|--|-------------|
| X'029A..01' | Invalid overstrike character increment | 01 |
| X'02A4..01' | Page boundary in the X-direction cannot be presented by the printer | 01 |
| X'02A5..01' | Page boundary in the Y-direction cannot be presented by the printer | 01 |
| X'02AC..01' | Insufficient Main Storage to print the Sheet | 09 |
| X'02AD..01' | Invalid or unsupported Load Page Position command | 01 |
| X'02AE..01' | Invalid or unsupported parameter in an IO command | 01 |
| X'02AF..01' | Insufficient storage to print the sheet | 0C |
| X'02AF..01' | Asynchronous Insufficient storage to print the sheet | 1E |
| X'02C0..01' | Mixture of Xm-axis duplex and Ym-axis duplex copy groups | 01 |
| X'02C0..02' | Mixture of N-up copy subgroups in a LCC command | 01 |
| X'02C0..03' | More than one N-up keyword specified in a copy subgroup | 01 |
| X'02C0..04' | Duplexing and N-up not supported together | 01 |
| X'02C0..05' | N-up partitioning not supported with envelope media | 01 |
| X'02C1..01' | Maximum number of simplex or duplex keywords in an LCC command | 01 |
| X'02C1..02' | Internal value not unique in an LE command | 01 |
| X'02C2..01' | Odd number of duplex copy groups in an LCC command | 01 |
| X'02C2..02' | More than one Media Source or Destination Keyword specified in a copy subgroup. | 01 |
| X'02C3..01' | Mixture of simplex and duplex parameters in an LCC command | 01 |
| X'02C4..01' | Unequal copy counts in an LCC command | 01 |
| X'02C5..01' | Unable to delete resource (needed on duplex side) | 01 |
| X'02C5..02' | Physical media not compatible with duplex printing | 01 |
| X'02C6..02' | Invalid mapping type in an LE command | 01 |
| X'02C8..01' | An unsupported Input Media Source ID was specified | 01 |
| X'02C8..02' | Invalid or unsupported internal value or external value in an Load Equivalence command | 01 |
| X'02FF..02' | Exceptions detected but not queued | 01 |

Host Notification Exceptions

Table 165. Host Notification Exceptions

| Exception ID | Description | Action Code |
|--------------|---|-------------|
| X'0100..00' | Normal Printer Restart (Printer IMLed or IPDS Dialog Resources Deleted) | 0D |
| X'0101..00' | Media Size or Input Media Source ID Changed | 1D |
| X'018F..00' | Error Printer Restart (Printer IMLed) | 0D |
| X'01E4..00' | Cancel Key Pressed | 15 |

Page Counter Adjustments

To identify which page or pages to send to the printer after an exception occurs, the host program must determine the position of the sheets in the paper path.

Count fields in the ACK command identify the state of a virtual paper path that includes a count of the number of pages received, the number of pages past the jam-recovery point, and the number of pages stacked.

The printer tracks the following:

- Received Page Counter
- Committed Page Counter
- Committed Copy Counter
- Stacked Page Counter
- Stacked Copy Counter

All other counters are mapped to the Stacked Page Counter (for pages) and the Stacked Copy Counter (for copies).

The following rules define how the counters are updated:

1. After power is switched on, all counter values equal X'0000'.
2. When a counter containing X'FFFF' increments, the counter wraps to X'0000'.
3. The counters are updated as shown in the following table as each condition is detected.
4. The Copy Counters are incremented when more than one copy of a page is printed. When all copies have passed a station, the Copy Counter is then reset to zero and the Page Counter is incremented. The Copy Counters are not reset to zero during exception recovery.

| Condition (in hex) | Counters | Counter Adjustments |
|--------------------------------|---|--|
| Action Codes 08 22 | Received Page Counter Committed Page Counter Committed Copy Counter Operator Viewing Page Counter Operator Viewing Copy Counter Jam Recovery Page Counter Jam Recovery Copy Counter Stacked Page Counter Stacked Copy Counter | Set to Jam Recovery Page Counter Set to Jam Recovery Page Counter Set to Jam Recovery Page Counter Set to Jam Recovery Page Counter Set to Jam Recovery Page Counter No change No change Set to Jam Recovery Page Counter Set to Jam Recovery Copy Counter |
| Action Codes 15 1A 1D | Received Page Counter Committed Page Counter Committed Copy Counter Operator Viewing Page Counter Operator Viewing Copy Counter Jam Recovery Page Counter Jam Recovery Copy Counter Stacked Page Counter Stacked Copy Counter | Set to Committed Page Counter No change No change No change No change No change No change No change No change |

| Condition (in hex) | Counters | Counter Adjustments |
|--|--|---|
| Action Code 0C | Received Page Counter Committed Page Counter Committed Copy Counter Operator Viewing Page Counter Operator Viewing Copy Counter Jam Recovery Page Counter Jam Recovery Copy Counter Stacked Page Counter Stacked Copy Counter | No change ¹ No change No change No change No change No change No change No change No change |
| Action Code 01 | Received Page Counter Committed Page Counter Committed Copy Counter Operator Viewing Page Counter Operator Viewing Copy Counter Jam Recovery Page Counter Jam Recovery Copy Counter Stacked Page Counter Stacked Copy Counter | No change ² No change No change No change No change No change No change No change No change |
| Action Code 1E | Received Page Counter Committed Page Counter Committed Copy Counter Operator Viewing Page Counter Operator Viewing Copy Counter Jam Recovery Page Counter Jam Recovery Copy Counter Stacked Page Counter Stacked Copy Counter | Set to Committed Page Counter ³ No change No change No change No change No change No change No change |
| All other action codes | Received Page Counter Committed Page Counter Committed Copy Counter Operator Viewing Page Counter Operator Viewing Copy Counter Jam Recovery Page Counter Jam Recovery Copy Counter Stacked Page Counter Stacked Copy Counter | No change ² No change No change No change No change No change No change No change |
| Command XOA - Discard Buffered Data | Received Page Counter Committed Page Counter Committed Copy Counter Operator Viewing Page Counter Operator Viewing Copy Counter Jam Recovery Page Counter Jam Recovery Copy Counter Stacked Page Counter Stacked Copy Counter | Set to Committed Page Counter No change No change No change No change No change No change No change |
| Normal Counter Wrap (on a Per-Counter Basis) | Received Page Counter Committed Page Counter Committed Copy Counter Operator Viewing Page Counter Operator Viewing Copy Counter Jam Recovery Page Counter Jam Recovery Copy Counter Stacked Page Counter Stacked Copy Counter | Reset to 0 Reset to 0 Reset to 0 Reset to 0 Reset to 0 Reset to 0 Reset to 0 Reset to 0 |

| Condition (in hex) | Counters | Counter Adjustments |
|--|---|---|
| Command XOH - Page Counters Control | Received Page Counter Committed Page Counter Committed Copy Counter Operator Viewing Page Counter Operator Viewing Copy Counter Jam Recovery Page Counter Jam Recovery Copy Counter Stacked Page Counter Stacked Copy Counter | See XOH PCC command under Chapter 4. Device Control Command Set in the <i>Intelligent Printer Data Stream Reference</i> |

Notes:

1. Should not be incremented for page in error (that is, any partial page is discarded).
2. The Received Page Counter should be incremented if a partial or complete page is printed.
3. For Action Code X'1E', the host should issue an XOH Print Buffered Data command with the ARQ bit on and a unique correlation ID (to ensure that the Acknowledge Reply matches the Print Buffer Data [PBD] command) to cause the Committed Page/Copy Counter to reflect the page in error.

Page and Copy Counter Adjustments for Data-Stream Exceptions

The following are counter adjustments for **simplex copy groups**.

| Condition (in hex) | Counters | Counter Adjustments |
|--|---|--|
| Action Code 01 and the page is printed | Received Page Counter Committed Page Counter Committed Copy Counter Operator Viewing Page Counter Operator Viewing Copy Counter Jam Recovery Page Counter Jam Recovery Copy Counter Stacked Page Counter Stacked Copy Counter | Does not reflect the page in which the error occurs. No change Reflects any committed copies resulting from prior error-free copy groups. No change No change No change No change No change No change No change |
| Action Code 01 and the page is not printed | Received Page Counter Committed Page Counter Committed Copy Counter Operator Viewing Page Counter Operator Viewing Copy Counter Jam Recovery Page Counter Jam Recovery Copy Counter Stacked Page Counter Stacked Copy Counter | Reflects the page in which the error occurs, only if the error occurred on the last copy group. No change Reflects any committed copies resulting from prior error-free copy groups or from the copy group in error. No change No change No change No change No change No change |

The following are counter adjustments for **duplex copy groups**.

| Condition (in hex) | Counters | Counter Adjustments |
|--|---|---|
| Action Code 01 on the front side and the page is printed | Received Page Counter Committed Page Counter Committed Copy Counter Operator Viewing Page Counter Operator Viewing Copy Counter Jam Recovery Page Counter Jam Recovery Copy Counter Stacked Page Counter Stacked Copy Counter | Reflects the page in which the error occurs (the front side) only if the error occurred on the other in a copy group other than the first copy group. No change Reflects any committed copies resulting from prior error-free copy group pairs. No change No change No change No change No change No change |
| Action Code 01 on back side and the page is not printed | Received Page Counter Committed Page Counter Committed Copy Counter Operator Viewing Page Counter Operator Viewing Copy Counter Jam Recovery Page Counter Jam Recovery Copy Counter Stacked Page Counter Stacked Copy Counter | Does not reflect the page in the error occurs (the back side) it does reflect the front side. No change Reflects any committed copies resulting from prior error-free copy group pairs. No change No change No change No change No change No change |
| Action Code 01 on the front side and the page is not printed | Received Page Counter Committed Page Counter Committed Copy Counter Operator Viewing Page Counter Operator Viewing Copy Counter Jam Recovery Page Counter Jam Recovery Copy Counter Stacked Page Counter Stacked Copy Counter | Reflects the page in which the error occurs (front side). No change Reflects any committed copies resulting from prior error-free copy group pairs. No change No change No change No change No change No change |
| Action Code 01 on the back side and the page is printed | Received Page Counter Committed Page Counter Committed Copy Counter Operator Viewing Page Counter Operator Viewing Copy Counter Jam Recovery Page Counter Jam Recovery Copy Counter Stacked Page Counter Stacked Copy Counter | Reflects the page in which the error occurs (back side) only if the error occurred on the last copy group. Reflects front side. No change Reflects any committed copies resulting from prior error-free copy group pairs or from the copy group in error. No change No change No change No change No change |

Chapter 14. Code Page and Font Identification

Network Printers are LF1 printers, but the resident fonts are all outline technology...the IBM Core Interchange Font Set, the IBM Coordinated Font Set, and the 4028 Compatibility Font Set. From these outline fonts all the supported LF1 "raster" fonts are created.

The valid combinations of GCSGID/CPGID, GCSGID/FGID/FW, or GCSGID/CPGID/FGID/FW are too numerous to list here. They can be obtained by the host using the Anystate command "XOA Request Resource List" on page 58 with the appropriate Resource Type and RIDF.

They can also be determined by using the information under "IBM Network Printers Resident IPDS Fonts" on page 289.

CPGID

- Values are listed in Table 177 on page 293, Table 179 on page 298, and Table 181 on page 300, and will be reported via XOA-RRL RT 06 RIDF 03.

GCSGID/CPGID

- Valid combinations are listed in Table 177 on page 293, Table 179 on page 298, and Table 181 on page 300, and will be reported via XOA-RRL RT 12 RIDF 03.

GCSGID SUB/SUPERSETS

- Valid combinations are listed in Table 176 on page 293 and Table 182 on page 300, and will be reported via XOA-RRL RT 11 RIDF 03.

GCSGID/FGID/FW

1. Valid combinations for the IBM Core Interchange Set are listed in Table 175 on page 291, and will be reported via XOA-RRL RT 07 RIDF 03.
 - Scalable Font Width (FW) will be reported as 0 to the host PSF. This indicates that any width/scale-factor is valid.
 - Table 176 on page 293 shows the subset GCSGIDs for each of the listed superset GCSGIDs in Table 175 on page 291. These subset GCSGIDs are valid combinations for the associated superset GCSGIDs in the GCSGID/FGID/FW, but will not be added to the RRL 0703 response unless required by the host PSF's.
2. Valid combinations for the IBM Coordinated Set are listed in Table 180 on page 299 and will be reported via XOA-RRL RT 07 RIDF 03.
 - Scalable Font Width (FW) will be reported as 0 to the host PSF. This indicates that any width/scale-factor is valid.
 - Table 182 on page 300 shows the subset GCSGIDs for each of the listed superset GCSGIDs in Table 180 on page 299. These subset GCSGIDs are

valid combination entries for the associated superset GCSGIDs in the GCSGID/FGID/FW, but will not be added to the RRL 0703 response unless required by the host PSF's.

3. Valid combinations for the 4028 Compatibility Set require Table 178 on page 297 (FGID/FW) and Table 179 on page 298 (GCSGID), and will be reported via XOA-RRL RT 07 RIDF 03.
 - The FW's for these fonts are non-zero, because they represent fixed-width fonts.
 - The Alternate FGIDs are valid values for GCSGID/FGID/FW combinations.
 - Native Mode - These fonts (which are representing 4028 raster fonts) don't have a GCSGID of their own, so the GCSGID used is from the associated Code Pages (CPGIDs).
 - a. The GCSGIDs are obtained by finding the Code Page(s) in Table 179 on page 298 that matches the Code Page(s) listed for a given FGID/FW entry in Table 178 on page 297. The GCSGID for each of the Code Pages listed with an FGID is a valid combination entry.
 - b. Since these fonts don't have a superset GCSGID, there is no subset condition. So each of these unique GCSGID/FGID/FW combinations will be added to the XOA-RRL 0703 report to the host PSF.
 - 4028 Emulation Mode - These fonts (which are representing 4028 raster fonts) don't have a GCSGID of their own, so the GCSGID used is 0.

GCSGID/CPGID/FGID/FW=GRID

1. Valid combinations for the IBM Core Interchange Set require Table 175 on page 291 (superset GCSGID/FGID/FW), Table 176 on page 293 (GCSGID subsets) and Table 177 on page 293 (GCSGID/CPGID), and will be reported via XOA-RRL RT 01 RIDF 03 (also RT 10 RIDF 03). In all GRIDs, the GCSGID chosen will belong to the Code Page, as this is almost always the subset of the outline font GCSGID.
 - Scalable Font Width (FW) will be reported as 0 to the host PSF. This indicates that any width/scale-factor is valid.
 - CPGIDs and GCSGIDs are listed in Table 177 on page 293. For each pair, determine which FGIDs in Table 175 on page 291 can combine with them. This is done by finding the superset GCSGID in Table 176 on page 293 which contains the Table 177 on page 293 GCSGID as a subset. An example is that there would be 51 GRID combinations for the Times New Roman Medium font...FGID is always 2308, FW is always 0, and there are 51 unique CPGID/GCSGID pairs in Table 177 on page 293 which are subsets of the superset GCSGID 1269.
2. Valid combinations for the IBM Coordinated Set require Table 180 on page 299 (superset GCSGID/FGID/FW), Table 182 on page 300 (GCSGID subsets) and Table 177 on page 293 and Table 181 on page 300 (GCSGID/CPGID), and will be reported via XOA-RRL RT 01 RIDF 03 (also RT 10 RIDF 03). In all GRIDs, the GCSGID chosen will belong to the Code Page, as this is almost always the subset of the outline font GCSGID.
 - Scalable Font Width (FW) will be reported as 0 to the host PSF. This indicates that any width/scale-factor is valid.
 - CPGIDs and GCSGIDs are listed in Table 177 on page 293 and Table 181 on page 300. For each pair, determine which FGIDs in Table 180 on page 299 can combine with them. This is done by finding the superset GCSGID in Table 182 on page 300 which contains the Table 177 and Table 181 GCSGID

as a subset. An example is that there would be 41 GRID combinations for the Letter Gothic font...FGID is always 400, FW is always 0, and there are 41 unique CPGID/GCSGID pairs in Table 177 and Table 181. which are subsets of the superset GCSGID 2039.

3. Valid combinations for the 4028 Compatibility Set require Table 178 on page 297 (FGID/FW) and Table 179 on page 298 (GCSGID/CPGID), and will be reported via XOA-RRL RT 01 RIDF 03. In all GRIDs, the GCSGID chosen will belong to the Code Page, as this is almost always the subset of the outline font GCSGID.
 - The FW's for these fonts are non-zero, because they represent fixed-width fonts.
 - The Alternate FGIDs are valid values for FGID/FW combinations.
 - The GCSGID/CPGID pairs for each font are obtained by finding the Code Page(s) in Table 179 on page 298 that match the Code Page(s) listed for a given FGID/FW pair in Table 178 on page 297.

Chapter 15. Using the Printer in IPDS Mode with AS/400

This chapter explains the Application System/400 (AS/400) applications that can be used to control the printer with an IPDS feature and in Emulation=IPDS mode. These explanations include descriptions of parameters in the following applications:

- Control Language (CL)
- Data Description Specifications (DDS)
- AS/400 OfficeVision
- Operating System/400 (OS/400) Graphics
- Business Graphics Utility (BGU)
- Personal Computer Image Document Utility (PCIDU)
- PC Support/400
- AFP Utilities (refer to AS/400 documentation for more information)

Using Control Language (CL) Commands

Use printer files to control the print format of your data. In printer files, use CL command parameters for selections such as page length, page width, overlays, and page segments, and fonts to be used. Printer files are used in conjunction with applications. Depending on your application, some of the parameters specified by your printer file (PRTF) may be overridden. Use the following CL commands to select format attributes in a printer file:

- Create Printer File (CRTPRTF)
- Change Printer File (CHGPRTF)
- Override Printer File (OVRPRTF).

For more information about these commands, refer to *IBM AS/400 Programming Control Language Reference*.

Printer File Command Parameters

The following pages list some of the key parameters of CRTPRTF. They are also common to the CHGPRTF and OVRPRTF commands. The values that are valid for the printer when you use these commands are included.

CDEFNT Parameter

Specifies a coded font for the system to use. It is valid only for print files with DEVTYPE(*AFPDS) specified.

CHRID Parameter

This parameter specifies the character identifier (character set and code page) for the printer file. CHRID(*SYSVAL) is the code page specified by the system on which the application is running.

If you do not use the CHRID parameter, the system default value (*DEV) causes the printer to default to the code page specified in the configuration settings. The printer factory default character set is 697 and the code page is 037, Version 1.

Certain fonts require special code pages. To determine whether the requested font requires a special code page, refer to the code page and font information in this book. For example, OCR-B requires special code page 893.

CPI Parameter

This parameter specifies the character density in characters per inch (CPI). Normally, the CPI is implied by the font global identifier (FGID) specified by the FONT parameter value. If the font parameter specifies (*CPI) instead of an FGID, the CPI parameter is used. Refer to the font and code page information elsewhere in this book. for the CPI or pitch of each font. The upright courier font of the correct CPI value is used by the printer.

If Font (*CPI) is specified, the font used is based on the CPI value. The following list gives the printed CPI value for each requested CPI value:

| Requested | Printed Result |
|------------------|-----------------------|
| 5 | 10 |
| 10 | 10 |
| 12 | 12 |
| 13.3 | 13.3 |
| 15 | 15 |
| 16.7 | 17 |
| 17 | 17 |
| 20 | 20 |

DEVTYPE Parameter

This parameter specifies the type of data stream that OS/400 generates for a printer file. This parameter affects the level of function and performance available because of the differences between various data streams. The data streams are:

- **AFPDS:** When *AFPDS is specified, the system generates The Advanced Function Presentation data stream, which is now called Mixed Object Document Content Architecture (MO:DCA) data stream.

MO:DCA is the highest level of printer function and is required if you use AFP resources such as downloaded (soft) fonts, page segments, or overlays (electronic forms).

When using DEVTYPE(*AFPDS), set the printer device description AFP parameter to *YES in the CRTDEVPRT command.

- **IPDS:** When *IPDS is specified, the system generates the Intelligent Printer Data Stream (IPDS). IPDS is the second highest level of printer function, and it enables IPDS printers to use OS/400 support for special print functions such as bar codes, images, and graphics. It does not permit using AFP resources.
- **SCS:** When *SCS is specified, the system generates the SNA Character String (SCS). SCS is the lowest level of printer function. If *SCS is specified and the spooled printer file is directed to an IPDS printer, the system converts the file to IPDS.

DRAWER Parameter

This parameter selects the paper/envelope source used when automatic, cut-sheet feed mode is specified using FORMFEED(*AUTOCUT). The values for selection are:

- 1 Paper is fed from the primary paper tray.
- 2 Paper is fed from the secondary paper tray.
- 3 Paper is fed from the 100-sheet Auxiliary Feeder
- *E1 Envelopes are fed from the Envelope+ Feeder.

See the discussion about envelopes in “Select Format and Change Format Menus” on page 159.

DUPLEX Parameter

This parameter specifies whether to print on one side or both sides of the paper.

- *NO Print on one side of the paper.
- *YES Print on both sides of the paper with the top of each page at the same end of the paper.
- *TUMBLE Print on both sides of the paper such that the top of one side is at the same end as the bottom of the other side of the paper. This is for output that is usually bound at the top.

FONT Parameter

The FONT parameter specifies the font with the font's FGID and point size. Fixed-pitch fonts do not require the point size. The printer does not require operator intervention to change fonts. When selected fonts are internal, the printer automatically selects the font and continues printing without interruption. For more information, see “CRTPRTF” in the *IBM AS/400 Programming: Control Language Reference*. Valid values range from 1 to 32767.

OS/400 may substitute some fonts for other fonts and issues a message indicating that substitution has occurred.

When a requested font is not resident in the printer, the printer performs a *Font Best Fit* algorithm to substitute the requested font with a resident font. The printer does not report an error message.

For a list of valid fonts and IDs for the printer, refer to the font and code page information in this book. The manual also contains more information on typographic font selection and details on Font Best Fit. The font parameter cannot access fonts on font cards or font cartridges.

FORMFEED Parameter

This parameter specifies the method by which forms are fed into the printer. Specify *AUTOCUT for single sheets or envelopes to be fed automatically. If you are using manual feed, specify *CUT.

See the discussion about envelopes in “Select Format and Change Format Menus” on page 159.

FRONTMGN/BACKMGN Parameters

These parameters specify the offset, down from the top edge of the media, and to the right, from the left edge of the media on the front and back sides. The offsets are in the unit of measure specified on the units of measure (UOM) parameter. You can use this parameter only for printer files with *DEVTYPE(*AFPDS) specified.

When *DEVD is specified, the margin values that AS/400 uses depend on the printer device configuration as follows:

AFP(*YES):

Margins equivalent to the no-print borders as reported by the IPDS printer. Thus you should set printer configuration setting Margins to System to Yes.

AFP(*NO):

Margin of 0

When you specify offsets down and across, make them large enough to position the page in the printable area.

FIDELITY Parameter

Specifies whether or not printing continues after print errors occur for printers configured for AFP(*YES).

*ABSOLUTE

Printing stops if a print error (invalid print data) occurs.

*CONTENT

Printing continues if a print error occurs.

FNTCHRSET Parameter

Specifies a downloaded font consisting of a character set and a code page. It is valid only for print files with DEVTYPE(*AFPDS) specified.

FRONTOVL/BACKOVL Parameter

Specifies the qualified name of the object that contains the overlay that is printed on the front and back sides of the page.

LPI Parameter

This parameter specifies the line spacing on the printer in lines per inch (LPI).

MULTIUP Parameter

For spooled output only, specifies the number of pages to print on a single physical page. If you request a value of 2 or 4, consider the size of the output and the paper.

OVRFLW Parameter

This parameter specifies the line number on the page when overflow to a new page occurs. Generally, after the specified line is printed, text overflows to the next page before printing continues. For example, if the parameter specifies the line number as 60, after line 60 has printed, text overflows to a new page. The OVRFLW parameter enables an application program to avoid printing in the no-print border at

the bottom of the page. See IBM Network Printers: Twinax/Coax Configuration Guide for more information on unprintable areas.

PAGESIZE Parameter

This parameter specifies the length and width of the printer forms used by this printer.

Notes:

1. Because this parameter specifies the physical size of the paper, it cannot be adjusted to reflect the size of the printable area. printing in the unprintable areas.

When the measurement method is set to *UOM, the page length and width are in the units of measure (centimeters or inches) specified in the UOM parameter.

When the measurement method is set to *ROWCOL, the page length is specified in lines per page, and the width is specified in print positions (characters) per line. To determine the page width (in columns), multiply the characters-per-inch (CPI) by the forms width in inches. For example, 10 CPI x 8.5 produces a page width of 85. Specify page length values based on the LPI parameter and the forms length.

The following table contains the appropriate page length values for several paper sizes and LPI values.

Table 166. Paper Length Values

| If Lines per Inch equals: | Then Lines per Page must be: | | | |
|---------------------------|--------------------------------|--------------------------------|--------------------|--------------------|
| | for 8.5 by 11 inch page length | for 8.5 by 14 inch page length | for A4- size paper | for B5- size paper |
| 4 | 44 | 56 | 46 | 40 |
| 6 | 66 | 84 | 70 | 60 |
| 8 | 88 | 112 | 93 | 80 |
| 9 | 99 | 126 | 105 | 90 |

Specify page sizes with reference to the way the data is printed on the page. For example, if you are using an 8.5-by-11 inch page in portrait orientation and format for six LPI (with a 10-pitch font), specify PAGESIZE(66 85) and PAGRTT(0). If you rotate the page, specify page size for an 8.5-by-11 inch page in landscape orientation and enter PAGESIZE(51 110) and PAGRTT(90).

PAGRTT Parameter

This parameter specifies the degree of clockwise page rotation for the printer file. Options of (0), (90), (180), and (270) rotate the file 0°, 90°, 180°, and 270°, respectively.

Option (*COR) forces computer output reduction (COR). COR allows printed output intended for a 13.2-by-11 inch form to be printed on an 8.5-by-11 inch (landscape) page.

In Non-IPDS mode, the printer calculates the COR reduction.

In IPDS mode, OS/400 calculates the COR reduction

When *COR is specified, a 10-pitch font is converted to a 13.3-pitch font, a 12-pitch font is converted to a 15-pitch font, and a 15-pitch font is converted to a 20-pitch font. Top and left margins of 0.5 inches are added to the printed output and the PAGESIZE is set to 8.5 by 11 inches.

Option (*AUTO) may cause page rotation or COR. OS/400 uses the PAGESIZE, LPI, and FONT parameters to determine when to perform page rotation or COR. For example, specifying PAGESIZE(66 132), LPI(6), and FONT(011)—pitch of 10 CPI—results in a page length of 11 inches (66/6 = 11) and a page width of 13.2 inches (132/10 = 13.2). In this example, the resulting text is reduced, using COR. The length and width are matched against a default page size of 8.5 by 14 inches to determine whether to perform page rotation or COR. Use the following table to determine printed results when *AUTO is specified:

Table 167. Results of *AUTO

| | L ≤ 8.5 | 8.5 < L ≤ 14 |
|--------------|-----------------------|--------------|
| W ≤ 8.5 | No change (See note.) | No change |
| 8.5 < W ≤ 14 | Rotation | COR |
| W > 14 | Rotation | COR |

Note: When page width is greater than page length, page rotation occurs.

Applications that do not specify margins to move text out of the unprintable border, but which use printer file parameters causing rotation only, may have characters or lines of text missing in the output. To move text into the print area, specify margins, change the printer file parameters given in the previous example, or specify *COR.

Note: Table 167 and the discussion above also apply when PAGRTT(*DEV) and PRTQLTY(*DRAFT) have been specified in the printer file.

Automatic rotation from the PAGRTT parameter does not occur through the printer file if the file contains elements such as the following:

- Graphics
- Bar codes
- Varying LPI
- Varying fonts
- Varying page rotations
- Varying drawer options

PRTTXT Parameter

This parameter prints a footer at the bottom of each page. To ensure that the footer prints in the print area, use the PAGESIZE (Page-length) and OVRFLW parameters to adjust the amount of text on the page.

QPRTVAL Parameter

With Printable Area = Expanded with rotated overlays on the AS/400, you may need to change the QPRTVALS data area position 2 to "Y". This tells PSF not to offset the logical page when rotating text 90 degrees.

RPLUNPRT Parameter

Use this parameter to specify substitution characters to be used in place of unprintable characters. If you specify DEVTYPE (*IPDS), a hyphen (-) or a space () prints instead of the unprintable character. If you specify RPLUNPRT (*YES), the specified substitution character prints instead of each unprintable character. If you specify RPLUNPRT (*NO) and the value of the unprintable character is Hex 00 through 3F, or is Hex FF, undesirable results may occur. If you specify RPLUNPRT (*NO) and the value of the unprintable character is Hex 40 through FE, the device signals a recoverable error and sends an inquiry message to the operator.

UOM Parameter

This parameter specifies the unit of measure to use for values specified in PAGESIZE, FRONTMGN, and BACKMGN parameters, and the offsets for FRONTOVL and BACKOVL parameters.

Additional Information for Create Printer File (CRTPRTF)

The following additional information may be helpful when specifying CRTPRTF parameters:

- IBM recommends that you print using a printer writer (specify SPOOL (*YES) on the printer file) rather than printing directly to the printer (specify SPOOL (*NO) on the printer file).
- If a character in a specific font is too tall to fit on the presentation surface, the character may not print. When using tall fonts, you may have to adjust your print line accordingly.
- You can use the DDS keyword PAGRTT to rotate pages within a printer file. The keyword is valid only on page boundaries and can have values of 0, 90, 180, or 270. Page rotation applies only to the page where you used the keyword. After the printer completes the page, rotation returns to the file level (as defined by the CRTPRTF, CHGPRTF, and OVRPRTF commands).

If your printer file PAGRTT parameter is set to *AUTO and the text is positioned in the unprintable area, see “PAGRTT Parameter” on page 151.

Using Data Description Specifications (DDS)

The printer file description contains information that is specified in two places:

- The source file that contains the DDS
- The CRTPRTF command.

DDS lets you describe various user-defined printer configurations to your host system. DDS contains the specifications for each printer file.

Several DDS parameters are similar in name and function to parameters on the CRTPRTF command. DDS parameters often allow you to modify these functions on a field, record, or page basis.

For more information on defining a DDS printer file, or for information about any of the following parameters, refer to *IBM AS/400 Data Description Specifications Reference Manual*, SC41-9620.

The CRTPRTF command creates the printer file and specifies the file name. You can use the CHGPRTF or OVRPRTF commands in a program to change or to override, respectively, the parameter values specified in the printer file description.

You can define the following printer parameters in keyword entries, positions 45 through 80:

BARCODE Parameter

Use this field-level keyword to print a named field as a user-specified bar code. The bar code ID and height are required parameters. Specify the height of the bar code in number of lines with valid values of 1 to 9.

The following bar codes are supported by the printer and the host system. See the *IBM AS/400 Data Description Specifications Reference Manual* for the bar code IDs supported by DDS.

Table 168. Bar Codes Supported by the Printer and the Host System

| Bar Code ID | Bar Code Name |
|-------------|---|
| CODEABAR | AIM USS-Codabar |
| CODE128 | Code 128, AIM USS-128 |
| CODE30F9 | 3 of 9 Code, AIM USS-39 |
| EAN2 | EAN Two-Digit Add-On |
| EAN5 | EAN Five-Digit Add-On |
| EAN8 | EAN-8 (JAN Short) |
| EAN13 | EAN-13 (JAN Standard) |
| INDUST2OF5 | 2 of 5 Industrial |
| INTERL2OF5 | 2 of 5 Interleaved AIM USS-I 2/5 |
| MATRIX2OF5 | 2 of 5 Matrix |
| MSI | MSI |
| POSTNET | POSTNET |
| UPCA | UPC/CGPC Version A |
| UPCE | UPC/CGPC Version E |
| UPC2 | UPC Two-Character Supplemental Encodation (Periodicals) |
| UPC5 | UPC Five-Character Supplemental Encodation (Paperbacks) |

For Code 128 bar codes, use “Code 128 Character Set” to determine the hex value of the desired character.



Figure 6. Bar Codes from the IPDS Printer

Print bar codes only in the recommended print area. If you place a bar code so that a portion of it is in the unprintable area, a portion of the bar code prints in solid black. For an example, see Figure 7 on page 156.

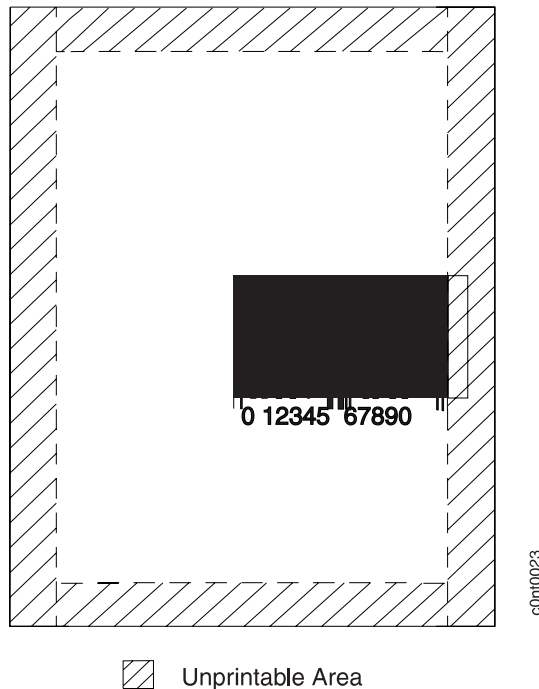


Figure 7. Bar Code Printed Outside of Print Area

The following example prints the Universal Product Code (UPCA) bar codes beginning at line 20 with a height of 4 lines.

```

5728PW1 R02M00 891006          SEU SOURCE LISTING

SOURCE FILE . . . . . SAMPLE/DDSSRC
MEMBER . . . . . EXAMPLE

SEQNBR*...+...1...+... 2 ...+... 3 ...+... 4 ...+... 5 ...+... 6 ...+...
 100          R RECORD1          FONT(087)
 200          FIELD1           11S 0 20 9BARCODE(UPCA 4)
 300          FIELD2           11S 0 20 45BARCODE(UPCA 4)

                * * * * E N D   O F   S O U R C E * * * *
  
```

BOX Parameter

Use this record-level parameter to print a rectangle. The horizontal and vertical positions of diagonal corners of the box, plus with the width of the lines, are required elements.

Horizontal and vertical positions are specified relative to the margins specified on the FRONTMGN or BACKMGN parameter of the CRTPRTF command. The UOM parameter on the CRTPRTF command determines the units of measure for these positions. Valid values are 0 to 57.790 cm (0 to 22.750 inches). An error message is issued at application run time if the box extends beyond the page boundaries.

The line-width element defines the width of the lines. Valid values are 0.001 to 57.790 cm (0.001 to 22.750 inches). You also can specify the following special values:

| Value | Line Width |
|----------------|---------------------------------|
| *NARROW | 0.022 cm (12/1440 in; 0.008 in) |
| *MEDIUM | 0.042 cm (24/1440 in; 0.017 in) |
| *WIDE | 0.064 cm (36/1440 in; 0.025 in) |

The line width is drawn on the inside of the box.

The BOX parameter is valid only when DEVTYPE(*AFPDS) is specified on the CRTPRTF command.

CHRSIZ Parameter

Use this record-level or field-level parameter to expand the width and height of a character in a record or field. This parameter allows you to scale the printer fonts by integer values or the GDDM graphic symbol sets by decimal values.

You may also use the CHRSIZ parameter to specify the size of graphic fonts.

Note: To maintain desirable character spacing when scaling typographic fonts, a font with a point size less than or equal to 12 must be used.

GDF Parameter

Use the Graphic Data File, record-level parameter to print a graphic data file. The graph file and graph member elements identify the chart to be printed and are required.

You can specify the graph file and member names and the optional library-name elements as constants, as program-to-system fields, or a combination of both.

The horizontal and vertical positions define the starting point of the chart and are required elements. These positions are specified relative to the margins specified on the FRONTMGN or BACKMGN parameter of the CRTPRTF command. The UOM parameter on the CRTPRTF command determines the units of measure for these positions. Valid values are 0 to 57.790 cm (0 to 22.750 inches).

The graph depth and graph width elements are required and define the depth and the width of the chart respectively. The chart is scaled to fit within the area specified by these elements. Valid values are 0.001 to 57.790 cm (0.001 to 22.750 inches). You also can specify the following special values.

The graph rotation element is required and defines the orientation of the chart with respect to the text on the page. Valid values are 0, 90, 180, and 270.

An error message is issued at print time if the chart is not positioned on the page.

The GDF parameter is valid only when DEVTYPE(*AFPDS) is specified on the CRTPRTF command.

HIGHLIGHT Parameter

Use this record-level or field-level parameter to print a field in bold letters. You may not use "Highlight" if a graphic symbol set is specified.

LINE Parameter

Use this record-level parameter to print a horizontal or vertical line. The horizontal and vertical positions of one end point, and the length, direction, and width of the line are required elements.

The horizontal and vertical positions are specified relative to the margins specified on the FRONTMGN or BACKMGN parameter of the CRTPRTF command. The UOM parameter on the CRTPRTF command determines the units of measure for these positions. Valid values are 0 to 57.790 cm (0 to 22.750 inches).

The line length element defines the length of the line. Valid values are 0.001 to 57.790 cm (0.001 to 22.750 inches).

The line direction element can have a value of horizontal (*HRZ) or vertical (*VRT).

The line-width element defines the width of the lines. Valid values are 0.001 to 57.790 cm (0.001 to 22.750 inches). The following special values can also be specified.

| Value | Line Width |
|---------|---|
| *NARROW | 12/1440 inches (0.008 inches, 0.022 cm) |
| *MEDIUM | 24/1440 inches (0.017 inches, 0.042 cm) |
| *WIDE | 36/1440 inches (0.025 inches, 0.064 cm) |

You can use an optional line pad parameter to specify where the line width value is placed relative to the actual line coordinates. Valid values are *TOP and *BOT for horizontal lines, and *LEFT and *RIGHT for vertical lines.

An error message is issued at application run time if the line extends beyond the page boundaries.

The LINE parameter is valid only when DEVTYPE(*AFPDS) is specified on the CRTPRTF command.

OVERLAY Parameter

Use this record-level parameter to print an overlay. The overlay name, and the horizontal and vertical position of the starting point are required elements.

The overlay name, and the optional library name, elements can be specified as constants, as program-to-system fields, or a combination of both.

The horizontal and vertical positions are specified relative to the margins specified on the FRONTMGN or BACKMGN parameter of the CRTPRTF command. The UOM parameter on the CRTPRTF command determines the units of measure for these positions. Valid values are 0 to 57.790 cm (0 to 22.750 inches).

An error message is issued at print time if the overlay does not fit on the page. A maximum of 10 overlays can be used per page.

The OVERLAY parameter is only valid when DEVTYPE(*AFPDS) is specified on the CRTPRTF command.

PAGSEG Parameter

Use this record-level parameter to print a page segment. The page segment name and the horizontal and vertical position of the starting point are required elements. You can specify the page segment name, and the optional library name elements as constants, as program-to-system fields, or a combination of both.

The horizontal and vertical positions are specified relative to the margins specified on the FRONTMGN or BACKMGN parameter of the CRTPRTF command. The UOM parameter on the CRTPRTF command determines the units of measure for these positions. Valid values are 0 to 57.790 cm (0 to 22.750 in). An error message is issued at print time if the page segment does not fit on the page. A maximum of 10 page segments can be on a page.

The PAGSEG parameter is valid only when DEVTYPE(*AFPDS) is specified on the CRTPRTF command.

TXTRTT Parameter

Use the TXTRTT (Text Rotation) field-level parameter to rotate any text contained in the field. The field rotation element is required and controls the rotation of the field. Valid values are 0, 90, 180, and 270.

The TXTRTT parameter is valid only when DEVTYPE(*AFPDS) is specified on the CRTPRTF command.

UNDERLINE Parameter

Use this field-level parameter to specify that the field is underlined when it prints.

Using OfficeVision/400

When working with documents using Office menu screens, you can edit text for printer output (bold, underlining), or you can change the printer parameters by document format changes (page rotation or LPI). For complete information and instructions on making these changes, refer to *IBM AS/400 Office: Using OfficeVision/400 Word Processing*. For office functions, see the IPDS Printer Function chart in Appendix A of the same publication.

Notes:

1. If characters such as the exclamation point print differently than expected, you may need to change the printer default code page. Refer to the appendix on code pages for more information.
2. When using superscripts and subscripts, a half-line index is performed. This may cause lines to overlap.
3. When using Underline, underlining always occurs at the baseline.
4. When using Word Underline, underlining occurs at the current level, for example, with superscript and subscript.

Select Format and Change Format Menus

The following options are controlled from the Select Format and Change Format menus of OfficeVision. The printer default configuration settings must be set properly for the options to function correctly.

- **Font (pitch) or FGID**

Notes:

1. Font selection by FGID supports IDs in the range 1 to 65534 under Word Processing. The font range is from 1 to 32767 for other office options.
 2. When using an application or host operating system that does not allow selection of point size, use the alternate FGID to access internal Times New Roman and/or Sonoran Serif typographic fonts.
 3. When using typographic fonts, justification and centering are not supported. You are responsible for determining line endings (or how many characters will fit on a line).
 4. When using large fonts, adjust the line spacing to prevent lines from overlapping.
- **Paper**
 - Paper width and length
 - Paper source
 - Paper drawer
 - Manual feed
 - Envelope feed
 - Rotation option.
 - **LPI and line spacing options**
 - **First and last typing line**

Note: If Unprintable Area is set to Normal, there is an unprintable area on all edges of each printed page. Make sure you set the first typing line in the header or body of the document, the last typing line in the body of the document or in the footer, and the left and right margins to allow for this.

- **Envelopes**

Set the AS/400 rotation value to 2 for 0° rotation. The printer automatically prints the text on the envelope in landscape orientation. You can select other rotation values too. For values other than 2, you may have to adjust the text to position it correctly on the envelope.
- **Symbols and Cursor Draw**

Symbols and Cursor Draw use the symbol code page 259.

Note: Symbol code page 259 does not exist for all fonts. Refer to the font appendix for more information.

Using the Print Options Menu

The following functions are available from the Print Options menu:

- **Supported Print Qualities**

The printer supports letter-quality printing only. Text-print or draft-print options print as letter quality.
- **Large Print**

Large print can only be selected for the entire document (not on a line-by-line basis). Use it to print characters that are twice the size of 15-pitch fonts. This supports all major functions except justification, centering, and bolding.

Note: Because this function uses graphics, it may print more slowly than normal print.

- **Error Log Page**

This page contains information about errors in your document, such as interchange errors, print resolve errors, and printing errors. To print the error log page, select it in the Print Options menu.

Using Graphics in OfficeVision/400

You can use graphics in your document to add visual effects to your letters and reports. *Graphics* are pictorial representations of relationships by means of dots, lines, or curves. Graphics include graphs and images. A *graph* is a series of points to represent variables such as percentages or bar graphs. An *image* is a likeness of an object created photographically.

A graph can be sent from another system, or created with BGU or PC products such as DisplayGraphics, and stored in a graphics data format (GDF) file or a PC File document. You can create images using either PCIDU or the IBM AFP drivers for Microsoft Windows and OS/2 that are supplied with PC Support/400 on a personal computer.

AS/400 Office supports the following graphic formats:

- PIF** Picture Interchange Format
- GDF** Graphic Data Format
- GOCA** Graphics Object Content Architecture.

AS/400 supports the following image formats:

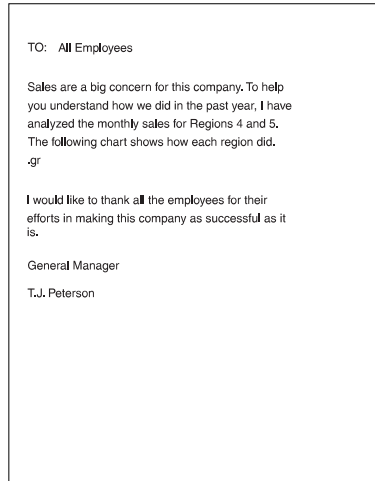
- IMDF** Image Data Format
- IOCA** Image Object Content Architecture.

Both formats can be stored in a PC File document or a file.

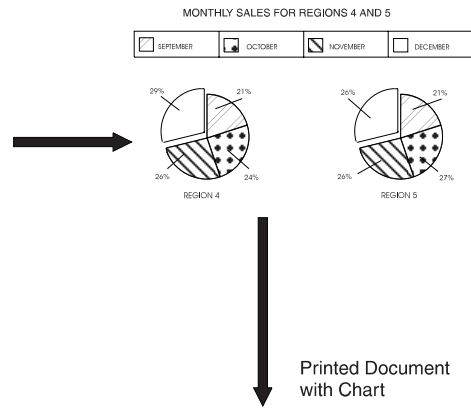
For information on how to create a graph and store it in a GDF, refer to *BGU User's Guide and Reference*, SC09-1167.

The following example shows a document with an embedded graph created using BGU:

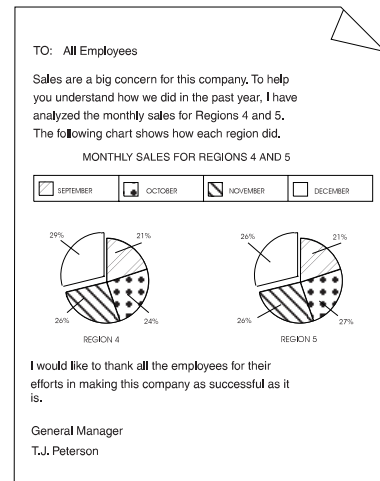
Document



Graphic Data Format File



Printed Document with Chart



c0m0002

Figure 8. BGU Example

If you use PC Support/400 and PC Organizer, you can store your graphs and images in a shared folder, and you can also view and print your graph or image PC File documents from the Work with Documents display. You may view graphs and images while editing your OfficeVision/400 documents.

Inserting Graphics in a Document: You use the Graphic text instruction (.gr) to mark the place in the document where the graphic will be printed. You must also store the graphic in the document using the Get Graphic display before you print the document. If you do not store the graphic in the document before you print it, a blank space will be left at the location where the graphic would be placed.

If you wish to print the graphic on a page by itself, you should type a value for the Top Margin prompt to leave at least one line of blank space above the graphic. If the Top Margin prompt is left blank, the graphic starts printing on the first print line, which may be in the unprintable area. You must also specify the value of the amount of space you want to leave for the left margin. This is the indent from the paper edge prompt. If you leave this prompt blank, the graphic prints at the left margin.

If you have a graphic stored in another document, you can copy the graphic into this document. If you do not have the graphic stored in another document, you will have to store the graphic in a file or a PC File document before you can copy the graphic into your document. See "Operating System/400 (OS/400) Graphics" on page 163 for information on storing a graphic.

A graphic can be printed with text above and below it or on a page by itself. Text cannot be printed to the left or right of the graphic unless you are using multiple text columns. If the graphic is in multiple text columns, the columns continue after the graphic. When a graphic prints on a page by itself, no headers, footers, or active running headings print on the page with the graphic.

A graph is automatically scaled to fit the available white space without distorting the shape of the graph. An image is not scaled to fit. It is trimmed to adjust to the specified size. If images are scanned at 300 dots per inch (dpi), the printer does not need to convert the image to 300 dpi and printing performance is improved. Images that are not 300 dpi are automatically converted to 300 dpi.

A signature or logo could also be treated as an image and included in the document with the OfficeVision/400 Graphic instruction. When treated as an image, signatures and logos are fully contained within their own image block. Any text part of the document would be printed before or after that block and could not print over or within the image block. Text can only be printed on either side of an image block and only if multiple text columns are used.

Operating System/400 (OS/400) Graphics

OS/400 Graphics includes both Graphical Data Display Manager (GDDM) and Presentation Graphics Routines (PGR). GDDM is a means of displaying, printing, or plotting pictures. PGR are a means of displaying, printing, or plotting charts.

GDDM and PGR are part of OS/400. To use OS/400 Graphics, you must write CALL statements in application programs using a high-level language.

Using Graphical Data Display Manager (GDDM) OS/400 Graphics

GDDM uses printer files to communicate with work station printers. The DEVICE-TOKEN parameter of the DSOPEN routine identifies the program to GDDM as one that is to generate printer output.

The printer can print graphics directly from an application program by selecting SPOOL (*NO) output on the CRTPRTF, CHGPRTF, and OVRPRTF commands. You may also print from a previously spooled file from an Output Queue. You can open graphics printer files by using the DSOPEN routine to specify printer using the device identifier. The device token (IPDS) identifies the device type. The DSUSE routine then uses the device identifier to make the printer the current device.

Creating or Storing Graphics Data Format (GDF) Files: A Graphics Data File (GDF) is used as a lower level programming interface within GDDM and allows you to define graphics for use in the printer.

You can create GDF files on the AS/400 in the following ways:

- From a GDDM application using the GSGET routine
- From a BGU chart format
- From a System/370 ADMGDF file (converted and sent to AS/400)

Note: System/370 GDDM creates ADMGDF files, which may then be converted to AS/400 GDF using tools provided on the System/370.

Printing Graphics Data Format (GDF) Files: To print a GDF file on an AS/400, you can use the DSPGDF CL command and specify (*PRINT) for the OUTPUT keyword and IPDS for the DEVTYPE keyword.

Note: You can print the spooled file after spooling it to your output queue.

For more information on printing a GDF file, see “Printing BGU Charts” on page 165.

For more detailed information, see the *IBM AS/400 GDDM Programming Guide*, SC33-0536, the *IBM AS/400 GDDM Programming Reference Manual*, SC33-0537, or the *IBM AS/400 Programming: Control Language Reference*.

Using Business Graphics Utility (BGU)

BGU is a menu-driven interface to GDDM. After creating a chart using BGU, you can save the business graphics in the form of a GDF file. The GDF file allows you to use your system or any other GDF-compatible system to print the chart. You can also transfer graphics to and from the GDDM application program by saving the chart as a GDF file.

BGU creates *chart formats* that contain attributes such as chart type and axis definition. The data for the BGU chart resides in AS/400 data base files. When you request a display or a printed chart, BGU combines chart formats with the data. It then executes a combination of GDDM instructions and PGR to draw the chart.

Notes:

1. There is an unprintable area on all edges of each printed page.
2. Both GDDM and PGR are programming interfaces for integrating graphics into application programs and for generating charts as program output.

Creating BGU Charts

You can use BGU to create:

- Line graphs
- Bar charts
- Surface charts
- Pie charts
- Text charts
- Venn diagrams
- Scatter diagrams
- Histograms

Note: Using the BGU/400 Easy Path to design charts and print them on the printer is not recommended. The Easy Path method limits your ability to move data out of the unprintable area. Use the Create Chart Format or Change Chart Format commands that allow flexibility in placing data.

When you create or change a BGU chart, avoid placing data in the unprintable area by selecting the location of the chart heading, the chart legend, a chart note, or the text on a text chart. Adjusting the margin of a chart on the Specify Margins menu

can also prevent data from being positioned in the unprintable area. Selecting page dimensions slightly smaller than the actual page size prevents data from being positioned in the right and bottom margins of the unprintable area. To specify page dimensions, create a new printer file or change an existing printer file and then specify this printer file on the Specify Printer menu. On this menu, you also may specify that the default printer options should be changed. If you do this, the Change Printer Options menu is displayed. You may specify a new page size on this menu. If part of the vertical axis title does not print, complete the following steps to correct the problem:

- Increase the size of the left margin. In most cases, this may solve the problem.
- Decrease the scale of the axis title characters.
- Use shorter axis labels, decrease the character scale, and change the orientation of the labels.
- Move the axis title to a position above the axis.

For more information on creating BGU charts on the AS/400, see the *IBM AS/400 Business Graphics Utility User's Guide and Reference Manual*, SC09-1167.

Printing BGU Charts

You can select a printer from the Select or Specify Printer menu and then select the device you want to use. You can also specify a printer file with the printing characteristics required for the chart.

The current printer file characteristics can be reviewed or changed before printing.

The following characteristics can be changed before printing:

- Output queue
- Library
- Number of copies
- Form type
- Page size
 - Length of page
 - Width of page
- Overflow line
- Rotation.

