

Program Numbers 5727-WS1, 5727-WS6

PC Support/36 Work Station Feature Technical Reference

Office Systems Family

PC Support/36 Work Station Feature Technical Reference

Office Systems Family



Personal
Computer
Software

First Edition (June 1987)

This edition applies to Release 5, Modification Level 1, of the IBM System/36 PC Support/36 Products (Program 5727-WS1, Feature 6181 for the 5360 and 5362 System Units, and Program 5727-WS6, Feature 6248 for the 5364 System Unit), and to all subsequent releases and modifications until otherwise indicated in new editions or Technical Newsletters. Changes are periodically made to the information herein; any such changes will be reported in subsequent revisions or Technical Newsletters.

References in this publication to IBM products, programs, or services do not imply that IBM intends to make these available in all countries in which IBM operates. Any reference to an IBM licensed program in this publication is not intended to state or imply that only IBM's licensed program may be used. Any functionally equivalent program may be used instead.

The numbers at the bottom right of illustrations are publishing control numbers and are not part of the technical content of this manual.

Publications are not stocked at the address given below. Requests for IBM publications should be made to your IBM representative or to your IBM-approved remarketer.

This publication could contain technical inaccuracies or typographical errors.

A form for readers' comments is provided at the back of this publication. If this form has been removed, comments may be addressed to IBM Corporation, Information Development, Department 245, Rochester, Minnesota, U.S.A. 55901. IBM may use or distribute any of the information you supply in any way it believes appropriate without incurring any obligation to you.

Contents

Preface	vii
Organization of This Manual	x
Related Publications	xi
Data Security	xii
Chapter 1. Introduction to Work Station	
Feature	1-1
Introduction	1-2
Description of Work Station Feature ...	1-2
Additional Capabilities of Work Station	
Feature	1-3
Requirements for Using Work Station	
Feature	1-4
Network Requirements	1-4
System/36	1-4
Personal Computer	1-6
Chapter 2. Display Characteristics ...	2-1
Introduction	2-2
Attribute Appearances	2-2
Monochrome Display	2-3
Color Display	2-9
Character Appearance	2-15
Graphics Function Handling	2-15
Display Specifications	2-20
Chapter 3. Using Printers	3-1
Introduction	3-2
Forms Handling Default Settings	3-3
EBCDIC to ASCII Translation Table for	
Printers	3-6
5219 Printer Commands	3-8
New Printer Commands	3-17
5224 Printer Commands	3-19
Chapter 4. Using the Printer Function	
Table Setup Program	4-1

Introduction	4-2
PFTs Provided by Work Station	
Feature	4-4
Creating a Printer Function Table	4-5
Entering Control Sequences	4-7
Variable N	4-8
Defining Printer Functions	4-10
Initialization and Reset	4-11
Vertical/Horizontal Spacing	4-13
Highlighting	4-17
Paper and Page Options	4-17
Type Styles and Character Sets	4-20
Function Selection Tests	4-22
Chapter 5. Graphics Support	5-1
Introduction	5-2
Fully Supported and No-op Orders	5-2
Graphics Orders Support	5-3
Modified Orders	5-5
Graphics Control Orders	5-5
Graphics Set Orders	5-8
Graphics Draw Orders	5-25
Read Orders	5-27
Printer Orders	5-31
IEEE-488 Interface Orders	5-32
Appendix A. Translation Tables	A-1
Introduction	A-2
IBM 5250 EBCDIC Character Set	A-2
EBCDIC to ASCII Conversion Table for	
Displays	A-4
IBM Personal Computer ASCII	
Character Set Table	A-6
IBM Personal Computer Printer	
Character Conversion	A-7
Decimal to Hexadecimal Conversion	A-8
Appendix B. Graphics Files Provided	
with Work Station Feature	B-1
Introduction	B-2
Program Files	B-2
Virtual Device Interface Files	B-3
Graphics Configuration Files	B-5

Glossary G-1

Index X-1

(

(

(

Preface

This manual provides technical information for using Work Station Feature with IBM Personal Computers connected to the System/36. The IBM Token-Ring Network connects the personal computer to System/36.