OPINION SURVEY RESULTS

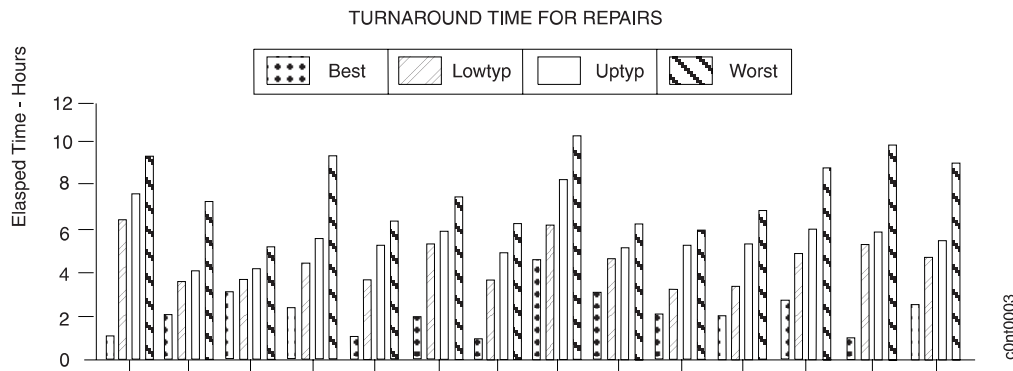
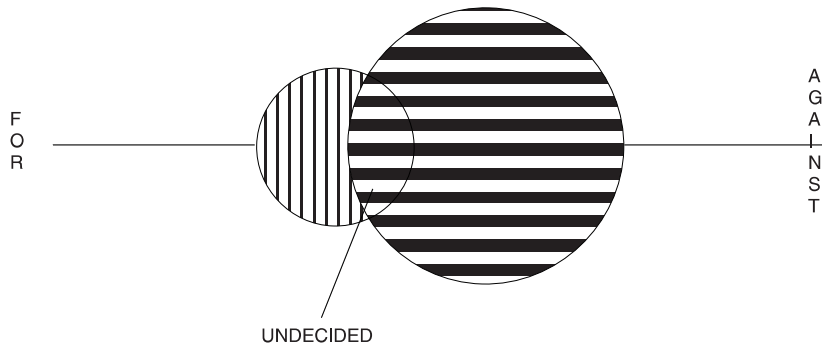


Figure 9. BGU Chart Examples

You may print an existing BGU chart by following instructions on menus, or you may use the Display Graphics Data Format (DSPGDF) command. An example of the DSPGDF command is:

```
DSPGDF FILE(KHABGU/PBGUA001) MBR(PBGUA001) OUTPUT(*PRINT) DEVTYPE(IPDS)
```

where:

- DSPGDF** Is the command.
- FILE** Specifies that you must enter the name of the library and the file name of the chart.
- KHABGU** Is the name of the library in this example. The chart is stored in this library.
- PBGUA001** Is the file name for the chart in this example.
- MBR** Stands for member. There may be multiple members within a file. Multiple members allow you to have different versions of a chart in the same file.
- PBGUA001** Is the name of the member in this example.
- OUTPUT** Specifies what output type you can choose (either print or plot).
- *PRINT** Specifies the output is to be printed.

| | |
|----------------|---|
| DEVTYPE | Stands for device type. Specify the name of the device type you want to use to print. |
| IPDS | Is the device type in this example. |

Using a Network Printer as a Virtual Printer with PC Support/400

AS/400 PC Support allows the user of a personal computer to take advantage of the printers that are attached to the AS/400 system. An AS/400 printer is typically shared or used by more than one program or person and allows the system to manage the printing on these printers more efficiently. The term virtual printer means that, although the printer is attached to the AS/400 system, it is used as though it were a PC printer. The virtual printer is accessed by the same commands used to control a PC printer.

You can define multiple printers when using PC Support/400. You can define LPT ports as virtual printers, or they can be a combination of locally-attached PC printers and virtual printers.

When setting up the virtual printer, you must specify a device name. Use the device name of the printer as defined in the OS/400 to specify this as a printer attached with a twinaxial cable connection. You also may specify the name of the OS/400 printer file if you want to override the virtual printer setup values.

Printout format and printer setup options, such as CPI, LPI, and page length in lines, can be selected for a virtual printer. Other options are available. Refer to *AS/400 PC Support User's Guide* for more information.

When using DisplayWrite* (DW) Versions 3, 4, 5, or 5/2 to print documents on printer attached to the AS/400, choose data type 3 (Final-Form Text). DW3, DW4, DW5, and DW5/2 should be configured to print using FFTDCA.PFT. ¹ If the document does not print as expected, choose data type 1. The printer function table, FFTDCA.PFT, outputs an Extended Binary-Coded Decimal Interchange Code (EBCDIC) print data stream in Final-Form Text format (L2DCA). The L2DCA data stream is translated to IPDS by the AS/400 operating system.

When assigned with data types 1 and 3, the virtual printer assumes that the data created by the personal computer is already in EBCDIC and does not have to be translated from American National Standard Code for Information Exchange (ASCII) to EBCDIC. Use data type 2 (ASCII to SCS) when printing with most other PC programs. When assigned with data type 2, the virtual printer assumes that the ASCII to be translated to SCS is at the IBM Proprinter level; therefore, configure the PC program for an IBM Proprinter. The AS/400 operating system translates the SCS data stream to IPDS. Graphics data cannot be printed using this virtual printer data type.

Refer to the *IBM AS/400 PC Support: Technical Reference* for details on specific programs and their functions, as well as other special considerations when using virtual printers.

Notes:

1. If printable area is set to normal, an unprintable area is on all edges of each printed page. This can be changed.

1. Final-Form Text Document Content Architecture printer data stream.

2. AFP printer drivers supplied with PC Support/400 allow you print output from Microsoft Windows and OS/2 applications to any AFP-compatible IPDS printer attached to an AS/400. The Microsoft Windows version is available in Version 2 Release 2 of PC/Support 400. The OS/2 version is available in Version 2 Release 3 of PC Support/400.
3. Use Printer Data Type 5 when printing data from IBM AFP drivers. Use Printer Data Type 4 when printing data from PCL on the printer and you don't want AS/400 to convert the data. Use only PCL data; with other types, the results are unpredictable. This option is not valid when the twinaxial attachment is in IPDS mode.

Chapter 16. Data Streams– Non-IPDS Mode with AS/400

Data stream controls consist of device controls, page controls, font controls, and cursor controls. They prepare the printer to receive data, set up the layout and appearance of the page, identify which fonts to use, and tell the printer where to place a character (when to start a new line, tabs, and so on).

In the following descriptions, “Ignored” means that it does not cause printing; it does not cause the horizontal (or vertical) position to move; nor does it move the printer off of a line or page boundary if it is already on one.

Device Control

Device controls set up the printer environment and prepare it to receive data.

Set Initial Conditions (SIC)

| | | | | |
|---------|---|-------|-------|----|
| 0 | 1 | 2 | 3 | 4 |
| X'2BD2' | | X'03' | X'45' | IS |

Sets the environment of the EBCDIC data stream transform. The one byte parameter IS (Initialization Set) has the following meanings:

- 1** Word processing initialization
- 255** Data processing initialization, the default
- All others** Invalid.

Note: These changes do not affect the *logical* meanings of the defaults of the DP environment. Logically, the application assumes it is printing at six lines per inch, ten characters per inch. If the application were to set the right margin to column 85, for example, the printer interprets that as a setting of 8.5 in., regardless of whether it is in COR mode or not.

Exceptions:

- Class 2** Control not encountered on a page boundary. When continuing, the printer ejects the current page then executes the control. Indicator=U35.
- Class 4** Invalid *IS* parameter. When continuing, the printer initializes the word processing environment. Indicator=U36.

The printer ignores this control.

Set Exception Action (SEA)

| | | | | |
|---------|---|--------|-------|-------------|
| 0 | 1 | 2 | 3 | 4-n |
| X'2BD2' | | length | X'85' | EC/AC Pairs |

Introduces a sequence of byte pairs of *length-2* bytes. The first byte of each pair is the Exception Class; the second byte is the Action for that Exception Class.

The Exception Class byte has the following meanings:

- 0** All exception classes
- 1-4** Exception classes 1-4, respectively
- All others** Invalid.

At least one EC/AC pair is required. The Action byte has the following meanings:

- 0** Accept. On the printer, this is treated the same as "Ignore."
- 1** Ignore. Ignore error and continue processing in as was described for each command. No error indicator is signalled, printed, or displayed.
- 2** Terminate. Print the corresponding 'Uxx' error indicator at the cursor location, inject a form feed to cause printing of the offending page, signal error status, and stop processing the input data stream. Unit not available is *not* posted on the interface. The error posted to the host in poll response byte 2 on the Arctic interface will only be cleared by an Arctic CLEAR.
- 3** Suspend. Print the corresponding 'Uxx' error indicator and do the continuation action as described for each control. Processing continues (no need to press Start), and no status is signalled.
- All others** Invalid.

The error display is blanked by the SEA and SIC commands and also when the attachment card issues an expedited Clear, or Power-on Reset.

The printed error indicator consists of a "U" followed by a 2-digit error code taken from the list that follows. The indicator is printed in the lower left corner of the page. Normally an exception will only result in the first error indicator being reported, but if more than one exception is reported, succeeding error indicators follow the first (left-to-right), not to exceed one full line. A vector is drawn from each error indicator to the location of the cursor when the exception was detected (provided the cursor is not off the physical page). If the user is printing at the extreme bottom of page, there is a chance that the error indicators will overlay user text.

- 01** Illegal parameter on BUS (not 0, 1, or 80).
- 02** BUS when underline already active.
- 03** EUS when underline not active.
- 04** Illegal parameter on BOS (not 0, 1, or 80).
- 05** BOS when overstrike already active.
- 06** EOS when overstrike not active.
- 07** Unrecognized control character.
- 08** Invalid STO sequence – too few parameters.
- 09** Illegal parameter on SJM (not 0 or 1).
- 10** Reserved.
- 11** Overstrike character not present on BOS.
- 12** Unrecognized ESC sequence X'2B D4 xx' –xx unrecognized.
- 13** Unrecognized ESC sequence X'2B D4' – no other data.
- 14** SJM not at start of line.

- 15 SGEA default graphic character less than X'40'.
- 16 Unrecognized PP sequence 34 xx–xx not X'4C', X'C0', X'C4', or X'C8'.
- 17 Horizontal tab encountered with no tab defined for it.
- 18 Indent tab encountered with no tab defined for it.
- 19 SEA not on line boundary.
- 20 SEA class parameter not 0, 1, 2, 3, or 4.
- 21 SEA action parameter not 0, 1, 2, or 3.
- 22 Odd number of parameters on SEA sequence.
- 23 Illegal JTF sequence (too short).
- 24 Illegal SJM sequence (too short).
- 25 Reserved.
- 26 Reserved.
- 27 Reserved.
- 28 Reserved.
- 29 Reserved.
- 30 Unrecognized ESC sequence X'2B xx' –xx unrecognized.
- 31 Unrecognized ESC sequence X'2B D2 xx' –xx unrecognized.
- 32 Unrecognized ESC sequence X'2B D2' with no other data.
- 33 Reserved.
- 34 Reserved.
- 35 SIC not on page boundary.
- 36 Illegal SIC parameter not 1 or 255.
- 37 PPM not on page boundary.
- 38 FC parameter of PPM not 0, 1 or 2.
- 39 QUALITY parameter of PPM not 0, 1, 2, or 3.
- 40 Illegal PPM sequence -- count less than 5.
- 41 SPPS not on a page boundary.
- 42 DX parameter of PPM not 0, 1, 2, or 3.
- 43 Reserved.
- 44 Reserved.
- 45 Illegal STO parameter.
- 46 SVM not on page boundary.
- 47 SHM not on line boundary.
- 48 Illegal code page on SCG.
- 49 Reserved.
- 50 Illegal SCD parameter
- 51 Illegal SCD sequence – no parameter specified (need 2 bytes).

- 52 STAB not on line boundary.
- 53 FF parameter on STAB illegal – not 0 or 1.
- 54 Illegal length on STAB; incomplete tab definition.
- 55 Reserved.
- 56 No tab defined for SIL level.
- 57 BES when emphasis already active.
- 58 EES when emphasis not active.
- 59 Unrecognized ESC sequence X'2B D1 xx yy'–yy unrecognized.
- 60 ESC sequence too short X'2B D1' – with no other data.
- 61 Illegal SFG sequence; count less than 6.
- 62 Reserved.
- 63 SCGL parameter illegal (X'0F' < LCID < X'FF').
- 64 Illegal SCGL sequence – no parameter specified.
- 65 Reserved.
- 66 Typographic font selected with justification on.
- 67 Reserved.
- 68 JTF command received when a typographic font is selected or SJM is active.
- 69 Reserved.
- 70 Reserved.
- 71 Reserved.
- 72 Reserved.
- 73 Reserved.
- 74 SPPS width is invalid (<0).
- 75 SPPS depth is invalid (<0).
- 76 SHM left margin is invalid.
- 77 SHM right margin is invalid.
- 78 SVM top margin is invalid.
- 79 SVM bottom margin is invalid.
- 80 SIL not on line boundary.
- 81 SSLD not on line boundary.
- 82 SLS not on line boundary.
- 83 Invalid SPPS sequence – too few parameters.
- 84 Invalid overstrike character (< X'40').
- 85 Invalid SSLD parameter (<=0).
- 86 Invalid SSLD sequence – too few parameters.
- 87 Invalid SLD sequence – too few parameters.
- 88 Reserved.

- 89 Reserved.
- 90 Tab value on STAB illegal (<0).
- 91 Illegal parameter on JTF command (<0).
- 92 Illegal SJM activation – either a typographic font is in use or JTF is active.
- 93 Invalid parameter in SFG (FWD=0).
- 94 Reserved.
- 95 Reserved.
- 96 Attempt to backspace off the left edge of the page.
- 97 Printing off the right edge of the page as set by SPPS.
- 98 Printing off the bottom edge of the page as set by SPPS.

If the Exception Class has two or more actions listed for it, the latest one encountered is taken.

Exceptions:

Class 2 Control not encountered on a line boundary. When continuing, the printer forces a new line then executes the control. Indicator=U19.

Class 4 The Exception Class byte and/or Action byte is an invalid value. When continuing, the pair is ignored. Indicator=U20(invalid EC) or U21 (invalid AC)

Unpaired Exception Class byte; that is, length is odd. When continuing, the EC byte is ignored. Indicator=U22.

Miscellaneous

| Exception | Class | Cont. Act | Ind | Check. |
|---------------------------------|-------|----------------|-----|------------------|
| 2B seq invalid, 2Bxx-xx unrecog | 3 | Cmd is ignored | U30 | Invalid SCS Ctrl |
| 2B D1 xx yy-yy unrecognized | 3 | Cmd is ignored | U59 | Invalid SCS Ctrl |
| 2B D1-no other data(length 0-1) | 3 | Cmd is ignored | U60 | Invalid SCS Ctrl |
| 2B D2 xx -xx unrecognized | 3 | Cmd is ignored | U31 | Invalid SCS Ctrl |
| 2B D2-no other data(length 0-1) | 3 | Cmd is ignored | U32 | Invalid SCS Ctrl |
| 2B D3 seq invalid,too few param | 3 | Cmd is ignored | U08 | Invalid SCS Ctrl |
| 2B D4 xx -xx unrecognized | 3 | Cmd is ignored | U12 | Invalid SCS Ctrl |
| 2B D4-no other data(length 0-1) | 3 | Cmd is ignored | U13 | Invalid SCS Ctrl |
| Unrecognized single byte contrl | 3 | Cmd is ignored | U07 | Invalid SCS Ctrl |

Null (NUL)

| |
|-------|
| 0 |
| X'00' |

The printer ignores this control.

Repeat (RPT)

| |
|-------|
| 0 |
| X'0A' |

The printer ignores this control.

Switch (SW)

| |
|-------|
| 0 |
| X'2A' |

The printer ignores this control.

ASCII Transparency (ATRN)

| | | |
|-------|--------|------------|
| 0 | 1 | 2 n |
| X'03' | length | ASCII data |

Length can be 0 to X'FF'. The length counts only the ASCII data bytes, not the length byte itself. The number of bytes of ASCII data that follow are sent to the ASCII printer without any processing by the host system. Send only PCL data with this control; results are unpredictable in other ASCII data streams.

Bell/Stop (BEL/STP)

| |
|-------|
| 0 |
| X'2F' |

The printer ignores this control. Unlike the 5219, the printer's higher speed makes it inadvisable to stop.

Set Print Setup (SPSU)

| | | | | |
|---------|--------|-------|---|------------|
| 0 | 1 | 2 | 3 | 4 n |
| X'2BD2' | length | X'4C' | | parameters |

Selects the paper source tray.

Parameters have the following meanings:

Length 4–65

Parameter xxpfxxsi

xx Not Used

pf=00 No Change

pf=01 Manual Feeder

pf=02 Tray 1

pf=03 If currently set to manual, select Tray 1

pf=4 - 255 Ignored

si Ignored

Page Controls

Page Controls establish the appearance and layout of a page, such as size, margins, and print-quality settings.

Page Presentation Media (PPM)

| | | | | | | | | | | | |
|---------|---|--------|-------|----------|---|----|----|-----|----|----|----|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| X'2BD2' | | length | X'48' | reserved | | FC | SD | DDO | DD | Q | DX |

The parameters in bytes 7-11 are optional, and the *length* value indicates whether they are present.

The parameters have the following meanings:

FC Forms Control:

- X'00'** No change from current selection (use last FC specified).
- X'01'** Use SD as paper source.
- X'02'** Select envelope feeder if it exists; otherwise, select auxiliary tray using the paper size specified by the AUXSIZE item in the Paper Menu.
- X'03'** Select manual feeder.
- X'04'-X'FF'** No change from current selection.

Note: For IP 20, when a tray contains envelopes (or envelope-sized paper), it is selected. If multiple trays contain envelopes, the tray with the lowest tray number (tray 1, tray 2) is selected.

SD Source Drawer. These parameters have the following meanings:

- X'00'** No change from current selection.
- X'01'** Select tray 1.
- X'02'** Select tray 2 if it exists; otherwise use tray specified by SOURCE item on Paper Menu.
- X'03'** Select tray 3 if it exists; otherwise use tray specified by SOURCE item on Paper Menu.
- X'04'** Select auxiliary feeder
- X'05'** Select tray 4 if it exists; otherwise use tray specified by SOURCE item on Paper Menu.
- X'06'** Select tray 5 if it exists; otherwise use tray specified by SOURCE item on Paper Menu.
- X'07'-X'FF'** No change from current selection.

DDO Destination Drawer Offset. These parameters have the following meanings:

- X'00'** No change from current selection.
- X'01'-X'FF'** Jog.

DD Destination Drawer. These parameters have the following meanings:

- X'00'** No change from current selection.

| | | |
|--|--------------|------------------------------------|
| | X'01' | Select standard output bin. |
| | X'02' | NP 12: face-up bin. |
| | | NP 17: 500-sheet offset bin. |
| | | NP 24: face-up bin. |
| | | IP 20: default bin. |
| | | IP 32: face-up bin. |
| | X'03' | NP 12: default bin. |
| | | NP 17: default bin. |
| | | NP 24: finisher bin 1 (face-down). |
| | | IP 20: default bin. |
| | | IP 32: finisher bin 1 (face-down). |
| | X'04' | NP 12: default bin. |
| | | NP 17: mailbox bin 1. |
| | | NP 24: finisher bin 2 (face-down). |
| | | IP 20: default bin. |
| | | IP 32: finisher bin 2 (face-down). |
| | X'05' | NP 12: default bin. |
| | | NP 17: mailbox bin 2. |
| | | NP 24: finisher bin 3 (face-down). |
| | | IP 20: default bin. |
| | | IP 32: finisher bin 3 (face-down). |
| | X'06' | NP 12: default bin. |
| | | NP 17: mailbox bin 3. |
| | | NP 24: finisher bin 1 (face-up). |
| | | IP 20: default bin. |
| | | IP 32: default bin. |
| | X'07' | NP 12: default bin. |
| | | NP 17: mailbox bin 4. |
| | | NP 24: finisher bin 2 (face-up). |
| | | IP 20: default bin. |
| | | IP 32: default bin. |
| | X'08' | NP 12: default bin. |
| | | NP 17: mailbox bin 5. |
| | | NP 24: finisher bin 3 (face-up). |
| | | IP 20: default bin. |
| | | IP 32: default bin. |
| | X'09' | NP 12: default bin. |

NP 17: mailbox bin 6.
 NP 24: auto-output (face-down).
 IP 20: default bin.
 IP 32: auto-output (face-down).

X'0A' NP 12, NP 24, IP 20, IP 32: default bin.
 NP 17: mailbox bin 7.
X'0B' NP 12, NP 24, IP 20, IP 32: default bin.
 NP 17: mailbox bin 8.
X'0C' NP 12, NP 24, IP 20, IP 32: default bin.
 NP 17: mailbox bin 9.
X'0D' NP 12, NP 24, IP 20, IP 32: default bin.
 NP 17: mailbox bin 10.

Q Quality

0 Do not change the quality setting.
1 Allow COR mode. This is the default if this field is not specified.
2 or 3 Do not allow COR mode, regardless of the configuration settings.
4-255 Invalid

DX Duplex.

0 Do not change current duplex or simplex mode of printer.
1 Print simplex mode.
2 Print duplex mode.
3 Print tumble duplex mode.
4-255 Invalid

Exceptions:

Class 2 Current page will be ejected and the control is executed. Indicator=U37.
Class 3 Too short PPM sequence. Indicator=U40.
Class 4 Invalid FC parameter (Indicator=U38), Q parameter (U39) or DX parameter (U42).

Set Presentation Page Size (SPPS)

| | | | | |
|---------|--------|-------|-------|-------|
| 0 1 | 2 | 3 | 4 5 | 6 7 |
| X'2BD2' | length | x'40' | width | depth |

Sets the presentation surface *width*, and optionally the *depth*, in units of 1440ths of an inch. Valid values for width and depth are 0 through 32767. Values of 0 result in no change.

The presentation surface is a different concept from the physical paper size. It describes a maximum area of print on a page, but does not guarantee that area will

be filled with printed characters. Therefore, you can specify an area larger than the physical paper, as long as no characters are actually printed off the paper.

This control causes the page orientation to be calculated according to the following rules:

1. If the page orientation is not currently "default" (that is, if the orientation has been explicitly set by Set Text Orientation), explicit orientation is used.
2. Otherwise, if the APO setting in the operator panel specifies disabling automatic orientation, the decision is made based on the Orientation setting in the operator panel. The printer has four possible settings.
 - a. COR (landscape orientation, reduced fonts and spacings)
 - b. Normal portrait orientation
 - c. Normal landscape orientation
 - d. Compressed portrait (text within each line is compressed)

You can change these settings; the factory default setting is for COR.

3. Otherwise, if the APO setting on the operator panel specifies automatic orientation (the default), then the following two cases are based on the presentation surface size:
 - a. If the presentation surface is a size larger than the printer can feed, the decision is made based on the customer-selected setting for the current paper. If that decision results in COR, and quality mode is active (Q=2 or 3) due to a previous PPM control, normal portrait output is selected instead.
 - b. If the presentation surface size is legal for current physical paper size of the source drawer, then the dimensions are compared. If the shorter dimension is specified as the depth, then landscape is used; otherwise, portrait is used.

If 0 is specified for either of the dimensions, that dimension will not be changed from its current setting.

This control implicitly deactivates the Auto New Line and Auto New Page functions.

Exceptions:

- Class 1** An attempt was made to print off the right side of the presentation surface. When continuing, text generation continues. Indicator=U97
- Class 2** Control not encountered on a page boundary. When continuing, the printer ejects the current page then executes the control. Indicator=U41
- An attempt was made to print off the bottom side of the presentation surface. When continuing, an auto page end is done. Indicator=U98
- Class 3** Invalid SPPS sequence- too few parameters Indicator=U83
- Class 4** An invalid parameter value was encountered. When continuing, the printer ignores the parameter (does not change the current setting). Invalid width Parameter (U74) or Depth Parameter (U75).

Set Horizontal Format (SHF)

| | | | |
|---------|---|--------|-----|
| 0 | 1 | 2 | 3 |
| X'2BC1' | | length | MPP |

Specifies the presentation surface width by specifying the number of characters per line in the *MPP* parameter.

The specification in characters is converted to a specification in inches, based on the current setting of the font width (the width of one character, see “Set FID Through GFID (SFG)” on page 183 and “Set Character Distance (SCD)” on page 184.

This control implicitly activates the Auto New Line function; that is, when the right margin is reached, a new line is automatically generated even if the New Line control is not present in the data stream. If the auto new line point is to the left of the current cursor position, the next character generated will cause a new line.

The *MPP* parameter is optional. If specified, it is a number of characters referenced to the left edge of the paper; it does not change the left margin. Valid values are 0 to 255. If omitted, or if its value is zero, the right margin is set to 13.2 in.

Each valid SHF control resets *MPP* to either the specified or default values.

If this control is encountered on a page boundary, it causes the page orientation to be recalculated according to the rules given in “Set Presentation Page Size (SPPS)” on page 177. Otherwise, it changes only the Auto New Line point (*MPP*).

Set Vertical Format (SVF)

| | | | |
|---------|---|--------|-----|
| 0 | 1 | 2 | 3 |
| X'2BC2' | | length | MPL |

Specifies the presentation surface depth by specifying the number of lines per page in the *MPL* parameter.

The specification in lines is converted to a specification in inches, based on the current setting of the lines per inch (see “Set Single Line Distance (SSLD)” on page 190).

This control implicitly activates the Auto Page End function; that is, when the bottom margin is reached, the page is automatically ejected even if the Page End control is not present in the data stream.

The *MPL* parameter is optional. If specified, valid values are 0 to 255. If omitted, or if its value is zero, the *MPL* is set to 66.

If received on a page boundary, this control causes the page orientation to be recalculated according to the rules given in “Set Presentation Page Size (SPPS)” on page 177.

Each valid SHF control resets *MPL* to either the specified or default values.

Form Feed/Page End (FF/PE)

| |
|-------|
| 0 |
| X'0C' |

Prints the current page in process.

Required Form Feed/Required Page End (RFF/RPE)

| |
|-------|
| 0 |
| X'3A' |

Prints the current page in process like a Form Feed, but in addition restores the indent level to the left margin.

Set Text Orientation (STO)

| | | | | |
|---------|--------|-------|------|------|
| 0 1 | 2 | 3 | 4 5 | 6 7 |
| X'2BD3' | length | X'F6' | cccc | pppp |

Sets the orientation of characters on a page. Its parameters are:

| | |
|-------------------|--|
| cccc | Character rotation. Ignored by the printer; characters are always in the same orientation as the page. |
| pppp | Page rotation. |
| X'0000' | Normal portrait (upright) orientation. |
| X'2D00' | Landscape left (270 degrees clockwise rotation of text). |
| X'5A00' | Portrait upside down (180 degrees clockwise rotation of text). |
| X'8700' | Landscape right (90 degrees clockwise rotation of text). |
| X'FFFE' | Select COR mode. |
| X'FFFF' | Default. This causes the orientation to be calculated based on the rules given in "Set Presentation Page Size (SPPS)" on page 177. |
| All others | Invalid |

This control can occur anywhere on the page, any number of times on a page. If this control is encountered on a page boundary, it will move the print position to the new upper left hand corner. If it is encountered at any other time, it does not change the print position. All subsequent characters on the current page will be printed in the new orientation starting at the current print position. At the next page boundary, the last received STO remains in effect.

Note: When printing envelopes the page rotation is offset 90 degrees clockwise.

Exceptions:

| | |
|----------------|--|
| Class 3 | Invalid length parameter. When continuing, the printer ignores the control. Indicator=U08. |
| Class 4 | Invalid pppp parameter. When continuing, the printer ignores the control. Indicator=U45. |

Set Horizontal Margins (SHM)

| | | | | |
|---------|--------|-------|-----|-----|
| 0 1 | 2 | 3 | 4 5 | 6 7 |
| X'2BD2' | length | X'11' | LM | RM |

Sets the left margin (*LM*) and optionally the right margin (*RM*) in terms of 1440ths of an inch from the left edge of the paper. Valid values for *LM* and *RM* are 0 through 32767. If a value of 0 is specified for a margin, the margin remains unchanged. The specified margin setting is not verified against either the physical machine limit or defined page width.

In COR mode, the margin locations are scaled by a factor of (requested pitch/emulated pitch). See “Set Character Distance (SCD)” on page 184 for details on emulated pitch.

Exceptions:

- Class 1** Auto New Line is inactive and an attempt is made to print outside the presentation surface. When continuing, the printer prints outside the presentation surface. Indicator=U97
- Class 2** Control not encountered on a line boundary. When continuing, the printer forces a new line then executes the control. Indicator=U47
- Class 4** Invalid parameter. When continuing, the particular margin remains unchanged. Indicator=U76(LM invalid) or U77(RM invalid)

Set Vertical Margins (SVM)

| | | | | |
|---------|--------|-------|-----|-----|
| 0 1 | 2 | 3 | 4 5 | 6 7 |
| X'2BD2' | length | X'49' | TM | BM |

Sets the top margin (*TM*) and optionally the bottom margin (*BM*) in terms of 1440ths of an inch from the top edge of the paper. Valid values for *TM* and *BM* are 0 through 32767.

If a value of 0 is specified for a margin, the margin remains unchanged.

In COR mode, the margin locations are scaled appropriately.

Note: The printer follows the Final Form Text definition that the top margin line is the *baseline* of the first writing line. See “Set Vertical Format (SVF)” on page 179 for a discussion of this.

Exceptions:

- Class 2** Control not encountered on a page boundary. When continuing the printer ejects to the next page and activates the new margins. Indicator=U46.
- Class 4** Invalid parameter. When continuing, the particular margin remains unchanged. Indicator=U78(invalid *TM*) or U79(invalid *BM*)

Set Form Feed Control (SFFC)

| | | | |
|---------|-------|-------|----|
| 0 1 | 2 | 3 | 4 |
| X'2BD1' | X'03' | X'87' | nn |

Specifies the number of form feeds to be issued before the page is printed. The default is x'01'. Valid range is x'00' (no change) to x'ff'.

Font Controls

The 5219 and similar products distinguish between the *code page*, the set of graphics mapped to EBCDIC codes X'40' through X'FF'; and the *character set*, the subset of the code page that fits on a particular print wheel or keyboard. The printer does not need to make that distinction and, therefore, ignores the character set specification; in theory, it will print all characters on the code page (in practice, not all characters have been digitized for all possible fonts and code pages).

Set CGCS Through Local ID (SCGL)

| | | | | |
|---------|---|-------|-------|------|
| 0 | 1 | 2 | 3 | 4 |
| X'2BD1' | | X'03' | X'81' | LCID |

Specifies the code page through a "local ID." The printer supports the 5219's local IDs as shown in Table 169.

Table 169. 5219 Local IDs

| Character Set Country Name | Code Page | LCID |
|--|-----------|-------|
| Multinational | 500 | X'00' |
| USA/Canada | 37 | X'01' |
| Austria/Germany | 273 | X'02' |
| Belgium | 274 | X'03' |
| Brazil | 275 | X'04' |
| Canada/French | 297 | X'05' |
| Denmark/Norway | 277 | X'06' |
| Finland/Sweden | 278 | X'07' |
| France | 297 | X'08' |
| Italy | 280 | X'09' |
| Japan-English | 281 | X'0A' |
| Japan-Katakana (Mapped to Japan English) | 281 | X'0B' |
| Portugal | 282 | X'0C' |
| Spain | 284 | X'0D' |
| Spanish Speaking | 284 | X'0E' |
| United Kingdom | 285 | X'0F' |
| Switch-set Default | | X'FF' |

Exceptions:

- Class 4** LCID parameter illegal. When continuing, the code page remains unchanged. Indicator=U63.
- Missing LCID parameter. When continuing, the code page remains unchanged. Indicator=U64.

Set GCGID Through GCID (SCG)

| | | | | | |
|---------|---|-------|-------|-------|-------|
| 0 | 1 | 2 | 3 | 4 | 5 |
| X'2BD1' | | X'06' | X'01' | GCGID | CPGID |

Sets the code page. The parameters are:

- GCGID** Graphic Character Set Global ID. This parameter is ignored.
- CPGID** Code Page Global ID. This parameter selects the code page.

Supported code pages are:

| Code Page | Character Set Country Name. |
|-----------|--|
| 500 | International Set 5 |
| 029 | Obsolete (mapped to CP 871) |
| 037 | USA/Canada |
| 038 | Obsolete (mapped to CP 500) |
| 256 | International Set 1 (mapped to CP 500) |
| 259 | Symbols (limited support) |
| 260 | Canada/French (mapped to CP 297) |
| 273 | Austria/Germany |
| 274 | Belgium |
| 275 | Brazil |
| 276 | Canada/French (mapped to Cp 297) |
| 277 | Danish/Norwegian |
| 278 | Finnish/Swedish |
| 279 | (same as CP 297) |
| 280 | Italy |
| 281 | Japanese-English |
| 282 | Portuguese |
| 283 | Spain (mapped to CP 284) |
| 284 | Spanish Speaking |
| 285 | United Kingdom |
| 290 | Japanese_Katakana (mapped to CP 281) |
| 297 | French |
| 340 | OCR (mapped to 037) |
| 871 | Icelandic |

Exceptions:

Class 4 Invalid code page. When continuing, the code page remains unchanged. Indicator=U48.

Set FID Through GFID (SFG)

| | | | | | | |
|---------|---|-------|-------|------|-----|----|
| 0 | 1 | 2 | 3 | 4 5 | 6 7 | 8 |
| X'2BD1' | | X'07' | X'05' | GFID | FWD | FA |

Selects the font. The parameters are:

GFID Global Font ID. If the GFID is not recognized, and is not in the range 154 through 200, the printer will automatically map to a font with a font width (FWD) that is closest (absolute) to the FWD specified in this command. The Courier fonts are used for such substitutions.

If the GFID is not recognized, and is in the range 154 through 200, 12-pitch Courier is used with PSM metrics for spacing.

The specified FWD is used even if the substituted font does not exactly match it. Typographic fonts are not used as substitutes for GFIDs below

400. For FGIDS of 400 and above, the “Compugraphics Times” typographic font is used if the ID is not recognized.

FWD Font Width. The width of the space character in the font, specified in 1440ths of an inch. This width is the “column width” for the Set Horizontal Format and Presentation Position controls. Zero is an invalid value.

If the font selected by the GFID was designed so that the space character had a different width than that specified, the difference will be added to or subtracted from the space allowed *every* character in the font. The difference will be rounded to the nearest value of 300th of an inch. It may not exceed 127/300ths.

FA Font Attribute.

X'01' Mono-spaced font
X'02' Proportional-spaced font
X'04' Typographic font <point size=(FWD*3/20)>

If FA is omitted, the FA remains unchanged.

The printer does not recalculate the right margin because of a change in the font width.

This control is ignored in COR mode; however, when terminating COR mode, the printer remembers the GFID set by this command and restores that font.

Exceptions:

Class 2 Justify selected with a typographic font. When continuing, the printer ignores the justify mode. Indicator=U66.
Class 3 Length in < X'06'. Indicator=U61.
Class 4 An invalid parameter value was encountered. When continuing, the printer ignores the parameter (does not change the current setting). Indicator=U93.

Set Character Distance (SCD)

| | | | | |
|---------|---|-------|-------|-----|
| 0 | 1 | 2 | 3 | 4 5 |
| X'2BD2' | | X'04' | X'29' | CD |

Note: This control is also known as Set Print Density (SPD).

This is the SCS alternative method of selecting the fonts. The following values of *CD* are supported:

X'0000' Leave the font selection unchanged.
X'0005' Select 5 pitch Courier 5
X'000A' Select 10-pitch: Prints Courier 10.
X'000B' Select document proportionally spaced: Prints Courier 12
X'000C' Select 12-pitch: Prints Courier 12
X'000F' Select 15-pitch: Prints Courier 15.
X'00FF' Select default characters per inch from op panel.

All others Invalid

If CD is omitted, the pitch and font remain unchanged.

When terminating COR mode, the printer remembers the CD selected by this command and restores that font.

Exceptions:

Class 3 Incomplete parameter. When continuing, the font remains unchanged. Indicator=U51

Class 4 An invalid parameter value was encountered. When continuing, the printer ignores the parameter (does not change the current setting). Indicator=U50

Cursor Controls

The printer keeps track of the current print position, which it calls the *cursor* position. This position can be anywhere, even off of the physical sheet of paper, without raising an exception.

The printer keeps track of two left margins: a permanent one called the left margin and a temporary one called the *effective left margin* or *indent level* which may be set to the right of the permanent one to indent a block of text.

Presentation Position (PP)

| 0 | 1 | 2 | 3 |
|-------|---|----------|-------|
| X'34' | | function | value |

Moves the current cursor position based on the parameters:

function A byte with the following interpretation:

X'4C' Relative move down

X'C0' Absolute horizontal move

X'C4' Absolute vertical move

X'C8' Relative move to the right

All others Invalid.

value Either the distance or the absolute coordinate, depending on whether the move is relative or absolute. In either case, the units of measure are unsigned and are columns (that is, font widths) for horizontal and lines for vertical. Valid values are 0 thru 255.

Absolute horizontal moves to the left of the current cursor position are allowed. If they are used, the cursor is offset two pels to produce **bold** printing if characters are overstruck.

Absolute vertical moves above the current cursor position cause the current page to be printed and the cursor to be positioned at that line on the next page. An absolute vertical move to line 1 guarantees that the printer is on a page boundary and will not cause a form feed of a blank sheet if the printer is already on line 1. Absolute

vertical moves below the bottom margin trigger a new page. Absolute vertical moves are done relative to the top edge of the page and not the top margin.

Horizontal moves are considered tab-type controls during justification. Vertical moves end a justified field See “Justify Text Field (JTF)” on page 193 for more information.

Exceptions:

Class 4 Invalid function parameter. When continuing, the control is ignored. Indicator=U16.

Attempts to print off the physical page (as explained in “Page Presentation Media (PPM)” on page 175) generate a Class 1 exception. Moving the cursor using PP will not generate an exception.

Subscript (SBS)

| |
|-------|
| 0 |
| X'38' |

Moves the cursor down 1/2 line. The printer may process any number of SBS controls on a line, each one moving 1/2 line.

Superscript (SPS)

| |
|-------|
| 0 |
| X'09' |

Moves the cursor up 1/2 line. The printer may process any number of SPS controls on a line.

New Line (NL)

| |
|-------|
| 0 |
| X'15' |

Moves the cursor horizontally to the current effective left margin and down one line spacing increment.

Interchange Record Separator (IRS)

| |
|-------|
| 0 |
| X'1E' |

Processed as a New Line control.

Required New Line (RNL)

| |
|-------|
| 0 |
| X'06' |

Processed as a New Line, with the additional effect that it resets any indent level.

Index Return (IRT)

| |
|-------|
| 0 |
| X'33' |

Processed as a Required New Line.

Set Horizontal Tab Stops (STAB)

| | | | | | |
|---------|---|--------|-------|----|---------|
| 0 | 1 | 2 | 3 | 4 | 5 n |
| X'2BD2' | | length | X'01' | FF | tab ... |

Sets tab stops. The parameter *FF* is required and has the following meanings:

0 Floating. Tabs are specified in character positions and change anytime the font width changes.

1 Fixed. Tabs are specified in 1440ths of an inch.

All others Invalid

The remaining bytes specify the tab stops. Each tab stop is specified with three bytes as follows:

| | |
|----|-----|
| 0 | 1 2 |
| AL | TAB |

Where:

AL Alignment. Ignored by the printer.

TAB Tab stop. The actual tab stop specified with two bytes.

The tab stops specified totally replace the current tab rack. It is permissible to have no tab stops. The tab stops may be specified in any order. Tab stops of zero are ignored, while a value of 1 sets a stop at the left margin. Values that exceed the maximum presentation position are permissible.

In COR mode, positions specified in inches are scaled appropriately.

A Set Horizontal Tabs control does not change the current indent position.

Exceptions:

Class 2 Control not encountered on a line boundary. When continuing, the printer forces a new line then executes the control. Indicator=U52.

Class 3 Invalid Length. Processing is terminated. Indicator=U54.

Class 4 An invalid parameter value was encountered. When continuing, the printer ignores the parameter (does not change the current setting). Indicator=U53(invalid FF) or U90(invalid tab).

Horizontal Tab (HT)

| |
|-------|
| 0 |
| X'05' |

Moves the cursor to the right to the next tab stop.

Exceptions:

Class 2 No tab stop to the right of the current position. When continuing, the printer moves the cursor, but not the margin, right one space character. Indicator=U17.

Indent Tab (IT)

| |
|-------|
| 0 |
| X'39' |

Processed as a Horizontal Tab, with the additional function that the indent level (the effective left margin) is set one tab stop further to the right. Note that this tab stop may be *before* the tab stop arrived at by the control if normal Horizontal Tabs have been executed on the line.

Exceptions:

Class 2 No tab stop to the right of the current position. When continuing, the printer moves right one space character. Indicator=U18.

Set Indent Level (SIL)

| | | | | |
|---------|---|-------|-------|----|
| 0 | 1 | 2 | 3 | 4 |
| X'2BD2' | | X'03' | X'07' | IL |

Sets the indent level to tab stop *#IL*. If *IL=0*, the indent level is set to the left margin.

Exceptions:

Class 2 Undefined tab stop. When continuing, the printer leaves the indent level unchanged. Indicator=U56.

Class 2 Control not encountered on a line boundary. When continuing, the printer forces a new line then executes the control. Indicator=U80.

Line Feed/Index (LF/INX)

| |
|-------|
| 0 |
| X'25' |

Moves the vertical position down one line increment. The horizontal position remains unchanged.

Carriage Return/Zero Index Carriage Return (CR/ZICR)

| |
|-------|
| 0 |
| X'0D' |

With BAC=On (Bolding Algorithm Control), returns the cursor to a position two pels to the right of the effective left margin. This emulates using the ZICR for multiple strikes of the same character for emphasis. Multiple ZICRs on a single line have no additional effect.

With BAC=Off, move cursor to the left margin.

ZICR changes the Auto New Line point by one pel; if 85 characters per line are allowed, the printer will attempt to place up to 85 characters on a line following the ZICR. Since there is one less pel to place these characters in, it is possible for the last character to be off the page to the right.

The vertical position is unchanged by this control.

Space (SP)

| |
|-------|
| 0 |
| X'40' |

Causes the cursor to move right by an amount that is either the font width (in non-justified mode) or an appropriate amount to cause the right margin to be justified.

Required Space (RSP)

| |
|-------|
| 0 |
| X'41' |

Processed as a graphic that happens to be blank in all IBM-supplied fonts.

Numeric Space (NSP)

| |
|-------|
| 0 |
| X'E1' |

Processed as a graphic that happens to be blank in all IBM-supplied fonts.

Backspace (BS)

| |
|-------|
| 0 |
| X'16' |

Causes the cursor to move to the left one font width. If BAC=On, cursor is offset two pels to produce bold printing. The printer ignores the left margin when processing this control.

Exceptions:

Class 2 An attempt is being made to backspace off the left edge of the presentation surface. When continuing, printing begins at the left edge of the presentation surface. Indicator=U96.

Unit Backspace (UBS)

| |
|-------|
| 0 |
| X'1A' |

Moves the cursor 1/60th of an inch to the left for proportionally spaced fonts. If BAC=On, the cursor is also offset two pels to produce bold printing. For fixed-pitch fonts, this control is ignored.

Exceptions:

Class 2 An attempt is being made to backspace off the left edge of the presentation surface. When continuing, printing begins at the left edge of the presentation surface. Indicator=U96.

Numeric Backspace (NBS)

| |
|-------|
| 0 |
| X'36' |

Is identical to backspace.

Exceptions:

Class 2 An attempt is being made to backspace off the left edge of the presentation surface. When continuing, printing begins at the left edge of the presentation surface. Indicator=U96.

Release Left Margin (RLM)

| | | | |
|---------|---|-------|-------|
| 0 | 1 | 2 | 3 |
| X'2BD2' | | X'02' | X'0B' |

This control releases the left margin for other printers, but ignored because the 3112/3116 allows backspacing to the left of the left margin. Only used in combination with NL and IRS to determine end of paragraph while justifying.

Set Line Density (SLD)

| | | | |
|---------|---|--------|----|
| 0 | 1 | 2 | 3 |
| X'2BC6' | | length | LD |

Sets the vertical distance occupied by one line to $LD/72$ nds of an inch. All values of LD from 0–255 are valid. (0 means set to $12/72$.)

The default is LD=12 (6 LPI)

This control causes recalculation of the bottom margin.

In COR mode, 70% of LD is used. When terminating COR mode, the printer remembers the LD value specified.

If this control is encountered on a page boundary, and auto page end is active, it causes the page orientation to be recalculated according to the rules given in “Set Presentation Page Size (SPPS)” on page 177.

Exceptions:

Class 3 Invalid length parameter LD parameter was omitted. When continuing, LD value is unchanged. Indicator=U87.

Set Single Line Distance (SSLD)

| | | | | | |
|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|

| | | | |
|---------|-------|-------|----------|
| X'2BD2' | X'04' | X'15' | distance |
|---------|-------|-------|----------|

Sets the vertical distance occupied by one line to *distance*/1440ths of an inch. Values of *distance* from 1 to +32767 are valid.

The default is 240 (6 LPI).

In COR mode, 70% of the distance is used. When terminating COR mode, the printer remembers the distance value. in "Set Presentation Page Size (SPPS)" on page 177.

If SSLD is not received on a line boundary, it forces a next new line.

Exceptions:

- Class 2** Control not encountered on a line boundary. When continuing, the printer forces a new line then executes the control. Indicator=U81.
- Class 3** Too short SSLD sequence. When continuing, the printer ignores the control. Indicator=U86.
- Class 4** Invalid *distance* parameter. When continuing, the line distance remains unchanged. Indicator=U85.

Set Line Spacing (SLS)

| | | | | |
|---------|-------|-------|----|---|
| 0 | 1 | 2 | 3 | 4 |
| X'2BD2' | X'03' | X'09' | LS | |

Sets the number of lines spaced by a new line control to be *LS*/2 lines. The power-on default is *LS*=2 (that is, one line). All values of *LS* are valid, from 0-255.

Exceptions:

- Class 2** Control not encountered on a line boundary. When continuing, the printer forces a new line then executes the control. Indicator=U82.

Generation Controls

Generation controls establish emphasis and substitution, such as underscoring and justification of text.

Bolding Algorithm Control (BAC)

Bolding On

| | | | | |
|---------|-------|-------|-------|---|
| 0 | 1 | 2 | 3 | 4 |
| X'2BD1' | X'03' | X'8B' | X'00' | |

Bolding Off

| | | | | |
|---------|-------|-------|-------|---|
| 0 | 1 | 2 | 3 | 4 |
| X'2BD1' | X'03' | X'8B' | X'01' | |

With Bolding On, a backspace or absolute move to the same line causes the data that follows on that line to be offset two pels to the right. This technique produces bold text. With Bolding Off, no data offset occurs.

Bolding On is the printer default. Bolding On/Off remains On or Off until you switch the printer off or until the printer receives the next BAC control command.

Word Underscore (WUS)

| |
|-------|
| 0 |
| X'23' |

Causes the entire word immediately preceding the control to be underscored. The beginning of the word is marked by one of the following controls: BS, NBS, NL, IRS, HT, LF, IT, JTF, FF, RNL, IRT, RFF, SP, NSP, UBS, WUS, CR, US, and PP.

Note: If you use this control with typographic fonts, the results are unpredictable.

Underscore (US)

| |
|-------|
| 0 |
| X'6D' |

Processed as a graphic character with the addition that it marks the beginning of a word for Word Underscore.

Substitute (SUB)

| |
|-------|
| 0 |
| X'3F' |

Processed as a graphic character. The Graphic Exception character is always printed in its place.

Eight Ones (EO)

| |
|-------|
| 0 |
| X'FF' |

Processed as a graphic character. It is not populated in IBM-supplied fonts; so, in those fonts, the Graphic Exception character is printed in its place.

Required Hyphen (HYP)

| |
|-------|
| 0 |
| X'60' |

Processed as a printable graphic.

Syllable Hyphen (SHY)

| |
|-------|
| 0 |
| X'CA' |

Processed as a printable graphic. On IBM-supplied fonts, it looks identical to the Required Hyphen.

Set Graphic Error Action (SGEA)

| | | | | |
|---------|---|--------|----|-----|
| 0 | 1 | 2 | 3 | 4 |
| X'2BC8' | | length | DG | UCO |

The parameters have the following meanings:

DG Default Graphic. Must be in the range X'40' through X'FF'. The graphic printed if the actual graphic for the character is not supported. At power-on, the hyphen character is the default graphic.

UCO Unprintable Character Option. The printer ignores this option.

If the Default Graphic selected is not a printable character (in the font active at the time it is needed), the printer prints the hyphen.

Exceptions:

Class 4 Invalid *DG* parameter. When continuing, the value for *DG* is unchanged. Indicator=U15.

Justify Text Field (JTF)

| | | | | | |
|---------|---|--------|-------|-----|----|
| 0 | 1 | 2 | 3 | 4 5 | 6 |
| X'2BD2' | | length | X'03' | RE | PR |

Causes the following text to be justified. The text is ended by one of the following controls: CR, NL, RNL, IRT, IRS, FF, RFF, a vertical PP, a succeeding JTF, an auto-new-line, or any exception causing a line end. Tab controls and line feed are not delimiters for JTF. All text to the left of the last tab control, LF, and PP control in the text field is not justified.

The parameters are as follows:

RE Right Edge. x'01' to x'7FFF' specifies the horizontal position which will be the right edge of the justified field. This position is specified in 1440ths of an inch from the left edge of the page. The left edge of the field is the current cursor position. In COR mode, the right edge position is scaled appropriately.

A value of X'00' means terminate justification.

PR Percent Rule. May be omitted. You can specify 0, 50, or 100 percent (default) justification.

If a tab-type control (HT, IT, PP horizontal) occurs in text to be justified, it defines the new left edge of the justified field; that is, any text to the left of the tab is not justified.

Exceptions:

Class 2 Justify selected with a typographic font. When continuing, the printer ignores the justify mode. Indicator=U68.

JTF occurred while SJM was active. When continuing, the printer ignores the JTF. Indicator=U68.

- Class 3** Too short JTF sequence. When continuing, the printer ignores the JTF. Indicator=U23.
- Class 4** Illegal parameter. When continuing, the printer ignores the JTF. Indicator=U91.

Set Justify Mode (SJM)

| | | | | | |
|---------|---|--------|-------|----|----|
| 0 | 1 | 2 | 3 | 4 | 5 |
| X'2BD2' | | length | X'0D' | ST | PR |

Sets justify mode on or off. The parameters of this control have the following meanings:

- ST** State. Has the following values:
- 0** Deactivate. Terminate justification.
 - 1** Activate. Begin justification.
 - All others** Invalid
- PR** Percent Rule. May be omitted. You can specify 0, 50, or 100 percent (default) justification.

This control causes each line of text to be justified between the left and right margins. This is done by adding space to any space characters in the line until the right margin is flush.

If a tab-type control (HT, IT, PP horizontal) or leading space(s) occurs in a line to be justified, it defines the new left edge of the justified field.

A line will not be justified to the right edge if it is the end of a paragraph. A paragraph end is determined by the following controls:

- RNL, IRT, RFF, vertical PP; or
- NL or IRS followed by (that is, no intervening graphics but possibly intervening controls) any of the following: NL, IRS, LF, HT, IT, SP, NSP, RSP, BS, NBS, UBS, CR, RNL, RFF, or RLM.

Exceptions:

- Class 2** Control not encountered on a line boundary. When continuing, the printer forces a new line then executes the control. Indicator=U14.
- SJM occurred while JTF was active or justify was used in combination with a typographic font. When continuing, the printer ignores the SJM. Indicator=U92.
- Class 3** Too short SJM sequence. When continuing, the printer ignores the parameter (does not change the current setting). Indicator=U24.
- Class 4** An invalid parameter value was encountered. When continuing, the printer ignores the parameter (does not change the current setting). Indicator=U09.

Begin Underscore (BUS)

| | | | | | |
|---------|---|--------|-------|------|--------|
| 0 | 1 | 2 | 3 | 4 | 5 |
| X'2BD4' | | length | X'0A' | MODE | BYPASS |

Begins underscoring. Underscoring is terminated only by the EUS and SIC controls. The parameters have the following meanings:

| | |
|-----------------------|---|
| MODE | Ignored by the printer. |
| BYPASS | Controls whether white space caused by space characters, tabs, and the Page Position control is to be underscored or not: |
| X'00' or X'01' | Underscore all white space. This is different from the 5219, which would not underscore space due to tabs when a X'00' is specified here. |
| X'80' | Do not underscore white space. |
| All others | Invalid |

The BYPASS parameter is optional; the default is X'00'.

Word Underscore controls are ignored if Begin Underscore is active.

Note: If you use this control with typographic fonts, the results are unpredictable.

Exceptions:

| | |
|----------------|--|
| Class 1 | Underscore already active. When continuing, the printer ignores the new control. Indicator=U02. |
| Class 4 | An invalid parameter value was encountered. When continuing, the printer ignores the parameter (does not change the current setting). Indicator=U01. |

End Underscore (EUS)

| | | | |
|---------|---|-------|-------|
| 0 | 1 | 2 | 3 |
| X'2BD4' | | X'02' | X'0E' |

Ends underscore.

Exceptions:

| | |
|----------------|--|
| Class 1 | Begin Underscore was not active. When continuing, the printer ignores the End Underscore. Indicator=U03. |
|----------------|--|

Begin Overstrike (BOS)

| | | | | | | | |
|---------|---|--------|-------|------|--------|--------|-------|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 7 | 8 9 |
| X'2BD4' | | length | X'72' | CHAR | BYPASS | GCSGID | CPGID |

Controls text overstriking. Overstriking is terminated by either an EOS or SIC command. The parameters have the following meanings:

| | |
|-----------------------|--|
| CHAR | The graphic which will be used for the overstrike. Must be in the range X'40' through X'FF'. |
| BYPASS | Controls whether white space caused by space characters, tabs, and the Page Position (absolute or relative horizontal) control is to be overstruck or not: |
| X'00' or X'01' | Overstrike all white space except space due to HT, IT, or absolute horizontal PP controls. This is the |

default and is different from the 5219, which would overstrike white space due to tabs in the default.

- X'80'** Do not overstrike white space.
- All others** Invalid

The BYPASS parameter is optional; the default is X'00'.

- GCSGID** Graphic Character Set Global ID. Ignored. May be omitted.
- CPGID** Cope Page Global ID. Ignored. May be omitted.

CHAR is taken from the font active at the time the overstruck field is terminated and applied to the whole field. Fields may be terminated by space, horizontal tab, Page Position, carriage return, any vertical motion, and, of course, the EOS control. Thus, there may be several fields between one BOS, EOS pair, and each field may be overstruck with CHAR from a different font. Changes in code page, however, will not change the overstrike character.

Each character in the overstruck field is overstruck once. If the font is proportional, the centerline of the overstruck character may not exactly align with the centerline of the overstriking character.

Note: If you use this control with typographic fonts, the results are unpredictable.

Exceptions:

- Class 1** Overstrike already active. When continuing, the printer ignores the new control. Indicator=U05.
- Class 3** Too few parameters. When continuing, the printer ignores the new control. Indicator=U11.
- Class 4** An invalid parameter value was encountered. When continuing, the printer ignores the parameter (does not change the current setting). Indicator=U04(BYPASS parameter) or U84(CHAR parameter)

End Overstrike (EOS)

| | | | |
|---------|---|-------|-------|
| 0 | 1 | 2 | 3 |
| X'2BD4' | | X'02' | X'76' |

Causes the printer to cease overstriking.

Note: If you use this control with typographic fonts, the results are unpredictable.

Exceptions:

- Class 1** Begin Overstrike was not active. When continuing, the printer ignores the End Overstrike. Indicator=U06.

Begin Emphasis (BES)

| | | | | |
|---------|---|--------|-------|----|
| 0 | 1 | 2 | 3 | 4 |
| X'2BD1' | | length | X'8A' | CA |

Begins emphasizing text. The printer prints emphasized characters by overlaying them with the same pel pattern displaced by two pels horizontally. The recommended emphasis technique on the printer is for the user to switch to a **bold** font.

The parameter *CA* is ignored.

Exceptions:

Class 1 Emphasis already active. When continuing, the printer ignores the new control. Indicator=U57.

End Emphasis (EES)

| | | | | |
|---------|---|--------|-------|----------|
| 0 | 1 | 2 | 3 | 4 |
| X'2BD1' | | length | X'8E' | reserved |

Ends emphasizing text.

Exceptions:

Class 1 Begin Emphasis was not active. When continuing, the printer ignores the End Emphasis. Indicator=U58.

Execute PMP (EPMP)

| | | | |
|---------|---|--------|--------------|
| 0 | 1 | 2 | 3 n |
| X'2BCA' | | length | PMP commands |

The printer ignores this control.

List of Controls by Hex Code

| Hex Code | Command |
|----------|--|
| 00 | "Null (NUL)" on page 173 |
| 03 | "ASCII Transparency (ATRN)" on page 174 |
| 05 | "Horizontal Tab (HT)" on page 187 |
| 06 | "Required New Line (RNL)" on page 186 |
| 09 | "Superscript (SPS)" on page 186 |
| 0A | "Repeat (RPT)" on page 174 |
| 0C | "Form Feed/Page End (FF/PE)" on page 179 |
| 0D | "Carriage Return/Zero Index Carriage Return (CR/ZICR)" on page 188 |
| 15 | "New Line (NL)" on page 186 |
| 16 | "Backspace (BS)" on page 189 |
| 1A | "Unit Backspace (UBS)" on page 189 |
| 1E | "Interchange Record Separator (IRS)" on page 186 |
| 23 | "Word Underscore (WUS)" on page 192 |
| 25 | "Line Feed/Index (LF/INX)" on page 188 |
| 2A | "Switch (SW)" on page 174 |

| Hex Code | Command |
|--------------------|--|
| 2BC1xxxx | "Set Horizontal Format (SHF)" on page 178 |
| 2BC2xxxx | "Set Vertical Format (SVF)" on page 179 |
| 2BC6xxxx | "Set Line Density (SLD)" on page 190 |
| 2BC8xxxxxx | "Set Graphic Error Action (SGEA)" on page 193 |
| 2BCAxxxx... | "Execute PMP (EPMP)" on page 197 |
| 2BD1xx01xxxxxxxx | "Set GCGID Through GCID (SCG)" on page 182 |
| 2BD1xx05xxxxxxxxxx | "Set FID Through GFID (SFG)" on page 183 |
| 2BD1xx81xx | "Set CGCS Through Local ID (SCGL)" on page 182 |
| 2BD1xx87xx | "Set Form Feed Control (SFFC)" on page 181 |
| 2BD1xx8A | "Begin Emphasis (BES)" on page 196 |
| 2BD1xx8B00 | "Bolding Algorithm Control (BAC)" on page 191, Bolding On |
| 2BD1xx8B01 | "Bolding Algorithm Control (BAC)" on page 191, Bolding Off |
| 2BD1xx8E | "End Emphasis (EES)" on page 197 |
| 2BD2xx01FFxx... | "Set Horizontal Tab Stops (STAB)" on page 187 |
| 2BD2xx03xxxxxx | "Justify Text Field (JTF)" on page 193 |
| 2BD2xx07xx | "Set Indent Level (SIL)" on page 188 |
| 2BD2xx09xx | "Set Line Spacing (SLS)" on page 191 |
| 2BD2xx0B | "Release Left Margin (RLM)" on page 190 |
| 2BD2xx0Dxxxx | "Set Justify Mode (SJM)" on page 194 |
| 2BD2xx11xxxxxxxx | "Set Horizontal Margins (SHM)" on page 180 |
| 2BD2xx15xxxx | "Set Single Line Distance (SSLD)" on page 190 |
| 2BD2xx29xxxx | "Set Character Distance (SCD)" on page 184 |
| 2BD2xx40xxxxxxxx | "Set Presentation Page Size (SPPS)" on page 177 |
| 2BD2xx45xx | "Set Initial Conditions (SIC)" on page 169 |
| 2BD2xx48xx... | "Page Presentation Media (PPM)" on page 175 |
| 2BD2xx49xxxxxxxx | "Set Vertical Margins (SVM)" on page 181 |
| 2BD2xx4Cxx... | "Set Print Setup (SPSU)" on page 174 |
| 2BD2xx85xx... | "Set Exception Action (SEA)" on page 169 |
| 2BD3xxF6xxxxxxxx | "Set Text Orientation (STO)" on page 180 |
| 2BD4xx0Axxxx | "Begin Underscore (BUS)" on page 194 |
| 2BD4xx0E | "End Underscore (EUS)" on page 195 |
| 2BD4xx72xx | "Begin Overstrike (BOS)" on page 195 |
| 2BD4xx76 | "End Overstrike (EOS)" on page 196 |
| 2F | "Bell/Stop (BEL/STP)" on page 174 |
| 33 | "Index Return (IRT)" on page 187 |
| 34xxxx | "Presentation Position (PP)" on page 185 |
| 36 | "Numeric Backspace (NBS)" on page 190 |
| 38 | "Subscript (SBS)" on page 186 |
| 39 | "Indent Tab (IT)" on page 188 |
| 3A | "Required Form Feed/Required Page End (RFF/RPE)" on page 180 |

| Hex Code | Command |
|----------|-------------------------------------|
| 3F | “Substitute (SUB)” on page 192 |
| 40 | “Space (SP)” on page 189 |
| 41 | “Required Space (RSP)” on page 189 |
| 60 | “Required Hyphen (HYP)” on page 192 |
| 6D | “Underscore (US)” on page 192 |
| CA | “Syllable Hyphen (SHY)” on page 192 |
| E1 | “Numeric Space (NSP)” on page 189 |
| FF | “Eight Ones (EO)” on page 192 |

List of Controls Alphabetically

| Command | Hex Code |
|--|----------------|
| “ASCII Transparency (ATRN)” on page 174 | 03 |
| “Backspace (BS)” on page 189 | 16 |
| “Begin Emphasis (BES)” on page 196 | 2BD1xx8A |
| “Begin Overstrike (BOS)” on page 195 | 2BD4ss72xx |
| “Begin Underscore (BUS)” on page 194 | 2BD4xx0Axxxx |
| “Bell/Stop (BEL/STP)” on page 174 | 2F |
| “Bolding Algorithm Control (BAC)” on page 191, Bolding Off | 2BD1xx8B01 |
| “Bolding Algorithm Control (BAC)” on page 191, Bolding On | 2BD1xx8B00 |
| “Carriage Return/Zero Index Carriage Return (CR/ZICR)” on page 188 | 0D |
| “Eight Ones (EO)” on page 192 | FF |
| “End Emphasis (EES)” on page 197 | 2BD1xx8E |
| “End Overstrike (EOS)” on page 196 | 2BD4xx76 |
| “End Underscore (EUS)” on page 195 | 2BD4xx0E |
| “Execute PMP (EPMP)” on page 197 | 2BCAxxxx... |
| “Form Feed/Page End (FF/PE)” on page 179 | 0C |
| “Horizontal Tab (HT)” on page 187 | 05 |
| “Indent Tab (IT)” on page 188 | 39 |
| “Index Return (IRT)” on page 187 | 33 |
| “Interchange Record Separator (IRS)” on page 186 | 1E |
| “Justify Text Field (JTF)” on page 193 | 2BD2xx03xxxxxx |
| “Line Feed/Index (LF/INX)” on page 188 | 25 |
| “New Line (NL)” on page 186 | 15 |
| “Null (NUL)” on page 173 | 00 |
| “Numeric Backspace (NBS)” on page 190 | 36 |
| “Numeric Space (NSP)” on page 189 | E1 |
| “Page Presentation Media (PPM)” on page 175 | 2BD2xx48... |
| “Presentation Position (PP)” on page 185 | 34xxxx |
| “Release Left Margin (RLM)” on page 190 | 2BD2xx0B |

| Command | Hex Code |
|--|------------------|
| “Repeat (RPT)” on page 174 | 0A |
| “Required Form Feed/Required Page End (RFF/RPE)” on page 180 | 3A |
| “Required Hyphen (HYP)” on page 192 | 60 |
| “Required New Line (RNL)” on page 186 | 06 |
| “Required Space (RSP)” on page 189 | 41 |
| “Set CGCS Through Local ID (SCGL)” on page 182 | 2BD1xx81xx |
| “Set Character Distance (SCD)” on page 184 | 2BD2xx29xxxx |
| “Set Exception Action (SEA)” on page 169 | 2BD2xx85xx... |
| “Set FID Through GFID (SFG)” on page 183 | 2BD1xx05xx... |
| “Set Form Feed Control (SFFC)” on page 181 | 2BD1xx87xx |
| “Set GCGID Through GCID (SCG)” on page 182 | 2BD1xx01xxxxxxxx |
| “Set Graphic Error Action (SGEA)” on page 193 | 2BC8xxxxxx |
| “Set Horizontal Format (SHF)” on page 178 | 2BC1xxxx |
| “Set Horizontal Margins (SHM)” on page 180 | 2BD2xx11xxxxxxxx |
| “Set Horizontal Tab Stops (STAB)” on page 187 | 2BD2xx01xx... |
| “Set Indent Level (SIL)” on page 188 | 2BD2xx07xx |
| “Set Initial Conditions (SIC)” on page 169 | 2BD2xx45xx |
| “Set Justify Mode (SJM)” on page 194 | 2BD2xx0Dxxxx |
| “Set Line Density (SLD)” on page 190 | 2BC6xxxx |
| “Set Line Spacing (SLS)” on page 191 | 2BD2xx09xx |
| “Set Presentation Page Size (SPPS)” on page 177 | 2BD2xx40xxxxxxxx |
| “Set Print Setup (SPSU)” on page 174 | 2BD2xx4Cxx... |
| “Set Single Line Distance (SSLD)” on page 190 | 2BD2ss15xxxx |
| “Set Text Orientation (STO)” on page 180 | 2BD3xxF6xxxxxxxx |
| “Set Vertical Format (SVF)” on page 179 | 2BC2xxxx |
| “Set Vertical Margins (SVM)” on page 181 | 2BD2xx49xxxxxxxx |
| “Space (SP)” on page 189 | 40 |
| “Subscript (SBS)” on page 186 | 38 |
| “Substitute (SUB)” on page 192 | 3F |
| “Superscript (SPS)” on page 186 | 09 |
| “Switch (SW)” on page 174 | 2A |
| “Syllable Hyphen (SHY)” on page 192 | CA |
| “Underscore (US)” on page 192 | 6D |
| “Unit Backspace (UBS)” on page 189 | 1A |
| “Word Underscore (WUS)” on page 192 | 23 |

Determining Page Orientation

When operating in non-IPDS emulation mode, the printer uses a combination of commands in the printer data stream and the settings of its configuration switches to determine page orientation. The flowcharts in this section explain how the printer accomplishes this task.

The printer uses the following rules to govern page orientation:

Note: The paragraph numbers correspond to the numbers found in the flowcharts on the following pages.

1 If a Set Text Orientation (STO) command is in the data stream and is not set to 'default', the printer bases page orientation on the STO command parameter. It does not use any other parameters to determine rotation.

2 If there is no STO command or the STO command is set to 'default', and you set the Automatic Print Orientation to **Disable**, the printer uses the Orientation setting. Orientation is set on the **Coax Setup Menu** for each paper source. If you set Orientation to COR, you can override COR by setting the print quality parameters in the Page Presentation Media command (see "Page Presentation Media (PPM)" on page 175).

3 If there is no STO command and you set the Automatic Print Orientation to **Enable**, the printer looks at the parameters of the print image defined in the data stream and calculates the page size in inches.

Calculations are based on the following equations:

$$\text{Physical Page Width (in inches)} = \frac{\text{Characters per line (MPP)}}{\text{Font pitch (characters per inch, CPI)}}$$

$$\text{Physical Page Length (in inches)} = \frac{\text{Lines per page (MPL)}}{\text{Lines per inch (LPI)}}$$

For example, if:

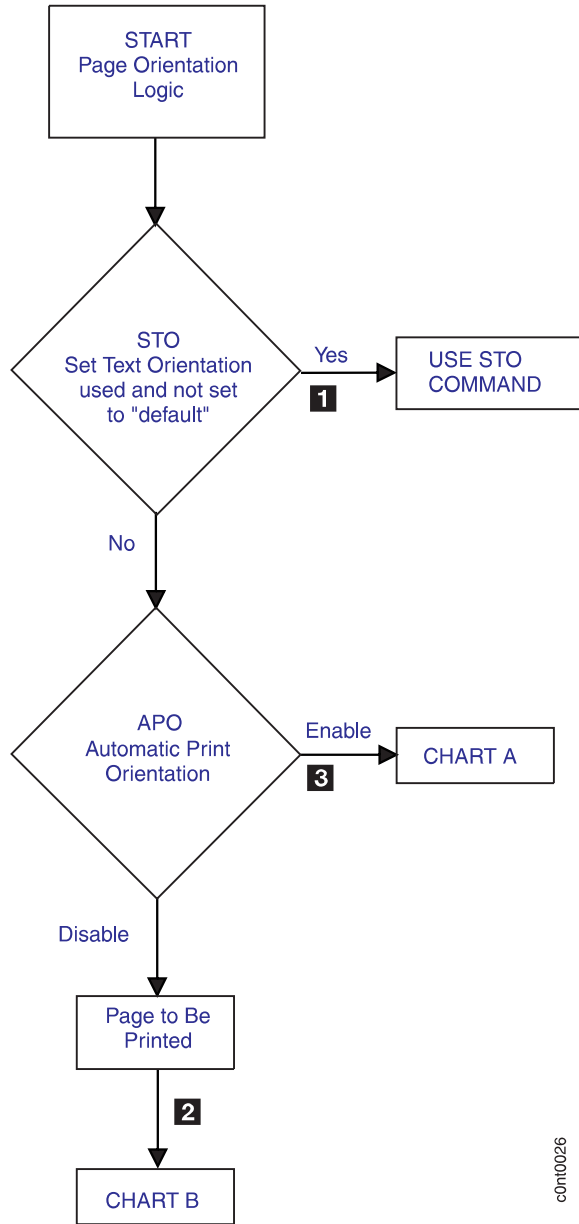
Characters per line = 132
Font = Courier 10 (10 pitch)
Lines per page = 66
Lines per inch = 6

The printer calculates a 335.3 x 279 mm (13.2 x 11 in.) page size.

4 The printer defines a valid page size as any page with dimensions equal to or less than the physical size of the media in the source tray.

5 If the page size is valid, the printer bases the orientation on the actual dimensions. The printer prints landscape if the length is less than the width; otherwise, it prints portrait.

6 If the page size is not valid, Orientation setting defines page orientation.

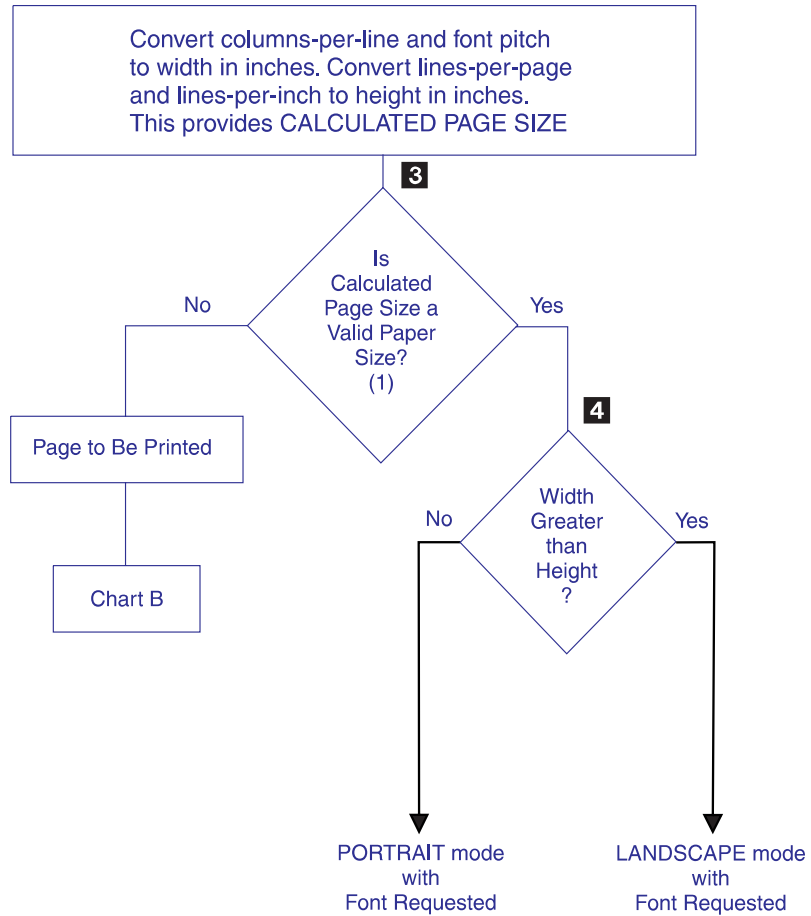


c0nt0026

Figure 10. Page Orientation Logic (Start)

The keys (**1** **2** and so on) refer to paragraph numbers earlier in this section.

CHART A



(1) Valid paper size is less than or equal to 8 1/2 x 14"

cont0034

Figure 11. Page Orientation Logic (Chart A)

The keys (**3** **6** and so on) refer to paragraph numbers earlier in this section.

CHART B

2

Table 170. Page Orientation Logic (Chart B)

| When Orientation Is One of The Following, | | | |
|---|--|-----------------------------|--|
| Portrait | Compressed Portrait | Landscape | Computer Output Reduction (COR) [Landscape Mode Reduced] |
| Prints with font requested. | Prints with font requested, with spaces between characters reduced to compensate for unprintable left and right borders. | Prints with font requested. | Prints with vertical spacing 70 percent of normal plus: 0.5-in margins 10-pitch fonts to 13-pitch 12-pitch fonts to 15-pitch 15-pitch fonts to 20-pitch |

Figure 12. Page Orientation Logic (Chart B)

The key **2** refers to paragraph **2** earlier in this section.

Chapter 17. Format-Control Parameters—DSC/DSE and LU-1 (SCS) Modes

This chapter explains format-control parameters in non-IPDS mode. The non-IPDS modes are: Data Stream Compatible (DSC), Data Stream Emulation (DSE), and Logical Unit-1 (LU-1) SNA Character String (SCS).

Page Control

The printer controls page size by using format-control parameters to specify printing requirements. A line counter exists within the printer for both DSC/DSE and LU-1 (SCS) modes. The counter tracks the current print line.

When the printer is turned on, the line counter is set to 1. The counter then increases by one as each line is sent to the printer. The counter resets to 1 when:

- The printer receives a data-stream-generated form feed.
- The data stream changes the Maximum Page Length (MPL) or the Top Margin (TM).

For all lines to fit on a page, the print area must be greater than or equal to the maximum page length (MPL) minus the Top Margin (TM) divided by lines per inch (LPI).

The printer configuration settings initially control line density and spacing, but a Set Line Density (SLD) command in LU-1 (SCS) mode can change these values. (Programming in DSC/DSE mode cannot change these values.) If the mode changes, the printer uses the new mode's format control parameters.

Figure 13 on page 206 shows the Maximum Print Position and the Maximum Page Length for a page.

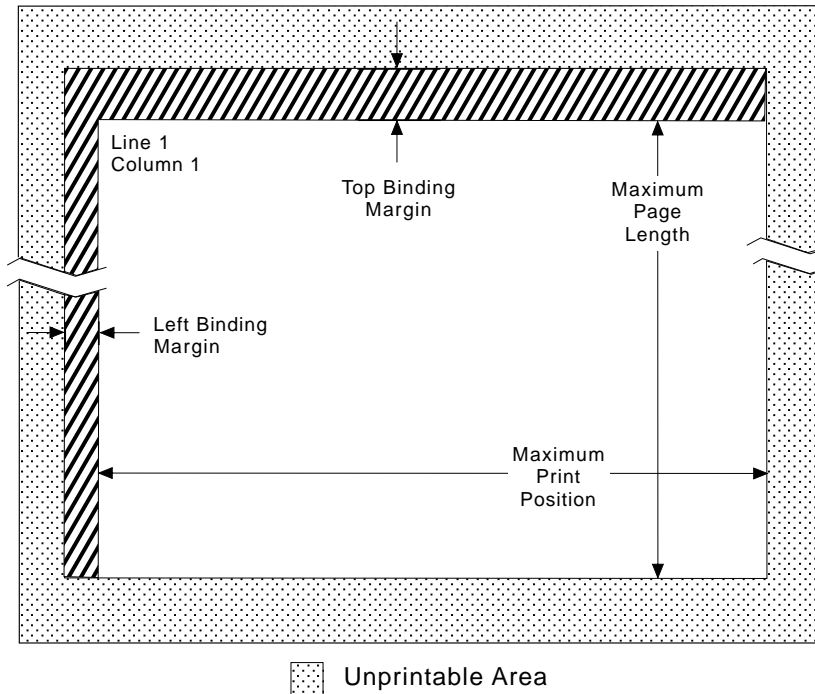


Figure 13. Page Control Using Format-Control Parameters

Format-Control Parameters

When the printer is turned on, the configuration settings determine the format-control parameters.

To prevent unexpected output formats caused by changes made in the configuration settings by previous jobs, the application program must initialize the printer format-control parameters.

Notes:

1. In LU-1 (SCS) mode, programming can override printer format-control parameters with control commands.
2. In DSC/DSE mode, programming can override only the Maximum Print Position (MPP) parameter.

The following information describes each format-control parameter for the printer.

Bottom Margin (BM)

The Bottom Margin defines the last printable line of a page and is measured in the number of lines away from the top of the printable area. When the current line is more than the BM, the print position moves to the bottom of the top margin of the next page.

When the printer is turned on, the BM defaults to the MPL configuration setting (see “Maximum Page Length (MPL)” on page 208). If MPL changes, BM also changes.

- In DSC/DSE print mode, BM is not applicable.
- In LU-1 (SCS) print mode, the SVF control code can change BM.

Characters Per Inch (CPI)

Characters per Inch, or print density, sets the number of horizontal characters per inch. When the printer is turned on, CPI defaults to the configuration setting. The CPI configuration setting is set in one of the screens of the **Coax Setup Menu** of the printer operator panel. Do the following to get to the **Coax Setup Menu**:

1. Select **Network Setup**.
2. Select **Coax Setup Menu**.
3. Select **MORE** until you see **CPI**.

Refer to *READ THIS FIRST*, G544-5265, for menu details.

- The configuration setting determines the power-on default for CPI.
- *In DSC/DSE print mode*, the printer uses the CPI configuration setting value; the system cannot change CPI.
- *In LU-1 (SCS) print mode*, the printer uses the CPI configuration setting value unless the Set Print Density control code specifies CPI.

Horizontal Tab Stops (HTS)

When the printer is turned on, the horizontal tab stops set column values for the Horizontal Tab (HT) function.

- *In DSC/DSE print mode*, horizontal tab stops are not applicable.
- *In LU-1 (SCS) print mode*, an SHF control code can change horizontal tab stop values.
- *For the power-on default*, the printer sets horizontal tab stops for all print positions.

Left Binding Margin (LBM)

The Left Binding Margin determines the position of column 1 relative to the left edge of the printable area when printing in portrait or landscape orientation. LBM is measured in tenths of an inch.

Notes

1. The Left Margin parameter of the Set Horizontal Format command is added to the LBM to determine the left-most print position.
2. The LBM cannot be changed by the data stream.
3. The power-on default for LBM is determined by this Left Binding Margin control on the operator panel.
4. The LBM is ignored in Computer Output Reduction mode and the printable area begins 1.27 mm (0.5 in) from the left edge of the paper.

Left Margin (LM)

The Left Margin is the left-most print position and is measured in column positions from the Left Binding Margin. When the printer is first turned on, LM defaults to 1.

- *In DSC/DSE print mode*, LM is always 1.
- *In LU-1 (SCS) print mode*, LM is 1 unless it is changed by an SHF control code.

Line Spacing (LS)

The Line Spacing parameter permits selection of single-line or double-line spacing. When the printer is turned on, line spacing defaults to the configuration setting. The line spacing configuration setting is set in one of the screens of the **Coax Setup Menu** of the printer operator panel.

To generate double spacing, the printer inserts a blank line after every print line. If the last line prints at one line before the bottom margin, a blank line is inserted at the bottom margin, a form feed occurs, and the next line prints at the first line of the next page. If the last line prints at the bottom margin, a form feed occurs and the next line still prints at the first line of the next page.

- The configuration setting determines the power-on default for line spacing.
- *In DSC/DSE print mode*, the printer uses the line spacing configuration setting value; the system cannot change line spacing.
- *In LU-1 (SCS) print mode*, the printer uses the line spacing configuration setting unless the SLD control code specifies lines per inch.

Lines Per Inch (LPI)

Lines per Inch, or vertical line density, determines the distance (in lines per inch) to be moved for single-line vertical spacing. When the printer is turned on, LPI defaults to configuration setting. The LPI configuration setting is set in one of the screens of the **Coax Setup Menu** of the printer operator panel and can be changed from the panel.

- The configuration setting determines *power-on default* for the LPI.
- *In DSC/DSE print mode*, the printer uses the LPI configuration setting value; the system cannot change LPI.
- *In LU-1 (SCS) print mode*, the Set Line Density (SLD) control code can change LPI.

Maximum Page Length (MPL)

Maximum Page Length is the number of lines from the first print line of one page to the first print line of the next page. The MPL configuration setting is set in one of the screens of the **Coax Setup Menu** of the printer operator panel.

Note: The MPL cannot be more than 255 lines, and MPL should not be more than the Physical Maximum Page Length (PMPL).

- The configuration setting determines *the power-on default* for MPL.
- *In DSC/DSE print mode*, the printer uses the MPL configuration setting value; the system cannot change MPL.
- *In LU-1 (SCS) print mode*, the SVF control code changes the MPL value. If the printer does not receive an SVF control code with an MPL value, the printer uses the MPL configuration setting value.
- Subtract the unprintable border (top and bottom) and Top Binding Margin from the length when calculating PMPL.

Maximum Print Position (MPP) - Print Output Format

The Maximum Print Position value is the right-most print position. When the printer is turned on, it uses the configuration setting to determine MPP. The MPP configuration setting is set in one of the screens of the **Coax Setup Menu** of the printer operator panel.

Note: The MPP cannot exceed the Physical Maximum Print Position (PMPP). See “Physical Maximum Print Position (PMPP)”.

Consider the following when changing MPP:

- The MPP configuration setting determines *the power-on default* for MPP.
- *In DSC/DSE print mode*, the MPP parameter set by the print order determines MPP. If this MPP parameter is 0, the printer uses the MPP configuration setting. MPP can be overridden using the Write Control Character (WCC), which fixes the MPP at either 40, 64, or 80.
- *In LU-1 (SCS) print mode*, the printer uses the MPP configuration setting unless an MPP value is set by a Set Horizontal Format (SHF) sequence from the host.
- When calculating PMPP, subtract the left binding margin (LBM) and the unprintable border (left and right) from the width.
- Consider *Pitch* when determining MPP.

Monocase or Dualcase

When the printer is turned on, monocase or dualcase (uppercase or mixed case) defaults to the configuration setting. The monocase or dualcase configuration setting is set in one of the screens of the **Coax Setup Menu** of the printer operator panel.

- The configuration setting determines the power-on default for monocase/dualcase.
- *In DSC/DSE print mode*, the printer uses the monocase/dualcase configuration setting unless it is overridden by the configuration.
- *In LU-1 (SCS) print mode*, dualcase is always used.

Physical Maximum Page Length (PMPL)

The Physical Maximum Page Length value is the upper limit of the MPL and is determined by page orientation and a combination of page format parameters as follows:

$$\text{PMPL} = (\text{Length of print area} - \text{TBM}) \times \text{LPI}$$

Any non-integral values of PMPL are truncated. See Table 171 on page 211 for some sample PMPL values.

Physical Maximum Print Position (PMPP)

The Physical Maximum Print Position value is the upper limit of the MPP and is determined by page orientation and a combination of page format parameters as follows:

$$\text{PMPP} = (\text{Width of print area} - \text{LBM}) \times \text{CPI}$$

Any non-integral values of PMPL are truncated. See Table 171 on page 211 for some sample PMPP values.

Physical Page Length (PPL) and Physical Page Width (PPW)

The physical page length is determined from the size and orientation selected with the configuration setting for each media source. This is the length of the paper in the selected tray for a specific orientation. PPL and PPW are measured in inches.

Top Binding Margin (TBM)

The Top Binding Margin determines the position of line 1 relative to the top edge of the printable area when printing in portrait or landscape orientation. TBM is measured in tenths of an inch.

Notes:

- The Top Margin parameter of the Set Vertical Format command is added to the TBM to determine the first print line position.
- The TBM cannot be changed by the data stream.
- The power-on default for TBM is determined by this Top Binding Margin control on the operator panel.
- The TBM is ignored in Computer Output Reduction (COR) mode and the printable area begins 1.27 mm (0.5 In) from the top of the paper.

Top Margin (TM)

Top Margin sets the first print line of a page and is measured from the Top Binding Margin. When the printer is turned on, TM defaults to 1.

- *In DSC/DSE print mode*, TM is always 1.
- *In LU-1 (SCS) print mode*, an SVF control code can change TM.

Vertical Tab Stops (VTS)

When the printer is turned on, the vertical tab stops set line number values for both the Vertical Tab (VT) and the Vertical Channel Select (VCS) functions. The printer's configuration settings cannot change the vertical tab stop settings.

- *In DSC/DSE print mode*, vertical tab stops are not applicable.
- *In LU-1 (SCS) print mode*, the SVF control code can change vertical tab stop values.
- *For the power-on default*, the printer sets vertical tab stops for all vertical print positions. These tab stops cannot be changed through the configuration settings.

Sample PMPP and PMPL Values in Print Page Format

(With TBM and LBM=0)

Table 171. Sample PMPP and PMPL Values in Print Page Format

| Paper Size | PMPP at | | | | PMPL at | |
|----------------------|---------|--------|--------|----------|---------|-------|
| | 10 CPI | 12 CPI | 15 CPI | 16.6 CPI | 6 LPI | 8 LPI |
| Letter | | | | | | |
| Portrait | 81 | 98 | 122 | 135 | 64 | 85 |
| Landscape | 106 | 128 | 160 | 177 | 49 | 65 |
| COR | 137 | 155 | 206 | 278 | 67 | 89 |
| Legal | | | | | | |
| Portrait | 81 | 98 | 122 | 135 | 82 | 109 |
| Landscape | 136 | 164 | 205 | 266 | 49 | 65 |
| COR | 177 | 200 | 266 | 359 | 67 | 89 |
| A4 | | | | | | |
| Portrait | 78 | 94 | 116 | 129 | 68 | 91 |
| Landscape | 114 | 137 | 171 | 189 | 46 | 62 |
| COR | 147 | 165 | 221 | 298 | 64 | 86 |
| A4 (203 mm) | | | | | | |
| Portrait | 80 | 96 | 120 | 132 | 68 | 91 |
| Landscape | 114 | 137 | 171 | 189 | 48 | 64 |
| COR | 147 | 165 | 221 | 298 | 65 | 87 |
| Executive | | | | | | |
| Portrait | 69 | 83 | 103 | 114 | 61 | 81 |
| Landscape | 101 | 122 | 152 | 168 | 41 | 55 |
| COR | 130 | 147 | 196 | 265 | 56 | 75 |
| Envelope Size | | | | | | |
| 7 3/4 | | | | | | |
| Landscape | 71 | 86 | 107 | 118 | 21 | 28 |
| 10 | | | | | | |
| Landscape | 91 | 110 | 137 | 152 | 22 | 30 |
| DL | | | | | | |
| Landscape | 83 | 99 | 124 | 138 | 23 | 31 |
| C5 | | | | | | |
| Landscape | 86 | 104 | 130 | 144 | 36 | 48 |

Priority of Format-Control Parameters

The application program, data stream commands, and configuration settings control the way the printer formats pages. The chart below lists the codes that can be changed with configuration settings from the printer operator panel. These configuration settings override the power-on defaults; the data stream overrides both the power-on defaults and the configuration settings.

| Parameter | Configuration Setting (See Note 1) | DSC/DSE Control Code | LU-1 (SCS) Control Code |
|-----------|------------------------------------|-------------------------|-------------------------|
| MPP | Maximum Print Position | Write Control Character | Set Horizontal Format |

| Parameter | Configuration Setting (See Note 1) | DSC/DSE Control Code | LU-1 (SCS) Control Code |
|-----------------------|------------------------------------|----------------------------------|----------------------------------|
| MPL | Maximum Page Length | Cannot be changed by data stream | Set Vertical Format |
| LPI | Lines per Inch | Cannot be changed by data stream | Set Line Density |
| CPI | Characters per Inch | Cannot be changed by data stream | Set Printer Density |
| Monocase/ Dualcase | Monocase/Dualcase | Host | Cannot be changed by data stream |
| Line Spacing | Line spacing | Cannot be changed by data stream | Set Line Density |

Notes:

1. The configuration settings are set in one of the screens of the **Coax Setup Menu** of the printer operator panel.
2. Change the configuration settings from the operator panel between jobs only.

Page-Synchronization and Line-Wrap Considerations

A print line that is more than the current MPP continues on the next line (wraps). The additional line feeds generated by these line wraps can go past the page and may interfere with page synchronization (top-of-forms alignment) on pages that follow.

To resolve this, first verify that all of the needed configuration settings and data stream controls are set for the print job. In addition, you can select application parameters to change the output format to get the result you want. In RSCS, for files containing *carriage-control characters*, setting the Vertical Forms Control (VFC) parameter to Yes causes a form feed command to be issued at the end of each page. Line wraps might occur, but top-of-forms alignment is ensured on pages that follow. For more information, see the programming guide for your specific application. For details on RSCS applications, refer to *VM RSCS Networking Version 3 Operation and Use*, SH24-5058.)

Note: Be sure that the MPP is within the printable area; If it is in the unprintable area, you will lose data.

Chapter 18. Control Codes—DSC/DSE and LU-1 (SCS)

This chapter describes the printer control codes valid in DSC/DSE and LU-1 (SCS) communication modes.

DSC/DSE Control Codes

The following control codes are valid when the printer is in DSC/DSE mode.

| Code | Name | DSC/DSE EBCDIC | Internal Code Value <i>(as seen in hex dumps)</i> |
|------|-----------------|----------------|--|
| CR | Carriage Return | 0D | 05 |
| EM | End of Medium | 19 | 01 |
| FF | Form Feed | 0C | 02 |
| NL | New Line | 15 | 03 |
| NUL | Null | 00 | 00 |

Notes:

1. These codes have different meanings in print and no-print fields in both formatted and unformatted modes, as explained below.
2. The LU-1 and SCS modes are referred to as format mode.
3. In DSC/DSE modes with the extended attribute buffer (EAB) on, groups of characters defined by associated attributes determine print and no-print fields.

Carriage Return (CR)

0D

Carriage Return causes the printer to move to the left margin of the current line in an unformatted print field. In a formatted print field or an unformatted no-print field, the printer treats CR as a space character. In a formatted no-print field, the printer treats CR as a null character.

End of Medium (EM)

19

End of Medium stops printing in an unformatted print field. In a formatted print field or unformatted no-print field, the printer treats EM as a space character. In a formatted no-print field, the printer treats EM as a null character.

Form Feed (FF)

0C

Form Feed causes the printer to move to the top margin of the next page in either print or no-print fields, formatted or unformatted modes.

All print jobs should end with a Form Feed command. This ensures that data on the last page prints and the page ejects.

New Line (NL)

15

New Line causes the printer to move to the first position of the next line in an unformatted print field. In a formatted print field or an unformatted no-print field, the printer treats NL as a space character. In a formatted no-print field, the printer treats NL as a null character.

Null (NUL)

00

Null causes no printer function. In unformatted mode, the printer treats NUL as a space for both print and no-print fields. In formatted print and no-print fields, the printer treats NUL as a null character.

LU-1 (SCS) Control Codes (Non-IPDS)

The rest of the chapter shows the SCS control codes that are valid when the printer is defined to VTAM as an LU-1 device. The control code descriptions are sorted alphabetically by control code abbreviation. **All values are shown in hexadecimal.** The following is a cross-reference list, sorted numerically by value.

| EBCDIC Value | Reference to..... |
|---------------------|---|
| 04 | "Vertical Channel Select (VCS)" on page 227 |
| 05 | "Horizontal Tab (HT)" on page 216 |
| 08 | "Graphic Escape (GE)" on page 215 |
| 0B | "Vertical Tab (VT)" on page 228 |
| 0C | "Form Feed (FF)" on page 215 |
| 0D | "Carriage Return (CR)" on page 215 |
| 1E | "Inter-Record Separator (IRS)" on page 216 |
| 14 | "Enable Presentation (ENP)" on page 215 |
| 15 | "New Line (NL)" on page 217 |
| 16 | "Backspace (BS)" on page 215 |
| 2F | "Bell (BEL)" on page 215 |
| 24 | "Inhibit Presentation (INP)" on page 216 |
| 25 | "Line Feed (LF)" on page 216 |
| 28 | "Set Attribute (SA)" on page 220 |
| 35 | "Transparent (TRN)" on page 227 |
| 2BC1 | "Set Horizontal Format (SHF)" on page 221 |
| 2BC2 | "Set Vertical Format (SVF)" on page 225 |
| 2BC6 | "Set Line Density (SLD)" on page 223 |
| 2BD10683 | STO (Set Text Orientation) is not supported |

2BD2NN29

“Set Print Density (SPD)” on page 223

2BD2NN48

“Page Presentation Media (PPM)” on page 217

Bell (BEL)

2F

The printer ignores this control.

Backspace (BS)

16

Backspace moves the current print position one column to the left. If the current print position equals the left margin, BS occurs. If the current print position equals column 1, BS is ignored.

Carriage Return (CR)

0D

Carriage Return moves the print position from the current position to the left margin. It does not change the vertical print position. If the current print position equals the left margin, CR is ignored.

Performing a CR without a new line and printing the same data will simulate bolding.

Enable Presentation (ENP)

14

The printer ignores this control.

Form Feed (FF)

0C

Form Feed moves the print position to the top margin and the left margin print position of the next page. If MPL equals 1, FF performs the same function as a New Line (explained below). If the current position equals MPP + 1, FF still occurs as described above.

All print jobs should end with an FF command. This ensures that data on the last page prints and the page ejects.

Graphic Escape (GE)

08

Graphic Escape allows APL/Text/Graphic characters to be sent in an SCS data stream. Each APL/Text/Graphic character is preceded by the graphic escape code (hex 08).

The following example shows the data stream required to send a mixed EBCDIC/APL character string:

Character

A H § ¶ Q ≠ B ≤ ↑

Hex Code

C1 C8 08 C8 08 D8 D8 40 08 BE C2 08 8C 08 8A

The printer prints the following as a result of the character string above:

AH§¶Q ≠B≤↑

If the graphic escape code (hex 08) is followed by another control code (hex 00 through hex 3F or hex FF), this two-byte combination is treated as one invalid SCS control code.

Horizontal Tab (HT)

05

Horizontal Tab moves the print position from its current position to the column specified by the next higher tab stop setting.

- If the current print position column value is equal to or greater than the highest tab stop setting (or if no stops have been set), HT performs the same as a space function.
- If HT is specified at MPP + 1, the print position moves to the left margin plus 1 (LM + 1) of the next line. (If the current line is the bottom margin line, the next line is the top margin of the next page.)

Inhibit Presentation (INP)

24

The printer ignores this control.

Inter-Record Separator (IRS)

1E

Inter-Record Separator performs the same function as a New Line (NL).

Line Feed (LF)

25

Line Feed moves the print position vertically from its current position to the next line. It does not change the horizontal print position. If the current line number equals BM or MPL, the print position moves to the top margin of the next page.

New Line (NL)

15

New Line causes a Carriage Return function and an LF function. If the current line number equals BM or MPL, the print position moves to the left margin print position of the top margin of the next page.

Page Presentation Media (PPM)

Page Presentation Media is a text-processing command. This command allows you to select the paper sources and specify simplex/duplex.

| PPM Command Format: | 2B | D2 | <u>NN</u> | 48 | 00 | 00 | <u>FC</u> | <u>SD</u> | <u>DDO</u> | <u>DD</u> | 00 | <u>DX</u> |
|--|----|----|-----------|----|----|----|-----------|-----------|------------|-----------|----|-----------|
| Example: Use Paper Menu / SOURCE item from printer menus (See NN) | 2B | D2 | 02 | 48 | | | | | | | | |
| Example: Select the envelope feeder. | 2B | D2 | 05 | 48 | 00 | 00 | 02 | | | | | |
| Example: Select second drawer | 2B | D2 | 06 | 48 | 00 | 00 | 01 | 02 | | | | |
| Example: Select second drawer, and duplex | 2B | D2 | 0A | 48 | 00 | 00 | 01 | 02 | 00 | 00 | 00 | 02 |

NN

Byte NN of PPM is the count byte. It specifies how many more bytes, including NN, are in the command.

- X'02'** FC is ignored, Paper Menu / SOURCE item setting used instead of SD. DX remains as previously defined (or defaults to simplex if not previously defined).
- X'05'** FC is used, Paper Menu / SOURCE item setting used instead of SD, DX remains as previously defined (or defaults to simplex if not previously defined).
- X'06'** FC is used and SD SD is used. DX remains as previously defined (or defaults to simplex if not previously defined).
- X'0A'** FC is used, SD is used, and DX is used.
- X'02' to X'0C'** Valid values, but only 02, 05, 06, and 0A are meaningful.
- Other** Results in an Invalid Parameter Error response to the host.

FC

The Forms Control byte of PPM selects manual, envelope, or directs the use of SD.

- X'00'** No change from current selection (use last FC specified).
- X'01'** Use SD as paper source.
- X'02'** Select envelope feeder if it exists; otherwise, select auxiliary tray using the paper size specified by the AUXSIZE item in the Paper Menu.
- X'03'-X'04'** Select manual feeder.

X'05'-X'FE' Use SD as paper source.
X'FF' Use tray specified by SOURCE item on Paper Menu.

Note: For InfoPrint 20, when a tray contains envelopes (or envelope-sized paper), it is selected. If multiple trays contain envelopes, the tray with the lowest tray number (tray 1, tray 2) is selected.

SD

Byte **SD** of PPM selects the paper source (Source Drawer), if byte FC directed to use SD.

X'00' No change from current selection.
X'01' Select tray 1.
X'02' Select tray 2 if it exists; otherwise use tray specified by SOURCE item on Paper Menu.
X'03' Select tray 3 if it exists; otherwise use tray specified by SOURCE item on Paper Menu.
X'04' Select auxiliary feeder
X'05' Select tray 4 if it exists; otherwise use tray specified by SOURCE item on Paper Menu.
X'06' Select tray 5 if it exists; otherwise use tray specified by SOURCE item on Paper Menu.
X'07'-X'FE' Select Tray 1.
X'FF' Use tray specified by SOURCE item on Paper Menu.

DD

Byte **DD** of PPM selects the destination drawer.

X'00' No change from current selection.
X'01' Select standard output bin.
X'02' NP 12: face-up bin.
NP 17: 500-sheet offset bin.
NP 24: face-up bin.
IP 20: default bin.
IP 32: face-up bin.
X'03' NP 12: default bin.
NP 17: default bin.
NP 24: finisher bin 1 (face-down).
IP 20: default bin.
IP 32: finisher bin 1 (face-down).
X'04' NP 12: default bin.
NP 17: mailbox bin 1.
NP 24: finisher bin 2 (face-down).

| | |
|--------------|--|
| | IP 20: default bin. |
| | IP 32: finisher bin 2 (face-down). |
| X'05' | NP 12: default bin. |
| | NP 17: mailbox bin 2. |
| | NP 24: finisher bin 3 (face-down). |
| | IP 20: default bin. |
| | IP 32: finisher bin 3 (face-down). |
| X'06' | NP 12: default bin. |
| | NP 17: mailbox bin 3. |
| | NP 24: finisher bin 1 (face-up). |
| | IP 20: default bin. |
| | IP 32: default bin. |
| X'07' | NP 12: default bin. |
| | NP 17: mailbox bin 4. |
| | NP 24: finisher bin 2 (face-up). |
| | IP 20: default bin. |
| | IP 32: default bin. |
| X'08' | NP 12: default bin. |
| | NP 17: mailbox bin 5. |
| | NP 24: finisher bin 3 (face-up). |
| | IP 20: default bin. |
| | IP 32: default bin. |
| X'09' | NP 12: default bin. |
| | NP 17: mailbox bin 6. |
| | NP 24: auto-output (face-down). |
| | IP 20: default bin. |
| | IP 32: auto-output (face-down). |
| X'0A' | NP 12, NP 24, IP 20, IP 32: default bin. |
| | NP 17: mailbox bin 7. |
| X'0B' | NP 12, NP 24, IP 20, IP 32: default bin. |
| | NP 17: mailbox bin 8. |
| X'0C' | NP 12, NP 24, IP 20, IP 32: default bin. |
| | NP 17: mailbox bin 9. |
| X'0D' | NP 12, NP 24, IP 20, IP 32: default bin. |
| | NP 17: mailbox bin 10. |

DDO

Byte DDO of PPM selects offsetting for the destination drawer.

X'00' No change from current selection.

X'01'-X'FF' Jog.

DX

Byte DX specifies duplex or simplex.

X'00' No change

X'01' Enter simplex mode.

X'02' Enter duplex mode.

X'03' Enter tumble duplex mode.

Notes:

1. SD ignored unless FC is 01 or between 05 and FE.
2. If the PPM control is received when the printer is at a page boundary (that is, after an internal or a data-stream-generated form feed and before any command is received that would change the current print position), the selections are used immediately. If not, the new selections become effective at the next page boundary.

Set Attribute (SA)

| | | |
|----|----|----|
| 28 | TT | VV |
|----|----|----|

Set Attribute specifies an attribute for all data following the SA control code. Each attribute uses two subsequent characters in the data stream.

Each attribute type requires one SA code. Each SA code stays in effect for the remainder of the chain unless the host sends another SA code of the same type. The character attribute values specified by SA codes apply to *all* subsequent data characters in the data stream. The codes remain valid until:

- A new SNA chain begins, or
- A new SA code changes the value of the character attribute.

Type

Byte TT specifies the type of attribute. Valid values for byte TT and their definitions are shown in the following table.

| Byte TT (in hex) | Selection |
|------------------|----------------------|
| 00 | Reset |
| 41 | Highlight |
| 42 | Color |
| 43 | Select character set |

Reset (TT = 00). A value of 00 for byte TT resets the attributes to normal highlighting, black color, and the base character set. Byte VV must be 0.

Highlight (TT = 41). A value of 41 for byte TT uses byte VV to select highlight characteristics. Valid values for byte VV and their selections are shown in the following table.

| Byte VV (in hex) | Selection |
|------------------|-------------------------|
| 00 | Normal |
| F1 | Blink (Ignored) |
| F2 | Reverse image (Ignored) |
| F4 | Underline |

Color (TT = 42). A value of 42 for byte TT selects a color for subsequent printing. Byte VV selects the color. The printer accepts all values shown but prints only in black. Valid values for byte VV and their selections are:

| Byte VV (in hex) | Selection |
|------------------|-----------|
| 00 | Black |
| F1 | Blue |
| F2 | Red |
| F3 | Magenta |
| F4 | Green |
| F5 | Cyan |
| F6 | Yellow |
| F7 | Black |

Select Character Set (TT = 43). A value of 43 for byte TT selects either the base character set or the APL character set, using byte VV. Valid values for byte VV and their selections are:

| Byte VV (in hex) | Selection |
|------------------|--------------------|
| 00 | Base character set |
| F1 | APL character set |

Set Horizontal Format (SHF)

| | | | | | | |
|----|----|----|----|----|----|----------------------------------|
| 2B | C1 | NN | PP | LM | RM | T ₁ ...T _n |
|----|----|----|----|----|----|----------------------------------|

Set Horizontal Format sets horizontal formatting controls including Maximum Print Position, Left Margin, Right Margin (RM), and up to 253 horizontal tab stops (T₁...T_n). A count byte defines the total number of bytes that follow, including the count byte. The first three bytes following the count byte define MPP, LM, and RM, respectively. Tab stop column values start in the fourth byte position.

Count

Byte NN is the count byte.