For convenience, this manual uses the following shortened terms:

- IBM PC Support/36 Work Station Feature is called Work Station Feature.
- The *IBM PC Support/36 Work Station Feature User's Guide* is called the *User's Guide*.
- The IBM Personal Computer, IBM PERSONAL COMPUTER XT™, and the IBM PERSONAL COMPUTER AT® are each referred to as personal computer.¹
- The IBM System/36, System Unit 5360; IBM System/36, System Unit 5362; and the IBM System/36, System Unit 5364 are each referred to as System/36.

¹ XT is a trademark of IBM Corporation.

This manual is intended for:

- The person responsible for installing Work Station Feature (personal computer technical coordinator)
- Programmers who have a personal computer attached to System/36 via the IBM Token-Ring Network
- Users who want to understand Work Station Feature in more detail

You should know how to use the IBM Personal Computer Disk Operating System (DOS). It is important that you are familiar with the following manuals:

IBM Personal Computer Guide to Operations
IBM Personal Computer Disk Operating System

You should also have some knowledge of the IBM Token-Ring Network and System/36. This manual does not teach you how to use System/36 or IBM Token-Ring Network functions.

Work Station Feature makes it possible for you to imitate the functions of System/36 work stations and printers and use System/36 functions. Work Station Feature supports graphics functions similar to an IBM 5292 Color Display Station Model 2 (5292-2). Work Station Feature also supports a plotter. Using Work Station Feature, your personal computer can perform the functions of up to five work stations at the same time on one IBM Token-Ring Network cable.

Graphics support functions have these limitations:

- You cannot use the asynchronous communications adapter in personal computer mode while you use the graphics plotter in a session.
- You can use a plotter for only one session at a time.
- Interrupt vector hex 59 is reserved for Virtual Device Interface (VDI) routines.
- You must inactivate DOS with the WFGDOS program before you use graphics.

The program files are contained on virtual disk #IWPCLD4 on System/36. The program files are a System/36 licensed program product. Once the program files are on System/36, you access them using PC Support/36 functions.

Organization of This Manual

This manual has five chapters, two appendixes, a glossary, and an index.

- Chapter 1, "Introduction to Work Station Feature," describes Work Station Feature, its capabilities, and its requirements.
- Chapter 2, "Display Characteristics," describes the difference between the appearance of the display on an actual 5250 or 5292-2 display station and the appearance of the personal computer display during a work station session.
- Chapter 3, "Using Printers," provides information about the ways various IBM printers handle forms and tells you how to translate the EBCDIC hex codes that System/36 uses into the ASCII hex codes that Work Station Feature uses.
- Chapter 4, "Using the Printer Function Table Setup Program," explains how to create a customized printer function table for a user-defined printer.
- Chapter 5, "Graphics Support," describes the commands you use for graphics.
- Appendix A, "Translation Tables," provides a quick reference section for information you use to translate codes.
- Appendix B, "Graphics Files Provided with Work Station Feature" describes the Work Station Feature program files for graphics.
- Glossary of Terms and Abbreviations.
- Index.

Related Publications

The following is a list of related publications referred to in this manual.

- *IBM PC Support/36 Work Station Feature User's Guide*, SC21-9564
- *IBM PC Support/36 Technical Reference*, SC21-9097
- *IBM PC Support/36 User's Guide*, SC21-9088
- *IBM Personal Computer Guide to Operations*
- *IBM Personal Computer Disk Operating System*
- *IBM PC Support/36 Organizer*, SC21-9563
- *IBM 5250 Information Display System Functions Reference Manual*, SA21-9247

Data Security

Work Station Feature, in conjunction with one of the IBM Personal Computers, is a powerful and useful tool to help you with your personal and business information processing needs. As with any information system, inadvertent errors may occur and information may be misused. We suggest that when processing sensitive or highly valuable information, you take steps to ensure that your data and programs are protected from accidental or unauthorized disclosure, modification, destruction, or misuse. Simple measures, such as removing diskettes when not in use, keeping backup copies of valuable information, or installing the equipment in a secure facility, can assist you in maintaining the integrity and privacy of your information.