- A count of hex 00 results in an Invalid Parameter Error response. Horizontal format controls are reset to their default values.
- A count of hex 01 sets MPP to the configuration setting value and other horizontal formatting controls to their default values.
- All other count values are valid; however, if the count is larger than MPP + 4, some tab stops must be repeated.

Maximum Print Position

Byte PP specifies the maximum print position.

- If byte PP is greater than 0, the MPP is equal to the specified value.
- If byte PP is 0, the MPP is calculated as current CPI value x 13.inch page width. If byte PP is not present, MPP is equal to the op panel values.
- If the printer reads a graphic character at MPP + 1, the printer:

- Automatically performs a new line function (CR + line feed)
- Prints the graphic character in the print position defined by the LM value.

Note: For a description of how the printer responds to a specific control function at MPP + 1, see the description for that function. MPP is not validated based on the actual physical page width.

Left Margin

Byte LM is the left margin byte. This value defines the leftmost print position and is the print position that is taken following a NL, CR, or FF function. Valid LM values are less than or equal to the MPP value. The default for LM is column 1. The LM value is stored as the first horizontal tab. The value for LM is as follows:

- If byte LM is greater than 0 and less than or equal to MPP, then the left margin is equal to byte LM's value.
- If byte LM is 0, the left margin defaults to column 1.
- If byte LM is not present (in which case, the count byte, NN, is less than 03), the left margin defaults to column 1.
- If byte LM is greater than MPP, the printer sends an Invalid Parameter Error response to the host. Processing of the data stops, and all horizontal format controls except MPP revert to their default values.

Right Margin (RM)

Byte RM is the right margin byte. The printer does not use the RM parameter, but it checks this value.

- Valid RM values are 0 or the range of values from LM to MPP.
- If the RM value is invalid, the printer sends an Invalid Parameter Error response to the host. Printing of the data stops, and all horizontal format controls except MPP and LM revert to their default values.

Horizontal Tab Stop (T₁...T_n)

Bytes T₁ to T_n are the Horizontal Tab Stop bytes. These bytes set column values for the Horizontal Tab (HT) function to use.

- Valid Horizontal Tab Stop column values are the range of values from LM to MPP.
- If no Horizontal Tab Stops are specified, the printer uses the default (a tab stop at each column from LM to MPP).
- A value of hex 00 is valid but sets no tab stops. If a value of hex 00 is the only tab stop specified, the printer clears all tab stops except the left margin stop.
- There is no check to determine if duplicate tab stops have been specified.
- The maximum number of unique tab stops that can be set is PMPP. The first unique value sets the tab stop; identical values that follow do not set stops. Therefore, duplicate values can exist.
- Tab stop parameters need not be in any ordered sequence.
- If an invalid Horizontal Tab Stop is specified, the printer sends an Invalid Parameter Error response to the host. Printing of the data stops. This error does not affect horizontal formats (MPP, LM, and RM), but tab stops enter an undetermined condition.

Note: The print buffer should be reinitialized after an SHF function by performing an NL or a CR, especially if the left margin is changed.

Set Line Density (SLD)

Set Line Density sets the LPI value for the printer. SLD overrides the LPI default value of 6 LPI and the LPI setting in the Coax Setup Menu.

| | | | | |
|---|----|----|------------------|------------------|
| SLD Command Format: | 2B | C6 | <u>NN</u> | <u>LD</u> |
| Example: Use LPI specified in the Coax Setup Menu. | 2B | C6 | 01 | |
| Example: Use 8 LPI. | 2B | C6 | 02 | 09 |

NN

Byte **NN** of SLD determines whether the LPI is controlled by the Coax Setup Menu setting, or the SPD byte LD:

X'01' The Coax Setup Menu setting determines LPI. (LD values are ignored.)

X'02' Byte LD determines CPI.

other Any other value results in an Invalid Parameter Error response to the host, with LD set to the default of 6 LPI.

LD

Byte **LD** of SLD defines the line density, or the distance (measured in lines per inch) to be moved for single-line vertical spacing.

X'00' 6 (8.57 in COR)—default value

X'0C' 6 (8.57 in COR)

X'09' 8 (11.43 in COR)

X'12' 4 (5.71 in COR)

X'18' 3 (4.29 in COR)

Other All other values for byte LD are invalid and result in an Invalid Parameter Error response to the host. The 6 LPI default value is used until a valid SLD specification is received.

Notes:

1. When the SLD count byte is not equal to 01, SLD sets line spacing to single space, overriding the line spacing configuration setting if it is different.
2. The LD change becomes effective when it is received. Printing results are unpredictable unless the command is sent while the printer is at a page boundary, and an SVF accompanies the SLD function to redefine page parameters before printing begins.

Set Print Density (SPD)

Set Print Density sets the number of horizontal characters printed per inch, based on the values of the NN and CD bytes.

| SPD Command Format: | 2B | D2 | <u>NN</u> | 29 | 00 | <u>CD</u> |
|--|-----------|-----------|------------------|-----------|-----------|------------------|
| Example: Accept CPI value from COAX SETUP MENU setting. | 2B | D2 | 02 | 29 | | |
| Example: Override CPI value from Coax Setup Menu setting; use 10 CPI for the job. | 2B | D2 | 04 | 29 | 00 | 00 |

The SPD command becomes **effective immediately** after it is received. Data following for the same print line prints at the new CPI value.

NN

Byte **NN** of SPD determines whether CPI is controlled by the Coax Setup Menu setting, or the SPD byte CD:

X'02' The Coax Setup Menu setting determines CPI. (CD values are ignored.)

X'04' Byte CD determines CPI.

other Any other value results in an Invalid Parameter Error response to the host. Ignores CD.

CD

When byte N= X'04', SPD byte **CD** defines the character density (CPI) to be used by the printer:

X'00' Select 10-CPI, default (in COR mode, prints as 13.3 CPI)

X'0A' Select 10-CPI (in COR mode, prints 13.3 CPI)

X'0C' Select 12-CPI (in COR mode, prints as 15 CPI)

X'0F' Select 15 CPI (in COR mode, prints as 20 CPI)

X'10' Select 16.67 CPI (in COR mode, prints as 27 CPI)

X'11' Select 17.1 CPI (in COR mode, prints as 27 CPI)

other All other values for byte CD are invalid and result in an Invalid Parameter Error response to the host. Then uses Coax Setup Menu setting for CPI.

Notes:

1. This command is also called SCD (Set Character Density).
2. Byte CD is ignored unless Byte NN= X'04'
3. When CPI changes, neither the MPP value nor the current print position is changed.
4. The CPI in effect determines the character location in the print line. As CPI changes, the physical location of a given print position also changes. Therefore, print position 50 at 15 CPI is closer to the left margin than print position 50 at 10 CPI. CPI also affects the physical location of the LM, the MPP, and the HT stop locations. The host must insert spaces or backspaces to position print where desired.

Set Vertical Format (SVF)

Set Vertical Format sets vertical formatting controls including Maximum Page Length, Top Margin, Bottom Margin, and up to 127 vertical tab stops. These tab stops include up to 12 vertical channel-select values.

| | | | | | | | |
|---------------------|----|----|------------------|------------------|------------------|------------------|---|
| SVF Command Format: | 2B | C2 | <u><i>NN</i></u> | <u><i>PL</i></u> | <u><i>TM</i></u> | <u><i>BM</i></u> | <u><i>T₁...T_n</i></u> |
|---------------------|----|----|------------------|------------------|------------------|------------------|---|

NN

The **NN** byte of SVF is a count byte to define the total number of bytes that follow, including the count byte.

- X'00'** Invalid Parameter Error response. Vertical format controls are set to their default values.
- X'01'** Sets MPL to the MPL printer menu setting and other vertical format controls to their default values.
- Other** All other count values are valid; however, if the count is greater than $MPL + 4$, some tab settings must be repeated. If the count is greater than 131, bytes 132 through NN are ignored.

PL

Byte **PL** of SVF is the Maximum Page Length. It specifies the number of lines from the first print line of one page to the first print line of the next page, or the MPL.

- If byte PL is greater than 0, the MPL is equal to byte PL's value.
- If byte PL is 0, the MPL is set equal to 1.
- If byte PL is not present (in which case, the count byte, NN, is 01), the MPL is equal to the configuration setting value.

TM

Byte **TM** of SVF is the top margin byte. This value defines the first print line of the page. An SVF function followed by an FF function causes the printer to skip to the new top margin of the next page.

- If byte TM is greater than 0 and less than or equal to MPL, the top margin is equal to byte TM's value.
- If byte TM is 0, the top margin defaults to print line 1.
- If byte TM is not present (in which case, the count byte, NN, is less than 04), the top margin defaults to print line 1.
- If byte TM is greater than MPL, the printer sends an Invalid Parameter Error response to the host. Printing of the data stops, and all vertical format controls except MPL revert to their default values.

BM

Byte **BM** of SVF is the bottom margin byte. This value defines the last printable line of the page. When the current line value is more than BM, the print position moves to the top margin of the next page.

- If byte BM is greater than or equal to TM and less than or equal to MPL, the bottom margin is equal to byte BM's value.
- If byte BM is 0, the bottom margin is equal to MPL.
- If byte BM is not present (in which case, the count byte, NN, is less than 04), the bottom margin is equal to MPL.

- If byte BM is less than TM or greater than MPL, the printer sends an Invalid Parameter Error response to the host. Printing of the data stops, and all vertical format controls except MPL and TM revert to their default values.

T

Bytes $T_1...T_n$ of SVF are 127 vertical tab stop bytes. These values set line number values for both the Vertical Tab function and for the Vertical Channel Select function.

- Valid vertical tab stop values are the values from TM to BM.
- If an invalid vertical tab stop is specified, the printer sends an Invalid Parameter Error to the host. Processing of the data stops.
- Hex 00 is a valid tab stop value but sets no tabs.
- A channel value of hex 00 does not assign a line number to that channel.
- The TM value is also the first tab stop and the vertical channel 1 value.
- Vertical tab stop bytes T1 through T11 are used for vertical channels 2 through 12 and for vertical tab values.
- Vertical tab stop bytes T12 through Tn are used only for vertical tab values.

Notes:

1. The SVF control should be sent only when the printer is at a page boundary (that is, after an internal or data-stream-generated form feed and before any command is received that would change the current print position). If this control is sent at any other time, a form feed is generated.
2. To enhance compatibility with printers that do not have an unprintable border, PL values are accepted as if the unprintable border does not exist. This may cause data to overflow to an additional sheet. However, forms synchronization will be maintained. MPL is not validated based on actual physical page length.

Transparent (TRN)

| | | |
|----|----|---------|
| 35 | NN | xx...nn |
|----|----|---------|

Transparent indicates the start of a transparent data stream. A count byte (NN) defines the number of bytes of transparent data to follow, *not* including the count byte. Valid byte NN values are from hex 01 to hex 255.

Data within a transparent data stream is defined by the user. Therefore, the printer does not scan the data for SCS (SNA character string) control codes; the printer receives the complete field as data.

Note: If TRN data values are from hex 00 through hex 3F, or if TRN has a value of hex FF, it is printed as a hyphen (hex 60).

Vertical Channel Select (VCS)

| | |
|----|----|
| 04 | VS |
|----|----|

Vertical Channel Select moves the print position to a specific line as defined by the SVF function. Vertical channels are defined by the Top Margin value and the first 11 vertical tab settings that were set with the SVF function.

Channel 1 is always set to the TM value, even if no vertical tabs are set. (SCS) **227**

Note: Vertical page movement does not change the current horizontal print position.

Byte VS selects one of 12 channels for vertical positioning. The valid values for byte VS and their selections are shown in the following table.

| Byte VS | Selection |
|---------|---------------------|
| X'81' | Vertical Channel 1 |
| X'82' | Vertical Channel 2 |
| X'83' | Vertical Channel 3 |
| X'84' | Vertical Channel 4 |
| X'85' | Vertical Channel 5 |
| X'86' | Vertical Channel 6 |
| X'87' | Vertical Channel 7 |
| X'88' | Vertical Channel 8 |
| X'89' | Vertical Channel 9 |
| X'7A' | Vertical Channel 10 |
| X'7B' | Vertical Channel 11 |
| X'7C' | Vertical Channel 12 |

Other attributes of channel selection are:

- If no line stop values are assigned to a channel, a VOSS function for that channel defaults to an LF function.
- If the select channel function specifies the current line number or specifies a number that is less than the current line number, the print position moves to the specified line on the next page.
- If an invalid select value is received, the printer sends an Invalid Parameter Error response to the host.

Vertical Tab (VT)

0B

Vertical Tab moves the print position vertically from its current line number to the line value specified by the next higher vertical tab stop setting.

Note: VT does not change the current horizontal print position.

A VT function results in a Line Feed if:

- No vertical tab stops are set.
- The current line number is equal to or greater than the highest tab stop value.

A vertical tab at MPP + 1 moves the print position to MPP + 1 of the specified tab line.

A vertical tab at MPL or BM moves the print position to the top margin of the next page.

Chapter 19. Query Processing and Replies—DSC/DSE and LU-1 (SCS)

This chapter explains how the printer uses structured fields for query processing and replies.

DSC/DSE Query Processing

A DSC/DSE order requests the printer to process a Read Partition Query. The printer loads a structured field at the address specified by the Message Starting Address (MSA).

FM Header Processing—LU-1 (SCS) Mode

The Function Management (FM) header data stream order begins with an FM header. Data that follow are in structured fields.

The printer uses type 1, subset 0 FM headers. The FM header must begin the chain as follows:

| Byte 0 | Byte 1 | Byte 2 | Byte 3 | Byte 4 | Byte 5 |
|--------------------|------------------|------------------------------|---------------------------------------|-------------------------------------|----------------------|
| Length (Hex 06) | Type (Hex 01) | Medium Select (Hex 00) | Data Stream Profile (Hex 0B) | FM Header Properties (Hex 60) | Reserved (Hex 00) |

Byte Function

Byte 0

Specifies the FM header length (6 bytes)

Byte 1

Specifies type 1 and no concatenation

Byte 2

Specifies console medium select with logical address 0

Byte 3

Specifies data stream profile select (hex 0B), meaning that structured fields follow

Byte 4

Specifies begin/end destination select; no compression, no compaction

Byte 5

Reserved

If the FM header does not contain the information above, the printer returns an Invalid FM Header response to the host and printing stops.

Notes:

1. For LU-1 (SCS) printer-to-host structured fields, byte 3 of the FM header will be hex 8B, indicating an inbound transmission.
2. For IPDS processing, a subset 4 FM header is used. Byte 3 of the FM header will be hex 0D, indicating IPDS selection. For more information about IPDS processing, see "LU-1/IPDS Processing" on page 243.

Structured Fields

The printer uses structured fields to allow the host to save or restore print formats and request printer definition. These fields are either host-to-printer requests or printer-to-host replies.

The general format of a structured field is:

| Length | Type | Data |
|---------|-----------|-------------|
| 2 bytes | 1—3 bytes | If required |

- **Length** specifies the length of the structured field in bytes (including the *length* and *type* bytes). If Length equals 00, the structured field continues to the end of the chain.
- **Type** specifies the type of structured field. All values not shown are invalid and result in sending an Invalid Type Code response to the host.

The following tables summarize the type codes for structured fields.

DSC (Non-IPDS), DSE, and LU-1 (SCS) Processing

| Hex Value (Type) | Structured Field | Direction | Reference |
|------------------|-----------------------------|-----------------|--|
| 01FF02 | Read Partition Query | Host-to-Printer | “Read Partition Query Structured Field (Host-to-Printer)” on page 231 |
| 01FF03 | Read Partition Query | Host-to-Printer | “Read Partition Query List Structured Field (Host-to-Printer)” on page 231 |
| 81 | Query Reply | Printer to Host | “Query Reply Structured Fields (Printer-to-Host)” on page 232 |
| 10 | Save/Restore Formats | Bidirectional | “Save/Restore Formats Structured Field (Bidirectional)” on page 239 |
| 41 | SCS Data | Host-to-Printer | “SCS Data Structured Field (Host-to-Printer)” on page 240 |
| 0F84 | Set Printer Characteristics | Host-to-Printer | “Set Printer Characteristics Structured Field (Host-to-Printer)” on page 240 |

DSC (IPDS) Processing

| Hex Value (Type) | Structured Field | Direction | Reference |
|------------------|------------------------|----------------------|---|
| 0F21 | Data Chain (in DSC) | Host Unit to Printer | “Data Chain (In DSC) (Host-to-Printer)” on page 241 |
| 0F83 | Select IPDS Mode | Bidirectional | “Select IPDS Mode (Bidirectional)” on page 242 |
| ---- | IPDS Structured Fields | Bidirectional | IPDS sections of this book |

Note: For non-IPDS processing, the only valid structured fields in DSC/DSE mode are the Read Partition Query and the Query Reply.

Structured Fields for DSC (Non-IPDS), DSE, and LU-1 (SCS) Processing

This section describes the Read Partition Query, Read Partition Query List, and Query Reply Structured fields.

Read Partition Query Structured Field (Host-to-Printer)

| | | | |
|------|----|----|----|
| 0000 | 01 | FF | 02 |
|------|----|----|----|

Or

| | | | |
|------|----|----|----|
| 0005 | 01 | FF | 02 |
|------|----|----|----|

The Read Partition Query structured field provides a way for the host to determine the following characteristics of the printer: highlighting, character size, and buffer size. The Read Partition Query must be the only or last structured field in the chain and must have the following format.

| Byte | Hex Value | Meaning |
|------|--------------|-------------------------|
| 0, 1 | 0000 or 0005 | Structured Field Length |
| 2 | 01 | Type = Read Partition |
| 3 | FF | Query (Partition ID) |
| 4 | 02 | Code = Query |

Notes:

1. If byte 4 is not hex 02, a Function Not Supported response is returned to the host and the order is stopped.
2. An Invalid Control Code Parameter response is returned to the host if any of the following conditions occur:
 - Bytes 0 and 1 (length) do not contain hex 0000 or hex 0005.
 - Byte 3 does not contain hex FF.
 - The structured field is not the last field in the chain.

Read Partition Query List Structured Field (Host-to-Printer)

| | | | | | |
|------|----|----|----|----|---------|
| LLLL | 01 | FF | 03 | x0 | xx...xx |
|------|----|----|----|----|---------|

The Read Partition Query List structured field specifies which query reply the printer should return to the host. This reply must be the only or last structured field in the chain and must have the following format.

| Byte | Hex Value | Meaning |
|------|-----------|--|
| 0, 1 | LLLL | Structured Field Length |
| 2 | 01 | Type = Read Partition |
| 3 | FF | Query (Partition ID) |
| 4 | 03 | Code = Query List |
| 5 | — | Extend Request 00 = List Only 40 = Query Plus List 80 = All Query Replies All Other Codes Reserved |

| Byte | Hex Value | Meaning |
|------|-----------|--|
| 6-n | xx...xx | Q Codes of Requested Query Replies: 80 = Summary 81 = Usable Area 85 = Character Sets 86 = Color 87 = Highlight 92 = Save/Restore Formats (LU-1 mode only) 98 = Data Chaining (DSC mode only) 9A = 3270 IPDS (DSC mode only) A0 = Device Characteristics (LU-1 mode only) A2 = Data Streams (LU-1 mode only) A9 = Settable Printer Characteristics FF = Null (no listed Q codes are supported) |

Query Reply Structured Fields (Printer-to-Host)

The printer supports the following printer-to-host structured fields (Type X'81'):

- Summary Query Reply
- Usable Area Query Reply
- Character Set Query Reply
- Color Query Reply
- Highlight Query Reply
- Save/Restore Formats Query Reply (LU-1 mode only)
- Data Chaining Query Reply (DSC mode only)
- 3270 IPDS Query Reply (DSC mode only)
- Device Characteristics Query Reply (LU-1 mode only)
- Data Streams Query Reply (LU-1 mode only)
- Null Query Reply
- Settable Printer Characteristics Query Reply (DSC mode only)

The printer sends these structured fields to the host when the host sends a structured field query.

Summary Query Reply (DSC Mode):

| | | | |
|------|----|----|---------|
| 000C | 81 | 80 | xx...xx |
|------|----|----|---------|

The Summary query reply (DSC mode) provides a list of available printer replies and has the following format.

| Byte | Hex Value | Description |
|------|-----------|-------------------------|
| 0, 1 | 000A | Structured Field Length |
| 2 | 81 | Type = Query Reply |
| 3 | 80 | Summary Indicator |
| 4 | 80 | Summary Reply |
| 5 | 81 | Usable Area |
| 6 | 85 | Character Sets |
| 7 | 86 | Color Query Reply |
| 8 | 87 | Highlight |
| 9 | 98 | Data Chaining |

| Byte | Hex Value | Description |
|------|-----------|--|
| A | 9A | 3270 IPDS (Returned only if the IPDS feature is installed) |
| B | A9 | Settable Printer Characteristics |

Notes:

1. The printer sends bytes 0 through 3 to the host in the order shown and sends the remaining bytes in any order.
2. The Settable Printer Characteristics query reply is valid only in DSC mode. It is not used by the IBM 3174 Controller prior to microcode Release 3.

Summary Query Reply (DSE Mode):

| | | | |
|------|----|----|---------|
| 0009 | 81 | 80 | xx...xx |
|------|----|----|---------|

The Summary query reply (DSE Mode) provides a list of available printer replies and has the following format.

| Byte | Hex Value | Description |
|------|-----------|-------------------------|
| 0, 1 | 0009 | Structured Field Length |
| 2 | 81 | Type = Query Reply |
| 3 | 80 | Summary Indicator |
| 4 | 80 | Summary Reply |
| 5 | 81 | Usable Area |
| 6 | 85 | Character Sets |
| 7 | 86 | Color Query Reply |
| 8 | 87 | Highlight |

Note: The printer sends bytes 0 through 3 to the host in the order shown and sends the remaining bytes in any order.

Summary Query Reply (LU-1 Mode):

| | | | |
|------|----|----|---------|
| 000C | 81 | 80 | xx...xx |
|------|----|----|---------|

The Summary query reply (LU-1 Mode) provides a list of available printer replies and has the following format.

| Byte | Hex Value | Description |
|------|-----------|-------------------------|
| 0, 1 | 000C | Structured Field Length |
| 2 | 81 | Type = Query Reply |
| 3 | 80 | Summary Indicator |
| 4 | 80 | Summary Reply |
| 5 | 81 | Usable Area |
| 6 | 85 | Character Sets |
| 7 | 86 | Color Query Reply |
| 8 | 87 | Highlight |
| 9 | 92 | Save/Restore Formats |
| A | A0 | Device Characteristics |

| Byte | Hex Value | Description |
|------|-----------|--|
| B | A2 | Data Stream query supported (returned only if the IPDS feature is installed) |

Note: The printer sends bytes 0 through 3 to the host in the order shown and sends the remaining bytes in any order.

Usable Area Query Reply:

| | | | |
|------|----|----|---------|
| LLLL | 81 | 81 | xx...xx |
|------|----|----|---------|

The Usable Area query reply specifies the page and print character cell characteristics and has the following format.

| Byte | Hex Value | Description |
|--------|---------------------------|--|
| 0, 1 | LLLL | Structured Field Length (0015 for LU-1, 0017 for DSC/DSE) |
| 2 | 81 | Type = Query Reply |
| 3 | 81 | Usable Area Indicator |
| 4 | 5F (LU-1) 51 (DSC/DSE) | <ul style="list-style-type: none"> Extended Structure Field A Hard Copy Device No Explicit Partition Addressing Page Printer |
| 5 | 00 | <ul style="list-style-type: none"> Variable Cell Size Not Available Non-Matrix Characters |
| 6, 7 | XXXX | Usable Area Width (in cells) Width of print area × CPI |
| 8, 9 | XXXX | Usable Area Height (in cells) Length of print area × LPI |
| A–14 | 00 | Reserved |
| 15, 16 | 0FB0 | Buffer Size (DSC/DSE Only) |

Notes:

1. In DSC/DSE mode, bytes 6 and 7 and bytes 8 and 9 are not applicable and are 0.
2. Use of the printer bit 1 of byte 4 requires Release 3 or higher of the 3174 Controller microcode.

Character Set Query Reply:

| | | | |
|------|----|----|---------|
| 0013 | 81 | 85 | xx...xx |
|------|----|----|---------|

The Character Set query reply specifies the character sets available with the printer and has the following format.

| Byte | Hex Value | Description |
|------|-----------|--------------------------|
| 0, 1 | 0013 | Structured Field Length |
| 2 | 81 | Type = Query Reply |
| 3 | 85 | Character Sets Supported |
| 4 | 80 | Flags |
| 5 | 00 | Reserved |

| Byte | Hex Value | Description |
|------|-----------|---|
| 6 | 0A | Default Matrix Width (10 Slices) |
| 7 | 08 | Default Matrix Height (8 Rows) |
| 8–B | 06000000 | Format Types 5 and 6 |
| C | 03 | Character Set Descriptor Length, Bytes |
| D | 00 | Character Set ID: ROS “00” |
| E | 10 | <ul style="list-style-type: none"> • Non-loadable Character Set • Single Plane • 1-Byte Coded Character Set • No LCID Compare Allowed |
| F | 00 | LCID = None |
| 10 | 01 | Character Set ID: ROS 1 |
| 11 | 00 | <ul style="list-style-type: none"> • Non-loadable Character Set • Single Plane • 1-Byte Coded Character Set • LCID Compare Allowed |
| 12 | F1 | LCID = APL |

Color Query Reply:

| | | | |
|------|----|----|---------|
| 0016 | 81 | 86 | xx...xx |
|------|----|----|---------|

The Color query reply describes the color features of the printer for all modes, as follows.

| Byte | Hex Value | Description |
|--------|-----------|--|
| 0, 1 | 0016 | Structured Field Length |
| 2 | 81 | Type = Query Reply |
| 3 | 86 | Color Indicator |
| 4 | 40 | Monochrome |
| 5 | 08 | Length of Color Attribute List |
| 6, 7 | 00F7 | Color 1 Accepted Color Printed - Black |
| 8, 9 | F100 | Color 2 Accepted Color Printed - Black |
| A, B | F200 | Color 3 Accepted Color Printed - Black |
| C, D | F300 | Color 4 Accepted Color Printed - Black |
| E, F | F400 | Color 5 Accepted Color Printed - Black |
| 10, 11 | F500 | Color 6 Accepted Color Printed - Black |
| 12, 13 | F600 | Color 7 Accepted Color Printed - Black |
| 14, 15 | F700 | Color 8 Accepted Color Printed - Black |

Highlight Query Reply:

| | | | | |
|------|----|----|----|---------|
| 000D | 81 | 87 | 04 | xx...xx |
|------|----|----|----|---------|

The Highlight query reply specifies the highlighting options available at the printer (only underlining is available) and has the following format.

| Byte | Hex Value | Description |
|------|-----------|--|
| 0, 1 | 000D | Structured Field Length |
| 2 | 81 | Type = Query Reply |
| 3 | 87 | Highlight Indicator |
| 4 | 04 | Number of Highlight Options |
| 5, 6 | 00 F0 | First Highlight Option Attribute Value (Default) Highlight Option = Normal |
| 7, 8 | F1 00 | Second Highlight Option Attribute Value (Blink) Highlight Option = Normal |
| 9–A | F2 00 | Third Highlight Option Attribute Value (Reverse Video) Highlight Option = Normal |
| B, C | F4 F4 | Fourth Highlight Option Attribute Value (Underline) Highlight Option = Underline |

Note: Normal means printing with no highlighting.

Save/Restore Formats Query Reply:

| | | | |
|------|----|----|---------|
| 0006 | 81 | 92 | xx...xx |
|------|----|----|---------|

Note: The Save/Restore Formats query reply is valid only in LU-1 (SCS) mode.

The Save/Restore Formats query reply specifies the format parameter control block length and has the following format.

| Byte | Hex Value | Description |
|------|-----------|-------------------------|
| 0, 1 | 0006 | Structured Field Length |
| 2 | 81 | Type = Query Reply |
| 3 | 92 | Save/Restore Format |
| 4, 5 | 0058 | FPCB Length |

Data Chaining Query Reply:

| | | | | |
|------|----|----|----|----|
| 0006 | 81 | 98 | 80 | 00 |
|------|----|----|----|----|

The Data Chaining query reply indicates that data chaining is available on the printer in DSC mode. This reply is valid only in DSC mode. The format for this reply is:

| Byte | Hex Value | Description |
|------|-----------|-----------------------------|
| 0, 1 | 0006 | Structured Field Length |
| 2 | 81 | Type = Query Reply |
| 3 | 98 | Data Chaining Indicator |
| 4 | 80 | Direction (to Printer Only) |
| 5 | 00 | Flags (Reserved—Must Be 0) |

3270 IPDS Query Reply:

| | | | | |
|------|----|----|------|------|
| 0008 | 81 | 9A | 0000 | 0FB0 |
|------|----|----|------|------|

The 3270 IPDS query reply indicates that IPDS in DSC mode is available on the printer. This reply is valid only in DSC mode. The format for this reply is:

| Byte | Hex Value | Description |
|------|-----------|--|
| 0, 1 | 0008 | Structured Field Length |
| 2 | 81 | Type = Query Reply |
| 3 | 9A | 3270 IPDS Indicator |
| 4, 5 | 0000 | Flags (Reserved—Must Be 0) |
| 6, 7 | 0FB0 | Maximum Outbound Transmission Size Allowed |

Device Characteristics Query Reply:

| | | | |
|------|----|----|---------|
| 00LL | 81 | A0 | xx...xx |
|------|----|----|---------|

Note: The Device Characteristics query reply is valid only in LU-1 (SCS) mode.

The Device Characteristics query reply specifies the horizontal and vertical parameters of the printer's fixed-cell geometry. Horizontal parameters are valid combinations of CPI and MPP. Vertical parameters are combinations of points (1/72 inch) and MPL. The Device Characteristics query reply has the following format.

| Byte | Value | Description |
|--------------------------|-------|--|
| 0–1 | 00LL | Structured Field Length |
| 2 | 81 | Type = Query Reply |
| 3 | A0 | Device Characteristics Indicator |
| First Descriptor | | |
| | 000D | Length of first descriptor |
| | FF01 | Horizontal dimensional parameter Identifier |
| | 80 | SPD supported |
| | 0A84 | 10 CPI, MPP = 132 |
| | 0C9E | 12 CPI, MPP = 158 |
| | 0FC6 | 15 CPI, MPP = 198 |
| | 10DE | 16.67 CPI, MPP = 220 |
| | 11E1 | 17.1 CPI, MPP = 225 |
| Second Descriptor | | |
| | 000D | Length of second descriptor |
| | FF02 | Vertical dimension parameter |
| | 80 | SLD supported |
| | 0CFF | 6 LPI, MPL = FF (255) |
| | 09FF | 8 LPI, MPL = FF (255) |
| | 18FF | 3 LPI, MPL = FF (255) |
| | 12FF | 4 LPI, MPL = FF (255) Note: The values for MPP and MPL depend on the values of the configuration settings. |

| Byte | Value | Description |
|-------------------------|-------|------------------------------------|
| Third Descriptor | | |
| | 0016 | Length of third descriptor |
| | FF03 | Page Presentation Media Parameters |
| | 80 | Page Presentation Media supported |
| | 80 | Forms control parameter supported |
| | 05 | Number of discrete Forms Controls |
| | FF | Use Op Panel FC setting |
| | 00 | No change to FC setting |
| | 01 | Select FC= automatic paper |
| | 02 | Select FC= automatic envelope |
| | 03/04 | Select paper/envelope. |
| | C0 | Source drawer supported |
| | 05 | Number of source drawer parameters |
| | FF | Use op panel value for SD |
| | 00 | No change in SD selection |
| | 01 | Primary Drawer selected |
| | 02 | Secondary Drawer selected |
| | 03 | Auxiliary Drawer selected |
| | 00 | DDO not supported |
| | 00 | DD not supported |
| | 00 | Quality parameter not supported |
| | 00/80 | Duplex not supported/supported |

Data Streams Query Reply:

| | | | | |
|------|----|----|----|----|
| 0006 | 81 | A2 | 00 | 02 |
|------|----|----|----|----|

Note: The Data Streams query reply is valid only in LU-1 (SCS) mode.

The Data Streams query reply indicates that the printer supports data streams. This reply has the following format.

| Byte | Hex Value | Description |
|------|-----------|-------------------------|
| 0, 1 | 0006 | Structured Field Length |
| 2 | 81 | Type = Query Reply |
| 3 | A2 | Data Streams Indicator |
| 4 | 00 | SCS Data Stream |
| 5 | 02 | IPDS Data Stream |

Null Query Reply:

| | | |
|------|----|----|
| 0004 | 81 | FF |
|------|----|----|

The Null query reply responds to a query list structured field when nothing is specified in the query list. The Null query reply has the following format.

| Byte | Hex Value | Description |
|------|-----------|-------------------------|
| 0, 1 | 0004 | Structured field length |
| 2 | 81 | Type = Query Reply |
| 3 | FF | Null indicator |

Settable Printer Characteristics Query Reply:

| | | | |
|------|----|----|---------|
| 0009 | 81 | A9 | xx...xx |
|------|----|----|---------|

The Settable Printer Characteristics query reply indicates support of one or more printer functions or modes that can be set and reset by the Set Printer Characteristics structured field. The Settable Printer Characteristics query reply has the following format.

Note: The Settable Printer Characteristics query reply is valid only in DSC mode. It is not compatible with the IBM 3174 Controller prior to microcode Release 3.

| Byte | Hex Value | Description |
|------|---|--|
| 0, 1 | 0009 | Structured Field Length |
| 2 | 81 | Type = Query Reply |
| 3 | A9 | Settable Printer Characteristics Indicator |
| 4, 5 | 0000 | Reserved—Must Be 0 |
| 6 | 03 | Parameter Length |
| 7 | 01 | Early Print Complete (EPC) |
| 8 | Bits 0, 1: 01 10 Bits 2–7: 000000 | Printer Operator Control (POC) POC, EPC off POC, EPC on Reserved—Must Be 0 |

Save/Restore Formats Structured Field (Bidirectional)

This section describes the Save Restore Formats and the SCS Data structured fields.

| | | | | |
|------|----|----|----|------|
| LLLL | 10 | 34 | x0 | Data |
|------|----|----|----|------|

Note: The Save/Restore Formats structured field is valid only in LU-1 (SCS) mode.

The Save/Restore Formats structured field provides a way to save and restore a Format Parameter Control Block (FPCB) either locally (at the printer) or remotely. The Save/Restore Formats structured field must be the only or last structured field in the chain and must have the following format.

| Byte | Hex Value | Meaning |
|------|-----------|-------------------------|
| 0, 1 | LLLL | Structured Field Length |
| 2 | 10 | Type = Save/Restore |
| 3 | 34 | Format ID |

| Byte | Hex Value | Meaning |
|------|-----------|---|
| 4 | — | Flag Byte 00 = Save FPCB Locally at the Printer 40 = Save FPCB Remotely 80 = Restore FPCB Locally from the Printer C0 = Restore FPCB Remotely All Other Codes Reserved |
| 5–n | — | FPCB Contents to Remote Save/Restore |

Note: When the printer receives a remote Save Structured Field, it responds with another remote Save Structured Field that contains the FPCB contents. In a remote restore, the contents of the returned bytes (5 through n) must be equal to the contents of the saved bytes. Otherwise, unpredictable results will occur.

SCS Data Structured Field (Host-to-Printer)

| | | | |
|------|----|----|------|
| LLLL | 41 | 00 | Data |
|------|----|----|------|

The SCS Data structured field allows you to combine SCS data with other structured fields in the same chain. The format is as follows:

| Byte | Hex Value | Meaning |
|------|-----------|-------------------------|
| 0, 1 | LLLL | Structured Field Length |
| 2 | 41 | Type = SCS Data |
| 3 | 00 | Partition ID |
| 4–n | Data | SCS Data Stream |

Set Printer Characteristics Structured Field (Host-to-Printer)

| | | | | | | |
|------|------|----|----|----|----|----|
| 00LL | 0F84 | xx | 00 | 03 | 01 | xx |
|------|------|----|----|----|----|----|

Note: The Set Printer Characteristics structured field is valid only in DSC mode. It is not compatible with the IBM 3174 Controller prior to microcode Release 3.

The Set Printer Characteristics structured field controls the setting and resetting of certain functions and modes. This structured field consists of a base part (bytes 0–5) that is normally followed by one or more self-defining parameters. Of these parameters, early print complete (EPC) is the only one available for your printer. The format of the Set Printer Characteristics structured field is as follows:

| Byte | Hex Value | Description |
|------|-----------|--|
| 0, 1 | 00LL | Structured Field Length If 0–5 → 0006 With self-defining parameters → 0009 |
| 2, 3 | 0F84 | Set Printer Characteristics Structured Field Indicator |
| 4 | 00 01 | Reset All Characteristics (RSTALL) Flag Off (no reset) On (reset) |
| 5 | 00 | Reserved—Must be 0 |
| 6 | 03 | EPC Self-defining Parameter Length |
| 7 | 01 | EPC Self-defining Parameter Indicator |

| Byte | Hex Value | Description |
|------|-----------|--|
| 8 | 00 | Set/Reset EPC (SREPC) Enable operator control |
| | 40 | EPC off, disable operator control |
| | 80 | EPC on, disable operator control |
| | C0 | Reserved |

Previously sent Set Printer Characteristics structured fields can be reset without setting new ones by sending bytes 0–5 without any self-defining parameters (RSTALL=On). If only the base part is received and RSTALL=Off, no action is taken.

EPC Parameter: The EPC parameter is used to set EPC mode on or off. It allows the Early Print Complete Response Timing configuration setting to be enabled or disabled from one of the screens of the **Coax Setup Menu** of the printer operator panel. The factory default for this configuration setting is enabled (set to YES).

Note: This structured field does not take effect until the EPC configuration setting is changed in the **Coax Setup Menu**.

DSC (IPDS) Processing

In the DSC environment, IPDS mode is contained within the 3270 data stream mode of operation. These two modes are mutually exclusive. The printer rejects the 3270 data stream commands while in IPDS mode. In addition, the printer attempts to interpret the commands in the received data stream in accordance with the current printer mode. This can lead to unpredictable results if the data stream and the structured fields do not match.

DSC Load Structured Fields define parameters for IPDS operations. The three types of valid structured fields are:

- Data Chain (In DSC)
- Select IPDS Mode
- IPDS structured fields

Each of these structured fields is explained below.

Data Chain (In DSC) (Host-to-Printer)

| | | |
|------|------|----|
| 0006 | 0F21 | 00 |
|------|------|----|

The Data Chain structured field allows a block of structured fields to be broken up into a number of transmissions. The division can be made without consideration for structured field boundaries or splitting control functions. A Data Chain structured field starts each transmission. The format of the Data Chain structured field is as follows:

| Byte | Hex Value | Description |
|------|-----------|-------------------------|
| 0, 1 | 0006 | Structured Field Length |
| 2, 3 | 0F21 | Data Chain Indicator |

| Byte | Hex Value | Description |
|------|-----------|--|
| 4 | Bit 0 | Reserved |
| | Bits 1, 2 | Group (see descriptions below) 00 = Continue 01 = End 10 = Begin 11 = Only |
| | Bits 3, 4 | Inbound Control Always 00 (No change) Inbound Data Chaining is not valid |
| | Bits 5–7 | Reserved—Must be 0 |
| 5 | 00 | Reserved—Must be 0 |

Continue Data Chaining: The transmissions following the first transmission contain a group parameter value of hex 00 - Continue. One or more IPDS structured fields follow the continue data chain field for each transmission until the last transmission.

End Data Chaining: The last transmission in the data chain contains a group parameter value of hex 20 - End. This indicates that the following group of IPDS structured fields is the last group of structured fields for this chain.

Begin Data Chaining: The first data chain structured field has a group parameter value of hex 40 - Begin. The field immediately after the begin data chain field is the Set IPDS structured field, which selects IPDS mode. One or more IPDS structured fields follow the Set IPDS field.

Only Data Chaining: If the group parameter value equals hex 60, this data chain is a single chain. The field immediately after the data chain field must be a Set IPDS structured field. Following the Set IPDS field is one or more IPDS structured fields.

Note: End Data Chaining and Only Data Chaining reset IPDS mode.

Select IPDS Mode (Bidirectional)

| | | |
|------|------|------|
| 0006 | 0F83 | 0000 |
|------|------|------|

In DSC mode, a Select IPDS Mode structured field causes the printer to switch from 3270 data stream to IPDS processing. If used with the Data Chaining In DSC structured field, the Select IPDS Mode field must immediately follow the Data Chaining field. If the Data Chain structured field is not used, the Select IPDS Mode structured field must be the first structured field in the transmission. This field is both inbound and outbound. The Select IPDS Mode structured field has the following format.

| Byte | Hex Value | Description |
|------|-----------|----------------------------|
| 0, 1 | 0006 | Structured Field Length |
| 2, 3 | 0F83 | Select IPDS Mode Indicator |
| 4, 5 | 0000 | Reserved—Must be 0 |

Note: The Select IPDS Mode command without chaining is treated as an only-in-chain field.

IPDS Structured Fields (Bidirectional)

IPDS structured fields contain the information for processing data in an IPDS environment. For more information about IPDS structured fields, refer to other sections of this book.

LU-1/IPDS Processing

The printer uses type 1, subset 0 FM headers for SCS data stream processing. However, IPDS uses type 1, subset 4 FM header. The format of the IPDS FM header is:

| Byte 0 | Byte 1 | Byte 2 | Byte 3 | Byte 4 | Byte 5 |
|--------------------|------------------|------------------------------|---------------------------------------|-------------------------------------|----------------------|
| Length (Hex 06) | Type (Hex 01) | Medium Select (Hex 30) | Data Stream Profile (Hex 0D) | FM Header Properties (Hex xx) | Reserved (Hex 00) |

| Byte | Function |
|------|----------|
|------|----------|

| | |
|---------------|--|
| Byte 0 | Specifies the FM header length (6 bytes) |
|---------------|--|

| | |
|---------------|---------------------------------------|
| Byte 1 | Specifies type 1 and no concatenation |
|---------------|---------------------------------------|

| | |
|---------------|--|
| Byte 2 | Specifies medium select with logical address 0 |
|---------------|--|

| | |
|---------------|---|
| Byte 3 | Specifies data stream profile select (hex 0D), meaning Set or Reset IPDS mode |
|---------------|---|

| | |
|---------------|---|
| Byte 4 | Specifies begin/end destination select: |
|---------------|---|

| | |
|---------------|------------|
| Hex 40 | Begin IPDS |
|---------------|------------|

| | |
|---------------|----------|
| Hex 20 | End IPDS |
|---------------|----------|

| | |
|---------------|-----------|
| Byte 5 | Reserved. |
|---------------|-----------|

The first FM header contains byte 4 with a value of hex 40, indicating the start of IPDS. This header is sent as only-in-chain (OIC) with no data. IPDS data then follows in one or more chains. The last FM header contains byte 4 with a value of hex 20, indicating the end of IPDS. This header is also sent as only-in-chain with no other data. The structured fields that the printer receives between the begin and end IPDS FM headers contain the IPDS commands.

LU-1 Error Summary

The following tables summarize LU-1 errors. They show:

- The error conditions detected by the printer
- The results of each error condition
- The sense-byte codes returned to the application program
- References to information in this book about each error condition.

Function Not Available: Sense-Byte Code Hex 0863

| Cause | Result | Explained In: |
|--------------------------|-----------------|----------------------------------|
| Illegal SA LCID selected | Stops the order | "Set Attribute (SA)" on page 220 |

Function Not Available: Sense-Byte Code Hex 1003

| Cause | Result | Explained In: |
|-------------------------------|--|---|
| Invalid SA byte | Stops the order | “Set Attribute (SA)” on page 220 |
| Invalid SA value | Stops the order | “Set Attribute (SA)” on page 220 |
| Invalid LU-1 control code | Terminates the order if the extended-order-parameter-valid bit is on in the print-order parameter byte and if the stop-on-error flag is on; otherwise, a hyphen prints and printing continues. | “LU-1 (SCS) Control Codes (Non-IPDS)” on page 214 |
| Invalid SF type | Stops the order | “Structured Fields” on page 230 |
| Invalid Query Code field | Stops the order | “Read Partition Query Structured Field (Host-to-Printer)” on page 231 |
| Invalid PARMS value | Stops the order | “Structured Fields” on page 230 |
| FM Header Reserved bits not 0 | Stops the order | “FM Header Processing—LU-1 (SCS) Mode” on page 229 |

Invalid Parameter: Sense-Byte Code Hex 1005

| Cause | Result | Explained In: |
|------------------------------|-----------------|---|
| LM > MPP | Stops the order | “Left Margin” on page 222 |
| RM < LM | Stops the order | “Right Margin (RM)” on page 222 |
| RM > MPP | Stops the order | “Right Margin (RM)” on page 222 |
| TAB < LM | Stops the order | “Horizontal Tab Stop (T ₁ ...T _n)” on page 222 |
| TAB > MPP | Stops the order | “Horizontal Tab Stop (T ₁ ...T _n)” on page 222 |
| TAB < TM | Stops the order | “Set Vertical Format (SVF)” on page 225 |
| TAB > BM | Stops the order | “Set Vertical Format (SVF)” on page 225 |
| BM > MPL | Stops the order | “Set Vertical Format (SVF)” on page 225 |
| BM < TM | Stops the order | “Set Vertical Format (SVF)” on page 225 |
| TM > MPL | Stops the order | “Set Vertical Format (SVF)” on page 225 |
| SHF Count = 0 | Stops the order | “Count” on page 221 |
| SVF Count = 0 | Stops the order | “Set Vertical Format (SVF)” on page 225 |
| SLD Count = 0 | Stops the order | “Set Line Density (SLD)” on page 223 |
| SLD Count > 2 | Stops the order | “Set Line Density (SLD)” on page 223 |
| Invalid SLD parameter | Stops the order | “Set Line Density (SLD)” on page 223 |
| Invalid channel select value | Stops the order | “Vertical Channel Select (VCS)” on page 227 |

| Cause | Result | Explained In: |
|---|-----------------|---------------------------------|
| Query or Save/Restore SF not "Only-in-Chain" or "Last-in-Chain" | Stops the order | "Structured Fields" on page 230 |
| Invalid SF length | Stops the order | "Structured Fields" on page 230 |
| Invalid SF extend length | Stops the order | "Structured Fields" on page 230 |
| Invalid SF partition ID | Stops the order | "Structured Fields" on page 230 |

Invalid FM Header: Sense-Byte Code Hex 1008

See "FM Header Processing—LU-1 (SCS) Mode" on page 229.

Chapter 20. Summary of IPDS for 3270-Family Controllers/Adapters

This chapter summarizes the LU-1 (SCS) and DSC requirements for IPDS communications between the IPDS printer and the:

- 3174 Controller
- 9221 ES/9000 Processor Workstation Subsystem Controller
- 9370 Information System, Workstation Subsystem Controller
- 9371 using the 3270 Adapter
- PS/2 with Micro Channel (R) PSA Card
- i-data 7913-03 and 7914-04 LAN Attachment (Requires RPQ 8B4311 or 8B4312 and Feature 4140 or 4170)

Copy Controls

The following three operations can send print data to the printer and start a print operation:

- **Host-directed copy.** The host sends print data directly to the printer and directs a print operation.
- **Host-initiated local copy.** The host prints information displayed on a terminal.
- **Operator-initiated local copy.** The display-station operator prints information displayed on a terminal.

Communication Methods

The IBM 3270-family controllers and adapters communicate with the printer in one of the communication modes shown in Figure 14 on page 248 and summarized as follows:

Non-IPDS Modes:

- DSE, LU-3 (3270 data stream)–SNA
- SCS, LU-1–SNA
- DSC, LU-0 (3270 data stream)–Non-SNA

IPDS Modes:

- LU-1–SNA
- DSC, LU-0–Non-SNA

While in LU-0 (DSC) mode or LU-1 mode, the printer can use the IPDS command structure. This structure gives the printer additional printing capabilities, such as:

- Graphics
- Font and character-set selection
- Bar code generation
- Page layout
- Stored images, overlays, and retained segments

Figure 14 shows connections for 3270-family controllers and adapters. For PS/2 and RISC/6000 connections, refer to the documentation for those systems.

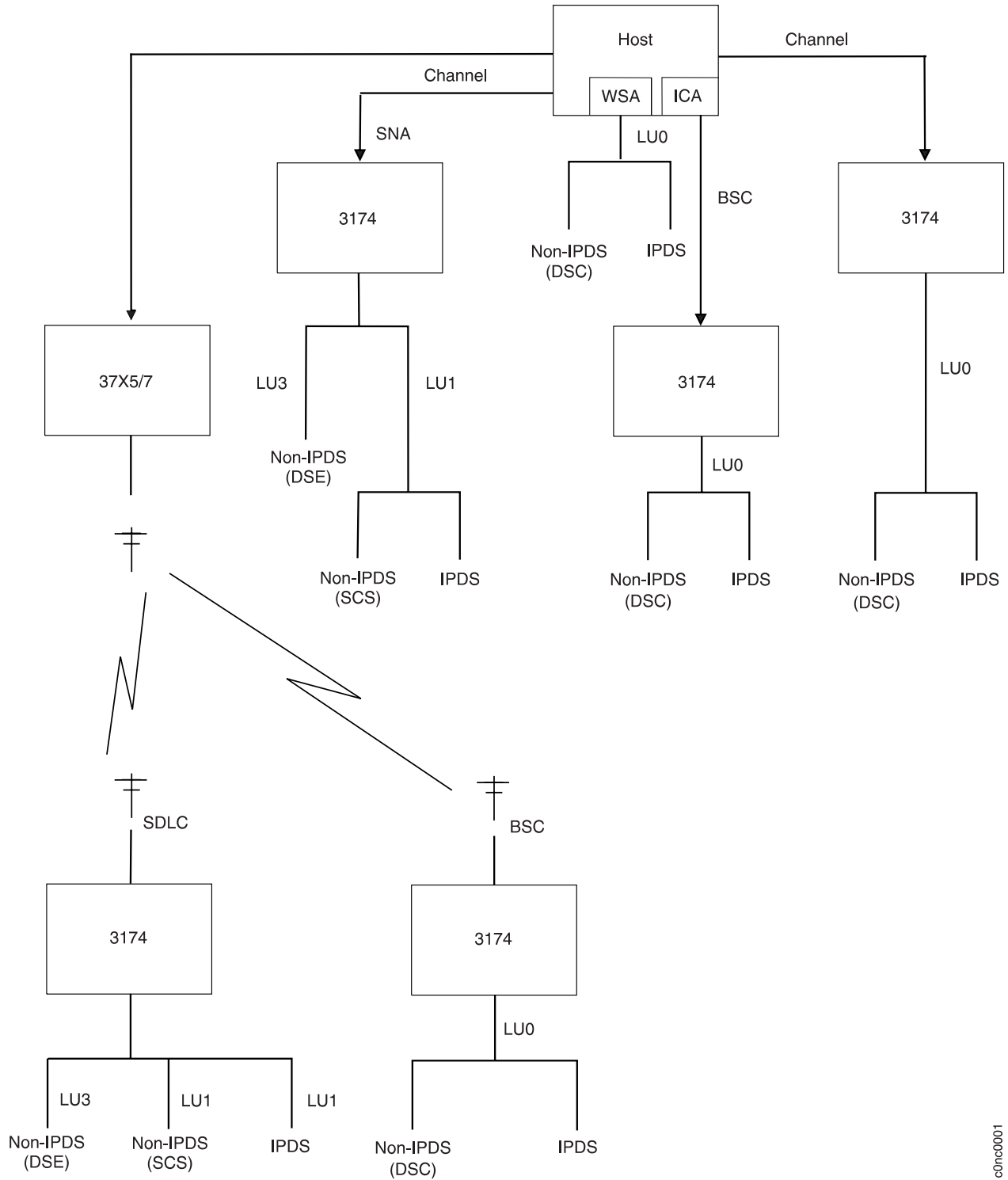


Figure 14. Communication Methods Structure

c0nc0001

System Attachment

The printer can operate with both SNA and non-SNA control units. For SNA control units, IPDS is only valid in LU-1 mode. For non-SNA control units, IPDS is only valid in DSC mode.

For SNA (LU-1), the communication protocols with host/control unit are:

- Channel-attachment
- Synchronous Data Link Control (SDLC)-attachment

For Non-SNA (DSC), the communication protocols with host/control unit are:

- Channel-attachment
- Binary Synchronous Communications (BSC)-attachment

Data Stream Summary

The following additions to LU-1 and DSC data streams are necessary for operation with IPDS printers.

LU-1 Mode

FM Header Type 1, subset 4.

This header contains a new data stream profile (DSP) code. A DSP code of hexadecimal D selects IPDS mode of operation.

Data Stream Query Reply structured field.

This query reply indicates the valid data streams for the printer. A new data stream indicator code X'02' indicates that IPDS is valid in LU-1 mode.

DSC Mode

Data Chain structured field.

This new structured field (0F21) defines the data chaining function.

Select IPDS Mode structured field.

This new structured field (0F83) defines the selection of IPDS mode.

Data Chaining Query Reply structured field.

This new query reply structured field (with a Q code of 98) indicates that data chaining is valid in DSC mode.

3270 IPDS Query Reply structured field.

This new query reply structured field (with a Q code of 9A) indicates that IPDS is valid in DSC mode. In addition, this query reply also specifies the maximum outbound transmission size allowed.

IPDS Application in LU-1 Mode

During an LU-1 session, an application program can switch the printer from the SCS data stream to IPDS. The IPDS data stream is carried in the IPDS structured fields and, like SCS data, is processed entirely by the printer.

Determining IPDS Capability

An application can determine the IPDS capability of a printer operating in LU-1 mode by issuing a Read Partition query or a Read Partition Query List structured field. The query list, if used, should contain a Q code of X'A2' (data streams).

The printer returns a Data Stream query reply structured field containing a data stream identifier indicating IPDS (X'02'). This IPDS identifier is in addition to (and following) the base data stream identifier of SCS (X'00').

Both the Read Partition query (or query list) structured field and the query reply structured field are sent in a chain that begins with an FMH header of Type 1. This header contains a destination select (DESSEL) of Begin/End [DESSEL=begin destination select (BDS)] along with a data stream profile (DSP) of Structured Fields (DSP=SF).

An FMH-1 that precedes a Read Partition query or query list has the following format:

```
0601000B6000
```

An FMH-1 that precedes a query reply has the following format:

```
0601008B6000
```

Inbound Structured Fields

When the printer is in LU-1 mode with SCS (extended) data stream, the query reply and the restore are the only structured fields sent inbound. These fields are preceded with an FMH.

When the printer is in LU-1 mode with IPDS, an IPDS acknowledge reply is the only structured field sent inbound. This field, which the printer sends without an FMH, can be an IPDS ACK/NACK.

It is also possible for the control unit to receive a solicited or an unsolicited acknowledgement (ACK/NACK) response from the printer when in LU-1 IPDS mode. When a NACK occurs, the information must be received after a Change Direction to allow data to flow inbound to the host.

Selecting and Terminating IPDS Mode

An application can select IPDS mode by sending an FMH-1 containing a destination select of Begin (DESSEL=BDS) along with a data stream profile of IPDS (DSP=IPDS). This FMH-1 must be sent as Only-in-Chain and cannot have any accompanying data. An FMH-1 that selects IPDS mode has the following format:

```
0601300D4000
```

After IPDS mode is selected, IPDS structured fields, in single or multi-element chains, must not have the FMH-1.

To terminate IPDS mode, an application sends an FMH-1 containing a destination select of End (DESSEL=EDS) along with a data stream profile of IPDS (DSP=IPDS). This FMH-1 must be sent as OIC and cannot have any accompanying data. An FMH-1 that terminates IPDS mode has the following format:

```
0601300D2000
```

Terminating IPDS mode causes LU-1 to return to its default data stream (SCS).

BIND

The BIND sent to establish an LU-1 session on which IPDS is used must indicate FM Headers Allowed (byte 6, bit 1=1).

End Bracket

If End Bracket (EB) is used with an FM data chain containing IPDS structured fields, IPDS mode is implicitly terminated following the processing of last-in-chain. This results in the loss of printer-generated IPDS ACK/NACKs occurring at last-in-chain.

To avoid this loss, do not use EB to terminate IPDS mode. Instead, use an FMH-1 containing DESSEL=EDS, DSP=IPDS. If you also want to terminate the bracket, EB may be used on the chain carrying the FMH-1. Figure 15 on page 252 shows the LU-1 data stream modes.

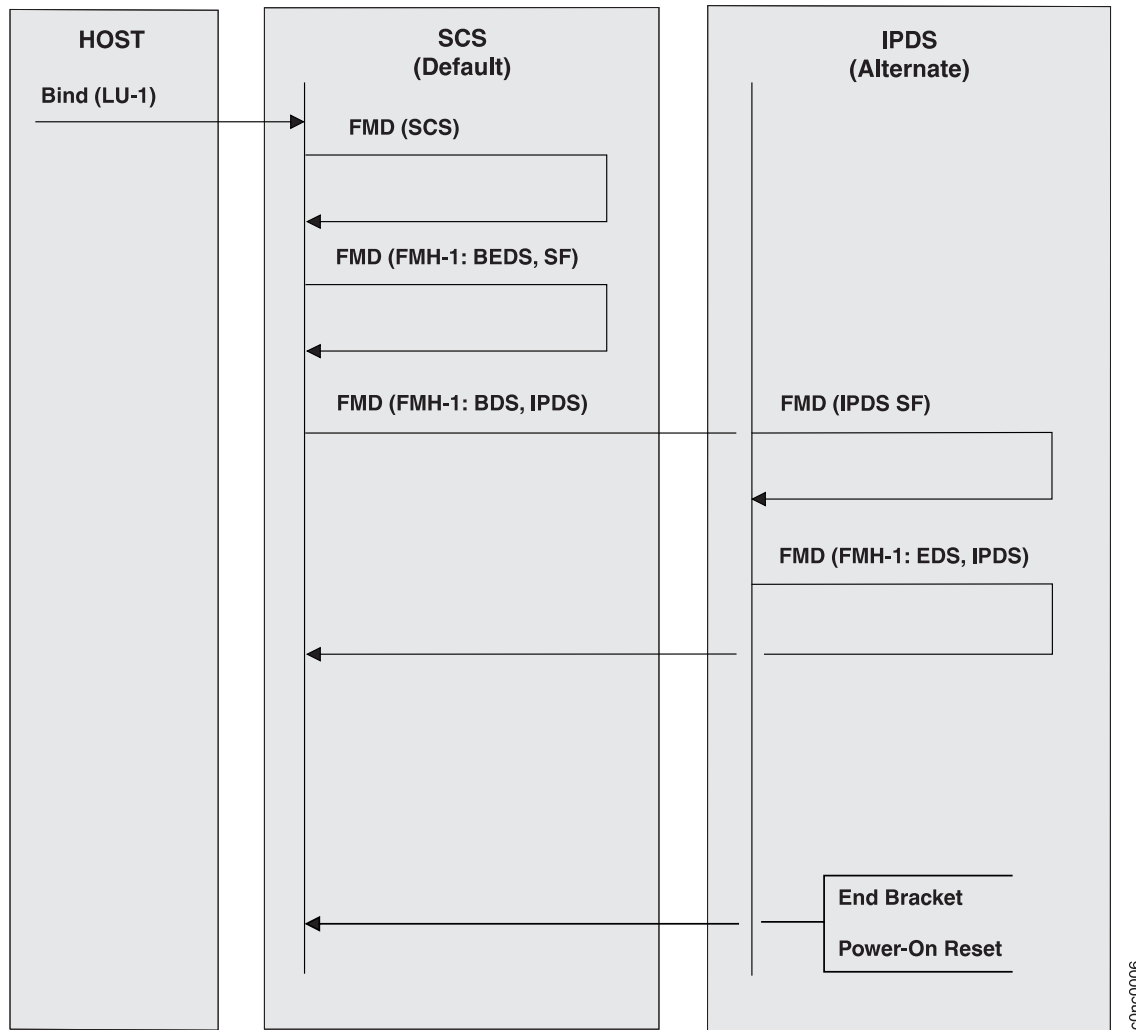


Figure 15. LU-1 Data Stream Modes

Implicit Termination of LU-1/IPDS Mode

If LU-1/IPDS mode is active, any of the following terminates the active destination selection and is an implicit termination of LU-1/IPDS mode:

- End bracket
- Power-On Reset

Note: IPDS always returns to home state upon termination.

IPDS and Local Screen Copy

An IPDS print job consisting of multiple chains is momentarily interrupted by an Operator-Initiated Local Screen Copy (OILC).

You can avoid this situation by sending the IPDS job as a single chain, effectively blocking the OILC until printing is complete. A single chain also improves printer performance.

Since an EB is also an implicit termination of IPDS mode, with-bracket printer-sharing can be used for either operator-initiated or host-initiated copy operations.

Error Recovery in LU-1 IPDS Mode

The unit of error recovery for a spooled device is the entire print job. The unit of error recovery is a page boundary if the printer, while directly attached, receives one of the following:

- OIC data
- A page of data by a sequence of begin, middle, and end chains

A SNA chain is not a unit of error recovery.

To ensure completion of all deferred printing, a complete chain of IPDS structured fields should end in home state. The printer forces IPDS into home state, if necessary, to force deferred printing to occur when IPDS terminates.

IPDS ACK/NACK Sequence in LU-1 Mode

Under certain conditions, the printer can have inbound data to send to the host. This can be because of an Acknowledgement Request condition on the prior outbound transmission, or because of an error condition to be reported with a NACK.

When the printer is in LU-1 mode with IPDS and the printer has inbound data to send, the following sequence occurs:

1. The printer returns Order Complete to the control unit.
2. The printer also returns Input Code Available status with either of the following:
 - Input code X'50' (attention)
 - Input code X'6F' (ACK/NACK data available)
3. The control unit, upon receiving a code X'50', will send a Signal command to the host to get direction if it does not already have it. When the control unit has the direction, it will send a System Status Available (SSA) order to the printer, placing the printer in send state. The printer then includes Input Code Available (X'6F') in the buffer to indicate ACK/NACK data available. If the printer is already in send state, the attention sequence is not performed.
4. When the control unit receives input code X'6F', it reads the inbound ACK/NACK data. This inbound data is not preceded by an inbound FMH structured field.

Figure 16 on page 254 shows the IPDS error-reporting sequence in LU-1 mode.

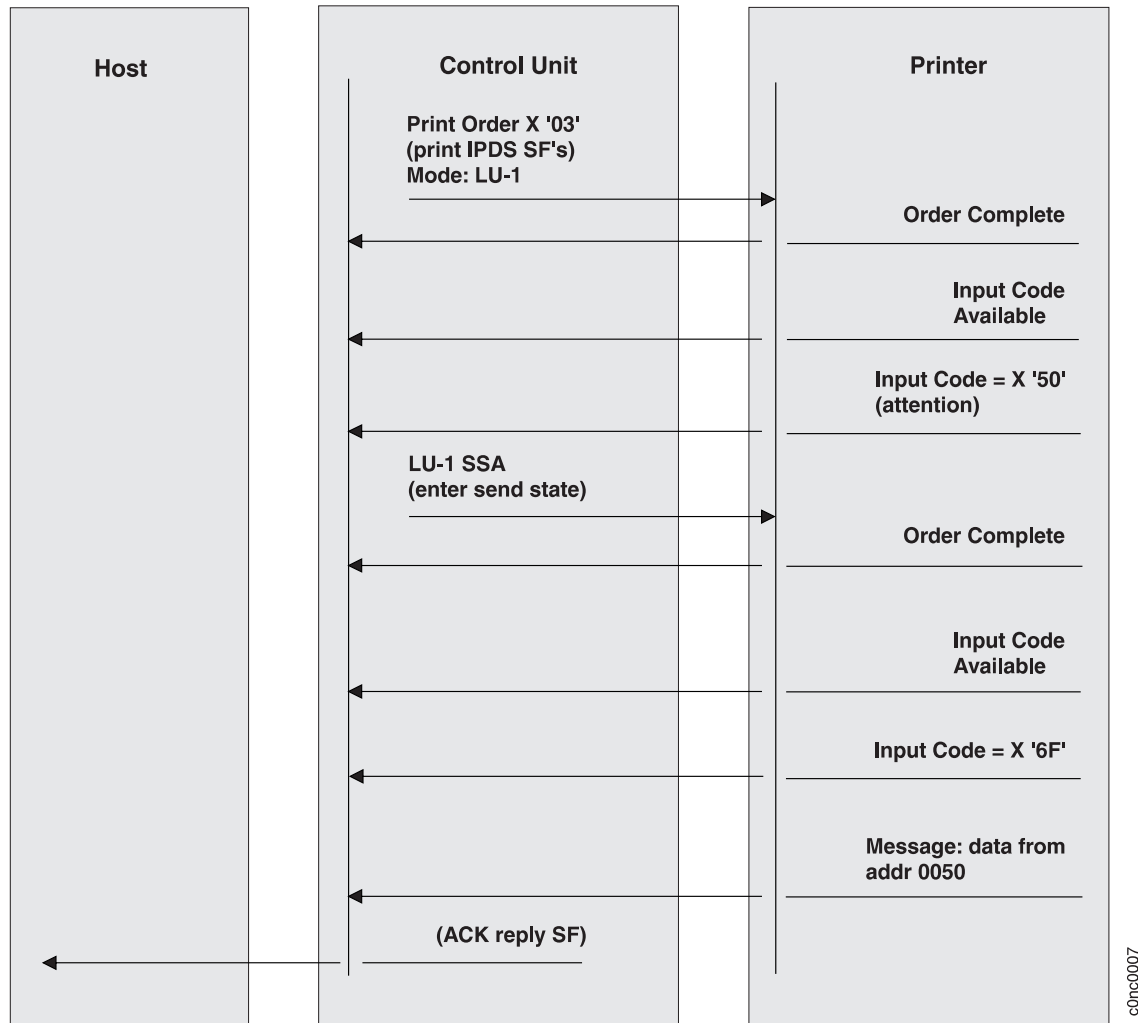


Figure 16. Reporting IPDS Errors Using the ACK in LU-1 Mode

IPDS Application in DSC Mode

An application program can switch the printer from the 3270 data stream to IPDS during a DSC session. The IPDS data stream is carried in the IPDS structured fields and is processed entirely by the printer. This differs from the 3270 data stream, which processes the data in the control unit before sending it to the printer.

Determining IPDS Capability

An application can determine the IPDS and data-chain capability of a printer operating in DSC mode by issuing a Read Partition query or a Read Partition Query List structured field. The query list, if used, should contain a Q code of X'9A' (3270 IPDS) and a Q code of X'98' (data chaining).

The printer returns a 3270 IPDS query reply and a data-chaining query reply.

In DSC mode, all outbound data streams containing structured fields are sent using the Write Structured Field (WSF) command. All inbound data streams containing structured fields begin with the attention identifier (AID) code of X'88'.

Inbound Structured Fields

When the printer is in DSC mode with the 3270 data stream, the query reply is the only structured field sent inbound.

When the printer is in DSC mode with IPDS, Select IPDS Mode (SIM) and IPDS Acknowledge Reply are the only structured fields sent inbound. The printer can send a SIM structured field inbound only if it has previously received an outbound IPDS structured field and a reply is required with the Acknowledge Reply structured field. This field can be an IPDS ACK/NACK.

Selecting and Terminating IPDS Mode

An application can select IPDS mode by sending a SIM structured field (X'0F83') at the beginning of each transmission containing IPDS structured fields. If the application is using data chaining, the SIM structured field must follow in the same transmission. A SIM structured field must not be sent with a continue or end chain.

IPDS mode terminates at the end of the transmission containing the SIM structured field unless data chaining is in effect.

IPDS mode remains in effect until the end of a transmission containing a Data Chain structured field that indicates End is received.

When IPDS mode terminates, the application returns to the base data stream (3270).

Note: For channel-attached control units, a transmission is defined as the data transferred by a WSF command (that is, a channel control word [CCW]).

Figure 17 on page 256 shows the DSC data stream modes.

Abnormal Termination of Printer Operation

Any of the following causes rejection of the transmission with sense = 0p Check and causes the control unit to send an End to the addressed printer:

- Receipt of a Data Chain structured field indicating Continue or End when not in chain state
- Receipt of a Data Chain structured field indicating Begin when already in chain state
- Receipt of any 3270 command when in chain state except Write Structured Field, Erase Write (WCC=Reset), or Erase Write Alternate (WCC=Reset)
- Receipt of a WSF command that does not contain a Data Chain structured field.

Copy Considerations

If a BSC Copy command is received when in IPDS mode, IPDS mode terminates and the BSC Copy operation occurs.

The printer is not available for operator-initiated copy operation when in IPDS mode. An OILC momentarily interrupts an IPDS print job consisting of multiple chains. Avoid this situation by sending the IPDS job as a single chain, effectively blocking the OILC until printing is complete. A single chain may also improve printer performance.

Chaining and Error Recovery in 3270 IPDS Mode

A chain is a unit of error recovery. At the end of the chain, the printer delays sending Operation-Complete to the control unit until all the received data prints.

To ensure that all deferred printing completes, a chain of IPDS structured fields should end in home state. The printer forces IPDS into home state, if necessary, to force deferred printing to occur when a chain terminates.

If chaining is not used, each transmission should end in home state. If necessary, the printer forces entry into home state.

IPDS ACK/NACK Sequence in DSC Mode

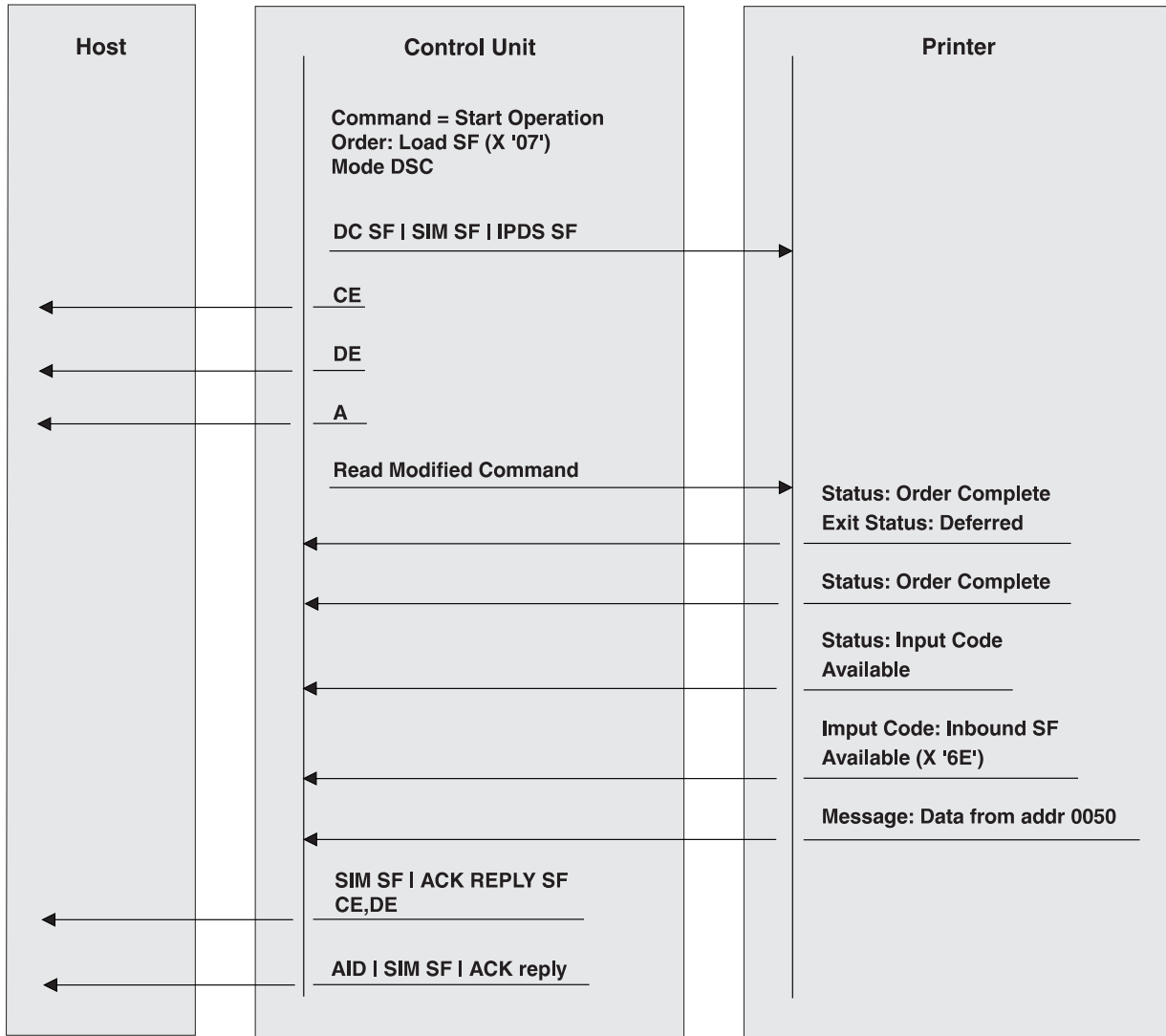
Under certain conditions, the printer can have inbound data to send to the control unit. This can be either because of an Acknowledgement Request condition on the prior outbound transmission or because of an error condition to be reported with a NACK.

When the printer is in DSC mode with IPDS and has inbound data to send, the following sequence occurs:

1. The printer returns Order Complete to the control unit.
2. The printer also returns Input Code Available status with a code of X'6E' (ACK/NACK data in buffer).
3. The control unit, upon receiving a X'6E', reads the inbound ACK/NACK data. This data is preceded by a Select IPDS Mode structured field (X'00060F8300').

Figure 18 on page 258 and Figure 19 on page 259 show the IPDS error-reporting sequence in 3270 mode.

Channel-Attached Control Unit



c0nc0009

Figure 18. Reporting Errors Using the ACK SF in 3270 Mode

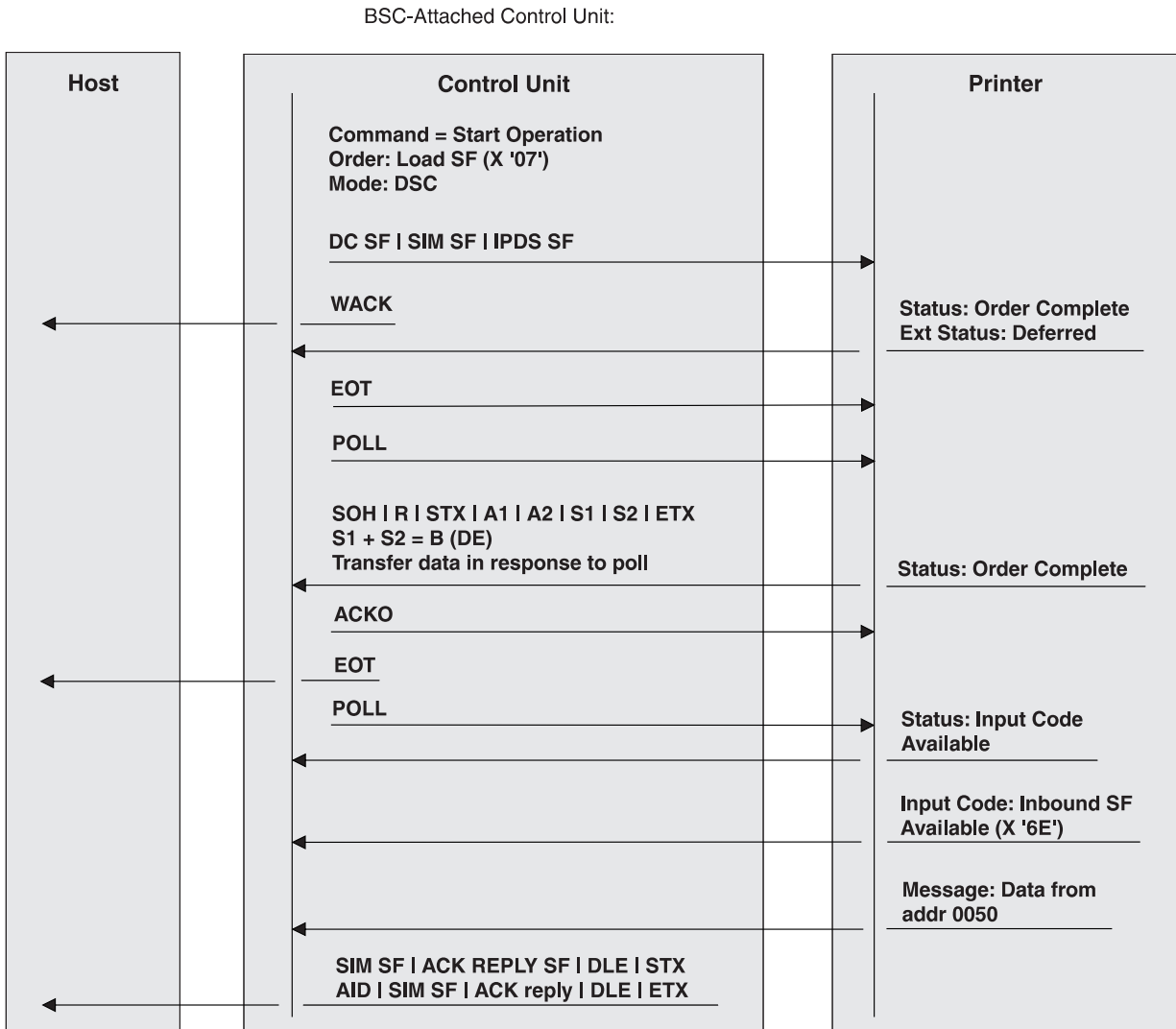


Figure 19. Reporting Errors Using the ACK SF in 3270 Mode

Not-in-Chain

Following the inbound transmission of an IPDS ACK/NACK at data chain end or data chain only (or implied only), a host acknowledgement is required to free the printer for local copy (if so configured).

Valid host acknowledgments are the same as those allowed for inbound transmission of a Query Reply. Examples of valid acknowledgments are an EW or EWA (with or without a WCC) or a WSF (with or without structured fields).

In-Chain

For inbound transmission of an unsolicited IPDS NACK after data chain start but before data chain end, the next WSF command carrying the data chain continue or data chain end can serve as the host acknowledgement of the NACK.

VTAM/NCP Programming Considerations

When using a remote control unit with IPDS, consider the following for programming support.

The VTAM/NCP transmission subsystem supports printer operation to a BSC-attached remote control unit without depending on the presence of a WCC indicating Start Print in the data stream.

The WSF command sends IPDS data from the application program to the printer. This data (contained within structured fields) does not include a WCC. In IPDS mode, the start of printing depends on the content of the data stream and conditions within the printer.

Transmissions to a printer in IPDS mode can therefore receive either an ACK response or a writer acknowledge reply (WACK) response from the control unit. The WACK response is the only positive indication that BSC sense/status indicating Device End will subsequently be sent by the control unit.

Chapter 21. Sending ASCII Data and PCL Commands to Network Printers over Coax and Twinax

Chapter Overview

This chapter describes the commands, methodology, and pitfalls of sending ASCII data and PCL commands to network printers via non-IPDS coax and twinax. This chapter is intended for the customer who would like to adapt his non-IPDS printing to use PCL resources and enhanced function that PCL can give over the standard SCS, PDS, or DSE/DSC command sets. It also can be used to aid in configuring network printers to accept ASCII data and PCL commands that were previously designed to other coax and twinax converters.

Introduction

IBM printers have a great heritage in printing from IBM hosts over coax and twinax media. Both IPDS and non-IPDS data streams are widely used throughout the world in a wide range of business applications.

The IPDS data stream was developed with the laser printer in mind. Its almost limitless command set and highly structured architecture make it ideal for the forms and complex document application.

The SCS, DSE/DSC, and PDS data streams (referred to as non-IPDS data streams from here on) were developed mainly for impact printers. Their command sets are more simple and their function is more limited than IPDS. They are still very efficient for printing simple documents and obtaining screen printouts and simple text applications.

Some customers now need to use more of the printing options of laser printers (extra fonts, forms or overlays, spacing, and format changes) that are not supported by the non-IPDS command sets. Many are moving to IPDS (especially with the low price for the upgrade on network printers), but others have a large legacy of non-IPDS applications and cannot make the move. Others have a large base of PC based applications and need to distribute the documents generated by those applications to printers via coax and twinax host networks. This is where being able to send PCL commands and ASCII characters becomes necessary.

Overview

IBM Coax and Twinax Network Interface Cards for network printers convert non-IPDS data streams into PCL data streams for printing. This is how ASCII transparency (sending non-EBCDIC encoded data in an EBCDIC based data stream) is possible.

Note: This document only deals with coax and twinax network interface cards. The IBM Ethernet and Token-Ring network interface cards for network printers can be used to enable network printers to receive IPDS, PCL, and PostScript.

One must understand the concept of how the converter works in order to avoid problems in inserting extra PCL in the stream.

- The network interface card does NOT rely on any PCL default parameters that are set in the PCL Menu of the printer.
- Network printers can have multiple connections or interfaces. Each interface is able to request and relinquish control of the printer. This is contrary to non-IPDS data streams. They always expect to have total control of the printer.
- The network interface card requests and obtains control of the printer when there is printable data transmitted on the coax or twinax line. This establishes a session.
- The network interface card relinquishes control of the printer when there has been no printable data sent over the line for the period set in the PORT TMEOUT values on the Coax Setup Menu or the Twinax Setup Menu. This ends a session.
- The network interface card maintains the state of the non-IPDS operator panel settings and non-IPDS data stream commands (NOT any transparent commands) internally between sessions with the printer controller (the PCL interpreter.) It will send all of the parameters to the PCL interpreter at the beginning of each session and each time it re-acquires control of the printer after a timeout.
- The users inserted PCL commands must be sent with each job to ensure that these settings were not lost over a network interface card timeout period.

Below is an example of the initialization commands that the network interface card sends to the PCL interpreter at the beginning of every "session".

Note: The # character represents the X'1B' (the PCL Escape character.) Some commands are sent more than once. The last call of any command has precedence.

```
#%-12345X@PJL SET LPARM:PCL EDGETOEDGE = OFF
#&11H#&11G#&10S#&126A#&130#&10;16c124e2306F;
#&15;6000C#&a0R#;*c5415y0T#(12U#(s0p13.3H#(s3T
#(s0b0S#&k9H;
```

Assigning an ESC (Escape) Character

Assign and use a character called an ESC character to tell the network interface card when a special sequence (data that is not normally in a non-IPDS data stream) is coming.

Note: Do not confuse this ESC character with the ASCII X'1B'. The term is the same, but this new ESC does NOT take the place of the X'1B' in the PCL commands. The ASCII X'1B' is referred to in this chapter as the ASCII escape character or the PCL escape character. When you see ESC it refers to the coax or twinax data stream character that the user has defined for sending special commands or transparent data.

With an ESC character, one can do the following:

1. Send HEX data (00 to FF) directly to the printer
2. Changing the settings of the network interface card (settings that deal solely with the coax and twinax interface). You can also change printer menu settings, although these changes last only until you power off the printer.
3. Send special commands to the network interface card (for example, save the contents of temporary memory in permanent memory).

The special commands in items 2 and 3 above are called FSL (Function Select via the Line.) These commands always start with the defined ESC character and usually end with an ESC. They are used to change the settings in the network interface card and to manipulate the network interface card memory.

This ESC character can be any printable character except:

- “,” “;” and “.” These are used as special command separators
 - 0 thru 9 Could be confused as Hex data
 - A thru F Could be confused as Hex data
 - a thru f Could be confused as Hex data
 - K,S,T,X,Y,Z These are introductory letters in FSL commands
 - certain national characters
 - EBCDIC HEX - 4A 4C 4F 5A 5F 6A 79 7B 7C 7F A1 C0 D0 E0
- There are times (e.g. when you change printer language) when some of these characters are allowed, but avoid them if possible.
- The single quote (') character. This is used in FSL to use readable characters in a command. (It makes FSL much easier to read.)
 - & and ? These are the intro characters to define a temporary ESC character.

The usual characters to use are \$,%,#,@,*,<, or >. Just be sure that it is a character that is not normally within the text the you want printed.

Once a character has been defined as the ESC character, it cannot be printed or used as a normal character. However, it is not necessary to have an ESC character defined permanently. When the ESC character has served its purpose, it can be deleted.

Defining the Temporary Escape Character

No ESC character is defined when you initially install the network interface card. If you wish to change the settings from the host system, you will have to define an ESC character. How to define “%” as the temporary ESC character follows:

```
&&??%
```

The five characters shown should be sent to the printer from the host system via your coax or twinax cable. (Just as if your wanted to print these five characters on the paper.) The ESC character is not defined permanently. When the printer is turned off, it will be lost. See “Defining a Permanent Escape Character” below for information on the definition of a permanent ESC character.

Removing the Temporary Escape Character

If you wish to remove the temporary ESC character in order to use that character as a printable character, you can send the following string: (i.e. define nothing as the ESC character.)

```
&&??%
```

Note: The character following the second ? can be a space, new line, or formfeed. (i.e. something other than a printable character.)

The temporary ESC character will also be removed when the commands for storing and restoring settings are used.

Defining the Permanent Escape Character

If you wish to define and save a permanent ESC character in the network interface card, you will have to define a temporary escape character, use FSL Function Y48, select Permanent Escape Character (this will be our first use of a FSL command,) and save the settings in the permanent memory by the command (ESC) X1 before powering off.

You can define the permanent ESC character in the following manner:

In apostrophe notation, e.g. %Y48,'<'%

Note: You may also define the permanent ESC character in hex form in FSL Function Y48, but because of translations between LU1 and LU3 characters in coax, the hex value for the character '<' is different between coax and twinax.

%Y48,09% would define the '<' as ESC character for coax
%Y48,4C% would define the '<' as ESC character for twinax

Note: If the character used in FSL Function Y48, Select Permanent Escape Character, is different from the one specified as temporary ESC character, the latest specified character (i.e. the one you have just specified in the FSL Function Y48) will take precedence immediately after you have defined FSL Function Y48.

Below is an example file that sets the permanent ESC character to < and saves it in permanent memory.

```
&&??%  
%Y48,'<'%  
<X1
```

Note: The temporary ESC character (%) is overwritten by the defined permanent ESC character (<).

Removing the Permanent Escape Character

The permanent ESC character may be removed again in the following ways:

1. Set FSL Function Y48, Select Permanent Escape Character, to "00" (No ESC character). (See the example following this list.)

OR

Define a new temporary ESC character as described above

2. Save the settings using the command "<ESC>X1".

Examples of these commands are shown below: (In the example, the permanent ESC character is "<" and the temporary ESC character is "%").:

```
<Y48,00<  
&&??%  
%X1
```

Note: This removes the permanent ESC character.

Passing PCL Commands

Passing PCL commands in a non-IPDS data stream would be easy if it were not for the ASCII Escape character (X'1B') that needs to precede them. This is because there is not a simple way to send this X'1B' for it is an "unprintable" character. (It normally would print as a dash or a space if sent as a X'1B' over the non-IPDS data stream.) All of the other characters in PCL commands are readable and printable and just sent to the PCL interpreter. We therefore have special ways for sending the ASCII escape character in a non-IPDS data stream.

When an ESC character has been defined, you may send any HEX code to your printer. Below you will see an example of how this is done ("% is the defined ESC character.) This PCL command will select the Roman 8 symbol set.

```
%% 1B 28 38 55 %
```

In the string sent above the two leading ESC characters tell network interface card that the following characters should be treated in pairs as HEX codes until the next ESC character is found in the data stream. Such commands may be found in the PCL and Postscript Technical Reference manual for your printer.

Note: In command strings in hex pair notation, only the hexadecimal characters 0-9 and A-F are allowed. The specifying of any other character will give unpredictable printing results.

Between the two leading and the trailing ESC character all control characters (i.e. new line, carriage return), spaces, and the character "," will be ignored by the network interface card. They may be inserted in command strings to facilitate the reading of the data stream.

There are 5 ways to send transparent data thru non-IPDS. Each are listed below and explained in detail in the next sections.

1. Using the SCS/PDS Transparency command (X'35' for coax, X'03' for twinax.)
2. Single byte transparency where 1 byte of HEX data is sent to the printer by using an escape character followed by 2 HEX characters which will be passed to the printer as 1 byte.
3. Multi-byte transparency with the following methods:
 - one or more bytes of HEX data can be sent to the printer by using two ESC characters to start the transparency and one or two ESC to end it. (As in the previous example in this section.)
 - one ESC character followed by a decimal count byte that defines how many of the following characters are to be sent as transparent.
 - a string consisting of 1 to 5 characters to start the transparency and a string of 1 to 5 characters to end it.
4. Strings that can produce HEX 1B to the printer (**Coax ONLY**)

```
<ESC><ESC>!TEXT<ESC><ESC>          Y47 = 3  
<lead-in>TEXT                        Y48 n2 (lead-in)
```

5. Filtered pass-through mode (or filter mode) where only transparent data in pass-through mode is sent to the printer. Filtered pass-through mode can be used to document/comment printer set-up files or other transparency applications. (**Coax ONLY**)

```
<lead-in>-<lead-out>                Y48 n2 (lead-in) and  
                                       n3 (lead-out)  
<lead-in>+<lead-out>                Y48 n2 (lead-in)and
```

| | |
|------------------------|--------------|
| | n3(Lead-out) |
| <ESC><ESC>--<ESC><ESC> | Y47 = 3 |
| <ESC><ESC>=<ESC><ESC> | Y47 = 3 |
| <ESC><ESC>+<ESC><ESC> | Y47 = 3 |

The PCL Reset command 1B45 (45 ASCII or E) will be used as the example PCL command in the detailed descriptions that follow.

SCS Coax Transparency Command (35

The SCS/PDS command set (not the DSE/DSC) have a built in command for passing non-EBCDIC data to a printer. Unfortunately, by default in past printers, you can only pass what the Coax SCS interpreter “thinks” are printable EBCDIC characters. These are the EBCDIC values X'40' thru X'FE'. This restriction can be circumvented with the use of FSL Function Y37=4. This function setting tells the network interface card to pass any hex value within this command to the printer as received across the Coax line.

FSL Function Y37 Syntax:

<ESC>Y37,4<ESC>

Note: Unless you include this FSL Function in every job, you will need to save the setting permanently with FSL Function X1. See “FSL Function X1 - Save Settings” on page 277 .

SCS/PDS Transparency Command Syntax:

X'35' <length> Hex data

Example:

35 02 1B 45

The above will send a X'1B45' to the printer which is an PCL reset command. (i.e. X'1B' E)

PDS Twinax ASCII Transparency Command (03

The Twinax version of the Transparency command is much easier to use. There are no restrictions on the hex data that can be sent within the confines of this command. Whatever hex is received across the twinax line that is within the length of this command's length byte will be sent as the same hex to the PCL interpreter. (i.e. no FSL Function is needed.)

Syntax:

03 NN xx xx xx xx

where: NN is the number of Transparent bytes that follow (not including the length byte.)

Example:

03 02 1B 45

The above will send a X'1B45' to the printer which is an PCL reset command. (i.e. X'1B' E)

Single Byte Transparency

There are two cases:

1. Twinax and Coax factory default.

This function is used for sending HEX data transparently to the printer with the following command:

Syntax: <ESC>HEX pair

EXAMPLE: ("% is the temporary ESC character)

%1B

will send ASCII X'1B' to the printer (The PCL Escape character). Therefore, an entire PCL RESET command could be sent with:

%1BE

which would send ASCII X'1B45' (EscE) to the printer's PCL interpreter.

Note: Be aware of the following situation if your non-IPDS application or printer queue (driver) inserts new lines for formatting. If you place <ESC>1B&l#A; PCL command in your non-IPDS data stream it may come in a place where your host thinks it wants a New Line <NL> for formatting purposes. Therefore, what could get sent over non-IPDS to the printer is <ESC>1B<NL>&l#A; which would not be taken by the PCL interpreter as a PCL command. To avoid this condition, use the <ESC><ESC> multi-byte method because all non-IPDS control codes are ignored within the limits for the initial <ESC><ESC> and the ending <ESC>. See "Multi-byte Transparency" for details.

2. **COAX ONLY** - FSL Function Y47 = 2 (<ESC>Y47,2<ESC> has been sent to the printer)

This is known as Tel-a-graph mode. (Tel-e-graph mode can be used to send multi-byte transparency too. Here we just illustrate how it can be used to send a single byte.) The first two digits after the ESC character are a counter, in **decimal** format, that is used to determine the length of the string to be sent. (i.e. You are telling the FSL command interpreter ahead of time how many bytes of transparent data are being sent.)

Syntax: <ESC>01 HEX Pair

EXAMPLE: ("% is the temporary ESC character)

%011B

When FSL Function Y47 = 2, this will send ASCII X'1B' to the printer's PCL interpreter. So to send a PCL Reset to the printer in this mode you send:

%011BE

across the Coax cable from your host to the network interface card.

Multi-byte Transparency

The syntax for pass-through of more than 1 byte of HEX data (as it is with 1 byte) to the printer will depend on the values set in FSL Function Y47 and/or the values defined for lead-in and lead-out string defined in the FSL Function Y48 n2 and n3 parameters.

Note: FSL Function Y48 was not implemented for parameters n2 and n3 in the IBM 3912/16, and 3112/16 and early releases of the IBM Network Printers. Contact IBM Network Printer Technical Support to find out if your code level supports these parameters.

1. Default - **THIS IS THE BEST WAY TO DO TRANSPARENCY!**

In the factory default case for FSL Functions Y47 and Y48 (i.e. Y47=1 and Y48 parameters n2 and/or n3 have not been defined) The way to enter and exit HEX transparent data mode uses two ESC character preceding the transparent data and one that follows it.

Syntax:

```
<ESC><ESC>HEX data<ESC>  
or  
<ESC><ESC>'TEXT'<ESC>  
or  
<ESC><ESC>HEX data'TEXT'<ESC>
```

Examples that will send ASCII X'1B45' to the printer are:

```
%1B45%  
%1B 45%  
%1B,45%  
%1B'E'%
```

Hexadecimal data must either be in HEX pairs (00-FF) or entered as text within apostrophes (for example, 'text'). See "Apostrophe Notation" on page 273.

Spaces, commas and IBM control codes (such as New Lines, Line Feeds, and Carriage returns) within a multi-byte transparency string are ignored. Therefore, spaces, commas, and New Lines can be used to make the hexadecimal data more readable.

- **COAX ONLY** FSL Function Y47=2 (<ESC>Y47,2<ESC>)

This FSL Function Y47 setting configures transparency for Tel-a-graph mode (Function Y47=2), the first two decimal digits after the ESC character are used to determine the length of the string to be sent.

Syntax:

```
<ESC><count>HEX DATA
```

Examples that will send the digits 0123456789 to the printer:

```
%1030313233343536373839  
%10 30 31 32 33 34 35 36 37 38 39
```

Note: The count byte is in decimal, not hexadecimal (i.e. base 10 not base 16.)

Hexadecimal data must be in HEX pairs (00-FF). Commas are not allowed in this multi-byte hexadecimal string.

Apostrophe notation is not supported.

Spaces and IBM control codes between HEX pairs in this multi-byte hexadecimal string are ignored.

The following syntax can also be used when FSL Function Y47=2:


```
<ESC><ESC>HEX data<ESC>  
or  
<ESC><ESC>'TEXT'<ESC>  
or  
<ESC><ESC>HEX data'TEXT'<ESC>
```

(i.e. The double ESC character syntax is just like when FSL Function Y47=1.)

- FSL Function Y47=3

Note: Again remember that FSL Function Y47 has not been implemented in IBM Twinax attachments to date.

When Function Y47=3, the two leading ESC characters denote that the following characters will be treated in pairs as HEX codes until the next two ESC characters in the data stream are encountered. (Remember that when Y47=1 you only need one ESC to terminate the transparency.)

This FSL Function setting has been developed to adapt IBM Network Printers Coax and Twinax attachment to other vendors methods of signalling transparent data. Avoid using these parameters if you do NOT have old data streams that you must support.

Syntax:

```
<ESC><ESC>HEX data<ESC><ESC>  
or  
<ESC><ESC>'TEXT'<ESC><ESC>  
or  
<ESC><ESC>HEX data'TEXT'<ESC><ESC>
```

Examples that will send ASCII HEX 1B45 to the printer:

```
%%1B45%%  
%%1B 45%%  
%%1B,45%%  
%%1B'E'%%
```

Hexadecimal data must either be in HEX pairs (00-FF) or entered as text within apostrophes: 'text'. See "Apostrophe Notation" on page 273.

Between the two leading and trailing ESC characters, all spaces, IBM control codes (i.e. Carriage Returns and Line Feed's) and commas will be ignored when in HEX transparent mode. They may be inserted in the data stream to make it more readable.

- FSL Function Y48, n2 (lead-in) and n3 (lead-out)

FSL Syntax:

```
<ESC>Y48,n1{;}{n2}{;}{n3}<ESC>  
where: n1 - defines the permanent ESC character  
          00 is the default (i.e. no permanent ESC character)  
          n2 - lead-in characters in apostrophe notation (note  
              the ; is used as separator here)  
          n3 - lead-out characters in apostrophe notation  
note: n2 and n3 parameters are optional
```

Note: FSL Function Y48 with parameter n1 is valid for the coax versions of the IBM 3912/16 and 3112/16 printers as well as the coax versions of network printers. Parameters n2 and n3 are implemented in coax code levels 1.01 and greater. FSL Function Y48 has never been implemented in any IBM

Twinax printer to date. Please contact IBM Network Printer Technical Support to see if your current printer code supports these parameters.

When the lead-in and lead-out strings defined in the Function Y48 n2 and n3 parameters are used for multi-byte transparency, the lead-in string denotes that the following characters will be treated in pairs as HEX codes until the lead-out string in the data stream is encountered.

Note: This FSL function has been developed to adapt the IBM Network Printers Coax and Twinax attachments to other vendors methods of signaling transparent data. Avoid using these parameters if you do NOT have old data streams that you must support.

Syntax:

```
<lead-in>HEX data<lead-out>
```

The lead-in string can be from 1 to 5 characters and must be defined in FSL Function Y48 in apostrophe notation. The only restriction is that it must not begin with the character defined as the ESC character or the ampersand (&) character.

The lead-out string can also be from 1 to 5 characters and must be defined in FSL Function Y48 in apostrophe notation. The lead-out string must not begin with valid HEX values (0-9, A-F, a- f).

FSL Example of a definition of a lead-in and lead-out string:

```
&&??%  
%Y48,; '@#'; '#@'%
```

Note: There is no permanent ESC character defined in this example.

Example of using the lead-in and lead-out string to send ASCII HEX 1B45 to the printer:

```
@#1B45#@  
@#1B 45#@  
@#1B,45#@
```

Hexadecimal data must be in HEX pairs (00-FF).

Spaces, commas and IBM control codes between HEX pairs are ignored when in HEX transparent mode. Commas and spaces can be used to make the hexadecimal data more readable.

Strings that can produce HEX 1B to the printer

1. COAX ONLY - FSL Function Y47=3 (<ESC>Y47,3<ESC>)

If FSL Function Y47=3, an ASCII HEX 1B will be produced when an exclamation mark is found inside a multi-byte transparency string.

An exclamation mark must immediately follow the two leading ESC characters and all other characters inside the multi-byte transparency string have to be text as HEX data is not supported. You may include as many exclamation marks as needed within the boundaries of the beginning and ending ESC's.

An apostrophe inside a multi-byte transparency string is invalid and terminates the string.

Syntax:

```
<ESC><ESC>!TEXT<ESC><ESC>
```

Example:

```
%%!E%%
```

will send ASCII X'1B45' to the printer.

```
%%!E!&l10;%%
```

will send ASCII X'1B45' followed by ASCII X'1B266C314F' to the printer. (i.e. PCL reset followed by PCL orientation landscape.)

Within the <ESC><ESC>!...<ESC><ESC>, all IBM control codes are ignored.

After the exclamation mark ("!"), all data should be characters supported by the 7 bit ASCII character set.

2. FSL Function Y48, n2 (lead-in) without n3 (lead-out)

If a string is defined as lead-in in FSL Function Y48, parameter n2, but no lead-out string, parameter n3, is defined in Function Y48, the lead-in string will be translated to ASCII X'1B' when detected in the data stream.

Note: As of November 1996 no IBM Twinax network interface card supports Y48 at all and the IBM 39112/16 and 3112/16 Coax do not support parameters n2 and n3. Network printers support the n2 and n3 parameters at Coax code level 1.01 and greater. Please contact IBM Network Printer Technical Support for information on your IBM Coax network interface card code level.

Example FSL Function Y48 Syntax with no n3 defined:

```
%Y48, '%'; '@#'%
```

The lead-in string can be from 1 to 5 characters and must be defined in apostrophe notation. See "Apostrophe Notation" on page 273. The only restriction is that it must not begin with the character defined as escape character or the ampersand (&) character.

Example: The input data stream @#E@#&l10; will be translated to ASCII HEX 1B451B266C314F (PCL reset followed by PCL orientation Landscape)

Filtered Pass-through Mode

Two filter modes are supported:

1. normal filter mode
2. partial filter mode

Normal Filter Mode

Normal filter mode will suppress all data and control characters which are not defined in multi-byte transparency. See "Multi-byte Transparency" on page 267.

Normal filter mode can be selected by:

```
<ESC><ESC>--<ESC><ESC>
```

if Function Y47 is set to 3 or it can be selected by:

```
<llead-in>--<llead-out>
```

if a lead-in and lead-out string is defined in the Function Y48, n2 (lead-in) and n3 (lead-out).

Normal filter mode is terminated by:

```
<ESC><ESC>+<ESC><ESC>
```

if Function Y47 is set to 3 or by:

```
<lead-in>+<lead-out>
```

if a lead-in and lead-out string is defined in the Function Y48, n2 (lead-in) and n3(lead-out).

Partial Filter Mode

Partial filter mode will suppress all CR and LF. Partial filter mode can only be selected by:

```
<ESC><ESC>=<ESC><ESC>
```

when Function Y47 is set to 3.

Partial filter mode is not supported when using the lead- in and lead-out strings.

Partial filter mode is terminated the same as Normal filter above.

Below is a list of examples:

1. Normal Filter Mode Example With Function Y48:

Example of Normal Filter Mode by use of a lead-in and lead-out string defined in Function Y48.

First we need to assign the lead-in and lead-out string:

```
&&??%  
%Y48,'%';'@#';'#@'%
```

Note: Be careful, the following definition will delete the ESC character for it has not assigned the n1 value which is the permanent ESC character

```
%Y48,; '@#'; '#@'%
```

Data stream sent to the interface:

```
@#-#@  
This file is used to select landscape orientation by use of a PCL  
command @#1B266C314F#@ Orientation of the printer is now landscape  
@#+#@
```

The only thing sent to the printer in the above example when it is received by the interface is the ASCII X'1B266C314F' which is the PCL command Esc&l1O; (i.e. all of the text around the @#1B266C314F#@ was "filtered" out.)

2. Normal Filter Mode Example With Function Y47:

Example of Normal Filter Mode by use of <ESC><ESC>- <ESC><ESC> when function Y47 is set to 3.

Again, we assign the parameters of the FSL function first:

```
&&??%  
%Y47,3%
```

After which the following data stream can be sent to the network interface card

```
%%-%%  
This file is used to select landscape orientation by use  
of a PCL command  
%%1B266C314F%%  
Orientation of the printer is now Landscape  
%%+%%
```

The only thing sent to the PCL interpreter when the above data stream is received by the network interface card is the ASCII X'1B266C314F' which is the PCL command Esc&l1O; (i.e. the network interface card “filtered” out the text around the %%1B266C314F%%)

3. Partial Filter Mode Example:

Example of Partial Filter Mode by use of <ESC><ESC>=<ESC><ESC> when function Y47 is set to 3.

Set the parameters of FSL Function Y47.

```
&&??%  
%Y47,3%
```

Then the following data stream can be sent to the network interface card:

```
%%=%%  
%%1B45%%  
RESET  
%%1B2873313648%%  
SELECT 16 CPI  
%%+%%
```

and the network interface card will send the following to the PCL interpreter:

```
EscE RESET Ec(s16H SELECT 16 CPI4
```

as all Carriage Return's and New Line's have been suppressed.

Apostrophe Notation

Another way of sending printer commands strings is to use the apostrophe notation. The apostrophe tells the network interface card that the characters following should be regarded as ASCII characters in the command. Below is an example of apostrophe notation which shows the PCL Esc character (X'1B) combined with apostrophe notation:

```
%%1B '\12'%
```

The apostrophe notation can only be used when sending command codes which can be found in the ASCII character table. All spaces, carriage returns, new lines, and line feeds and form feeds are ignored within the leading ESCESC and the trailing ESC (i.e. the “%%” and “%” respectively in the above example.)