Chapter 1. Introduction to Work Station Feature

Introduction	1-2
Description of Work Station Feature . . .	1-2
Additional Capabilities of Work Station Feature	1-3
Requirements for Using Work Station Feature	1-4
Network Requirements	1-4
System/36	1-4
Hardware Requirements	1-4
Software Requirements	1-5
Personal Computer	1-6
Hardware Requirements	1-6
Software Requirements	1-8
Storage Requirements	1-9

Introduction

This chapter describes the capabilities of Work Station Feature and lists requirements for using Work Station Feature.

Description of Work Station Feature

IBM PC Support/36 Work Station Feature is a licensed program product (software) that allows you to use the IBM Personal Computer as a work station connected to System/36. The IBM Personal Computer is connected to System/36 by the IBM Token-Ring Network.

System/36 can address each personal computer individually. Each personal computer can have as many as five sessions in operation at the same time. You can run all five sessions as display sessions, or run four display sessions and one printer session.

Work Station Feature is different from other emulators because it does not require a work station controller between the personal computer and System/36.

With Work Station Feature, you can use a personal computer as:

- A display work station
- A printer work station
- A graphics work station
- A stand-alone personal computer

Work Station Feature allows you explicit control of the keyboard, display, and printer features. System/36 logically controls display and printer functions for any display station or operator function; therefore, System/36 handles any problems that arise from conflicting commands.

Work Station Feature also allows you to use PC text assist, a personal computer program which runs as part of the PC Support/36 Organizer and uses the computing power of the personal computer to enhance the Displaywrite/36 edit display. For more information on PC text assist, refer to the *PC Support/36 Organizer* manual.

Additional Capabilities of Work Station Feature

The additional capabilities of Work Station Feature include:

- Modifying display attributes
- Customizing the keyboard
- Advanced printer functions
- Graphics support
- Multiple System/36 support

You can use the Work Station Feature configuration program to customize a work station for these features. See the *User's Guide* for more information.

Requirements for Using Work Station Feature

This section lists the hardware and software required by Work Station Feature for System/36 and personal computers.

Network Requirements

Refer to the *PC Support/36 User's Guide* and *PC Support/36 Technical Reference* for hardware and software requirements for your networks.

System/36

This section lists the hardware and software requirements for the System/36.

Hardware Requirements

The System/36 computer may be one of the following:

- IBM System/36, System Unit 5360
- IBM System/36, System Unit 5362
- IBM System/36, System Unit 5364

For the 5364 system unit, you need the following IBM Token-Ring Network attachments:

- An IBM Personal Computer supported by the IBM System/36 LAN feature (to serve as the personal computer console)
- IBM Token-Ring Network Adapter II card (to attach to the LAN)
- IBM Token-Ring Network Attachment Cable

For the 5360 and 5362 system units, you need the following IBM Token-Ring Network attachments:

- IBM Personal Computer AT (to serve as controller), which must contain the following:
 - LAN Adapter card (connects to LAN Attachment Feature in System Units 5360 and 5362, feature 3098)
 - Token-Ring Network Adapter II card (to attach to the LAN)
- IBM Token-Ring Network Attachment Cable
- IBM System/36 LAN Attachment feature (number 6500 for 5360, 3315 for 5362)

Software Requirements

The System/36 software requirements for Work Station Feature are as follows:

- IBM PC Support/36, Release 5, Modification Level 1 or later
- If you are using the System Unit 5360 or 5362, Release 5, Modification Level 1 or later of the System Support Program (5727-SS1)
- If you are using the System Unit 5364, Release 5.1 or later of Release 5, Modification Level 1 or later of the System Support Program (5727-SS6)
- If you are using graphics, a graphics support package such as the IBM System/36 Business Graphics Utilities (Program 5727-BG1)

Personal Computer

Work Station Feature is compatible with these personal computers:

- IBM Personal Computer
- IBM Personal Computer XT
- IBM Personal Computer AT

Hardware Requirements

Work Station Feature requires that each personal computer have the following:

- IBM Token-Ring Adapter card (to attach the personal computer to System/36 Token-Ring Network)
- One of the following display subsystems:
 - IBM 5151 Monochrome Display and one IBM Monochrome Display and Printer Adapter or one IBM Enhanced Graphics Adapter (EGA) card.
 - IBM 5153 Color Graphics Monitor and one IBM Color Graphics Adapter (CGA) card or one IBM Enhanced Graphics Adapter (EGA) card.
 - IBM Enhanced Graphics Monitor, 5154 Model 1, with the IBM EGA card. (This combination gives the best results for graphics sessions. See Note 2.)
 - Monitor that can support 25 by 80 character displays, with the appropriate adapter.

Notes:

1. *The EGA is required to support graphics on the Monochrome Display.*
 2. *The addition of the IBM Graphics Memory Expansion Card with the EGA provides full 16-color support. The EGA card has 64K of storage and provides four colors; with the Memory Expansion card it has 128K of storage and provides 16 colors. The use of the Graphics Memory Module Kit does not provide additional functions.*
- One of the following adapters:
 - Asynchronous communications adapter for serial printers
 - Parallel printer adapter or monochrome display printer adapter for parallel printers

For a printer session, Work Station Feature requires one of the following printers:

- IBM 5152 Model 2 Graphics Printer
- IBM 5216 Wheelprinter

Note: The 5216 requires a parallel or serial attachment interface to be installed on the printer before connecting it to one of the personal computers.

- IBM 5201 Quietwriter
- IBM 4201 Proprinter
- User-defined printer

Refer to Chapter 4, “Using the Printer Function Table Setup Program” for information about creating printer function tables for user-defined printers.

If you use graphics support, you may use one of the following plotters during a graphics session:

- IBM 6180 Plotter (six of eight pens)
- IBM 7371 Plotter (two pen)
- IBM 7372 Plotter (six pen)

Notes:

1. *A plotter requires an asynchronous communications adapter.*
2. *Work Station Feature cannot support a plotter when both an asynchronous communications adapter and a synchronous data link control (SDLC) adapter or binary synchronous communications (BSC) adapter are in use at the same time.*
3. *Work Station Feature cannot support use of a plotter and a serial printer at the same time.*
4. *The 7371 is a two-pen plotter. The 6180 is an eight-pen plotter, but is supported by the System/36 as a 7371 with six of the eight pens accessible.*

Software Requirements

The personal computer software requirements for Work Station Feature are:

- IBM Token-Ring Network PC Adapter Support Interface
- IBM PC Support/36
- IBM Personal Computer Disk Operating System (DOS), Version 3.2 or later

Storage Requirements

Work Station Feature requires a minimum of 512K (640K recommended) to load display or printer session functions. Following are storage requirements for different components of Work Station Feature:

- 54K storage for the first display session
- 7K for each additional display session
- 45K of additional storage for a printer session
- A minimum of 170K storage for graphics support for one session
- 12K additional storage if you use the IBM Color Graphics Adapter (CGA) card or Enhanced Graphics Adapter (EGA) card

Facility and Type or Version	Size in Bytes
WSF (1 display session)	54K
WSF (2 display sessions)	61K
WSF (3 display session)	68K
WSF (4 display sessions)	75K
WSF (5 display sessions)	82K
WSF (1 printer and 1 display session)	99K
WSF (1 printer and 2 display sessions)	106K
WSF (1 printer and 3 display sessions)	113K
WSF (1 printer and 4 display sessions)	120K
Color/Graphics Adapter	12K
WSF Graphics	
<ul style="list-style-type: none"> • One graphics display session (including VDI.SYS and one VDI device driver) 	170K (see Note 1)
<ul style="list-style-type: none"> • Each additional graphics display session 	26K (see Note 1)
<p><i>Notes:</i></p> <ol style="list-style-type: none"> 1. <i>These figures include the minimum VDI buffer size of 20K bytes. The graphics configuration program can be used to configure a larger VDI buffer size up to 65.5K bytes, which increases the storage needed for a session.</i> 2. <i>An additional 10K of storage is required to support user-defined printers.</i> 3. <i>Refer to the appropriate manuals for the storage requirements of the version of DOS and the application programs you plan to use.</i> 	