Note: To ensure correct processing of the data, all spaces inside the apostrophe notation must be sent as the hexadecimal value (X'20'). For example, if the data “Network Printer Coax Interface Card” need be sent to the PCL interpreter, a sequence that could be sent to the network interface card is shown below:

```
%%'Network'20'Printer'20'Coax'20'Int  
erface'20'Card'%
```

The above is an example of a command with blanks (spaces) sent in apostrophe notation. Note that the break (i.e. New Line) in the word “Interface” is not sent to the PCL interpreter because the New Line is within two apostrophe's.

Glossary

non-IPDS

The IBM host data streams of DSE/DSC, SCS, and PDS. The two former from a coax attached host and the latter from a twinax attached host.

session

The start of printable data being sent to the coax or twinax network interface card.

network interface card

Network Interface Card. This document only refers to coax and twinax network interface cards.

ASCII Transparency

sending non-EBCDIC encoded data in an EBCDIC based data stream.

ASCII Escape

Hex 1B (also written X'1B') The first byte in a PCL command

ESC character

The special character placed in a non-IPDS data stream to signal that special data is following.

FSL Function Selection via the Line

IBM control codes

Carriage Return, Line Feed, or New Line characters

Test Menu Functions

The following Test Menu Functions are valuable in working with and developing applications on network printers. The IBM 3912/16 and 3112/16 have similar functions and can be referenced in the documents that were supplied with your printer.

Test Menu/PRINT CONFIG PAGE

The PRINT CONFIG PAGE function prints a page containing all of the operator panel settings that are current in your printer. This page also contains a list of installed options and all of the micro-code levels installed in the printer that generated the page. Always have this page available to you when you call IBM technical support.

Test Menu/ONLINE HEX PRT

Online Hex Print is the users and applications programmers best tool for debugging problems with any of network printers. This setting enables the printer to print the exact data stream as it is received by the PCL interpreter. An example is shown below:

```
INSERT AN ONLINE HEX PRT HERE
```

The left hand section shows the bytes received in hexadecimal notation and the right hand section shows the ASCII representation of the HEX to the left.

Test Menu/CX HEX PRT or TX HEX PRT

The Coax and Twinax Hex Print settings enable the network interface card to print HEX formatted pages of the data that is coming to the network interface card via the Coax or Twinax cable. An example is shown below:

INSERT A CX HEX PRT EXAMPLE HERE

The left hand section shows the byte receive in hexadecimal notation and the right hand section shows the EBCDIC representation of the HEX to the left. The section at the very top of a Coax Hex Print shows the values that are currently set in the Printer Controller Information Area (PCIA) which can affect the way some data should be printed.

FSL Function Reference

FSL Function Y47 - ESC Mode Selection

USE - This function is used for selecting of, standard esc-mode, Tel-a-graf support or special transparency.

SYNTAX . #Y47,<n1>#

where: n1

1 Standard ESC Mode (default)

ESC XX sent as 'XX' HEX to the controller

ESC ESC XX ESC sent as 'XX' HEX.

ESC ESC 'ascii' ESC sent as 'ascii'.

2 Tel-a-graf support (See note 1.)

ESC NXX sent as 'XX' hex. (where NN is the byte count)

ESC ESC XX ESC sent as 'XX' HEX.

ESC ESC 'ascii' ESC sent as 'ascii'.

3 Special transparency.

ESC 'X sent as XX' HEX to the controller.

ESC,ESC XX ESC,ESC sent as 'XX' HEX.

ESC,ESC !ascii ESC,ESC sent as 1Bhex 'ascii'.

NOTES:

1) In Tel-a-graf mode, the first two decimal digits after the Escape

character are used to determine the length of the string to be sent.

2) Filter mode is a special compatible feature for replacing of protocol

converters. The filter-modes will suppress control-codes and/or text.

3) To enter filter mode the ESC character has to be used.

Filter mode can be implemented in two ways:

Normal mode:

<ESC><ESC>-<ESC><ESC> sets filter mode on

<ESC><ESC>+<ESC><ESC> sets filter mode off

Normal filter mode will suppress all data which is not defined in an

<ESC> or <ESC><ESC> notation.

Partial mode:

<ESC><ESC>=<ESC><ESC> sets partial filter mode

on

<ESC><ESC>+<ESC><ESC> sets partial filter mode off

In partial filter mode only CR and LF are suppressed.

EXAMPLES:

1) #Y47,2#

This selects Tel-a-graf support.

2) #02 41 42

This will send HEX codes 41 42 to the printer.

FSL Function Y48 - Set Permanent ESC Character

USE - This function is used to set the permanent escape character, and/or define lead-in/lead-out sequences.

SYNTAX: #Y48,n1{n2;n3}# (n2 and n3 are not required)
 where:
 n1 - Character for permanent ESC character selected from the EBCDIC character table (Twinax) or the LU3 character table (Coax), can be stated in apostrophe notation.
 n1=00 is the Default. (i.e. no ESC Character).
 n2 - characters: String of maximum 5 characters to introduce the transparency, the string must not begin with the same character defined as n1, or the character '&'.
 n3 - characters: String of maximum 5 characters to end the transparency, the string must not begin with valid hex-values {'0'-'9'}, {'A'-'F'} or {'a'-'f'}.

NOTES:
 1) If parameter n3 is omitted, n2 will be scanned for in the data-stream, and substituted with ascii-Escape (X'1B').
 2) Filtered mode is activated the following way: <lead-in><-><lead-out> and is deactivated the following way: <lead-in><+><lead-out>

EXAMPLES:
 1) #Y48,'>'#
 This will set the character > as permanent escape character. All further FSL escape strings will then require > as escape character.
 2) #Y48,' '#, #48,00#
 Either of these will clear the permanent escape character. (No permanent escape character is used).
 3) #Y48,57;'in';'out'#
 Sets the character 57 Hex as permanent escape and the string 'in' as lead-in sequence and the string 'out' as lead-out sequence.

Testing via the Line

Tests may be selected via the line by a special FSL functions. The syntax of the test selection is as follows:

FSL Function T1 - Offline HEX Print of System Buffer - Coax Only

OFFLINE HEX Dump prints a dump of the buffer received by the network interface card (i.e. across the coax cable) in which the <ESC>T1 command was included.

Offline Hex Dump terminates automatically.

FSL Function T1 - Twinax HEX Print - Twinax Only

Twinax HEX Print sets the interface in HEX print mode. This is the same as the TX HEX PRT from the Test Menu on network printers. The data following the <ESC> T1 command is printed in a combined Hex and EBCDIC format as it is received by the interface. This function is very useful in debugging application problems.

Twinax HEX Print is terminated by pressing the TEST button on the rear of the network interface card or by issuing a CANCEL TX HEX PRT from the Network Printer operator panel.

FSL Function T2 - Coax HEX Print

Coax HEX Print sets the interface in HEX print mode. This is the same as the CX HEX PRT from the Test Menu of the network printers or pressing the TEST button on the back of the Coax network interface card twice in succession. The data following the <ESC> T2 command is printed in a combined Hex and EBCDIC format as it is received by the interface. This function is very useful in debugging application problems.

Coax HEX Print is terminated by pressing the TEST button on the rear of the network interface card or by issuing a CANCEL CX HEX PRT from the Network Printer operator panel.

FSL Function T3 - Online ASCII Print

Online ASCII Hex Print sets the network interface card in ASCII print mode. The data following the <ESC>T3 command is printed in a format depicting how the ASCII data is sent to the PCL interpreter. This is similar, but not exactly the same as Test Menu/ONLINE HEX PRT from the operator panel.

Online ASCII Print is terminated by pressing the TEST key on the rear panel or by selecting FSL Function T6 - Cancel Test 3 which is explain below.

FSL Function T4 - Network Interface Card Settings Print

network interface card Settings Print will print a page containing information on the current FSL settings and firmware revision.

Note: In network printers, this page contains a full firmware version listing that is used by IBM technical support and the network interface card developers to track firmware levels. It may not completely correlate to the CX or TX LVL listed on the Test Menu/PRINT MENUS page. Also, this page contains the current settings of FSL Functions that are not listed in this document.

Network interface card Settings Print may also be activated by pressing the TEST button, located in the back of the printer near the coax or twinax cable connector, once after the printer has come up to a READY prompt on the operator panel. (3912/16 and 3112/16 Twinax cards have a Twinax address setting dial instead of a TEST button. Turn this dial to the T position to produce a network interface card settings printout or use the operator panel menus as listed in your documentation.)

FSL Function T5 - Print SCS Character Sets

Print SCS Character Sets, also available as an operator panel selection, will print the LU1, LU3 and APL character sets for Coax or the PDS character sets for twinax for the current symbol set and translate table. If any changes have been made to the current translate table, these will also be seen in the tables generated.

FSL Function T6 - Cancel Online ASCII Print

Cancel Online ASCII print cancels the state set by FSL Function T3 - Online ASCII Print.

Special FSL Functions

FSL Function X1 - Save Settings

Use FSL Function X1 to permanently save FSL Function parameter settings across power off cycles. X1 will save all FSL function parameters to flash (permanent, non-volatile) memory.

Syntax:

<ESC>X1

Chapter 22. Fonts

IBM Font Structure

In IBM AFP terminology, a font has three components (Figure 20). They are:

- Coded font
- Character set
- Code page

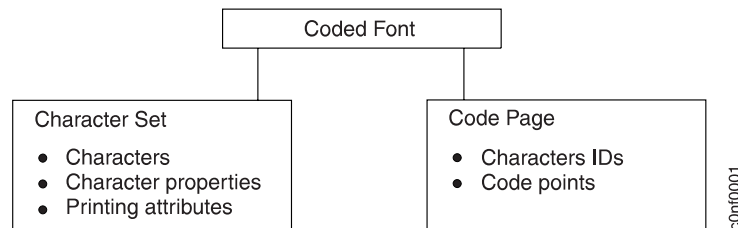


Figure 20. Font Components

Note: These terms have different meanings in Operating System/400 (OS/400). See Table 172 on page 282 for what these terms mean in OS/400.

Coded Font

In IBM font structure, a *coded font* translates your request for type (for example, text you previously entered at a computer terminal) into characters for printing. A coded font consists of two parts:

- References to specific character sets
- References to specific code pages

A character must be included in the specified character set and listed on the specified code page before it can be printed.

A coded font associates a specific code page with a specific character set. A coded font contains one code-page and one character-set pair.

Character Set

In IBM font structure, a *character set* corresponds to the definition of a font; it contains the characters of a single type family, typeface, and type size. In addition, a character set specifies *character properties* and printing attributes (Figure 21 on page 280).

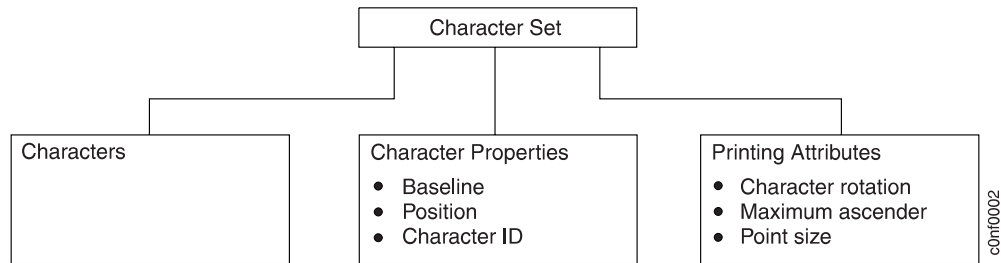


Figure 21. Composition of a Character Set

characters

Characters are the letters, numerals, punctuation marks, or other symbols of a font.

character properties

Character properties detail how a character is positioned relative to the characters around it. Some character properties include the following:

- The baseline of a character, showing its general alignment
- The dimensions of space in which the character is printed
- The position of the character within that space
- The identifier of the character (the character ID)

One of the character properties is the *character ID* (or graphic character ID). Each character is assigned a character ID; for example, the character A (uppercase A) is assigned the character ID LA020000.

The purpose of a character ID is to distinguish the character from similar characters. For example, the following characters look similar; however, they are different and are assigned different character IDs:

| | |
|----------------|-----------------------|
| Minus sign (–) | Character ID SA000000 |
| Hyphen (-) | Character ID SP100000 |
| Em dash (—) | Character ID SM900000 |

For a list of character IDs and the graphic character each represents, refer to *ABOUT TYPE: IBM's Technical Reference for Core Interchange Digitized Type*

printing attributes

The printing attributes define how the character set will be printed. Some printing attributes include rotation of characters, maximum ascender, and point size.

Code Page

A *code page* is a set of symbols that can be printed by your printer. These symbols can be letters, numbers, or graphic elements such as lines or patterns. The symbols may be grouped to be specific to a country, language, or special symbol set. By supporting different code pages, the printer can support different language requirements.

No particular typeface is assumed for any particular code page. The typeface is defined as a font by the assignment of size, weight, and posture. For code page mapping, see Appendix. IBM Code Pages for Non-IPDS Printing.

Character IDs and Code Points

In IBM font structure, a *code page* maps each character of text to the characters in a character set. Figure 22 shows how a code page maps text to the characters in a character set. As you enter your text at a computer terminal, 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 then is matched to the image (*raster pattern*) of the character in the character set you specified. The image in the character set is the image that is printed in your text. To be a valid code page for a particular character set, all character IDs in the code page must be included in that character set.

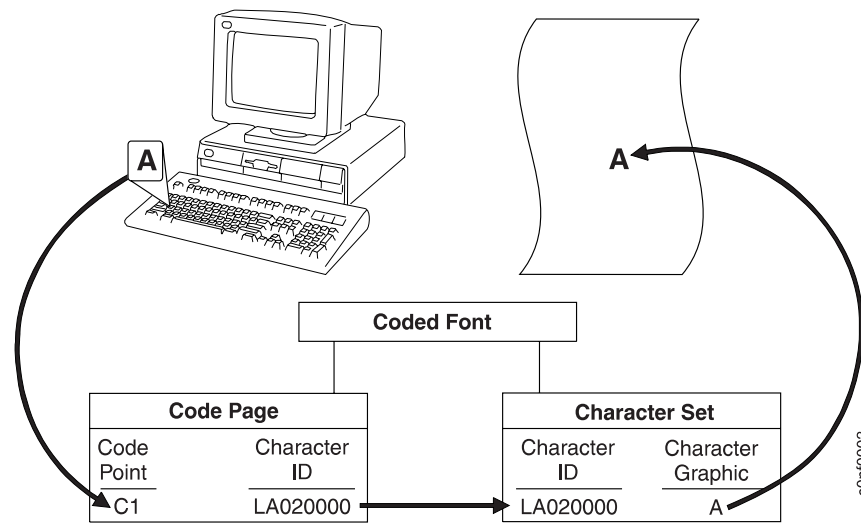


Figure 22. Translation of a Keyboard Character into a Printed Character

Every code page has 256 positions, or *code points*, that represent potential characters. Each of the code points is normally identified by its bit configuration in hexadecimal, with two hex characters per byte. The range of values is hex 00 through hex FF, or 256 values. The code page determines which character prints for each of the printable code points.

A character ID is an 8-byte standard identifier for a character regardless of its type family. For example, all uppercase “A”s have the same character ID (LA020000). Character IDs also are called graphic character identifiers (GCIDs).

| | |
|-------------|----------|
| Binary | 11000001 |
| Decimal | 193 |
| Hexadecimal | C1 |

Figure 23 shows an example of a part of a code page. When the printer receives hexadecimal code point C1 for the code page shown (code page 00037 Version 1), it prints an uppercase A (character ID LA020000). Baselines for each character on the example code page show the general alignment of characters.

| Hex Codes 1st → 2nd ↓ | 4- | 5- | 6- | 7- | 8- | 9- | A- | B- | C- | D- | E- | F- |
|-----------------------------|-------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| -0 | _____ SP010000 | & SM030000 | - SP100000 | ø LO610000 | ø LO620000 | ° SM190000 | μ SM170000 | ^ SD150000 | { SM110000 | } | \ | 0 ND100000 |
| -1 | _____ SP300000 | é LE110000 | / | É LE120000 | a LA010000 | j LJ010000 | ~ SD190000 | £ SC020000 | À LA020000 | J LJ020000 | ÷ SA060000 | 1 ND010000 |
| -2 | â LA150000 | ê LE150000 | Â LA160000 | Ê LE160000 | b LB010000 | k LK010000 | s LS010000 | ¥ SC050000 | B LB020000 | K LK020000 | S LS020000 | 2 ND020000 |
| -3 | ä LA170000 | ë LE170000 | Ä LA180000 | Ë LE180000 | c LC010000 | l LL010000 | t LT010000 | · SD630000 | C LC020000 | L LL020000 | T LT020000 | 3 ND030000 |
| -4 | à LA130000 | è LE130000 | À LA140000 | È LE140000 | d LD010000 | m LM010000 | u LU010000 | © SM520000 | D LD020000 | M LM020000 | U LU020000 | 4 ND040000 |
| -5 | á LA110000 | í LI110000 | Á LA120000 | Í LI120000 | e LE010000 | n LN010000 | v LV010000 | § SM240000 | E LE020000 | N LN020000 | V LV020000 | 5 ND050000 |
| -6 | ã LA190000 | î LI150000 | Ã LA200000 | Ï LI160000 | f LF010000 | o LO010000 | w LW010000 | ¶ SM250000 | F LF020000 | O LO020000 | W LW020000 | 6 ND060000 |
| -7 | â LA270000 | ï LI170000 | Â LA280000 | Ï LI180000 | g LG010000 | p LP010000 | x LX010000 | ¼ NF040000 | G LG020000 | P LP020000 | X LX020000 | 7 ND070000 |
| -8 | ç LC410000 | ì LI130000 | Ç LC420000 | Ì LI140000 | h LH010000 | q LQ010000 | y LY010000 | ½ NF010000 | H LH020000 | Q LQ020000 | Y LY020000 | 8 ND080000 |

Figure 23. IBM Code Page 00037 Version 1

Different Code Pages

Code pages accommodate various national languages by using characters and special symbols appropriate to the language. Code pages can have identical character IDs assigned to different code points.

For example, the character é (lowercase e accent acute, character ID LE110000) has the following code point assignments in two different code pages:

- Hexadecimal code point 51 in code page 00037 Version 1
- Hexadecimal code point 5A in code page 00280 Version 1

Operating System/400 Terms

Table 172 lists the IBM AFP font terminology and describes how it is used with the OS/400 printing interfaces.

Table 172. OS/400 Font Terminology

| AFP Term | OS/400 AFP Implementation | OS/400 Print File Term |
|---------------|---|-----------------------------------|
| Coded font | *FNTRSC object with CDEFNT attribute | Coded font |
| Character set | *FNTRSC object with FNTCHRSET attribute | Font |
| Code page | *FNTRSC object with CDEPAG attribute | Character ID (CHRID) See note. |

Table 172. OS/400 Font Terminology (continued)

| AFP Term | OS/400 AFP Implementation | OS/400 Print File Term |
|---|---------------------------|------------------------|
| <p>Note: This is not the character ID that identifies individual characters within an AFP character set. This is a control object that identifies a code page by two numbers representing a character set ID and a code page ID.</p> | | |

Font Terms

A *font* is a complete set of characters in a particular typeface, type size, and code page.

The following terms help define a font:

Character Set

A set of numeric, alphabetic, or graphic characters with their assigned code points.

Code Page

A table of alphanumeric characters and graphic characters each of which is assigned a 1-byte value (a *code point*). These values define which characters will print. "Appendix. IBM Code Pages for Non-IPDS Printing" on page 307 shows the values for code points in all code pages supported by the printer.

Code Page Global ID (CPGID)

Identifies a specific set of code points assigned to a specific list of graphic character IDs.

Font Global ID (FGID)

Specifies a value for selecting a font. IBM fonts have a preassigned FGID value.

Graphic Character Set Global ID (GCSGID)

Identifies the list of graphic character IDs included in the code page.

Spacing

Also called *font width* or *escapement*. Spacing is the distance from the start of a character to the start of the next character. Font spacing can be defined by spacing type:

- *Fixed-pitch fonts* – All characters in a fixed-pitch font have the same spacing, which is specified as the number of characters per inch.
- *Typographic fonts* – Typographic fonts are identified as Typo.

Most documents are easier to read if the widths of the characters vary, that is, if a W is printed wider than an I. Typographic fonts have this variability. These fonts are sized by height, not width. Seventy-two points equals approximately one inch. Therefore, a 10-point font is 10/72 inch high. Type height includes some white space above and below the printed character for adequate minimum spacing between the lines of type.

Text is most readable when character spacing ranges from 8 to 12 points. For example, the text in this document is 10 point.

Note: For typographic fonts, it is recommended that the first and last print positions on each line be left blank.

- *Proportionally spaced machine (PSM) fonts* – Proportionally spaced machine fonts are identified by PSM or PS. PSM fonts are a compromise

between the variability of typographic sizes and the simple uniformity of fixed pitch. With PSM fonts, the widths of the characters vary. For example, a lowercase *i* has a different width than an uppercase *W*. However, a specific character in one font will be the same width in another font. For example, a *W* in one PSM font is the same width as the *W* in every other PSM font. Therefore, it is possible to have only one character-width table that applies to every PSM font.

Posture

Refers to a character's incline, or tilt. Roman posture is upright. *Italic* posture is inclined to the right.

Type Size

Also called *point size*. Specifies the overall height of the font, measured in printer's points. A point is 1/72 inch. For example, a 12-point font is 1/6 inch high.

Typeface

Also called *type style*. Specifies the shape and design of each letter of the alphabet. A complete alphabet of letter designs makes up one typeface.

Weight

Refers to the thickness of the strokes that make up the characters of a font, as in a **bold** font weight.

Font and Code Page Selection

Printers with an IPDS feature receive IPDS commands to specify fonts. The IPDS command set can select any font or code page supported by the printer. See the printer *User's Guide* for a list of the IPDS fonts supported. However, host software may restrict the actual fonts or code pages that can be selected. This includes typographic and nontypographic fonts in all pitches, point sizes, and widths. The information provided to the printer to select a font is called a *GRID* (Global Resource Identifier). The GRID consists of the following (see "Font Terms" on page 283 for a description of these terms):

- FGID (Font Global Identifier)
- GCSGID (Graphic Character Set Global Identifier)
- CPGID (Code Page Global Identifier)
- Font Width

For typographic fonts with the same FGID, specify the FONT WIDTH parameter to the printer. The printer needs the font width parameter to identify the font in order to specify the point size. The FONT WIDTH parameter is described in detail in the IPDS section.

Note: When using an application that does not allow selection of font width, use the alternate FGID when available to access typographic fonts.

You can select the code page and code page version from a configuration setting. Refer to your printer's *User's Guide* for instructions on changing code page and code page version configuration settings. Some system software does not allow you to change code pages by software and uses the printer default code page for printing. The printer factory default character set is 0697 and the code page is 00037 version 1. This may require you to change the printer code page to match the system software.

Fonts for Non-IPDS Printing

When printing coax or twinax non-IPDS jobs, the printer uses some of the PCL emulation fonts available for parallel/serial printing.

Coax (Non-IPDS)

- Uses the resident PCL 5 scalable Courier font to provide the required pitch.

Twinax (Non-IPDS)

- For fonts requested via CPI values, uses the resident PCL 5 scalable Courier font to provide the required pitch.
- For non-typographic font requests, uses the resident PCL 5 scalable Courier and Letter Gothic fonts.
- For typographical font requests, uses the Times New Roman, CG Times, and Univers resident scalable PCL 5 fonts.

Note: For PCL font samples, enter:

```
TEST MENU  
PRINT PCL FONTS
```

Font Substitution for Non-IPDS

The printer uses its PCL fonts when operating with a non-IPDS host data stream. The IPDS fonts resident in the printer are not available with non-IPDS data streams. The printer selects and uses these PCL fonts differently depending upon whether the attachment is coaxial or twinaxial.

Attachment Font Selection

Coaxial Selects fonts only by specifying characters-per-inch (cpi) as described in “Non-IPDS Fonts Specified by CPI - Coax and Twinax”.

Twinaxial Selects fonts in either of two ways:

- By specifying characters-per-inch (cpi) as described in “Non-IPDS Fonts Specified by CPI - Coax and Twinax” (same as coaxial).
- By specifying an FGID (Font Global Identifier).

This section describes these differences.

Non-IPDS Fonts Specified by CPI - Coax and Twinax

You can specify non-IPDS fonts by cpi, as described in this section, for both Coax and Twinax attached printers. Fonts are selected by specifying characters per inch (cpi) in either of the following ways:

- From the printer’s operator panel (see your printer’s *User’s Guide* for details)
- From the SCS data stream commands:
 - Set Print Density
 - Set Character Distance

Only non-typographic (fixed-pitch) PCL fonts are available for font substitution that is driven by cpi.

| Requested cpi | Network Printer result |
|--|---|
| 5 | Courier 5 |
| 10 | Courier 10 |
| 12 | Courier 12 |
| 15 | Courier 15 |
| 16 | Courier 16 |
| 20 | Courier 20 |
| 27 | Courier 27 |
| PSM Note: Not available from the operator panel; must use SCS command. | Uses Courier 12 with proportional spaced machine (PSM) font |

Non-IPDS Fonts Specified by FGID- Twinax Only

You can specify non-IPDS fonts by FGID, as described in this section, for the Twinax attached printers. (This means either with the standard Twinax SCS printer, or with IPDS but emulation set to non-IPDS.)

In addition to selecting fonts by specifying cpi as described in “Non-IPDS Fonts Specified by CPI - Coax and Twinax” on page 285, AS/400 programs can use FGIDs to specify the desired font. In this case, the printer uses various font characteristics to select substitute fonts.

The mapping from the requested IBM FGID to the available PCL fonts is a font substitution. It does not always provide the exact font specification by FGID. The mapping from FGID characteristics to PCL fonts can only be as accurate as the available PCL fonts allow.

The following tables illustrate the substitutions:

- Table 173 shows Nontypographic (fixed pitch) substitution
- Table 174 on page 289 shows Typographic substitution

Nontypographic FGID

Table 173 lists the fonts used as replacements when non-IPDS *nontypographic* fonts (fixed pitch fonts) are requested for Twinax printing. The FGIDs shown are for fonts resident in some other IBM printers but not resident in the standard IBM network printers.

Table 173. Nontypographic Typefaces Substitution - Twinax only

| Typeface | IBM FGID | Substituted typeface |
|-------------------|----------|-------------------------|
| OCR B 10 | 03 | Courier 10 |
| Orator 10 | 05 | Courier 10 (PN 1255824) |
| Courier 10 | 11 | Courier 10 |
| Prestige Pica 10 | 12 | Courier 10 |
| Courier 10 Italic | 18 | Courier 10 Italic |
| OCR A 10 | 19 | Courier 10 |

Table 173. Nontypographic Typefaces Substitution - Twinax only (continued)

| Typeface | IBM FGID | Substituted typeface |
|-----------------------------|----------|--------------------------|
| Kateb 10 | 33 | Courier 10 |
| Letter Gothic 10 | 36 | Letter Gothic 10 |
| Gothic Text 10 Bold | 39 | Letter Gothic 10 Bold |
| Letter Gothic 10 | 40 | Letter Gothic 10 |
| Roman Text 10 | 41 | Courier 10 |
| Serif Text 10 | 42 | Courier 10 |
| Serif Text Italic 10 | 43 | Courier 10 Italic |
| Katakana Gothic 10 | 44 | Courier 10 |
| APL 10 | 45 | Courier 10 |
| Courier 10 Bold | 46 | Courier 10 Bold |
| Shalom 10 | 49 | Courier 10 |
| Gothic Text 12 | 66 | Letter Gothic 12 |
| Gothic Text Italic 12 | 68 | Letter Gothic 12 Italic |
| Gothic Text 12 Bold | 69 | Letter Gothic 12 Bold |
| Serif Text 12 | 70 | Courier 12 |
| Serif Text Italic 12 | 71 | Courier 12 Italic |
| APL 12 | 76 | Courier 12 |
| Script 12 | 84 | Courier 12 |
| Courier 12 | 85 | Courier 12 |
| Prestige Elite 12 | 86 | Courier 12 |
| Letter Gothic 12 | 87 | Letter Gothic 12 |
| Courier 12 Italic | 91 | Courier 12 Italic |
| Courier 12 Italic | 92 | Courier 12 Italic |
| Shalom 12 | 98 | Courier 12 |
| Letter Gothic 12 Italic | 109 | Letter Gothic 12 Italic |
| Letter Gothic 12 Bold | 110 | Letter Gothic 12 Bold |
| Prestige Elite Bold 12 | 111 | Courier 12 Bold |
| Prestige Elite Italic 12 | 112 | Courier 12 Italic |
| Boldface Italic (PSM) | 155 | Courier 10 spaced as PSM |
| Boldface (PSM) | 159 | Courier 10 spaced as PSM |
| Essay (PSM) | 160 | Courier 10 spaced as PSM |

Table 173. Nontypographic Typefaces Substitution - Twinax only (continued)

| Typeface | IBM FGID | Substituted typeface |
|---------------------|----------|--------------------------|
| Essay Italic (PSM) | 162 | Courier 10 spaced as PSM |
| Prestige (PSM) | 164 | Courier 10 spaced as PSM |
| Yasmin (PSM) | 166 | Courier 10 spaced as PSM |
| Barak (PSM) | 167 | Courier 10 spaced as PSM |
| Yasmin Exp (PSM) | 169 | Courier 10 spaced as PSM |
| Essay Light (PSM) | 173 | Courier 10 spaced as PSM |
| Document (PSM) | 175 | Courier 10 spaced as PSM |
| Shalom 15 | 211 | Courier 15 |
| Shalom Bold 15 | 212 | Courier 15 Bold |
| Prestige 15 | 221 | Courier 15 |
| Gothic Text 15 | 222 | Letter Gothic 15 |
| Courier 15 | 223 | Courier 15 |
| Shalom Condensed 15 | 226 | Courier 15 |
| Serif Text 15 | 229 | Courier 15 |
| Courier 5 | 244 | Courier 5 |
| Courier 5 Bold | 245 | Courier 5 Bold |
| Courier 17 | 252 | Courier 17 |
| Courier 17.1 | 254 | Courier 17.1 |
| Letter Gothic 17.1 | 255 | Letter Gothic 17.1 |
| Prestige 17.1 | 256 | Courier 17.1 |
| Kateb 8 | 265 | Courier 8.55 |
| APL 20 | 280 | Courier 20 |
| Letter Gothic 20 | 281 | Letter Gothic 20 |
| Aviv 20 | 282 | Courier 20 |

Typographic FGID

Table 174 on page 289 lists the fonts used as replacements when *typographic* fonts are requested for Twinax printing. The FGIDs shown are for fonts resident in some other IBM printers but not resident in the standard IBM Network Printers. Also included are some typographic fonts from 4028 font cards.

The point size is not shown, but it will be as specified to the printer in the Set FID Through GFID (SFG) control command (unless using Alternate FGIDs, which define typeface and point size).

Table 174. *Typographic Typefaces Substitution*

| Typeface | IBM FGID | Substituted typeface |
|-------------------------|----------|--|
| Sonoran Serif | 4407 | CG Times Alternate FGIDs (1051, 1351) also supported as CG Times. |
| Sonoran Serif Bold | 4427 | CG Times Bold Alternate FGIDs (1053, 1653, 1803, 2103) also supported as CG Times Bold. |
| Sonoran Serif Italic | 4535 | CG Times Italic Alternate FGID (1056) also supported as CG Times Italic. |
| Times Roman | 5687 | Times New Roman Alternate FGIDs (760, 751) also supported as Times New Roman. |
| Times Roman Bold | 5707 | Times New Roman Bold Alternate FGIDs (761, 762) also supported as Times New Roman Bold. |
| Times Roman Italic | 5815 | Times New Roman Italic Alternate FGID (763) also supported as Times New Roman Italic. |
| Times Roman Bold Italic | 5835 | Times New Roman Bold Italic Alternate FGIDs (764, 765) also supported as Times New Roman Bold Italic. |
| Narkis | 12855 | Times New Roman |
| Narkis Bold | 12875 | Times New Roman Bold |
| Helvetica | 34103 | Univers |
| Helvetica Bold | 34123 | Univers Bold |
| Helvetica Italic | 34231 | Univers Italic |

IBM Network Printers Resident IPDS Fonts

Network Printers will support outline fonts from both the IBM Core Interchange Font Set and the IBM Coordinated Font Set as resident fonts. In addition, a selection of these fonts are grouped into the 4028 Compatibility Font set. This set is used to represent the 4028 base internal raster fonts for limited compatibility. The font technologies used in the printer are:

- IBM Core Interchange - Type 1 Outlines
- IBM Coordinated - Type 1 Outlines
- 4028 Compatibility - Type 1 Outlines

Resident Font Activation Methods

Load Font Equivalence

The Load Font Equivalence (LFE) command maps font local identifiers, specified within text, graphics or bar code data, to font Host Assigned IDs (HAIDs) and Global Resource IDs (GRIDs).

If the GRID specified in the LFE command matches a GRID contained in the printer, the font is activated.

Activate Resource (Load Resource Equivalence)

The Activate Resource (AR) command (previously known as Load Resource Equivalence) maps Host Assigned IDs to global names of another format. The format for the global name is identified by a resource type and resource ID combination.

If the Network Printers have a resource that matches the global name in the AR command, that resource is activated.

The following combinations of Resource Type and Resource ID Format are supported by the Network Printers.

| Resource Type | RT Hex | Resource ID Format | RIDF Hex |
|-------------------------------|--------|----------------------|----------|
| Single Byte Coded Raster Font | X'01' | IBM GRID | X'03' |
| Single Byte Coded Raster Font | X'01' | MVS Host Unalterable | X'06' |
| Single Byte Coded Font Index | X'08' | IBM GRID | X'03' |
| Single Byte Coded Font Index | X'08' | MVS Host Unalterable | X'06' |

Because the Network Printers will only support the IPDS LF1 tower at GA, the scalable outline fonts will be activated as raster fonts, using the GRID information in listed in this document. Note that Resource Type 10 will be treated internally as Resource Type 01.

IBM Core Interchange Resident Scalable Font Set

The IBM Core Interchange fonts as shown in Table 175 on page 291 will be supported as resident fonts in the following language groups:

- Latin 1/2/3/4/5
- Symbols
- Arabic
- Cyrillic Greek
- Hebrew

Table 175 on page 291 lists the typefaces resident in the Network Printers and includes the valid FGID and code pages for each font.

GCSGID Subsets

Table 176 on page 293 provides a mapping of the valid subsets of the GCSGIDs listed for the IBM Core Interchange fonts.

XOA-RRL Replies for Font Character Sets

The resident set as shown in Table 175 will support a font character set of any valid font width when queried as an individual font character set.

When queried for a list of font character sets, the resident character sets will be reported with a font width of zero. A font width of zero indicates that the font is scalable.

Valid combinations of the CPGIDs, GCSGIDs, FGIDs and Font Widths for the resident fonts are defined in Chapter 14. Code Page and Font Identification.

Table 175. IBM Core Interchange Resident Scalable Font Set

| Typeface | FGID | GCSGID | Font Width | Code Pages |
|--------------------------------------|------|--------|------------|---------------------------|
| Latin 1/2/3/4/5 | | | | |
| Times New Roman Medium | 2308 | 1355 | Scalable | See Table 177 on page 293 |
| Times New Roman Bold | 2309 | 1355 | Scalable | See Table 177 on page 293 |
| Times New Roman Italic Medium | 2310 | 1355 | Scalable | See Table 177 on page 293 |
| Times New Roman Italic Bold | 2311 | 1355 | Scalable | See Table 177 on page 293 |
| Helvetica Roman Medium | 2304 | 1355 | Scalable | See Table 177 on page 293 |
| Helvetica Roman Bold | 2305 | 1355 | Scalable | See Table 177 on page 293 |
| Helvetica Italic Medium | 2306 | 1355 | Scalable | See Table 177 on page 293 |
| Helvetica Italic Bold | 2307 | 1355 | Scalable | See Table 177 on page 293 |
| Courier Roman Medium | 416 | 1355 | Scalable | See Table 177 on page 293 |
| Courier Roman Bold | 420 | 1355 | Scalable | See Table 177 on page 293 |
| Courier Italic Medium | 424 | 1269 | Scalable | See Table 177 on page 293 |
| Courier Italic Bold | 428 | 1269 | Scalable | See Table 177 on page 293 |
| Times New Roman Medium | 2308 | 1275 | Scalable | See Table 177 on page 293 |
| Times New Roman Bold | 2309 | 1275 | Scalable | See Table 177 on page 293 |
| Helvetica Roman Medium | 2304 | 1275 | Scalable | See Table 177 on page 293 |
| Helvetica Roman Bold | 2305 | 1275 | Scalable | See Table 177 on page 293 |
| Courier Roman Medium | 416 | 1275 | Scalable | See Table 177 on page 293 |
| Courier Roman Bold | 420 | 1275 | Scalable | See Table 177 on page 293 |
| Cyrillic Greek | | | | |
| Times New Roman Medium | 2308 | 1300 | Scalable | See Table 177 on page 293 |
| Times New Roman Bold | 2309 | 1300 | Scalable | See Table 177 on page 293 |
| Times New Roman Italic Medium | 2310 | 1300 | Scalable | See Table 177 on page 293 |
| Times New Roman Italic Bold | 2311 | 1300 | Scalable | See Table 177 on page 293 |
| Helvetica Roman Medium | 2304 | 1300 | Scalable | See Table 177 on page 293 |
| Helvetica Roman Bold | 2305 | 1300 | Scalable | See Table 177 on page 293 |

Table 175. IBM Core Interchange Resident Scalable Font Set (continued)

| Typeface | FGID | GCSGID | Font Width | Code Pages |
|--|------|--------|------------|---------------------------|
| Helvetica Italic Medium | 2306 | 1300 | Scalable | See Table 177 on page 293 |
| Helvetica Italic Bold | 2307 | 1300 | Scalable | See Table 177 on page 293 |
| Courier Roman Medium | 416 | 1300 | Scalable | See Table 177 on page 293 |
| Courier Roman Bold | 420 | 1300 | Scalable | See Table 177 on page 293 |
| Courier Italic Medium | 424 | 1300 | Scalable | See Table 177 on page 293 |
| Courier Italic Bold | 428 | 1300 | Scalable | See Table 177 on page 293 |
| Arabic | | | | |
| ITC Boutros Setting Medium | 2308 | 1264 | Scalable | See Table 177 on page 293 |
| ITC Boutros Setting Bold | 2309 | 1264 | Scalable | See Table 177 on page 293 |
| ITC Boutros Setting Italic Medium | 2310 | 1264 | Scalable | See Table 177 on page 293 |
| ITC Boutros Setting Italic Bold | 2311 | 1264 | Scalable | See Table 177 on page 293 |
| ITC Boutros Modern Rokaa Medium | 2304 | 1264 | Scalable | See Table 177 on page 293 |
| ITC Boutros Modern Rokaa Bold | 2305 | 1264 | Scalable | See Table 177 on page 293 |
| ITC Boutros Modern Rokaa Italic Medium | 2306 | 1264 | Scalable | See Table 177 on page 293 |
| ITC Boutros Modern Rokaa Italic Bold | 2307 | 1264 | Scalable | See Table 177 on page 293 |
| Boutros Typing Medium | 416 | 1264 | Scalable | See Table 177 on page 293 |
| Boutros Typing Bold | 420 | 1264 | Scalable | See Table 177 on page 293 |
| Boutros Typing Italic Medium | 424 | 1264 | Scalable | See Table 177 on page 293 |
| Boutros Typing Italic Bold | 428 | 1264 | Scalable | See Table 177 on page 293 |
| Hebrew | | | | |
| Narkissim Medium | 2308 | 1265 | Scalable | See Table 177 on page 293 |
| Narkissim Bold | 2309 | 1265 | Scalable | See Table 177 on page 293 |
| Narkissim Italic Medium | 2310 | 1265 | Scalable | See Table 177 on page 293 |
| Narkissim Italic Bold | 2311 | 1265 | Scalable | See Table 177 on page 293 |
| Narkiss Tam Medium | 2304 | 1265 | Scalable | See Table 177 on page 293 |
| Narkiss Tam Bold | 2305 | 1265 | Scalable | See Table 177 on page 293 |
| Narkiss Tam Italic Medium | 2306 | 1265 | Scalable | See Table 177 on page 293 |
| Narkiss Tam Italic Bold | 2307 | 1265 | Scalable | See Table 177 on page 293 |
| Shalom Medium | 416 | 1265 | Scalable | See Table 177 on page 293 |
| Shalom Bold | 420 | 1265 | Scalable | See Table 177 on page 293 |
| Shalom Italic Medium | 424 | 1265 | Scalable | See Table 177 on page 293 |
| Shalom Italic Bold | 428 | 1265 | Scalable | See Table 177 on page 293 |

Table 176. GCSGID Subsets for IBM Core Interchange Fonts

| GCSGID | Valid GCSGID Subsets |
|--------|--|
| 1269 | 0101, 0103, 0119, 0251, 0265, 0269, 0273, 0277, 0281, 0285, 0288, 0289, 0293, 0297, 0301, 0305, 0309, 0313, 0317, 0321, 0325, 0329, 0337, 0341, 0611, 0697, 0919, 0959, 0965, 0980, 0982, 0983, 0987, 0990, 0991, 0993, 0995, 1111, 1132, 1133, 1145, 1146, 1149, 1152, 1166, 1167, 1174, 1188, 1189, 1198, 1220, 1232, 1233, 1237, 1256, 1258, 1259, 1260, 1261, 1268, 1286, 1301, 1302, 2039 |
| 1355 | 1269, 2041 |
| 2041 | 0695, 0988, 1353, 1412, 2039 |
| 1275 | 0340, 0630, 0909, 1191, 1257 |
| 1264 | 0235, 0994, 1154, 1162, 1177, 1244 |
| 1265 | 0941, 0687, 0986, 0992, 1147, 1199, 1217, 1218 |
| 1300 | 0218, 0925, 0960, 0981, 0985, 0996, 0998, 1150, 1190, 1231, 1235, 1249, 1251, 1276, 1401 |

IBM Core Interchange Resident Code Page Set

Table 177 lists the code pages used with the IBM Core Interchange Resident Fonts. Not all code Pages apply to each font; this is determined by the character set. Please correlate the GCSGIDs found in Table 177 with the correct IBM Core Interchange Font GCSGID superset in Table 176 to determine which code pages apply to a particular font family.

Table 177. IBM Core Interchange Resident Code Page Set

| Code Page Global ID (CPGID) | Graphic Character Set ID (GCSGID) | Language Supported |
|--|-----------------------------------|--|
| Latin 1 Country Extended Code Pages | | |
| 037 | 697 | US English, Canadian English, Canadian French, Dutch, Brazilian Portuguese, Portuguese |
| 273 | 697 | Austrian, German |
| 274 | 697 | Belgian |
| 275 | 697 | Brazilian |
| 277 | 697 | Danish, Norwegian |
| 278 | 697 | Finnish, Swedish |
| 280 | 697 | Italian |
| 281 | 697 | Japanese |
| 282 | 697 | Portuguese |
| 284 | 697 | Castillian Spanish, Latin American Spanish |
| 285 | 697 | UK English |

Table 177. IBM Core Interchange Resident Code Page Set (continued)

| Code Page Global ID (CPGID) | Graphic Character Set ID (GCSGID) | Language Supported |
|--|-----------------------------------|---|
| 297 | 697 | French, Catalan |
| 500 | 697 | Multinational, Belgium French, Belgium Dutch, Swiss French, Swiss German, Swiss Italian |
| 871 | 697 | Icelandic |
| Latin 1 EBCDIC Publishing Code Pages | | |
| 1140 | 695 | US, Canada, Netherlands, Brazil, Portugal |
| 1141 | 695 | Austrian, German |
| 1142 | 695 | Danish, Norwegian |
| 1143 | 695 | Finnish, Swedish |
| 1144 | 695 | Italian |
| 1145 | 695 | Spanish |
| 1146 | 695 | UK English |
| 1147 | 695 | French |
| 1148 | 695 | Belgium, Switzerland/International |
| 1149 | 695 | Iceland |
| Latin 1 Country Extended Code Pages with Euro Character | | |
| 361 | 1145 | Multinational, Belgium French, Belgium Dutch, Swiss French, Swiss German, Swiss Italian |
| 382 | 1145 | German |
| 383 | 1145 | Belgian |
| 384 | 1145 | Brazilian Portuguese |
| 385 | 1145 | Canadian French |
| 386 | 1145 | Danish, Norwegian |
| 387 | 1145 | Finnish, Swedish |
| 388 | 1145 | French, Catalan |
| 389 | 1145 | Italian |
| 390 | 1145 | Japanese |
| 391 | 1145 | Portuguese |
| 392 | 1145 | Castillian Spanish |
| 393 | 1145 | Latin American Spanish |
| 394 | 1145 | UK English |
| 395 | 1145 | US English, Canadian English |
| Latin 1 ASCII Code Pages | | |

Table 177. IBM Core Interchange Resident Code Page Set (continued)

| Code Page Global ID (CPGID) | Graphic Character Set ID (GCSGID) | Language Supported |
|---|-----------------------------------|--|
| 437 | 919 | Multinational, US English, UK English, Dutch, German, Finnish, French, Italian, Spanish, Swedish |
| 850 | 980 | Multinational PC |
| 858 | 988 | Multinational PC with Euro |
| 860 | 990 | Portugese (Primary = 850) |
| 861 | 991 | Icelandic (Primary = 850) |
| 863 | 993 | Canadian French (Primary = 850) |
| 865 | 995 | Nordic (Primary = 850) |
| 1004 | 1146 | IBM PC Desktop Publishing |
| 819 | 697 | ISO Latin 1 |
| 1252 | 1412 | Windows Latin 1 |
| Latin 2/3/4/5 EBCDIC and ASCII Code Pages | | |
| 852 | 982 | Croatian, Czech, East German, Hungarian, Polish, Romanian, Slovak, Slovenian |
| 870 | 959 | Latin 2 Multilingual |
| 912 | 959 | Latin 2 ISO/ ANSI 8 Bit |
| 853 | 983 | Latin 3 Multilingual PC |
| 905 | 1286 | Latin 3 Multilingual |
| 1069 | 1256 | Latin 4 EBCDIC |
| 914 | 1256 | Latin 4 ISO/ASCII |
| 857 | 987 | Latin 5 PC |
| 920 | 1152 | Latin 5 ISO/ANSI 8 Bit |
| 1026 | 1152 | Latin 5 |
| Latin 9 EBCDIC and ASCII Code Pages | | |
| 923 | 1353 | Latin 9 |
| 924 | 1353 | Latin 9 EBCDIC |
| Latin EBCDIC DCF Code Pages | | |
| 1002 | 1132 | DCF Release 2 Compatibility |
| 1003 | 1133 | US Text Subset |
| 1068 | 1259 | Text with Numeric Spacing |
| 1039 | 1258 | GML List Symbols |
| Cyrillic and Greek EBCDIC and ASCII Code Pages | | |
| 880 | 960 | Cyrillic Multilingual (Primary = 1025) |
| 915 | 1150 | Cyrillic ISO/ASCII 8 Bit |
| 855 | 985 | Cyrillic PC |
| 866 | 996 | Cyrillic #2 PC |

Table 177. IBM Core Interchange Resident Code Page Set (continued)

| Code Page Global ID (CPGID) | Graphic Character Set ID (GCSGID) | Language Supported |
|---|-----------------------------------|--|
| 1025 | 1150 | Cyrillic Multilingual |
| 423 | 218 | Greek 183 (Primary = 875) |
| 813 | 925 | Greek ISO/ASCII 8 Bit |
| 851 | 981 | Greek PC (Primary = 869) |
| 869 | 998 | Greek PC |
| 875 | 925 | Greek |
| 1039 | 1258 | GML List Symbols |
| Arabic EBCDIC and ASCII Code Pages | | |
| 420 | 235 | Arabic Bilingual |
| 864 | 994 | Arabic PC |
| 1008 | 1162 | Arabic ISO/ASCII 8 Bit |
| 1029 | 1154 | Arabic Extended ISO/ASCII 8 Bit |
| 1046 | 1177 | Arabic Extended ISO/ASCII 8 Bit |
| 1039 | 1258 | GML List Symbols |
| Hebrew EBCDIC and ASCII Code Pages | | |
| 916 | 941 | Hebrew ISO/ASCII 8 Bit |
| 1028 | 1199 | Hebrew Publishing |
| 424 | 941 | Hebrew |
| 803 | 1147 | Hebrew Character Set A (Primary = 424) |
| 856 | 986 | Hebrew PC (Primary = 862) |
| 862 | 992 | Hebrew PC |
| 1039 | 1258 | GML List Symbols |
| Symbols | | |
| 259 | 340 | Symbols, Set 7 |
| 899 | 340 | Symbols, Set 7 ASCII |
| 1087 | 1257 | Symbols, Adobe |
| 1038 | 1257 | Symbols, Adobe ASCII |
| 1091 | 1191 | Symbols, Modified Set 7 |
| 1092 | 1191 | Symbols, Modified Set 7 ASCII |
| 363 | 630 | Symbols, Set 8 |
| 829 | 909 | Math Symbols |

4028 Compatibility Resident Font Set

Table 178 on page 297 lists the typefaces resident in the Network Printers and includes the valid FGID and code pages for each font.

The Network Printers will substitute Times New Roman (from the IBM Core Interchange Set) for the Times Roman fonts listed in Table 178. The Courier fonts will also come from the IBM Core Interchange Set. All the remaining listed fonts will be from the IBM Coordinated Font Set (see Table 180 on page 299).

See Table 179 on page 298 for an explanation of the groups used in the "Code Pages" column.

A font that is referenced with a CPGID of 259 is mapped to the Courier Roman Medium Symbols font (FGID 416) and character set (GCSGID 1275) as shown in Table 175 on page 291.

Notes:

1. The Prestige 10 and 12 pt fonts (FGIDs 86 and 12) support Symbol Set 7 (Code Page 259) for resident activation. The Courier Symbol Set font is substituted, since there are no special Prestige symbol set characters. The 4028 did the same thing.
2. To match the 4028 and 3116 printed font sizes, the FGIDs 254, 256, 281, and 290 are scaled anamorphically (internal to the Network Printers) as follows:

| FGID | Vertical x Horizontal Scale Factors (points) |
|-------------|---|
| 254 | 7.8 vpt x 7.0 hpt |
| 256 | 7.8 vpt x 7.0 hpt |
| 281 | 7.0 vpt x 6.0 hpt |
| 290 | 5.0 vpt x 4.5 hpt |

Table 178. 4028 Compatibility Resident Font Set

| Typeface | FGID | Alt FGID | Pitch | Point Size | Font width | Code Pages |
|------------------------|-------------|-----------------|--------------|-------------------|-------------------|-------------------|
| APL | 76 | | 12 | 10 | 120 | 310 |
| Boldface | 159 | 20224 | Proportional | 12 | 120 | A, B |
| Courier | 11 | | 10 | 12 | 144 | 259, A, B |
| Courier | 85 | | 12 | 10 | 120 | 259, A, B |
| Courier | 223 | | 15 | 9 | 96 | A, B |
| Courier Ultra Expanded | 244 | | 5 | 12 | 288 | A, B |
| Courier | 254 | | 17.1 | 8.5 | 84 | A, B |
| Courier Bold | 46 | | 10 | 12 | 144 | A, B |
| Courier Italic | 18 | | 10 | 12 | 144 | A, B |
| Courier Italic | 92 | | 12 | 10 | 120 | A, B |
| Letter Gothic | 281 | | 20 | 7.5 | 72 | A, B |
| OCR A | 19 | | 10 | 12 | 144 | 892 |
| OCR B | 03 | | 10 | 12 | 144 | 893 |
| Prestige Elite | 86 | | 12 | 10 | 120 | 259, A, B |
| Prestige PSM | 164 | | Proportional | 12 | 120 | A, B |
| Prestige | 221 | | 15 | 9 | 96 | A, B |
| Prestige | 256 | | 17.1 | 8.5 | 84 | A, B |
| Prestige Pica | 12 | | 10 | 12 | 144 | 259, A, B |
| Prestige Elite Bold | 111 | | 12 | 10 | 120 | A, B |

Table 178. 4028 Compatibility Resident Font Set (continued)

| Typeface | FGID | Alt FGID | Pitch | Point Size | Font width | Code Pages |
|-------------------------|------|----------|-------|------------|------------|------------|
| Prestige Elite Italic | 112 | | 12 | 10 | 120 | A, B |
| Times Roman | 5687 | 760 | Typo | 6 | 40 | A |
| Times Roman | 5687 | 751 | Typo | 8 | 53 | A |
| Times Roman | 5687 | 1051 | Typo | 10 | 67 | A |
| Times Roman | 5687 | 1351 | Typo | 12 | 80 | A |
| Times Roman Bold | 5707 | 1053 | Typo | 10 | 67 | A |
| Times Roman Bold | 5707 | 761 | Typo | 12 | 80 | A |
| Times Roman Bold | 5707 | 762 | Typo | 14 | 93 | A |
| Times Roman Bold | 5707 | 1803 | Typo | 18 | 120 | A |
| Times Roman Bold | 5707 | 2103 | Typo | 24 | 160 | A |
| Times Roman Italic | 5815 | 1056 | Typo | 10 | 67 | A |
| Times Roman Italic | 5815 | 763 | Typo | 12 | 80 | A |
| Times Roman Bold Italic | 5835 | 764 | Typo | 10 | 67 | A |
| Times Roman Bold Italic | 5835 | 765 | Typo | 12 | 80 | A |
| Gothic Text (311x) | 203 | | 13.3 | 9 | 108 | A, B |
| Gothic Text (311x) | 283 | | 20 | 6 | 72 | A, B |
| Gothic Text (311x) | 290 | | 26.7 | 5 | 54 | A, B |

4028 Compatibility Resident Code Page Set

Table 179 provides an explanation of the groups as used in the Code Pages column of Table 178 on page 297.

Table 179. 4028 Compatibility Resident Code Page Set

| Code Page Global ID (CPGID) | Graphic Character Set ID (GCSGID) |
|--|-----------------------------------|
| Group A | |
| 037, 273, 274, 277, 278, 280, 281, 284, 285, 297, 500, 871 | 697 |
| 1140, 1141, 1142, 1143, 1144, 1145, 1146, 1147, 1148, 1149 | 695 |
| 038, 367 | 103 |
| 260 | 341 |
| 276 | 277 |
| 286 | 317 |
| 287 | 321 |
| 288 | 325 |
| 1002 | 1132 |
| 437 | 919 |
| 850 | 980 |
| 858 | 988 |
| 1003 (Addition to network printer 4028 font support. Not supported by 4028.) | 1133 |

Table 179. 4028 Compatibility Resident Code Page Set (continued)

| Code Page Global ID (CPGID) | Graphic Character Set ID (GCSGID) |
|--|-----------------------------------|
| Group B | |
| 256 (Replaced by 500) | 337 |
| 289 (Replaced by 500, but missing obsolete "Peseta" character) | 329 |
| Miscellaneous | |
| 310 | 963 |
| 259 | 340 |
| 892 | 968 |
| 893 | 969 |

IBM Coordinated Font Set

Table 180 lists the scalable IBM Coordinated font set typefaces resident in the Network Printers and includes the valid FGID and code pages for each font.

Where the IBM Core Interchange code pages are referenced in Table 177 on page 293, only the Latin 1 Country Extended, Latin 1 EBCDIC Publishing, Latin 1 ASCII and Latin EBCDIC DCF code pages are supported.

GCSGID Subsets

Table 182 on page 300 provides an a mapping of the valid subsets of the GCSGIDs listed for the PSC Strategic Font Set 2.

Table 180. Resident PSCStrategic Scalable Font Set 2

| Typeface | FGID | GCSGID | Font width | Code Pages |
|--------------------|-------|--------|------------|---------------------------|
| APL | 307 | 1304 | Scalable | 293, 310, 910 |
| APL Bold | 322 | 1304 | Scalable | 293, 310, 910 |
| Boldface | 20224 | 2039 | Scalable | See Table 177 on page 293 |
| Gothic Text | 304 | 2039 | Scalable | See Table 177 on page 293 |
| Letter Gothic | 400 | 2039 | Scalable | See Table 177 on page 293 |
| Letter Gothic Bold | 404 | 2039 | Scalable | See Table 177 on page 293 |
| OCR A | 305 | 968 | Scalable | 876, 892 |
| OCR B | 306 | 969 | Scalable | 877, 893 |
| Prestige | 432 | 2039 | Scalable | See Table 177 on page 293 |
| Prestige Bold | 318 | 2039 | Scalable | See Table 177 on page 293 |
| Prestige Italic | 319 | 2039 | Scalable | See Table 177 on page 293 |
| Katakana Gothic | 304 | 1306 | Scalable | 290, 897, 1027, 1041 |

IBM Coordinated Font Set Code Page Set

Table 181 provides the GCSGIDs and CPGIDs for the individual Code Pages listed in the Code Pages column of Table 180 on page 299.

Table 181. IBM Coordinated Font Set Code Page Set

| Code Page Global ID (CPGID) | Graphic Character Set ID (GCSGID) |
|-----------------------------|-----------------------------------|
| 293 | 380 |
| 310 | 963 |
| 910 | 1113 |
| 876, 892 | 968 |
| 877, 893 | 969 |
| 290, 1027 | 1172 |
| 897 | 1164 |
| 1041 | 1187 |

Table 182. GCSGID Subsets for the Strategic Font Set 2

| GCSGID | Valid GCSGID Subsets |
|--------|--|
| 1304 | 0380, 0963, 1113 |
| 2039 | 0101, 0103, 0119, 0251, 0265, 0269, 0273, 0277, 0281, 0285, 0288, 0289, 0293, 0297, 0301, 0305, 0309, 0313, 0317, 0321, 0325, 0329, 0337, 0341, 0611, 0697, 0919, 0980, 0990, 0991, 0993, 0995, 1132, 1133, 1145, 1146, 1149, 1198, 1220, 1258, 1259, 1260 |
| 1306 | 0332, 1164, 1172, 1187 |
| 2041 | 0695, 0988, 1353, 1412, 2039 |

IPDS Default Font

Factory Setting

The factory setting for the default font is Courier Roman Medium 10 pitch (12 point) using code page 037, version 1. The GRID for the default font is: FGID=416, GCSGID=697, CPGID=037, FontWidth=144 (CPI setting is 10.0). The default font may be changed by the operator using the operator panel. It will reset to the Factory Setting upon each IML.

Potential change to this is to save the last requested default font in NVRAM and IML with those values.

Selectable IPDS Default Font

To change the default font requires the use of the operator panel. The operator panel will present menu choices for selecting the various parts of the font.

The operator may select the default font using any or all of the Code Page (CPGID), Font (FGID), and Characters Per Inch (CPI) parameters. The available parameters will be listed in Groups to help identify valid/invalid combinations. An invalid combination will be resolved inside the printer because the printer must have

a valid default font. However, the parameter adjustment will not be visible at the OP Panel display. Detailed information listing the valid combinations and how to select them will be available with the printer.

The selection is based upon a hierarchy: Code Page is highest, Font is next, and Font Width (CPI) is the lowest. Should an invalid combination be selected, the Code Page will override Font and CPI, and Font will override CPI.

There are 5 Groups, A-E, into which all the fonts, code pages, and widths fall. All combinations defined within a Group are valid. When internal modification is necessary, the following rules apply:

1. An invalid/unsupported CPGID becomes Code Page 037 (Group A).
2. An invalid/unsupported Font Width (CPI) becomes 10.0 CPI (which will translate to 12 points).
3. For a Group A CPGID, an invalid/unsupported FGID becomes 416 Courier Roman Medium.
4. For a Group B CPGID, the FGID is automatically 304 Gothic Katakana.
5. For a Group C CPGID, the FGID is automatically 305 OCR A. Font Width is 10.0 CPI.
6. For a Group D CPGID, the FGID is automatically 306 OCR B. Font Width is 10.0 CPI.
7. For a Group E CPGID, an invalid/unsupported FGID becomes 416 Courier Roman Medium.

Note: The 4028 compatibility fonts are a new addition to the OP Panel selection. This is necessary because some of these FGIDs are anamorphically scaled, and therefore cannot be correctly reproduced with just an AFP FGID and a CPI value.

These fonts are handled specially in that all of these FGIDs (except 5687, 5707, 5815, 5835) ignore the OP Panel CPI value, because the FGID fully describes the font. In the case of the 4 typographic FGIDs, there are valid discrete sizes associated with them. If the correct CPI values are not used, the printer will default to the nearest discrete size value. Tie goes to the smaller value.

Selectable Code Pages

The following code pages are selectable by the operator:

| Code-Page/Group | Code Page Description |
|------------------------|--------------------------------------|
| 500 A | Belgium, Switzerland / International |
| 037 A | US, Canada, Netherlands, Portugal |
| 038 A | US English ASCII |
| 260 A | Canadian French |
| 273 A | Austrian / German |
| 274 A | Belgium |
| 276 A | Canadian French (94 character set) |
| 277 A | Danish / Norwegian |
| 278 A | Finnish / Swedish |

| | |
|--------|--|
| 280 A | Italian |
| 281 A | Japanese |
| 284 A | Spanish |
| 285 A | UK English |
| 286 A | Austrian / German (alternate) |
| 287 A | Danish / Norwegian (Alternate) |
| 288 A | Finnish / Swedish (Alternate) |
| 297 A | French |
| 871 A | Icelandic |
| 1140 A | US, Canada, Netherlands, Portugal (Euro) |
| 1141 A | Austrian, German (Euro) |
| 1142 A | Danish Norwegian (Euro) |
| 1143 A | Finnish, Swedish (Euro) |
| 1144 A | Italian (Euro) |
| 1145 A | Spanish (Euro) |
| 1146 A | UK English (Euro) |
| 1147 A | Catalan French (Euro) |
| 1148 A | Multinational (Euro) |
| 1149 A | Icelandic (Euro) |
| 290 B | Japanese / Katakana |
| 892 C | OCR - A |
| 893 D | OCR - B |
| 420 E | Arabic |
| 423 E | Greek |
| 424 E | Hebrew |
| 870 E | Latin 2 Multilingual |
| 875 E | Greek |
| 880 E | Cyrillic |
| 905 E | Turkish |
| 1025 E | Cyrillic (primary) |
| 1026 E | Turkish (primary) |

Selectable Fonts

The following fonts (FGID) are selectable by the operator:

| FGID/Group | FGID Description |
|-------------------|---|
| 2304 A, E | Helvetica Roman/ITC Boutros Modern Rokaa/Narkiss Tam - Medium |
| 2305 A, E | Helvetica Roman/ITC Boutros Modern Rokaa/Narkiss Tam - Bold |

| | |
|------------------|--|
| 2306 A, E | Helvetica Roman/ITC Boutros Modern Rokaa/Narkiss Tam - Italic Medium |
| 2307 A, E | Helvetica Roman/ITC Boutros Modern Rokaa/Narkiss Tam - Italic Bold |
| 2308 A, E | Times New Roman/ITC Boutros Setting Rokaa/Narkissim - Medium |
| 2309 A, E | Times New Roman/ITC Boutros Setting Rokaa/Narkissim - Bold |
| 2310 A, E | Times New Roman/ITC Boutros Setting Rokaa/Narkissim - Italic Medium |
| 2311 A, E | Times New Roman/ITC Boutros Setting Rokaa/Narkissim - Italic Bold |
| 416 A, E | Courier Roman/Boutros Typing/Shalom - Medium |
| 420 A, E | Courier Roman/Boutros Typing/Shalom - Bold |
| 424 A, E | Courier Roman/Boutros Typing/Shalom - Italic Medium |
| 428 A, E | Courier Roman/Boutros Typing/Shalom - Italic Bold |
| 20224 A | Boldface |
| 304 A | Gothic Text |
| 400 A | Letter Gothic |
| 404 A | Letter Gothic Bold |
| 432 A | Prestige |
| 318 A | Prestige Bold |
| 319 A | Prestige Italic |
| 304 B | Katakana Gothic |
| 305 C | OCR A |
| 306 D | OCR B |

Selectable Fonts

The following 4028 fonts (FGID) are also selectable by the operator:

| FGID/Group | FGID Description |
|-------------------|---|
| 159 A | Boldface (Proportional Space 12 pt., based on 10 CPI) |
| 11 A | Courier 10.0 CPI |
| 85 A | Courier 12.0 CPI |
| 223 A | Courier 15.0 CPI |
| 254 A | Courier 17.1 CPI |
| 46 A | Courier Bold 10.0 CPI |
| 18 A | Courier Italic 10.0 CPI |
| 92 A | Courier Italic 12.0 CPI |
| 203 A | Gothic Text 13.3 CPI |
| 283 A | Gothic Text 20.0 CPI |
| 290 A | Gothic Text 26.7 CPI |

| | |
|---------------|--|
| 281 A | Letter Gothic 20 CPI |
| 19 C | OCR A |
| 03 D | OCR B |
| 12 A | Prestige Pica 10.0 CPI |
| 86 A | Prestige Elite 12.0 CPI |
| 221 A | Prestige Elite 15.0 CPI |
| 256 A | Prestige Elite 17.1 CPI |
| 111 A | Prestige Elite Bold 12.0 CPI |
| 112 A | Prestige Elite Italic 12.0 CPI |
| 5687 A | Times Roman Typographic 6, 8, 10, 12, pt |
| 5707 A | Times Roman Typographic Bold 10, 12, 14, 18, 24 pt |
| 5815 A | Times Roman Typographic Italic 10, 12, pt |
| 5835 A | Times Roman Typographic Bold Italic 10, 12, pt |

Selectable Font Widths

The following Font Widths (CPI) are selectable by the operator:

| Group | Range in characters per inch |
|-------------------------|--|
| A, B, E | 5.0 CPI - 30.0 CPI, in increments of 0.1 CPI. |
| C, D | 10.0 CPI. |
| 4028 Fixed Width | Ignored. Handled internally because the FGID defines the size. |
| 5687 6 pt | 20.0 CPI |
| 5687 8 pt | 15.1 CPI |
| 5687 10 pt | 11.9 CPI |
| 5687 12 pt | 10.0 CPI |
| 5707 10 pt | 11.9 CPI |
| 5707 12 pt | 10.0 CPI |
| 5707 14 pt | 8.6 CPI |
| 5707 18 pt | 6.7 CPI |
| 5707 24 pt | 5.0 CPI |
| 5815 10 pt | 11.9 CPI |
| 5815 12 pt | 10.0 CPI |
| 5835 10 pt | 11.9 CPI |
| 5835 12 pt | 10.0 CPI |

Normally, IPDS Font Width is in terms of 1440ths of an inch (for example, 144, 120). However, Op Panel Font Width selection is more easily understood (and more universally used) as Characters Per Inch. So the values will range from 5.0 cpi (Font Width 288) to 30.0 cpi (Font Width 48) in increments of 0.1 cpi. The resulting cpi will be translated internally to the nearest integer font width value. Since CPI is

inherently a reciprocal, 0.1 cpi increments will be a non-linear font width progression. This should not prove a serious problem since default fonts for IPDS are not the primary selection path.

An extra note is that font widths for fixed width fonts are calculated differently than for typographic fonts. The vertical point size is the real common ground. So to get a 12 point size, a fixed width font will use a font width of 144; 10 cpi. A typographic font will use a font width of 80. To keep compatible sizes this is also translated from 10 cpi. The FGID defines which range to use. For further detail, refer to the LFE and/or AR command sections of the IPDS architecture spec.

IPDS Bar Code Printing

To support the BCOCA tower for printing of bar codes, the OCR-A and OCR-B fonts and their corresponding code pages (892 and 893) must be resident in the printer. These are supported as shown in “4028 Compatibility Resident Font Set” on page 296.

Code page 1303 is also resident to be used for printing code 128 bar codes.

IPDS Font Bolding

The Network Printers will accept the IPDS Load Font Equivalence command and support the bold and double strike bits for both resident Type 1 and loaded raster fonts. No other bits within the LFE flags byte are supported.

The bold/doublestrike attributes are handled the same way within the printer. The function is provided by printing a text block multiple times, each time shifted an appropriate amount. Since the attributes are tied to the font LID and not the font resource, the font resource is not affected.

Font and Code Page Storage Estimates

Following are estimates of the storage required for resident fonts and code pages. Code pages are estimated at 2560 bytes (ASCII) and 1920 bytes (EBCDIC) each. Estimate on Resident Font Character Map is 26 KB. (KB = 1024 bytes)

Table 183. Resident Font and Code Page Storage Requirements

| | Font(s) | Code Page(s) | Total |
|---------------------------------|----------|---------------------|----------|
| IBM Core Interchange | | | |
| Latin 1/2/3/4/5 | 716.1 KB | 104.4 KB (51) | 821.0 KB |
| Symbols | 402.4 KB | 17.0 KB (8) | 419.4 KB |
| Cyrillic Greek | 756.1 KB | 22.5 KB (10) | 778.6 KB |
| Arabic | 610.2 KB | 12.0 KB (5) | 622.2 KB |
| Hebrew | 585.5 KB | 13.2 KB (6) | 598.7 KB |
| IBM Coordinated Font Set | | | |
| 12 Fonts | 512.0 KB | 32.0 KB (16 unique) | 544.0 KB |

Appendix. IBM Code Pages for Non-IPDS Printing

| | |
|--|-----|
| Information Contained in This Chapter | 307 |
| How to Read a Code Page | 307 |
| Special Notes | 308 |
| Code Pages | 309 |
| Version 1 vs Version 0. | 309 |
| Code Page 00037, Version 1: Country Extended: United States and Canada | 309 |
| Code Page 00038: Country Extended: Canada (Bilingual). | 310 |
| Code Page 00260: Canada (French) | 311 |
| Code Page 00273, Version 1: Country Extended: Austria and Germany. | 312 |
| Code Page 00274, Version 1: Country Extended: Belgium | 313 |
| Code Page 00276: Data Processing (DP 94): Canada (French). | 314 |
| Code Page 00277, Version 1: Data Processing: Denmark and Norway | 315 |
| Code Page 00278, Version 1: Data Processing: Finland and Sweden | 316 |
| Code Page 00280, Version 1: Data Processing: Italy | 317 |
| Code Page 00281, Version 1: Data Processing: Japan (Latin) | 318 |
| Code Page 00284, Version 1: Data Processing: Spain, Latin America | 319 |
| Code Page 00285, Version 1: Data Processing: United Kingdom | 321 |
| Code Page 00286: Alternate (3270) Austria and Germany. | 322 |
| Code Page 00287: Alternate (3270) Denmark and Norway | 323 |
| Code Page 00288: Alternate (3270) Finland and Sweden | 324 |
| Code Page 00289: Alternate (3270) Spain | 325 |
| Code Page 00290: Japan (Katakana) | 326 |
| Code Page 00297, Version 1: Country Extended: France | 327 |
| Code Page 00500, Version 1: Country Extended: International # 5 | 328 |
| Code Page 00871, Version 1: Country Extended: Iceland | 329 |
| Code Page 00892: OCR-A | 330 |
| Code Page 00893: OCR-B | 331 |

Information Contained in This Chapter

A code page maps the character IDs in a character set to code points. Code pages accommodate various national languages by using characters and special symbols appropriate to the language. Different code pages may have identical character IDs assigned to different code points.

This chapter contains information about how to read a code page, some special notes about code pages, and code pages for the IBM font products.

Note: To change code pages, use the DEF CD PAG item on the IPDS Menu, or the CODE PAGE item on the Twinax SCS Menu or Coax SCS Menu.

How to Read a Code Page

Each code page includes detailed information. Figure 24 shows how information is arranged on a code page. Definitions of the terms in Figure 24 on page 308 follow the figure.

GCSGID CPGID

CPGID: 37
GCSGID: 897

Code Point

Character Graphic

Character ID

Baseline

Code Page ID

| Hex Codes 1st → 2nd ↓ | 4- | 5- | 6- | 7- | 8- | 9- | A- | B- | C- | D- | E- | F- |
|-----------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| -0 | SP010000 | SM030000 | SP700000 | ␣ | ␣ | SM190000 | SS170000 | SD150000 | SS110000 | SM140000 | SM070000 | ND160000 |
| -1 | SP400000 | LE110000 | SP120000 | LE200000 | LA190000 | LJ100000 | ST190000 | SC420000 | LA020000 | LJ020000 | SA000000 | ND010000 |
| -2 | LA150000 | LE130000 | LA160000 | LE120000 | LE010000 | LR010000 | LS010000 | SC030000 | FR020000 | FR020000 | FR020000 | ND010000 |
| -3 | LA170000 | LE170000 | LA180000 | LE180000 | LC010000 | LI010000 | LY010000 | NS040000 | FR020000 | LI030000 | LI030000 | ND020000 |
| -4 | LA130000 | LE130000 | LA140000 | LE140000 | LD010000 | LS010000 | LS010000 | SV020000 | LA020000 | LM020000 | LI020000 | ND040000 |
| -5 | LA110000 | LE110000 | LA120000 | LE120000 | LE010000 | LS010000 | LY010000 | SM040000 | LE020000 | LN020000 | LV020000 | ND050000 |
| -6 | LA190000 | LE150000 | LA200000 | LE160000 | LE010000 | LE010000 | LS010000 | SM020000 | FR020000 | LO020000 | LV020000 | ND060000 |

Codepage 00037 Version 1

Figure 24. Example of an IBM Code Page

code page ID

The code page ID is the name by which the code page is referenced. The names of code pages shown in this chapter are generic, for example, Code Page 00037 Version 1 instead of T1V10037. However, they are identical.

code point

A 1-byte code point is assigned to each character in the code page. The code points are represented as hexadecimal values; for example, hexadecimal 50 is equivalent to decimal 80. The numeral or letter above the character in the matrix is the first hexadecimal digit of the code point. The numeral or letter to the left of the character is the second hexadecimal digit. In Figure 24, for example, character ID SM030000 (&) is assigned to hexadecimal code point 50.

character graphic

Each character that appears on the code page is associated with its character ID.

character ID

The character ID is the standard identifier for a character regardless of its type family. For example, all uppercase A's have the same character ID (LA020000). Character IDs are also called graphic character identifiers or graphic character IDs.

baseline

The baseline shows where the character is aligned in a line of text.

Special Notes

You can add, delete, and change code point assignments for characters. However, this manual does not describe the methods for doing this.

- ASCII, ANSI, and personal computer code pages

Code pages that use ASCII code points cannot be processed by Document Composition Facility (DCF) and Print Management Facility (PMF) because DCF and PMF do not support ASCII code pages. These ASCII and ANSI code pages, however, allow printing of already formatted ASCII data streams on host-attached page printers when used with IBM Systems Application Architecture (SAA) Application Connection Services and IBM SAA PrintManager. ASCII and ANSI code pages have the words “ASCII,” “ANSI”, or “Personal Computer” in their code page name.

- identifying similar code pages

Two different code pages can appear to be identical. However, they are not identical unless both the code page global identifier (CPGID) and graphic character set global identifier (GCSGID) on one code page are identical to the CPGID and GCSGID on the other code page.

Code Pages

Code pages in this chapter are arranged numerically by code page ID.

Version 1 vs Version 0

Code pages 0037, 0273, 0274, 277, 278, 0280, 0281, 0284, 0285, and 0297 each have a 'Version 1' and 'Version 0'. In each case, there are only a few differences from Version 0.

| Code Point | Version 0 | Version 1. |
|------------|-------------------|---------------|
| B4 | f SC070000 | © SM520000 |
| BF | = SM100000 | × SA070000 |
| DA | 1 LI610000 | ¹ ND010000 |
| E1 | (NSP) SP310000 | ÷ SA060000 |

Code Page 00037, Version 1: Country Extended: United States and Canada

CPGID 037/1 GCSGID 697/1

| HEX DIGITS 1ST → 2ND ↓ | 4- | 5- | 6- | 7- | 8- | 9- | A- | B- | C- | D- | E- | F- |
|------------------------------|-------------------|----------------|---------------|---------------|---------------|---------------|---------------|---------------|-------------------|---------------|---------------|---------------|
| -0 | (SP) SP010000 | & SM030000 | - SP100000 | ø LO610000 | Ø LO620000 | ° SM190000 | μ SM170000 | ^ SD150000 | { SM110000 | } | \ SM140000 | 0 ND100000 |
| -1 | (RSP) SP300000 | é LE110000 | / SP120000 | É LE120000 | a LA010000 | j LJ010000 | ~ SD190000 | £ SC020000 | A LA020000 | J LJ020000 | ÷ SA060000 | 1 ND010000 |
| -2 | â LA150000 | ê LE150000 | Â LA160000 | Ê LE160000 | b LB010000 | k LK010000 | s LS010000 | ¥ SC050000 | B LB020000 | K LK020000 | S LS020000 | 2 ND020000 |
| -3 | ä LA170000 | ë LE170000 | Ä LA180000 | Ë LE180000 | c LC010000 | l LL010000 | t LT010000 | · SD630000 | C LC020000 | L LL020000 | T LT020000 | 3 ND030000 |
| -4 | à LA130000 | è LE130000 | À LA140000 | È LE140000 | d LD010000 | m LM010000 | u LU010000 | © SM520000 | D LD020000 | M LM020000 | U LU020000 | 4 ND040000 |
| -5 | á LA110000 | í LI110000 | Á LA120000 | Í LI120000 | e LE010000 | n LN010000 | v LV010000 | § SM240000 | E LE020000 | N LN020000 | V LV020000 | 5 ND050000 |
| -6 | ã LA190000 | î LI150000 | Ã LA200000 | Î LI160000 | f LF010000 | o LO010000 | w LW010000 | ¶ SM250000 | F LF020000 | O LO020000 | W LW020000 | 6 ND060000 |
| -7 | å LA270000 | ï LI170000 | Å LA280000 | Ï LI180000 | g LG010000 | p LP010000 | x LX010000 | ¼ NF040000 | G LG020000 | P LP020000 | X LX020000 | 7 ND070000 |
| -8 | ç LC410000 | ì LI130000 | Ç LC420000 | Ì LI140000 | h LH010000 | q LQ010000 | y LY010000 | ½ NF010000 | H LH020000 | Q LQ020000 | Y LY020000 | 8 ND080000 |
| -9 | ñ LN190000 | ß LS610000 | Ñ LN200000 | ` SD130000 | i LI010000 | r LR010000 | z LZ010000 | ¾ NF050000 | I LI020000 | R LR020000 | Z LZ020000 | 9 ND090000 |
| -A | ¢ SC040000 | ! SP020000 | ¡ SM650000 | : SP130000 | « SP170000 | @ SM210000 | ì SP030000 | [SM060000 | (SHY) SP320000 | 1 ND011000 | 2 ND021000 | 3 ND031000 |
| -B | · SP110000 | \$ SC030000 | , SP080000 | # SM010000 | » SP180000 | º SM200000 | í SP160000 |] | ô LO150000 | û LU150000 | Ô LO160000 | Û LU160000 |
| -C | < SA030000 | * SM040000 | % SM020000 | @ SM050000 | ð LD630000 | æ LA510000 | Ð LD620000 | - SM150000 | ö LO170000 | ü LU170000 | Ö LO180000 | Ü LU180000 |
| -D | (SP060000 |) SP070000 | _ SP090000 | ' SP050000 | ý LY110000 | , SD410000 | Ý LY120000 | ¨ SD170000 | ò LO130000 | ù LU130000 | Ò LO140000 | Ù LU140000 |
| -E | + SA010000 | ; SP140000 | > SA050000 | = SA040000 | þ LT630000 | Æ LA520000 | Þ LT640000 | ' SD110000 | ó LO110000 | ú LU110000 | Ó LO120000 | Ú LU120000 |
| -F | SM130000 | ¬ SM660000 | ? SP150000 | " SP040000 | ± SA020000 | ⊘ SC010000 | ® SM530000 | × SA070000 | õ LO190000 | ÿ LY170000 | Õ LO200000 | (EO) |

Code Page 00037

Note: Version 1 of this code page is shown. For Version 0 details, see "Version 1 vs Version 0" on page 309.

Code Page 00038: Country Extended: Canada (Bilingual)

CPGID 038 GCSGID 103, 697

| HEX DIGITS 1ST → 2ND ↓ | 4- | 5- | 6- | 7- | 8- | 9- | A- | B- | C- | D- | E- | F- |
|------------------------------|------------------|----------------|---------------|---------------|---------------|---------------|----|----|---------------|---------------|---------------|---------------|
| -0 | (SP) SP010000 | & SM030000 | - SP100000 | | | | | | { SM110000 | } SM140000 | \ SM070000 | 0 ND100000 |
| -1 | | / SP120000 | | a LA010000 | j LJ010000 | ~ SD190000 | | | A LA020000 | J LJ020000 | | 1 ND010000 |
| -2 | | | | b LB010000 | k LK010000 | s LS010000 | | | B LB020000 | K LK020000 | S LS020000 | 2 ND020000 |
| -3 | | | | c LC010000 | l LL010000 | t LT010000 | | | C LC020000 | L LL020000 | T LT020000 | 3 ND030000 |
| -4 | | | | d LD010000 | m LM010000 | u LU010000 | | | D LD020000 | M LM020000 | U LU020000 | 4 ND040000 |
| -5 | | | | e LE010000 | n LN010000 | v LV010000 | | | E LE020000 | N LN020000 | V LV020000 | 5 ND050000 |
| -6 | | | | f LF010000 | o LO010000 | w LW010000 | | | F LF020000 | O LO020000 | W LW020000 | 6 ND060000 |
| -7 | | | | g LG010000 | p LP010000 | x LX010000 | | | G LG020000 | P LP020000 | X LX020000 | 7 ND070000 |
| -8 | | | | h LH010000 | q LQ010000 | y LY010000 | | | H LH020000 | Q LQ020000 | Y LY020000 | 8 ND080000 |
| -9 | | | ` SD130000 | i LI010000 | r LR010000 | z LZ010000 | | | I LI020000 | R LR020000 | Z LZ020000 | 9 ND090000 |
| -A | [SM060000 |] SM080000 | SM130000 | : | | | | | | | | |
| -B | . SP110000 | \$ SC030000 | , SP080000 | # SM010000 | | | | | | | | |
| -C | < SA030000 | * SM040000 | % SM020000 | @ SM050000 | | | | | | | | |
| -D | (SP060000 |) SP070000 | _ SP090000 | ' SP050000 | | | | | | | | |
| -E | + SA010000 | ; SP140000 | > SA050000 | = SA040000 | | | | | | | | |
| -F | ! SP020000 | ^ SD150000 | ? SP150000 | " SP040000 | | | | | | | | (EO) |

Code Page 00038

Code Page 00260: Canada (French)

CPGID 260 GCSGID 341, 697

| HEX DIGITS 1ST → 2ND ↓ | 4- | 5- | 6- | 7- | 8- | 9- | A- | B- | C- | D- | E- | F- |
|------------------------------|------------------|----------------|---------------|---------------|---------------|---------------|---------------|----|---------------|---------------|---------------|---------------|
| -0 | (SP) SP010000 | & SM030000 | - SP100000 | | | | | | é LE110000 | è LE130000 | ¸ SD410000 | 0 ND100000 |
| -1 | | | / SP120000 | É LE120000 | a LA010000 | j LJ010000 | ¨ SD170000 | | A LA020000 | J LJ020000 | | 1 ND010000 |
| -2 | â LA150000 | ê LE150000 | Â LA160000 | Ê LE160000 | b LB010000 | k LK010000 | s LS010000 | | B LB020000 | K LK020000 | S LS020000 | 2 ND020000 |
| -3 | | ë LE170000 | | Ë LE180000 | c LC010000 | l LL010000 | t LT010000 | | C LC020000 | L LL020000 | T LT020000 | 3 ND030000 |
| -4 | | | À LA140000 | È LE140000 | d LD010000 | m LM010000 | u LU010000 | | D LD020000 | M LM020000 | U LU020000 | 4 ND040000 |
| -5 | | | | | e LE010000 | n LN010000 | v LV010000 | | E LE020000 | N LN020000 | V LV020000 | 5 ND050000 |
| -6 | | î LI150000 | | Î LI160000 | f LF010000 | o LO010000 | w LW010000 | | F LF020000 | O LO020000 | W LW020000 | 6 ND060000 |
| -7 | | ï LI170000 | | Ï LI180000 | g LG010000 | p LP010000 | x LX010000 | | G LG020000 | P LP020000 | X LX020000 | 7 ND070000 |
| -8 | ç LC410000 | | Ç LC420000 | | h LH010000 | q LQ010000 | y LY010000 | | H LH020000 | Q LQ020000 | Y LY020000 | 8 ND080000 |
| -9 | | | | ` SD130000 | i LI010000 | r LR010000 | z LZ010000 | | I LI020000 | R LR020000 | Z LZ020000 | 9 ND090000 |
| -A | à LA130000 | ' SD110000 | ù LU130000 | : | | | | | | | | |
| -B | · SP110000 | \$ SC030000 | , SP080000 | # SM010000 | | | | | ô LO150000 | û LU150000 | Ô LO160000 | Û LU160000 |
| -C | < SA030000 | * SM040000 | % SM020000 | @ SM050000 | | | | | | ü LU170000 | | Ü LU180000 |
| -D | (SP060000 |) SP070000 | _ SP090000 | ' SP050000 | | | | | | | | Û LU140000 |
| -E | + SA010000 | ; SP140000 | > SA050000 | = SA040000 | | | | | | | | |
| -F | ! SP020000 | ^ SD150000 | ? SP150000 | " SP040000 | | | | | | | | (EO) |

Code Page 00260

Code Page 00273, Version 1: Country Extended: Austria and Germany

CPGID 273/1 GCSGID 697

| HEX DIGITS 1ST → 2ND ↓ | 4- | 5- | 6- | 7- | 8- | 9- | A- | B- | C- | D- | E- | F- |
|------------------------------|-------------------|----------------|---------------|---------------|---------------|---------------|---------------|---------------|-------------------|---------------|---------------|---------------|
| -0 | (SP) SP010000 | & SM030000 | - SP100000 | ø LO610000 | Ø LO620000 | ° SM190000 | μ SM170000 | ¢ SC040000 | ä LA170000 | ü LU170000 | Ö LO180000 | 0 ND100000 |
| -1 | (RSP) SP300000 | é LE110000 | / SP120000 | É LE120000 | a LA010000 | j LJ010000 | ß LS610000 | £ SC020000 | A LA020000 | J LJ020000 | ÷ SA060000 | 1 ND010000 |
| -2 | â LA150000 | ê LE150000 | Â LA160000 | Ê LE160000 | b LB010000 | k LK010000 | s LS010000 | ¥ SC050000 | B LB020000 | K LK020000 | S LS020000 | 2 ND020000 |
| -3 | { SM110000 | ë LE170000 | [SM060000 | Ë LE180000 | c LC010000 | l LL010000 | t LT010000 | · SD630000 | C LC020000 | L LL020000 | T LT020000 | 3 ND030000 |
| -4 | à LA130000 | è LE130000 | À LA140000 | È LE140000 | d LD010000 | m LM010000 | u LU010000 | © SM520000 | D LD020000 | M LM020000 | U LU020000 | 4 ND040000 |
| -5 | á LA110000 | í LI110000 | Á LA120000 | Í LI120000 | e LE010000 | n LN010000 | v LV010000 | @ SM050000 | E LE020000 | N LN020000 | V LV020000 | 5 ND050000 |
| -6 | ã LA190000 | î LI150000 | Ã LA200000 | Î LI160000 | f LF010000 | o LO010000 | w LW010000 | ¶ SM250000 | F LF020000 | O LO020000 | W LW020000 | 6 ND060000 |
| -7 | å LA270000 | ï LI170000 | Å LA280000 | Ï LI180000 | g LG010000 | p LP010000 | x LX010000 | ¼ NF040000 | G LG020000 | P LP020000 | X LX020000 | 7 ND070000 |
| -8 | ç LC410000 | ì LI130000 | Ç LC420000 | Ì LI140000 | h LH010000 | q LQ010000 | y LY010000 | ½ NF010000 | H LH020000 | Q LQ020000 | Y LY020000 | 8 ND080000 |
| -9 | ñ LN190000 | ~ SD190000 | Ñ LN200000 | ` SD130000 | i LI010000 | r LR010000 | z LZ010000 | ¾ NF050000 | I LI020000 | R LR020000 | Z LZ020000 | 9 ND090000 |
| -A | Ä LA180000 | Ü LU180000 | ö LO170000 | : SP130000 | « SP170000 | ª SM210000 | ı SP030000 | ¬ SM660000 | (SHY) SP320000 | 1 ND011000 | 2 ND021000 | 3 ND031000 |
| -B | · SP110000 | \$ SC030000 | , SP080000 | # SM010000 | » SP180000 | º SM200000 | ¿ SP160000 | SM130000 | ô LO150000 | û LU150000 | Ô LO160000 | Û LU160000 |
| -C | < SA030000 | * SM040000 | % SM020000 | § SM240000 | ð LD630000 | æ LA510000 | Ð LD620000 | – SM150000 | ı SM650000 | } | \ |] SM080000 |
| -D | (SP060000 |) SP070000 | _ SP090000 | ' SP050000 | ý LY110000 | , SD410000 | Ý LY120000 | ¨ SD170000 | ò LO130000 | ù LU130000 | Ò LO140000 | Ù LU140000 |
| -E | + SA010000 | ; SP140000 | > SA050000 | = SA040000 | þ LT630000 | Æ LA520000 | Þ LT640000 | ' SD110000 | ó LO110000 | ú LU110000 | Ó LO120000 | Ú LU120000 |
| -F | ! SP020000 | ^ SD150000 | ? SP150000 | " SP040000 | ± SA020000 | ⊘ SC010000 | ® SM530000 | × SA070000 | õ LO190000 | ÿ LY170000 | Õ LO200000 | (EO) |

Code Page 00273

Note: Version 1 of this code page is shown. For Version 0 details, see “Version 1 vs Version 0” on page 309.

Code Page 00274, Version 1: Country Extended: Belgium

CPGID 274/1 GCSGID 697

| HEX DIGITS 1ST → 2ND ↓ | 4- | 5- | 6- | 7- | 8- | 9- | A- | B- | C- | D- | E- | F- |
|------------------------------|-------------------|----------------|---------------|---------------|---------------|---------------|---------------|---------------|-------------------|---------------|---------------|---------------|
| -0 | (SP) SP010000 | & SM030000 | - SP100000 | ø LO610000 | Ø LO620000 | ° SM190000 | μ SM170000 | ¢ SC040000 | é LE110000 | è LE130000 | ç LC410000 | 0 ND100000 |
| -1 | (RSP) SP300000 | { SM110000 | / SP120000 | É LE120000 | a LA010000 | j LJ010000 | ¨ SD170000 | £ SC020000 | A LA020000 | J LJ020000 | ÷ SA060000 | 1 ND010000 |
| -2 | â LA150000 | ê LE150000 | Â LA160000 | Ê LE160000 | b LB010000 | k LK010000 | s LS010000 | ¥ SC050000 | B LB020000 | K LK020000 | S LS020000 | 2 ND020000 |
| -3 | ä LA170000 | ë LE170000 | Ä LA180000 | Ë LE180000 | c LC010000 | l LL010000 | t LT010000 | · SD630000 | C LC020000 | L LL020000 | T LT020000 | 3 ND030000 |
| -4 | @ SM050000 | } SM140000 | À LA140000 | È LE140000 | d LD010000 | m LM010000 | u LU010000 | © SM520000 | D LD020000 | M LM020000 | U LU020000 | 4 ND040000 |
| -5 | á LA110000 | í LI100000 | Á LA120000 | Í LI120000 | e LE010000 | n LN010000 | v LV010000 | § SM240000 | E LE020000 | N LN020000 | V LV020000 | 5 ND050000 |
| -6 | ã LA190000 | î LI150000 | Ã LA200000 | Î LI160000 | f LF010000 | o LO010000 | w LW010000 | ¶ SM250000 | F LF020000 | O LO020000 | W LW020000 | 6 ND060000 |
| -7 | å LA270000 | ï LI170000 | Å LA280000 | Ï LI180000 | g LG010000 | p LP010000 | x LX010000 | ¼ NF040000 | G LG020000 | P LP020000 | X LX020000 | 7 ND070000 |
| -8 | \ SM070000 | ì LI130000 | Ç LC420000 | Ì LI140000 | h LH010000 | q LQ010000 | y LY010000 | ½ NF010000 | H LH020000 | Q LQ020000 | Y LY020000 | 8 ND080000 |
| -9 | ñ LN190000 | ß LS610000 | Ñ LN200000 | ` SD130000 | i LI010000 | r LR010000 | z LZ010000 | ¾ NF050000 | I LI020000 | R LR020000 | Z LZ020000 | 9 ND090000 |
| -A | [SM060000 |] SM080000 | ù LU130000 | : SP130000 | « SP170000 | ª SM210000 | ı SP030000 | ¬ SM660000 | (SHY) SP320000 | 1 ND011000 | 2 ND021000 | 3 ND031000 |
| -B | · SP110000 | \$ SC030000 | , SP080000 | # SM010000 | » SP180000 | º SM200000 | ¿ SP160000 | SM130000 | ô LO150000 | û LU150000 | Ô LO160000 | Û LU160000 |
| -C | < SA030000 | * SM040000 | % SM020000 | à LA130000 | ð LD630000 | æ LA510000 | Ð LD620000 | – SM150000 | ö LO170000 | ü LU170000 | Ö LO180000 | Ü LU180000 |
| -D | (SP060000 |) SP070000 | – SP090000 | ’ SP050000 | ý LY110000 | ¸ SD410000 | Ý LY120000 | ~ SD190000 | ò LO130000 | ı SM650000 | Ò LO140000 | Ù LU140000 |
| -E | + SA010000 | ; SP140000 | > SA050000 | = SA040000 | þ LT630000 | Æ LA520000 | Þ LT640000 | ’ SD110000 | ó LO110000 | ú LU110000 | Ó LO120000 | Ú LU120000 |
| -F | ! SP020000 | ^ SD150000 | ? SP150000 | " SP040000 | ± SA020000 | ⊘ SC010000 | ® SM530000 | × SA070000 | õ LO190000 | ÿ LY170000 | Õ LO200000 | (EO) |

Code Page 00274

Note: Version 1 of this code page is shown. For Version 0 details, see “Version 1 vs Version 0” on page 309.

Code Page 00276: Data Processing (DP 94): Canada (French)

CPGID 276 GCSGID 277

| HEX DIGITS 1ST → 2ND ↓ | 4- | 5- | 6- | 7- | 8- | 9- | A- | B- | C- | D- | E- | F- |
|------------------------------|------------------|----------------|---------------|---------------|---------------|---------------|---------------|----|---------------|---------------|---------------|---------------|
| -0 | (SP) SP010000 | & SM030000 | - SP100000 | | | | | | é LE110000 | è LE130000 | ¸ SD410000 | 0 ND100000 |
| -1 | | | / SP120000 | | a LA010000 | j LJ010000 | ¨ SD170000 | | A LA020000 | J LJ020000 | | 1 ND010000 |
| -2 | | | | | b LB010000 | k LK010000 | s LS010000 | | B LB020000 | K LK020000 | S LS020000 | 2 ND020000 |
| -3 | | | | | c LC010000 | l LL010000 | t LT010000 | | C LC020000 | L LL020000 | T LT020000 | 3 ND030000 |
| -4 | | | | | d LD010000 | m LM010000 | u LU010000 | | D LD020000 | M LM020000 | U LU020000 | 4 ND040000 |
| -5 | | | | | e LE010000 | n LN010000 | v LV010000 | | E LE020000 | N LN020000 | V LV020000 | 5 ND050000 |
| -6 | | | | | f LF010000 | o LO010000 | w LW010000 | | F LF020000 | O LO020000 | W LW020000 | 6 ND060000 |
| -7 | | | | | g LG010000 | p LP010000 | x LX010000 | | G LG020000 | P LP020000 | X LX020000 | 7 ND070000 |
| -8 | | | | | h LH010000 | q LQ010000 | y LY010000 | | H LH020000 | Q LQ020000 | Y LY020000 | 8 ND080000 |
| -9 | | | | ` SD130000 | i LI010000 | r LR010000 | z LZ010000 | | I LI020000 | R LR020000 | Z LZ020000 | 9 ND090000 |
| -A | à LA130000 | ' SD110000 | ù LU130000 | : | | | | | | | | |
| -B | . SP110000 | \$ SC030000 | , SP080000 | # SM010000 | | | | | | | | |
| -C | < SA030000 | * SM040000 | % SM020000 | @ SM050000 | | | | | | | | |
| -D | (SP060000 |) SP070000 | _ SP090000 | ' SP050000 | | | | | | | | |
| -E | + SA010000 | ; SP140000 | > SA050000 | = SA040000 | | | | | | | | |
| -F | ! SP020000 | ^ SD150000 | ? SP150000 | " SP040000 | | | | | | | | (EO) |

Code Page 00276

Code Page 00277, Version 1: Data Processing: Denmark and Norway

CPGID 277/1 GCSGID 697

| HEX DIGITS 1ST → 2ND ↓ | 4- | 5- | 6- | 7- | 8- | 9- | A- | B- | C- | D- | E- | F- |
|------------------------------|-------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|-------------------|---------------|---------------|---------------|
| -0 | (SP) SP010000 | & SM030000 | - SP100000 | ¡ SM650000 | @ SM050000 | ° SM190000 | μ SM170000 | ¢ SC040000 | æ LA510000 | å LA270000 | \ SM070000 | 0 ND100000 |
| -1 | (RSP) SP300000 | é LE110000 | / SP120000 | É LE120000 | a LA010000 | j LJ010000 | ü LU170000 | £ SC020000 | A LA020000 | J LJ020000 | ÷ SA060000 | 1 ND010000 |
| -2 | â LA150000 | ê LE150000 | Â LA160000 | Ê LE160000 | b LB010000 | k LK010000 | s LS010000 | ¥ SC050000 | B LB020000 | K LK020000 | S LS020000 | 2 ND020000 |
| -3 | ä LA170000 | ë LE170000 | Ä LA180000 | Ë LE180000 | c LC010000 | l LL010000 | t LT010000 | · SD630000 | C LC020000 | L LL020000 | T LT020000 | 3 ND030000 |
| -4 | à LA130000 | è LE130000 | À LA140000 | È LE140000 | d LD010000 | m LM010000 | u LU010000 | © SM520000 | D LD020000 | M LM020000 | U LU020000 | 4 ND040000 |
| -5 | á LA110000 | í LI110000 | Á LA120000 | Í LI120000 | e LE010000 | n LN010000 | v LV010000 | § SM240000 | E LE020000 | N LN020000 | V LV020000 | 5 ND050000 |
| -6 | ã LA190000 | î LI150000 | Ã LA200000 | Î LI160000 | f LF010000 | o LO010000 | w LW010000 | ¶ SM250000 | F LF020000 | O LO020000 | W LW020000 | 6 ND060000 |
| -7 | } SM140000 | ï LI170000 | Š SC030000 | Ï LI180000 | g LG010000 | p LP010000 | x LX010000 | ¼ NF040000 | G LG020000 | P LP020000 | X LX020000 | 7 ND070000 |
| -8 | ç LC410000 | ì LI130000 | Ç LC420000 | Ì LI140000 | h LH010000 | q LQ010000 | y LY010000 | ½ NF010000 | H LH020000 | Q LQ020000 | Y LY020000 | 8 ND080000 |
| -9 | ñ LN190000 | ß LS610000 | Ñ LN200000 | ` SD130000 | i LI010000 | r LR010000 | z LZ010000 | ¾ NF050000 | I LI020000 | R LR020000 | Z LZ020000 | 9 ND090000 |
| -A | # SM010000 | ☒ SC010000 | ø LO610000 | : SP130000 | « SP170000 | ª SM210000 | ı SP030000 | ¬ SM660000 | (SHY) SP320000 | 1 ND011000 | 2 ND021000 | 3 ND031000 |
| -B | · SP110000 | Å LA280000 | , SP080000 | Æ LA520000 | » SP180000 | º SM200000 | ¿ SP160000 | SM130000 | ô LO150000 | û LU150000 | Ô LO160000 | Û LU160000 |
| -C | < SA030000 | * SM040000 | % SM020000 | Ø LO620000 | ð LD630000 | { SM110000 | Ð LD620000 | – SM150000 | ö LO170000 | ~ SD190000 | Ö LO180000 | Ü LU180000 |
| -D | (SP060000 |) SP070000 | _ SP090000 | ' SP050000 | ý LY110000 | , SD410000 | Ý LY120000 | ¨ SD170000 | ò LO130000 | ù LU130000 | Ò LO140000 | Ù LU140000 |
| -E | + SA010000 | ; SP140000 | > SA050000 | = SA040000 | þ LT630000 | [SM060000 | Þ LT640000 | ' SD110000 | ó LO110000 | ú LU110000 | Ó LO120000 | Ú LU120000 |
| -F | ! SP020000 | ^ SD150000 | ? SP150000 | " SP040000 | ± SA020000 |] SM080000 | ® SM530000 | × SA070000 | õ LO190000 | ÿ LY170000 | Õ LO200000 | (EO) |

Code Page 00277

Note: Version 1 of this code page is shown. For Version 0 details, see “Version 1 vs Version 0” on page 309.

Code Page 00278, Version 1: Data Processing: Finland and Sweden

CPGID 278/1 GCSGID 697

| HEX DIGITS 1ST → 2ND ↓ | 4- | 5- | 6- | 7- | 8- | 9- | A- | B- | C- | D- | E- | F- |
|------------------------------|-------------------|---------------|----------------|---------------|---------------|---------------|---------------|---------------|-------------------|---------------|---------------|---------------|
| -0 | (SP) SP010000 | & SM030000 | - SP100000 | ø LO610000 | Ø LO620000 | ° SM190000 | μ SM170000 | ¢ SC040000 | ä LA170000 | å LA270000 | É LE120000 | 0 ND100000 |
| -1 | (RSP) SP300000 | ` SD130000 | / SP120000 | \ SM070000 | a LA010000 | j LJ010000 | ü LU170000 | £ SC020000 | A LA020000 | J LJ020000 | ÷ SA060000 | 1 ND010000 |
| -2 | â LA150000 | ê LE150000 | Â LA160000 | Ê LE160000 | b LB010000 | k LK010000 | s LS010000 | ¥ SC050000 | B LB020000 | K LK020000 | S LS020000 | 2 ND020000 |
| -3 | { SM110000 | ë LE170000 | # SM010000 | Ë LE180000 | c LC010000 | l LL010000 | t LT010000 | · SD630000 | C LC020000 | L LL020000 | T LT020000 | 3 ND030000 |
| -4 | à LA130000 | è LE130000 | À LA140000 | È LE140000 | d LD010000 | m LM010000 | u LU010000 | © SM520000 | D LD020000 | M LM020000 | U LU020000 | 4 ND040000 |
| -5 | á LA110000 | í LI110000 | Á LA120000 | Í LI120000 | e LE010000 | n LN010000 | v LV010000 | [SM060000 | E LE020000 | N LN020000 | V LV020000 | 5 ND050000 |
| -6 | ã LA190000 | î LI150000 | Ã LA200000 | Î LI160000 | f LF010000 | o LO010000 | w LW010000 | ¶ SM250000 | F LF020000 | O LO020000 | W LW020000 | 6 ND060000 |
| -7 | } SM140000 | ï LI170000 | \$ SC030000 | Ï LI180000 | g LG010000 | p LP010000 | x LX010000 | ¼ NF040000 | G LG020000 | P LP020000 | X LX020000 | 7 ND070000 |
| -8 | ç LC410000 | ì LI130000 | Ç LC420000 | Ì LI140000 | h LH010000 | q LQ010000 | y LY010000 | ½ NF010000 | H LH020000 | Q LQ020000 | Y LY020000 | 8 ND080000 |
| -9 | ñ LN190000 | ß LS610000 | Ñ LN200000 | é LE110000 | i LI010000 | r LR010000 | z LZ010000 | ¾ NF050000 | I LI020000 | R LR020000 | Z LZ020000 | 9 ND090000 |
| -A | § SM240000 | ☒ SC010000 | ö LO170000 | : SP130000 | « SP170000 | ª SM210000 | ï SP030000 | ¬ SM660000 | (SHY) SP320000 | 1 ND011000 | 2 ND021000 | 3 ND031000 |
| -B | · SP110000 | Å LA280000 | , SP080000 | Ä LA180000 | » SP180000 | º SM200000 | ¿ SP160000 | SM130000 | ô LO150000 | û LU150000 | Ô LO160000 | Û LU160000 |
| -C | < SA030000 | * SM040000 | % SM020000 | Ö LO180000 | ø LD630000 | æ LA510000 | Ð LD620000 | - SM150000 | ¡ SM650000 | ~ SD190000 | @ SM050000 | Û LU180000 |
| -D | (SP060000 |) SP070000 | _ SP090000 | ' SP050000 | ý LY110000 | , SD410000 | Ý LY120000 | ¨ SD170000 | ò LO130000 | ù LU130000 | Ò LO140000 | Ù LU140000 |
| -E | + SA010000 | ; SP140000 | > SA050000 | = SA040000 | þ LT630000 | Æ LA520000 | Ɔ LT640000 | ' SD110000 | ó LO110000 | ú LU110000 | Ó LO120000 | Ú LU120000 |
| -F | ! SP020000 | ^ SD150000 | ? SP150000 | " SP040000 | ± SA020000 |] SM080000 | ® SM530000 | × SA070000 | õ LO190000 | ÿ LY170000 | Õ LO200000 | (EO) |

Code Page 00278

Note: Version 1 of this code page is shown. For Version 0 details, see "Version 1 vs Version 0" on page 309.