Figure 1-1. Storage Requirements

Chapter 2. Display Characteristics

Introduction	2-2
Attribute Appearances	2-2
Monochrome Display	2-3
Color Display	2-9
Character Appearance	2-15
Graphics Function Handling	2-15
Display Specifications	2-20

Introduction

When you use a personal computer as a display station on System/36, its functions and display appearance are not identical to the display station it imitates. This chapter describes these differences.

The first section lists the differences in attribute appearances on 5250 display stations and personal computer displays. The second section describes the appearance of the display and characters on a 5250 display station and the corresponding characters on the personal computer when the personal computer is acting as a 5250 display station. The third section explains the differences between 5250 EBCDIC characters and personal computer ASCII characters. The final section summarizes the specifications of displays and adapters (such as resolution and number of colors).

Attribute Appearances

When you use a personal computer as a 5250 display station, attributes on the personal computer appear similar to those on a 5250 display station. Because the personal computer and the 5250 display station are different, some attributes look different. The following tables give the hex code and description for each attribute and a description of how the attribute appears on the 5250 display station and on the personal computer you are using as a 5250 display station.

The form of translation of System/36 attributes to personal computer attribute styles is controlled by the configuration program.

Monochrome Display

Figure 2-1 shows the display attributes you can select if you are using a personal computer monochrome display with a Monochrome Display Adapter card installed. The first column lists the hex code for the attribute. The second column describes the attribute. The third column describes the appearance of a 5250 display station display when you specify the attribute. The fourth column describes how a personal computer monochrome display appears when you specify the attribute while using the personal computer as a 5250 display station.

Hex Code	Attribute	IBM 5250 Display Station	Personal Computer Display
20	Normal	Green characters on black field	Green characters on black field
21	Reverse	Black characters on green field	Black characters on green field
22	High intensity	Brighter green characters on black field	Brighter green characters on black field
23	High intensity and reverse	Black characters on brighter green field	Black characters on green field
24	Underscore	Underscore	Underscore

Figure 2-1 (Part 1 of 6). Attributes on Monochrome Displays

Hex Code	Attribute	IBM 5250 Display Station	Personal Computer Display
25	Underscore and reverse	Black characters on green field, black underscore	Green characters on black field, green underscore
26	Underscore and high intensity	Brighter green characters on black field, bright green underscore	Brighter green characters on black field, bright green underscore
27	Blank field	Solid black field, no characters	Solid black field, no characters
28	Blink	Blinking green characters on black field	Blinking green characters on black field
29	Blink and reverse	Blinking black characters on green field	Blinking black characters on green field
2A	Blink and high intensity	Blinking bright green characters on black field	Blinking bright green characters on black field
2B	Blink, high intensity, and reverse	Blinking black characters on bright green field	Blinking black characters on green field

Figure 2-1 (Part 2 of 6). Attributes on Monochrome Displays

Hex Code	Attribute	IBM 5250 Display Station	Personal Computer Display
2C	Blink and underscore	Blinking green characters on black field, green underscore	Blinking green characters on black field, green underscore
2D	Blink, underscore, and reverse	Blinking black characters on green field, black underscore	Blinking green characters on black field, green underscore
2E	Blink, underscore, and high intensity	Blinking bright green characters on black field, green underscore	Blinking bright green characters on black field, green underscore
2F	Blank field	Solid black field, no characters	Solid black field, no characters
30	Column separators	Vertical green bars between green characters on black field	Green rectangles in null positions on black field
31	Column separators and reverse	Vertical black bars between black characters on green field	Black rectangles with black characters on green field