Code Page 00280, Version 1: Data Processing: Italy

CPGID 280/1 GCSGID 697

| HEX DIGITS 1ST → 2ND ↓ | 4- | 5- | 6- | 7- | 8- | 9- | A- | B- | C- | D- | E- | F- |
|------------------------------|-------------------|----------------|---------------|---------------|---------------|---------------|---------------|---------------|-------------------|---------------|---------------|---------------|
| -0 | (SP) SP010000 | & SM030000 | - SP100000 | ø LO610000 | Ø LO620000 | [SM060000 | μ SM170000 | ¢ SC040000 | à LA130000 | è LE130000 | ç LC410000 | 0 ND100000 |
| -1 | (RSP) SP300000 |] SM080000 | / SP120000 | É LE120000 | a LA010000 | j LJ010000 | ì LI130000 | # SM010000 | A LA020000 | J LJ020000 | ÷ SA060000 | 1 ND010000 |
| -2 | â LA150000 | ê LE150000 | Â LA160000 | Ê LE160000 | b LB010000 | k LK010000 | s LS010000 | ¥ SC050000 | B LB020000 | K LK020000 | S LS020000 | 2 ND020000 |
| -3 | ä LA170000 | ë LE170000 | Ä LA180000 | Ë LE180000 | c LC010000 | l LL010000 | t LT010000 | · SD630000 | C LC020000 | L LL020000 | T LT020000 | 3 ND030000 |
| -4 | { SM110000 | } SM140000 | À LA140000 | È LE140000 | d LD010000 | m LM010000 | u LU010000 | © SM520000 | D LD020000 | M LM020000 | U LU020000 | 4 ND040000 |
| -5 | á LA110000 | í LI110000 | Á LA120000 | Í LI120000 | e LE010000 | n LN010000 | v LV010000 | @ SM050000 | E LE020000 | N LN020000 | V LV020000 | 5 ND050000 |
| -6 | ã LA190000 | î LI150000 | Ã LA200000 | Î LI160000 | f LF010000 | o LO010000 | w LW010000 | ¶ SM250000 | F LF020000 | O LO020000 | W LW020000 | 6 ND060000 |
| -7 | å LA270000 | ï LI170000 | Å LA280000 | Ï LI180000 | g LG010000 | p LP010000 | x LX010000 | ¼ NF040000 | G LG020000 | P LP020000 | X LX020000 | 7 ND070000 |
| -8 | \ SM070000 | ~ SD190000 | Ç LC420000 | Ì LI140000 | h LH010000 | q LQ010000 | y LY010000 | ½ NF010000 | H LH020000 | Q LQ020000 | Y LY020000 | 8 ND080000 |
| -9 | ñ LN190000 | ß LS610000 | Ñ LN200000 | ù LU130000 | i LI010000 | r LR010000 | z LZ010000 | ¾ NF050000 | I LI020000 | R LR020000 | Z LZ020000 | 9 ND090000 |
| -A | ° SM190000 | é LE110000 | ò LO130000 | : SP130000 | « SP170000 | ª SM210000 | ï SP030000 | ¬ SM660000 | (SHY) SP320000 | 1 ND011000 | 2 ND021000 | 3 ND031000 |
| -B | · SP110000 | \$ SC030000 | , SP080000 | £ SC020000 | » SP180000 | º SM200000 | ¿ SP160000 | SM130000 | ô LO150000 | û LU150000 | Ô LO160000 | Û LU160000 |
| -C | < SA030000 | * SM040000 | % SM020000 | § SM240000 | ð LD630000 | æ LA510000 | Ð LD620000 | – SM150000 | ö LO170000 | ü LU170000 | Ö LO180000 | Ü LU180000 |
| -D | (SP060000 |) SP070000 | _ SP090000 | ' SP050000 | ý LY110000 | , SD410000 | Ý LY120000 | ¨ SD170000 | ¡ SM650000 | ` SD130000 | Ò LO140000 | Ù LU140000 |
| -E | + SA010000 | ; SP140000 | > SA050000 | = SA040000 | þ LT630000 | Æ LA520000 | Þ LT640000 | ' SD110000 | ó LO110000 | ú LU110000 | Ó LO120000 | Ú LU120000 |
| -F | ! SP020000 | ^ SD150000 | ? SP150000 | " SP040000 | ± SA020000 | ⊘ SC010000 | ® SM530000 | × SA070000 | õ LO190000 | ÿ LY170000 | Õ LO200000 | (EO) |

Code Page 00280

Note: Version 1 of this code page is shown. For Version 0 details, see “Version 1 vs Version 0” on page 309.

Code Page 00281, Version 1: Data Processing: Japan (Latin)

CPGID 281/1 GCSGID 697

| HEX DIGITS 1ST → 2ND ↓ | 4- | 5- | 6- | 7- | 8- | 9- | A- | B- | C- | D- | E- | F- |
|------------------------------|-------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|-------------------|---------------|----------------|---------------|
| -0 | (SP) SP10000 | & SM030000 | - SP100000 | ø LO610000 | Ø LO620000 | ° SM190000 | μ SM170000 | ¢ SC040000 | { SM110000 | } | \$ SC030000 | 0 ND100000 |
| -1 | (RSP) SP300000 | é LE110000 | / SP120000 | É LE120000 | a LA010000 | j LJ010000 | – SM150000 | [SM060000 | A LA020000 | J LJ020000 | ÷ SA060000 | 1 ND010000 |
| -2 | â LA150000 | ê LE150000 | Â LA160000 | Ê LE160000 | b LB010000 | k LK010000 | s LS010000 | \ SM070000 | B LB020000 | K LK020000 | S LS020000 | 2 ND020000 |
| -3 | ä LA170000 | ë LE170000 | Ä LA180000 | Ë LE180000 | c LC010000 | l LL010000 | t LT010000 | • SD630000 | C LC020000 | L LL020000 | T LT020000 | 3 ND030000 |
| -4 | à LA130000 | è LE130000 | À LA140000 | È LE140000 | d LD010000 | m LM010000 | u LU010000 | © SM520000 | D LD020000 | M LM020000 | U LU020000 | 4 ND040000 |
| -5 | á LA110000 | í LI110000 | Á LA120000 | Í LI120000 | e LE010000 | n LN010000 | v LV010000 | § SM240000 | E LE020000 | N LN020000 | V LV020000 | 5 ND050000 |
| -6 | ã LA190000 | î LI150000 | Ã LA200000 | Î LI160000 | f LF010000 | o LO010000 | w LW010000 | ¶ SM250000 | F LF020000 | O LO020000 | W LW020000 | 6 ND060000 |
| -7 | å LA270000 | ï LI170000 | Å LA280000 | Ï LI180000 | g LG010000 | p LP010000 | x LX010000 | ¼ NF040000 | G LG020000 | P LP020000 | X LX020000 | 7 ND070000 |
| -8 | ç LC410000 | ì LI130000 | Ç LC420000 | Ì LI140000 | h LH010000 | q LQ010000 | y LY010000 | ½ NF010000 | H LH020000 | Q LQ020000 | Y LY020000 | 8 ND080000 |
| -9 | ñ LN190000 | ß LS610000 | Ñ LN200000 | ´ SD130000 | i LI010000 | r LR010000 | z LZ010000 | ¾ NF050000 | I LI020000 | R LR020000 | Z LZ020000 | 9 ND090000 |
| -A | £ SC020000 | ! SP020000 | ¡ SM650000 | : SP130000 | « SP170000 | ª SM210000 | ï SP030000 | ^ SD150000 | (SHY) SP320000 | 1 ND011000 | 2 ND021000 | 3 ND031000 |
| -B | · SP110000 | ¥ SC050000 | , SP080000 | # SM010000 | » SP180000 | º SM200000 | ¿ SP160000 |] SM080000 | ô LO150000 | û LU150000 | Ô LO160000 | Û LU160000 |
| -C | < SA030000 | * SM040000 | % SM020000 | @ SM050000 | ð LD630000 | æ LA510000 | Ð LD620000 | ~ SD190000 | ö LO170000 | ü LU170000 | Ö LO180000 | Ü LU180000 |
| -D | (SP060000 |) SP070000 | _ SP090000 | ' SP050000 | ý LY110000 | , SD410000 | Ý LY120000 | ¨ SD170000 | ò LO130000 | ù LU130000 | Ò LO140000 | Ù LU140000 |
| -E | + SA010000 | ; SP140000 | > SA050000 | = SA040000 | þ LT630000 | Æ LA520000 | Þ LT640000 | ' SD110000 | ó LO110000 | ú LU110000 | Ó LO120000 | Ú LU120000 |
| -F | SM130000 | ⌋ SM660000 | ? SP150000 | " SP040000 | ± SA020000 | ⊘ SC010000 | ® SM530000 | × SA070000 | õ LO190000 | ÿ LY170000 | Õ LO200000 | (EO) |

Code Page 00281

Note: Version 1 of this code page is shown. For Version 0 details, see “Version 1 vs Version 0” on page 309.

Code Page 00284, Version 1: Data Processing: Spain, Latin America

CPGID 284/1 GCSGID 697

| HEX DIGITS 1ST → 2ND ↓ | 4- | 5- | 6- | 7- | 8- | 9- | A- | B- | C- | D- | E- | F- |
|------------------------------|-------------------|----------------|---------------|---------------|---------------|---------------|---------------|---------------|-------------------|---------------|---------------|---------------|
| -0 | (SP) SP010000 | & SM030000 | - SP100000 | ø LO610000 | Ø LO620000 | ° SM190000 | μ SM170000 | ¢ SC040000 | { SM110000 | } | \ SM070000 | 0 ND100000 |
| -1 | (RSP) SP300000 | é LE110000 | / SP120000 | É LE120000 | a LA010000 | j LJ010000 | ¨ SD170000 | £ SC020000 | A LA020000 | J LJ020000 | ÷ SA060000 | 1 ND010000 |
| -2 | â LA150000 | ê LE150000 | Â LA160000 | Ê LE160000 | b LB010000 | k LK010000 | s LS010000 | ¥ SC050000 | B LB020000 | K LK020000 | S LS020000 | 2 ND020000 |
| -3 | ä LA170000 | ë LE170000 | Ä LA180000 | Ë LE180000 | c LC010000 | l LL010000 | t LT010000 | · SD630000 | C LC020000 | L LL020000 | T LT020000 | 3 ND030000 |
| -4 | à LA130000 | è LE130000 | À LA140000 | È LE140000 | d LD010000 | m LM010000 | u LU010000 | © SM520000 | D LD020000 | M LM020000 | U LU020000 | 4 ND040000 |
| -5 | á LA110000 | í LI110000 | Á LA120000 | Í LI120000 | e LE010000 | n LN010000 | v LV010000 | § SM240000 | E LE020000 | N LN020000 | V LV020000 | 5 ND050000 |
| -6 | ã LA190000 | î LI150000 | Ã LA200000 | Î LI160000 | f LF010000 | o LO010000 | w LW010000 | ¶ SM250000 | F LF020000 | O LO020000 | W LW020000 | 6 ND060000 |
| -7 | å LA270000 | ï LI170000 | Å LA280000 | Ï LI180000 | g LG010000 | p LP010000 | x LX010000 | ¼ NF040000 | G LG020000 | P LP020000 | X LX020000 | 7 ND070000 |
| -8 | ç LC410000 | ì LI130000 | Ç LC420000 | Ì LI140000 | h LH010000 | q LQ010000 | y LY010000 | ½ NF010000 | H LH020000 | Q LQ020000 | Y LY020000 | 8 ND080000 |
| -9 | ı SM650000 | ß LS610000 | # SM010000 | ` SD130000 | ı LI010000 | r LR010000 | z LZ010000 | ¾ NF050000 | I LI020000 | R LR020000 | Z LZ020000 | 9 ND090000 |
| -A | [SM060000 |] SM080000 | ñ LN190000 | : SP130000 | « SP170000 | ª SM210000 | ı SP030000 | ^ SD150000 | (SHY) SP320000 | 1 ND011000 | 2 ND021000 | 3 ND031000 |
| -B | · SP110000 | \$ SC030000 | , SP080000 | Ñ LN200000 | » SP180000 | º SM200000 | ¿ SP160000 | ! SP020000 | ô LO150000 | û LU150000 | Ô LO160000 | Û LU160000 |
| -C | < SA030000 | * SM040000 | % SM020000 | @ SM050000 | ð LD630000 | æ LA510000 | Ð LD620000 | – SM150000 | ö LO170000 | ü LU170000 | Ö LO180000 | Ü LU180000 |
| -D | (SP060000 |) SP070000 | – SP090000 | ’ SP050000 | ý LY110000 | ¸ SD410000 | Ý LY120000 | ~ SD190000 | ò LO130000 | ù LU130000 | Ò LO140000 | Ù LU140000 |
| -E | + SA010000 | ; SP140000 | > SA050000 | = SA040000 | þ LT630000 | Æ LA520000 | Þ LT640000 | ’ SD110000 | ó LO110000 | ú LU110000 | Ó LO120000 | Ú LU120000 |
| -F | SM130000 | ⌋ SM660000 | ? SP150000 | " SP040000 | ± SA020000 | ⊘ SC010000 | ® SM530000 | × SA070000 | õ LO190000 | ÿ LY170000 | Õ LO200000 | (EO) |

Code Page 00284

Note: Version 1 of this code page is shown. For Version 0 details, see “Version 1 vs Version 0” on page 309.

Code Page 00285, Version 1: Data Processing: United Kingdom

CPGID 285/1 GCSGID 697

| HEX DIGITS 1ST → 2ND ↓ | 4- | 5- | 6- | 7- | 8- | 9- | A- | B- | C- | D- | E- | F- |
|------------------------------|-------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|-------------------|---------------|---------------|---------------|
| -0 | (SP) SP010000 | & SM030000 | - SP100000 | ø LO610000 | Ø LO620000 | ° SM190000 | μ SM170000 | ¢ SC040000 | { SM110000 | } | \ SM070000 | 0 ND100000 |
| -1 | (RSP) SP300000 | é LE110000 | / SP120000 | É LE120000 | a LA010000 | j LJ010000 | ˉ SM150000 | [SM060000 | A LA020000 | J LJ020000 | ÷ SA060000 | 1 ND010000 |
| -2 | â LA150000 | ê LE150000 | Â LA160000 | Ê LE160000 | b LB010000 | k LK010000 | s LS010000 | ¥ SC050000 | B LB020000 | K LK020000 | S LS020000 | 2 ND020000 |
| -3 | ä LA170000 | ë LE170000 | Ä LA180000 | Ë LE180000 | c LC010000 | l LL010000 | t LT010000 | · SD630000 | C LC020000 | L LL020000 | T LT020000 | 3 ND030000 |
| -4 | à LA130000 | è LE130000 | À LA140000 | È LE140000 | d LD010000 | m LM010000 | u LU010000 | © SM520000 | D LD020000 | M LM020000 | U LU020000 | 4 ND040000 |
| -5 | á LA110000 | í LI110000 | Á LA120000 | Í LI120000 | e LE010000 | n LN010000 | v LV010000 | § SM240000 | E LE020000 | N LN020000 | V LV020000 | 5 ND050000 |
| -6 | ã LA190000 | î LI150000 | Ã LA200000 | Î LI160000 | f LF010000 | o LO010000 | w LW010000 | ¶ SM250000 | F LF020000 | O LO020000 | W LW020000 | 6 ND060000 |
| -7 | å LA270000 | ï LI170000 | Å LA280000 | Ï LI180000 | g LG010000 | p LP010000 | x LX010000 | ¼ NF040000 | G LG020000 | P LP020000 | X LX020000 | 7 ND070000 |
| -8 | ç LC410000 | ì LI130000 | Ç LC420000 | Ï LI140000 | h LH010000 | q LQ010000 | y LY010000 | ½ NF010000 | H LH020000 | Q LQ020000 | Y LY020000 | 8 ND080000 |
| -9 | ñ LN190000 | ß LS610000 | Ñ LN200000 | ` SD130000 | i LI010000 | r LR010000 | z LZ010000 | ¾ NF050000 | I LI020000 | R LR020000 | Z LZ020000 | 9 ND090000 |
| -A | \$ SC030000 | ! SP020000 | ¡ SM650000 | : SP130000 | « SP170000 | ª SM210000 | ï SP030000 | ^ SD150000 | (SHY) SP320000 | 1 ND011000 | 2 ND021000 | 3 ND031000 |
| -B | · SP110000 | £ SC020000 | , SP080000 | # SM010000 | » SP180000 | º SM200000 | ¿ SP160000 |] SM080000 | ô LO150000 | û LU150000 | Ô LO160000 | Û LU160000 |
| -C | < SA030000 | * SM040000 | % SM020000 | @ SM050000 | ð LD630000 | æ LA510000 | Ð LD620000 | ~ SD190000 | ö LO170000 | ü LU170000 | Ö LO180000 | Ü LU180000 |
| -D | (SP060000 |) SP070000 | — SP090000 | ' SP050000 | ý LY110000 | ¸ SD410000 | Ý LY120000 | ¨ SD170000 | ò LO130000 | ù LU130000 | Ò LO140000 | Ù LU140000 |
| -E | + SA010000 | ; SP140000 | > SA050000 | = SA040000 | þ LT630000 | Æ LA520000 | Þ LT640000 | ' SD110000 | ó LO110000 | ú LU110000 | Ó LO120000 | Ú LU120000 |
| -F | SM130000 | ¬ SM660000 | ? SP150000 | " SP040000 | ± SA020000 | œ SC010000 | ® SM530000 | × SA070000 | õ LO190000 | ÿ LY170000 | Õ LO200000 | (EO) |

Code Page 00285

Note: Version 1 of this code page is shown. For Version 0 details, see "Version 1 vs Version 0" on page 309.

Code Page 00286: Alternate (3270) Austria and Germany

CPGID 286 GCSGID 317

| HEX DIGITS 1ST → 2ND ↓ | 4- | 5- | 6- | 7- | 8- | 9- | A- | B- | C- | D- | E- | F- |
|------------------------------|------------------|---------------|---------------|---------------|---------------|---------------|---------------|----|---------------|---------------|---------------|---------------|
| -0 | (SP) SP010000 | & SM030000 | - SP100000 | | | | | | | | | 0 ND100000 |
| -1 | | | / SP120000 | | a LA010000 | j LJ010000 | | | A LA020000 | J LJ020000 | | 1 ND010000 |
| -2 | | | | | b LB010000 | k LK010000 | s LS010000 | | B LB020000 | K LK020000 | S LS020000 | 2 ND020000 |
| -3 | | | | | c LC010000 | l LL010000 | t LT010000 | | C LC020000 | L LL020000 | T LT020000 | 3 ND030000 |
| -4 | | | | | d LD010000 | m LM010000 | u LU010000 | | D LD020000 | M LM020000 | U LU020000 | 4 ND040000 |
| -5 | | | | | e LE010000 | n LN010000 | v LV010000 | | E LE020000 | N LN020000 | V LV020000 | 5 ND050000 |
| -6 | | | | | f LF010000 | o LO010000 | w LW010000 | | F LF020000 | O LO020000 | W LW020000 | 6 ND060000 |
| -7 | | | | | g LG010000 | p LP010000 | x LX010000 | | G LG020000 | P LP020000 | X LX020000 | 7 ND070000 |
| -8 | | | | | h LH010000 | q LQ010000 | y LY010000 | | H LH020000 | Q LQ020000 | Y LY020000 | 8 ND080000 |
| -9 | | | | | i LI010000 | r LR010000 | z LZ010000 | | I LI020000 | R LR020000 | Z LZ020000 | 9 ND090000 |
| -A | ö LO170000 | ü LU170000 | ß LS610000 | : SP130000 | | | | | | | | |
| -B | · SP110000 | Ü LU180000 | , SP080000 | Ä LA180000 | | | | | | | | |
| -C | < SA030000 | * SM040000 | % SM020000 | Ö LO180000 | | | | | | | | |
| -D | (SP060000 |) SP070000 | – SP090000 | ' SP050000 | | | | | | | | |
| -E | + SA010000 | ; SP140000 | > SA050000 | = SA040000 | | | | | | | | |
| -F | SM130000 | ¬ SM660000 | ? SP150000 | ä LA170000 | | | | | | | | (EO) |

Code Page 00286

Code Page 00287: Alternate (3270) Denmark and Norway

CPGID 287 GCSGID 321

| HEX DIGITS 1ST → 2ND ↓ | 4- | 5- | 6- | 7- | 8- | 9- | A- | B- | C- | D- | E- | F- |
|------------------------------|------------------|---------------|---------------|---------------|---------------|---------------|---------------|----|---------------|---------------|---------------|---------------|
| -0 | (SP) SP010000 | & SM030000 | - SP100000 | | | | | | | | | 0 ND100000 |
| -1 | | | / SP120000 | | a LA010000 | j LJ010000 | | | A LA020000 | J LJ020000 | | 1 ND010000 |
| -2 | | | | | b LB010000 | k LK010000 | s LS010000 | | B LB020000 | K LK020000 | S LS020000 | 2 ND020000 |
| -3 | | | | | c LC010000 | l LL010000 | t LT010000 | | C LC020000 | L LL020000 | T LT020000 | 3 ND030000 |
| -4 | | | | | d LD010000 | m LM010000 | u LU010000 | | D LD020000 | M LM020000 | U LU020000 | 4 ND040000 |
| -5 | | | | | e LE010000 | n LN010000 | v LV010000 | | E LE020000 | N LN020000 | V LV020000 | 5 ND050000 |
| -6 | | | | | f LF010000 | o LO010000 | w LW010000 | | F LF020000 | O LO020000 | W LW020000 | 6 ND060000 |
| -7 | | | | | g LG010000 | p LP010000 | x LX010000 | | G LG020000 | P LP020000 | X LX020000 | 7 ND070000 |
| -8 | | | | | h LH010000 | q LQ010000 | y LY010000 | | H LH020000 | Q LQ020000 | Y LY020000 | 8 ND080000 |
| -9 | | | | | i LI010000 | r LR010000 | z LZ010000 | | I LI020000 | R LR020000 | Z LZ020000 | 9 ND090000 |
| -A | ø LO610000 | å LA270000 | ı SM650000 | ː SP130000 | | | | | | | | |
| -B | ˙ SP110000 | Å LA280000 | , SP080000 | Æ LA520000 | | | | | | | | |
| -C | < SA030000 | * SM040000 | % SM020000 | Ø LO620000 | | | | | | | | |
| -D | (SP060000 |) SP070000 | – SP090000 | ' SP050000 | | | | | | | | |
| -E | + SA010000 | ; SP140000 | > SA050000 | = SA040000 | | | | | | | | |
| -F | SM130000 | ¬ SM660000 | ? SP150000 | æ LA510000 | | | | | | | | (EO) |

Code Page 00287

Code Page 00288: Alternate (3270) Finland and Sweden

CPGID 288 GCSGID 325

| HEX DIGITS 1ST → 2ND ↓ | 4- | 5- | 6- | 7- | 8- | 9- | A- | B- | C- | D- | E- | F- |
|------------------------------|------------------|---------------|---------------|---------------|---------------|---------------|---------------|----|---------------|---------------|---------------|---------------|
| -0 | (SP) SP010000 | & SM030000 | - SP100000 | | | | | | | | | 0 ND100000 |
| -1 | | | / SP120000 | | a LA010000 | j LJ010000 | | | A LA020000 | J LJ020000 | | 1 ND010000 |
| -2 | | | | | b LB010000 | k LK010000 | s LS010000 | | B LB020000 | K LK020000 | S LS020000 | 2 ND020000 |
| -3 | | | | | c LC010000 | l LL010000 | t LT010000 | | C LC020000 | L LL020000 | T LT020000 | 3 ND030000 |
| -4 | | | | | d LD010000 | m LM010000 | u LU010000 | | D LD020000 | M LM020000 | U LU020000 | 4 ND040000 |
| -5 | | | | | e LE010000 | n LN010000 | v LV010000 | | E LE020000 | N LN020000 | V LV020000 | 5 ND050000 |
| -6 | | | | | f LF010000 | o LO010000 | w LW010000 | | F LF020000 | O LO020000 | W LW020000 | 6 ND060000 |
| -7 | | | | | g LG010000 | p LP010000 | x LX010000 | | G LG020000 | P LP020000 | X LX020000 | 7 ND070000 |
| -8 | | | | | h LH010000 | q LQ010000 | y LY010000 | | H LH020000 | Q LQ020000 | Y LY020000 | 8 ND080000 |
| -9 | | | | | i LI010000 | r LR010000 | z LZ010000 | | I LI020000 | R LR020000 | Z LZ020000 | 9 ND090000 |
| -A | ö LO170000 | å LA270000 | ı SM650000 | : | SP130000 | | | | | | | |
| -B | . | Å LA280000 | , | Ä LA180000 | | | | | | | | |
| -C | < SA030000 | * SM040000 | % SM020000 | Ö LO180000 | | | | | | | | |
| -D | (SP060000 |) SP070000 | _ | ' SP050000 | | | | | | | | |
| -E | + SA010000 | ; SP140000 | > SA050000 | = SA040000 | | | | | | | | |
| -F | SM130000 | ¬ SM660000 | ? SP150000 | ä LA170000 | | | | | | | | (EO) |

Code Page 00288

Code Page 00289: Alternate (3270) Spain

CPGID 289 GCSGID 329

| HEX DIGITS 1ST → 2ND ↓ | 4- | 5- | 6- | 7- | 8- | 9- | A- | B- | C- | D- | E- | F- |
|------------------------------|------------------|---------------|---------------|----|---------------|---------------|---------------|----|---------------|---------------|---------------|---------------|
| -0 | (SP) SP010000 | & SM030000 | - SP100000 | | | | | | | | | 0 ND100000 |
| -1 | | | / SP120000 | | a LA010000 | j LJ010000 | | | A LA020000 | J LJ020000 | | 1 ND010000 |
| -2 | | | | | b LB010000 | k LK010000 | s LS010000 | | B LB020000 | K LK020000 | S LS020000 | 2 ND020000 |
| -3 | | | | | c LC010000 | l LL010000 | t LT010000 | | C LC020000 | L LL020000 | T LT020000 | 3 ND030000 |
| -4 | | | | | d LD010000 | m LM010000 | u LU010000 | | D LD020000 | M LM020000 | U LU020000 | 4 ND040000 |
| -5 | | | | | e LE010000 | n LN010000 | v LV010000 | | E LE020000 | N LN020000 | V LV020000 | 5 ND050000 |
| -6 | | | | | f LF010000 | o LO010000 | w LW010000 | | F LF020000 | O LO020000 | W LW020000 | 6 ND060000 |
| -7 | | | | | g LG010000 | p LP010000 | x LX010000 | | G LG020000 | P LP020000 | X LX020000 | 7 ND070000 |
| -8 | | | | | h LH010000 | q LQ010000 | y LY010000 | | H LH020000 | Q LQ020000 | Y LY020000 | 8 ND080000 |
| -9 | | | | | i LI010000 | r LR010000 | z LZ010000 | | I LI020000 | R LR020000 | Z LZ020000 | 9 ND090000 |
| -A | ¢ SC040000 | ! | ¡ | : | | | | | | | | |
| -B | . | Pts | , | Ñ | | | | | | | | |
| -C | < | * | % | @ | | | | | | | | |
| -D | (|) | _ | ' | | | | | | | | |
| -E | + | ; | > | = | | | | | | | | |
| -F | | ¬ | ? | ñ | | | | | | | | (EO) |

Code Page 00289

Code Page 00290: Japan (Katakana)

CPGID 290 GCSGID 332

| HEX DIGITS 1ST → 2ND ↓ | 4- | 5- | 6- | 7- | 8- | 9- | A- | B- | C- | D- | E- | F- |
|------------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| -0 | (SP) SP010000 | & SM030000 | - SP100000 | [SM060000 |] SM080000 | ソ JS500000 | ~ SD190000 | ^ SD150000 | { SM110000 | } | \$ SC030000 | 0 ND100000 |
| -1 | 。 (JQ) JQ700000 | エ (JE) JE010000 | / (SP) SP120000 | i (LI) LI010000 | ア (JA) JA000000 | タ (JT) JT100000 | - (SM) SM150000 | ¢ (SC) SC040000 | A (LA) LA020000 | J (LJ) LJ020000 | | 1 (ND) ND010000 |
| -2 | 「 (JQ) JQ710000 | オ (JO) JO010000 | a (LA) LA010000 | j (LJ) LJ010000 | イ (JI) JI000000 | チ (JT) JT200000 | へ (JH) JH400000 | \ (SM) SM070000 | B (LB) LB020000 | K (LK) LK020000 | S (LS) LS020000 | 2 (ND) ND020000 |
| -3 | 」 (JQ) JQ720000 | ヤ (JY) JY100000 | b (LB) LB010000 | k (LK) LK010000 | ウ (JU) JU000000 | ツ (JT) JT300000 | ホ (JH) JH500000 | t (LT) LT010000 | C (LC) LC020000 | L (LL) LL020000 | T (LT) LT020000 | 3 (ND) ND030000 |
| -4 | 、 (JQ) JQ730000 | ユ (JY) JY310000 | c (LC) LC010000 | l (LL) LL010000 | エ (JE) JE000000 | テ (JT) JT400000 | マ (JM) JM100000 | u (LU) LU010000 | D (LD) LD020000 | M (LM) LM020000 | U (LU) LU020000 | 4 (ND) ND040000 |
| -5 | ・ (JQ) JQ740000 | ヨ (JY) JY510000 | d (LD) LD010000 | m (LM) LM010000 | オ (JO) JO000000 | ト (JT) JT500000 | ミ (JM) JM200000 | v (LV) LV010000 | E (LE) LE020000 | N (LN) LN020000 | V (LV) LV020000 | 5 (ND) ND050000 |
| -6 | ヲ (JW) JW500000 | ツ (JT) JT310000 | e (LE) LE010000 | n (LN) LN010000 | カ (JK) JK100000 | ナ (JN) JN100000 | ム (JM) JM300000 | w (LW) LW010000 | F (LF) LF020000 | O (LO) LO020000 | W (LW) LW020000 | 6 (ND) ND060000 |
| -7 | ア (JA) JA010000 | | f (LF) LF010000 | o (LO) LO010000 | キ (JK) JK200000 | ニ (JN) JN200000 | メ (JM) JM400000 | x (LX) LX010000 | G (LG) LG020000 | P (LP) LP020000 | X (LX) LX020000 | 7 (ND) ND070000 |
| -8 | イ (JI) JI010000 | ー (JX) JX700000 | g (LG) LG010000 | p (LP) LP010000 | ク (JK) JK300000 | ヌ (JN) JN300000 | モ (JM) JM500000 | y (LY) LY010000 | H (LH) LH020000 | Q (LQ) LQ020000 | Y (LY) LY020000 | 8 (ND) ND080000 |
| -9 | ウ (JU) JU010000 | | h (LH) LH010000 | ` (SD) SD130000 | ケ (JK) JK400000 | ネ (JN) JN400000 | ヤ (JY) JY100000 | z (LZ) LZ010000 | I (LI) LI020000 | R (LR) LR020000 | Z (LZ) LZ020000 | 9 (ND) ND090000 |
| -A | £ (SC) SC020000 | ! (SP) SP020000 | | : | コ (JK) JK500000 | ノ (JN) JN500000 | ユ (JY) JY300000 | レ (JR) JR400000 | | | | |
| -B | ・ (SP) SP110000 | ¥ (SC) SC050000 | , | # (SM) SM010000 | q (LQ) LQ010000 | r (LR) LR010000 | s (LS) LS010000 | ロ (JR) JR500000 | | | | |
| -C | < (SA) SA030000 | * (SM) SM040000 | % (SM) SM020000 | @ (SM) SM050000 | サ (JS) JS100000 | | ヨ (JY) JY500000 | ワ (JW) JW100000 | | | | |
| -D | ((SP) SP060000 |) (SP) SP070000 | _ (SP) SP090000 | ' (SP) SP050000 | シ (JS) JS200000 | ハ (JH) JH100000 | ラ (JR) JR100000 | ン (JN) JN000000 | | | | |
| -E | + (SA) SA010000 | ; (SP) SP140000 | > (SA) SA050000 | = (SA) SA040000 | ス (JS) JS300000 | ヒ (JH) JH200000 | リ (JR) JR200000 | ゝ (JX) JX710000 | | | | |
| -F | (SM) SM130000 | ⌋ (SM) SM660000 | ? (SP) SP150000 | " (SP) SP040000 | セ (JS) JS400000 | フ (JH) JH300000 | ル (JR) JR300000 | 。 (JX) JX720000 | | | | (EO) |

Code Page 00290

Code Page 00297, Version 1: Country Extended: France

CPGID 297/1 GCSGID 697

| HEX DIGITS 1ST → 2ND ↓ | 4- | 5- | 6- | 7- | 8- | 9- | A- | B- | C- | D- | E- | F- |
|------------------------------|-------------------|----------------|---------------|---------------|---------------|---------------|---------------|---------------|-------------------|---------------|---------------|---------------|
| -0 | (SP) SP010000 | & SM030000 | - SP100000 | ø LO610000 | Ø LO620000 | [SM060000 | ` SD130000 | ¢ SC040000 | é LE110000 | è LE130000 | ç LC410000 | 0 ND100000 |
| -1 | (RSP) SP300000 | { SM110000 | / SP120000 | É LE120000 | a LA010000 | j LJ010000 | ¨ SD170000 | # SM010000 | A LA020000 | J LJ020000 | ÷ SA060000 | 1 ND010000 |
| -2 | â LA150000 | ê LE150000 | Â LA160000 | Ê LE160000 | b LB010000 | k LK010000 | s LS010000 | ¥ SC050000 | B LB020000 | K LK020000 | S LS020000 | 2 ND020000 |
| -3 | ä LA170000 | ë LE170000 | Ä LA180000 | Ë LE180000 | c LC010000 | l LL010000 | t LT010000 | · SD630000 | C LC020000 | L LL020000 | T LT020000 | 3 ND030000 |
| -4 | @ SM050000 | } SM140000 | À LA140000 | È LE140000 | d LD010000 | m LM010000 | u LU010000 | © SM520000 | D LD020000 | M LM020000 | U LU020000 | 4 ND040000 |
| -5 | á LA110000 | í LI110000 | Á LA120000 | Í LI120000 | e LE010000 | n LN010000 | v LV010000 |] SM080000 | E LE020000 | N LN020000 | V LV020000 | 5 ND050000 |
| -6 | ã LA190000 | î LI150000 | Ã LA200000 | Î LI160000 | f LF010000 | o LO010000 | w LW010000 | ¶ SM250000 | F LF020000 | O LO020000 | W LW020000 | 6 ND060000 |
| -7 | å LA270000 | ï LI170000 | Å LA280000 | Ï LI180000 | g LG010000 | p LP010000 | x LX010000 | ¼ NF040000 | G LG020000 | P LP020000 | X LX020000 | 7 ND070000 |
| -8 | \ SM070000 | ì LI130000 | Ç LC420000 | Ì LI140000 | h LH010000 | q LQ010000 | y LY010000 | ½ NF010000 | H LH020000 | Q LQ020000 | Y LY020000 | 8 ND080000 |
| -9 | ñ LN190000 | ß LS610000 | Ñ LN200000 | µ SM170000 | i LI010000 | r LR010000 | z LZ010000 | ¾ NF050000 | I LI020000 | R LR020000 | Z LZ020000 | 9 ND090000 |
| -A | ° SM190000 | § SM240000 | ù LU130000 | : SP130000 | « SP170000 | ª SM210000 | ¡ SP030000 | ¬ SM660000 | (SHY) SP320000 | 1 ND011000 | 2 ND021000 | 3 ND031000 |
| -B | · SP110000 | \$ SC030000 | , SP080000 | £ SC020000 | » SP180000 | º SM200000 | ¿ SP160000 | SM130000 | ô LO150000 | û LU150000 | Ô LO160000 | Û LU160000 |
| -C | < SA030000 | * SM040000 | % SM020000 | à LA130000 | ð LD630000 | æ LA510000 | Ð LD620000 | – SM150000 | ö LO170000 | ü LU170000 | Ö LO180000 | Ü LU180000 |
| -D | (SP060000 |) SP070000 | – SP090000 | ´ SP050000 | ý LY110000 | ¸ SD410000 | Ý LY120000 | ~ SD190000 | ò LO130000 | ï SM650000 | Ò LO140000 | Ù LU140000 |
| -E | + SA010000 | ; SP140000 | > SA050000 | = SA040000 | þ LT630000 | Æ LA520000 | Þ LT640000 | ´ SD110000 | ó LO110000 | ú LU110000 | Ó LO120000 | Ú LU120000 |
| -F | ! SP020000 | ^ SD150000 | ? SP150000 | " SP040000 | ± SA020000 | œ SC010000 | ® SM530000 | × SA070000 | õ LO190000 | ÿ LY170000 | Õ LO200000 | (EO) |

Code Page 00297

Note: Version 1 of this code page is shown. For Version 0 details, see "Version 1 vs Version 0" on page 309.

Code Page 00500, Version 1: Country Extended: International # 5

CPGID 500/1 GCSGID 697

| HEX DIGITS 1ST → 2ND ↓ | 4- | 5- | 6- | 7- | 8- | 9- | A- | B- | C- | D- | E- | F- |
|------------------------------|-------------------|----------------|---------------|---------------|---------------|---------------|---------------|---------------|-------------------|---------------|---------------|---------------|
| -0 | (SP) SP010000 | & SM030000 | - SP100000 | ø LO610000 | Ø LO620000 | ° SM190000 | μ SM170000 | ¢ SC040000 | { SM110000 | } | \ SM070000 | 0 ND100000 |
| -1 | (RSP) SP300000 | é LE110000 | / SP120000 | É LE120000 | a LA010000 | j LJ010000 | ~ SD190000 | £ SC020000 | A LA020000 | J LJ020000 | ÷ SA060000 | 1 ND010000 |
| -2 | â LA150000 | ê LE150000 | Â LA160000 | Ê LE160000 | b LB010000 | k LK010000 | s LS010000 | ¥ SC050000 | B LB020000 | K LK020000 | S LS020000 | 2 ND020000 |
| -3 | ä LA170000 | ë LE170000 | Ä LA180000 | Ë LE180000 | c LC010000 | l LL010000 | t LT010000 | · SD630000 | C LC020000 | L LL020000 | T LT020000 | 3 ND030000 |
| -4 | à LA130000 | è LE130000 | À LA140000 | È LE140000 | d LD010000 | m LM010000 | u LU010000 | © SM520000 | D LD020000 | M LM020000 | U LU020000 | 4 ND040000 |
| -5 | á LA110000 | í LI110000 | Á LA120000 | Í LI120000 | e LE010000 | n LN010000 | v LV010000 | § SM240000 | E LE020000 | N LN020000 | V LV020000 | 5 ND050000 |
| -6 | ã LA190000 | î LI150000 | Ã LA200000 | Î LI160000 | f LF010000 | o LO010000 | w LW010000 | ¶ SM250000 | F LF020000 | O LO020000 | W LW020000 | 6 ND060000 |
| -7 | å LA270000 | ï LI170000 | Å LA280000 | Ï LI180000 | g LG010000 | p LP010000 | x LX010000 | ¼ NF040000 | G LG020000 | P LP020000 | X LX020000 | 7 ND070000 |
| -8 | ç LC410000 | ì LI130000 | Ç LC420000 | Ï LI140000 | h LH010000 | q LQ010000 | y LY010000 | ½ NF010000 | H LH020000 | Q LQ020000 | Y LY020000 | 8 ND080000 |
| -9 | ñ LN190000 | ß LS610000 | Ñ LN200000 | ` SD130000 | i LI010000 | r LR010000 | z LZ010000 | ¾ NF050000 | I LI020000 | R LR020000 | Z LZ020000 | 9 ND090000 |
| -A | [SM060000 |] | ¡ SM650000 | : SP130000 | « SP170000 | ª SM210000 | ı SP030000 | ¬ SM660000 | (SHY) SP320000 | 1 ND011000 | 2 ND021000 | 3 ND031000 |
| -B | . SP110000 | \$ SC030000 | , SP080000 | # SM010000 | » SP180000 | º SM200000 | ¿ SP160000 | SM130000 | ô LO150000 | û LU150000 | Ô LO160000 | Û LU160000 |
| -C | < SA030000 | * SM040000 | % SM020000 | @ SM050000 | ð LD630000 | æ LA510000 | Ð LD620000 | - SM150000 | ö LO170000 | ü LU170000 | Ö LO180000 | Ü LU180000 |
| -D | (SP060000 |) SP070000 | — SP090000 | ' SP050000 | ý LY110000 | , SD410000 | Ý LY120000 | ¨ SD170000 | ò LO130000 | ù LU130000 | Ò LO140000 | Ù LU140000 |
| -E | + SA010000 | ; SP140000 | > SA050000 | = SA040000 | þ LT630000 | Æ LA520000 | Þ LT640000 | ' SD110000 | ó LO110000 | ú LU110000 | Ó LO120000 | Ú LU120000 |
| -F | ! SP020000 | ^ SD150000 | ? SP150000 | " SP040000 | ± SA020000 | ∕ SC010000 | ® SM530000 | × SA070000 | õ LO190000 | ÿ LY170000 | Õ LO200000 | (EO) |

Code Page 00500

Code Page 00871, Version 1: Country Extended: Iceland

CPGID 871/1 GCSGID 697

| HEX DIGITS 1ST → 2ND ↓ | 4- | 5- | 6- | 7- | 8- | 9- | A- | B- | C- | D- | E- | F- |
|------------------------------|-------------------|----------------|---------------|---------------|---------------|---------------|---------------|---------------|-------------------|---------------|---------------|---------------|
| -0 | (SP) SP010000 | & SM030000 | - SP100000 | ø LO610000 | Ø LO620000 | ° SM190000 | μ SM170000 | ¢ SC040000 | þ LT630000 | æ LA510000 | ' SD110000 | 0 ND100000 |
| -1 | (RSP) SP300000 | é LE110000 | / SP120000 | É LE120000 | a LA010000 | j LJ010000 | ö LO170000 | £ SC020000 | A LA020000 | J LJ020000 | ÷ SA060000 | 1 ND010000 |
| -2 | â LA150000 | ê LE150000 | Â LA160000 | Ê LE160000 | b LB010000 | k LK010000 | s LS010000 | ¥ SC050000 | B LB020000 | K LK020000 | S LS020000 | 2 ND020000 |
| -3 | ä LA170000 | ë LE170000 | Ä LA180000 | Ë LE180000 | c LC010000 | l LL010000 | t LT010000 | · SD630000 | C LC020000 | L LL020000 | T LT020000 | 3 ND030000 |
| -4 | à LA130000 | è LE130000 | À LA140000 | È LE140000 | d LD010000 | m LM010000 | u LU010000 | © SM520000 | D LD020000 | M LM020000 | U LU020000 | 4 ND040000 |
| -5 | á LA110000 | í LI110000 | Á LA120000 | Í LI120000 | e LE010000 | n LN010000 | v LV010000 | § SM240000 | E LE020000 | N LN020000 | V LV020000 | 5 ND050000 |
| -6 | ã LA190000 | î LI150000 | Ã LA200000 | Î LI160000 | f LF010000 | o LO010000 | w LW010000 | ¶ SM250000 | F LF020000 | O LO020000 | W LW020000 | 6 ND060000 |
| -7 | å LA270000 | ï LI170000 | Å LA280000 | Ï LI180000 | g LG010000 | p LP010000 | x LX010000 | ¼ NF040000 | G LG020000 | P LP020000 | X LX020000 | 7 ND070000 |
| -8 | ç LC410000 | ì LI130000 | Ç LC420000 | Ì LI140000 | h LH010000 | q LQ010000 | y LY010000 | ½ NF010000 | H LH020000 | Q LQ020000 | Y LY020000 | 8 ND080000 |
| -9 | ñ LN190000 | ß LS610000 | Ñ LN200000 | Ð LD630000 | i LI010000 | r LR010000 | z LZ010000 | ¾ NF050000 | I LI020000 | R LR020000 | Z LZ020000 | 9 ND090000 |
| -A | Ð LT640000 | Æ LA520000 | ı SM650000 | : SP130000 | « SP170000 | ª SM210000 | ı SP030000 | ¬ SM660000 | (SHY) SP320000 | 1 ND011000 | 2 ND021000 | 3 ND031000 |
| -B | · SP110000 | \$ SC030000 | , SP080000 | # SM010000 | » SP180000 | º SM200000 | ¿ SP160000 | SM130000 | ô LO150000 | û LU150000 | Ô LO160000 | Û LU160000 |
| -C | < SA030000 | * SM040000 | % SM020000 | Ð LD620000 | ` SD130000 | } | @ SM050000 | - SM150000 | ~ SD190000 | ü LU170000 | ^ SD150000 | Û LU180000 |
| -D | (SP060000 |) SP070000 | _ SP090000 | ' SP050000 | ý LY110000 | , SD410000 | Ý LY120000 | ¨ SD170000 | ò LO130000 | ù LU130000 | Ò LO140000 | Ù LU140000 |
| -E | + SA010000 | ; SP140000 | > SA050000 | = SA040000 | { SM110000 |] SM080000 | [SM060000 | \ SM070000 | ó LO110000 | ú LU110000 | Ó LO120000 | Ú LU120000 |
| -F | ! SP020000 | Ö LO180000 | ? SP150000 | " SP040000 | ± SA020000 | ∕ SC010000 | ® SM530000 | × SA070000 | õ LO190000 | ÿ LY170000 | Õ LO200000 | (EO) |

Code Page 00871

Code Page 00892: OCR-A

CPGID 892 GCSGID 968

| HEX DIGITS 1ST → 2ND ↓ | 4- | 5- | 6- | 7- | 8- | 9- | A- | B- | C- | D- | E- | F- |
|------------------------------|------------------|----------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| -0 | (SP) SP010000 | & SM030000 | - SP100000 | | ∅ LO620000 | | | | { SM110000 | } SM140000 | \ SM070000 | 0 ND100000 |
| -1 | | | / SP120000 | | a LA010000 | j LJ010000 | | £ SC020000 | A LA020000 | J LJ020000 | | 1 ND010000 |
| -2 | | | | | b LB010000 | k LK010000 | s LS010000 | ¥ SC050000 | B LB020000 | K LK020000 | S LS020000 | 2 ND020000 |
| -3 | | | Ä LA180000 | | c LC010000 | l LL010000 | t LT010000 | | C LC020000 | L LL020000 | T LT020000 | 3 ND030000 |
| -4 | | | | | d LD010000 | m LM010000 | u LU010000 | | D LD020000 | M LM020000 | U LU020000 | 4 ND040000 |
| -5 | | | | | e LE010000 | n LN010000 | v LV010000 | | E LE020000 | N LN020000 | V LV020000 | 5 ND050000 |
| -6 | | | | | f LF010000 | o LO010000 | w LW010000 | | F LF020000 | O LO020000 | W LW020000 | 6 ND060000 |
| -7 | | | Å LA280000 | — SO150000 | g LG010000 | p LP010000 | x LX010000 | | G LG020000 | P LP020000 | X LX020000 | 7 ND070000 |
| -8 | | | | | h LH010000 | q LQ010000 | y LY010000 | | H LH020000 | Q LQ020000 | Y LY020000 | 8 ND080000 |
| -9 | | | Ñ LN200000 | | i LI010000 | r LR010000 | z LZ010000 | | I LI020000 | R LR020000 | Z LZ020000 | 9 ND090000 |
| -A | [SM060000 |] SM080000 | | : | SP130000 | | | | | | | |
| -B | . SP110000 | \$ SC030000 | , SP080000 | # SM010000 | | | | SO130000 | ¶ SO020000 | Œ SO000000 | Ɔ SO010000 | |
| -C | < SA030000 | * SM040000 | % SM020000 | @ SM050000 | | | | | | | Ö LO180000 | Ü LU180000 |
| -D | (SP060000 |) SP070000 | | ' SP050000 | | | | | | | | |
| -E | + SA010000 | ; SP140000 | > SA050000 | = SA040000 | | Æ LA520000 | | | | | | |
| -F | ! SP020000 | | ? SP150000 | " SP040000 | | | | ■ SO140000 | | ^ SM090000 | | (EO) |

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Code Page 00893: OCR-B

CPGID 893 GCSGID 969

| HEX DIGITS 1ST → 2ND ↓ | 4- | 5- | 6- | 7- | 8- | 9- | A- | B- | C- | D- | E- | F- |
|------------------------------|------------------|----------------|---------------|---------------|----------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| -0 | (SP) SP010000 | & SM030000 | - SP100000 | ø LO610000 | Ø LO620000 | | | | { SM110000 | } SM140000 | \ SM070000 | 0 ND100000 |
| -1 | | | / SP120000 | | a LA010000 | j LJ010000 | ~ SD190000 | £ SC020000 | A LA020000 | J LJ020000 | | 1 ND010000 |
| -2 | | | | | b LB010000 | k LK010000 | s LS010000 | ¥ SC050000 | B LB020000 | K LK020000 | S LS020000 | 2 ND020000 |
| -3 | ä LA170000 | | Ä LA180000 | | c LC010000 | l LL010000 | t LT010000 | | C LC020000 | L LL020000 | T LT020000 | 3 ND030000 |
| -4 | | | | | d LD010000 | m LM010000 | u LU010000 | | D LD020000 | M LM020000 | U LU020000 | 4 ND040000 |
| -5 | | | | | e LE010000 | n LN010000 | v LV010000 | § SM240000 | E LE020000 | N LN020000 | V LV020000 | 5 ND050000 |
| -6 | | | | — SD470000 | f LF010000 | o LO010000 | w LW010000 | | F LF020000 | O LO020000 | W LW020000 | 6 ND060000 |
| -7 | å LA270000 | | Å LA280000 | — SO150000 | g LG010000 | p LP010000 | x LX010000 | | G LG020000 | P LP020000 | X LX020000 | 7 ND070000 |
| -8 | | | | | h LH010000 | q LQ010000 | y LY010000 | | H LH020000 | Q LQ020000 | Y LY020000 | 8 ND080000 |
| -9 | | ß LS610000 | Ñ LN200000 | ` SD130000 | i LI010000 | r LR010000 | z LZ010000 | | I LI020000 | R LR020000 | Z LZ020000 | 9 ND090000 |
| -A | [SM060000 |] SM080000 | | : | SP130000 | | | | | | | |
| -B | . | \$ SC030000 | , | # SM010000 | | | | SO130000 | | | | |
| -C | < SA030000 | * SM040000 | % SM020000 | @ SM050000 | | æ LA510000 | | | ö LO170000 | ü LU170000 | Ö LO180000 | Ü LU180000 |
| -D | (SP060000 |) SP070000 | — SP090000 | ' SP050000 | | ’ SD410000 | | “ SD170000 | | | | |
| -E | + SA010000 | ; SP140000 | > SA050000 | = SA040000 | ij LI510000 | Æ LA520000 | | ’ SD110000 | | | | |
| -F | ! SP020000 | ^ SD150000 | ? SP150000 | " SP040000 | IJ LI520000 | □ SC010000 | | ■ SO140000 | | Λ SM090000 | | (EO) |

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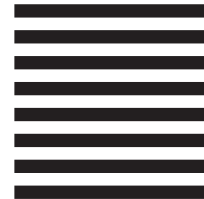
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