Figure 2-1 (Part 3 of 6). Attributes on Monochrome Displays

Hex Code	Attribute	IBM 5250 Display Station	Personal Computer Display
32	Column separators and high intensity	Bright green bars between bright green characters on black field	Bright green rectangle for nulls with bright green characters on black field
33	Column separators, high intensity, and reverse	Black bars between black characters on bright green field	Black rectangle for nulls with black characters on green field
34	Column separators and underscore	Green bars between green underscored characters on black field	Green rectangle for nulls with green underscored characters on black field
35	Column separators, underscore, and reverse	Black bars between black characters on green field, black underscore	Green rectangle for nulls with green characters on black field, green underscore
36	Column separators, underscore, and high intensity	Bright green bars between bright green characters on black field	Bright green rectangle for nulls with bright green characters on black field, bright green underscore

Figure 2-1 (Part 4 of 6). Attributes on Monochrome Displays

Hex Code	Attribute	IBM 5250 Display Station	Personal Computer Display
37	Column separators and no characters	Green bars on black field, no characters	Green rectangles for nulls on black field, no characters
38	Column separators and blink	Green bars between blinking green characters on black field	Blinking green rectangles for nulls with blinking green characters on black field
39	Column separators, blink, and reverse	Black bars between blinking black characters on a green field	Blinking black rectangle for nulls with blinking black characters on green field
3A	Column separators, blink, and high intensity	Bright green bars between blinking bright green characters on black field	Bright green rectangle for nulls with blinking bright green characters on black field
3B	Column separators, blink, high intensity, and reverse	Black bars between blinking black characters on bright green field	Blinking black rectangle for nulls with blinking black characters on a green field

Figure 2-1 (Part 5 of 6). Attributes on Monochrome Displays

Hex Code	Attribute	IBM 5250 Display Station	Personal Computer Display
3C	Column separators, blink, and underscore	Green bars between blinking characters on black field, green underscore	Blinking rectangles for nulls with blinking green characters on black field, green underscore
3D	Column separators, blink, underscore, and reverse	Black bars between blinking black characters on green field, black underscore	Blinking rectangles for nulls with blinking green characters on black field, green underscore
3E	Column separators, blink, underscore, and high intensity	Bright green bars between blinking bright green characters on black field, bright green underscore	Blinking bright green rectangles for nulls with blinking bright green characters on black field
3F	Column separators and no characters	Green bars on black field, no characters	Green rectangles for nulls on black field, no characters

Figure 2-1 (Part 6 of 6). Attributes on Monochrome Displays

Color Display

Figure 2-2 shows the display attributes you can select if you are using a personal computer color display with either of the following installed:

- Color Graphics Adapter (CGA) card
- Enhanced Graphics Adapter (EGA) card

The first column lists the hex code for the attribute. The second column describes the attribute. The third column describes the appearance of a 5292 color display station display when you specify that attribute. The fourth column describes how a personal computer color display appears when you specify the attribute while you are using the personal computer as a 5292 color display station.

Hex Code	Attribute	IBM 5292 Display Station	Personal Computer Display
20	Normal	Green characters on black field	Green characters on black field
21	Reverse	Black characters on green field	Black characters on green field
22	High intensity	White characters on black field	White characters on black field
23	High intensity and reverse	Black characters on white field	Black characters on white field

Figure 2-2 (Part 1 of 6). Attributes on Color Displays

Hex Code	Attribute	IBM 5292 Display Station	Personal Computer Display
24	Underscore	Green characters on black field with blue underscore	Green characters on black field with green underscore characters for nulls
25	Underscore and reverse	Black characters on green field with blue underscore	Black characters on green field with black underscore characters for nulls
26	Underscore and high intensity	White characters on black field with blue underscore	White characters on black field with white underscore characters for nulls
27	Blank field	Solid black field, no characters	Solid black field, no characters
28	Blink	Red characters on black field	Red characters on black field
29	Blink and reverse	Black characters on red field	Black characters on red field
2A	Blink and high intensity	Blinking red characters on black field	Blinking red characters on black field

Figure 2-2 (Part 2 of 6). Attributes on Color Displays

Hex Code	Attribute	IBM 5292 Display Station	Personal Computer Display
2B	Blink, high intensity, and reverse	Blinking black characters on red field	Blinking black characters on red field
2C	Blink and underscore	Red characters on black field with blue underscore	Red characters on black field with red underscore characters for nulls
2D	Blink, underscore, and reverse	Black characters on red field with blue underscore	Black characters on red field with black underscore characters for nulls
2E	Blink, underscore, and high intensity	Blinking red characters on black field with blue underscore	Blinking red characters on black field with blinking red underscore characters for nulls
2F	Blank field	Solid black field, no characters	Solid black field, no characters
30	Column separators	Blue dots in lower corner with turquoise characters on black field	Black rectangle characters for nulls on cyan field

Figure 2-2 (Part 3 of 6). Attributes on Color Displays

Hex Code	Attribute	IBM 5292 Display Station	Personal Computer Display
31	Column separators and reverse	Blue dots in lower corners with black characters on turquoise field	Black rectangle characters for nulls with black characters on cyan field
32	Column separators and high intensity	Blue dots in lower corners with yellow characters on black field	Yellow rectangle characters for nulls with yellow characters on black field
33	Column separators, high intensity, and reverse	Blue dots in lower corners with black characters on yellow field	Black rectangle characters for nulls with black characters on yellow field
34	Column separators and underscore	Segmented blue underscore with turquoise characters on black field	Cyan rectangle characters for nulls with cyan characters on black field, no underscores
35	Column separators, underscore, and reverse	Segmented blue underscore with black characters on turquoise field	Black rectangle characters for nulls with black characters on cyan field, no underscore

Figure 2-2 (Part 4 of 6). Attributes on Color Displays

Hex Code	Attribute	IBM 5292 Display Station	Personal Computer Display
36	Column separators, underscore, and high intensity	Segmented blue underscore with yellow characters on black field	Yellow rectangle characters for nulls with yellow characters on black field, no underscore
37	Column separators and no characters	No characters and no column separators	Red rectangle characters for nulls, no other characters
38	Column separators and blink	Pink characters on black field, no column separators	Magenta rectangle characters for nulls with magenta characters on black field
39	Column separators, blink, and reverse	Black characters on pink field, no column separators	Black rectangle characters for nulls with black characters on magenta field
3A	Column separators, blink, and high intensity	Blue characters on black field, no column separators	Blue rectangle characters for nulls with blue characters on black field

Figure 2-2 (Part 5 of 6). Attributes on Color Displays

Hex Code	Attribute	IBM 5292 Display Station	Personal Computer Display
3B	Column separators, blink, high intensity, and reverse	Black characters on blue field, no column separators	Black rectangle characters for nulls with black characters on blue field
3C	Column separators, blink, and underscore	Blue underscore with pink characters on black field, no column separators	Magenta rectangle characters for nulls with magenta characters on black field
3D	Column separators, blink, underscore, and reverse	Blue underscore with black characters on pink field, no column separators	Black rectangle characters for nulls with black characters on magenta field
3E	Column separators, blink, underscore, and high intensity	Blue underscore with blue characters on black field, no column separators	Blue rectangle characters for nulls with blue characters on black field
3F	Column separators and no characters	Black field, no characters	Red rectangle characters for nulls on black field, no other characters

Figure 2-2 (Part 6 of 6). Attributes on Color Displays

Character Appearance

System/36 display stations have characters on the keyboards that are not on personal computer keyboards. When you use your personal computer to function as a System/36 display station, you can use any of the characters that are on a System/36 display station keyboard. Some of these characters appear different on the personal computer display from they appear on an actual System/36 display station display.

Refer to the EBCDIC to ASCII translation table in your personal computer reference manual for a description of these characters.

Graphics Function Handling

Figure 2-3 lists the differences in the ways the IBM 5292-2 and a personal computer running Work Station Feature handle graphics functions. The first column lists the function. The second and third columns describe how IBM 5292-2 work stations and personal computers acting as graphics work stations handle the function.

See the *User's Guide* for information about Local Select functions.

Function	IBM 5292-2	Personal Computer
Control of graphics displays	Turned on and off via Local Select functions.	<p>May be turned on and off by entering Local Select 1.</p> <p>Simulated by saving and rebuilding the display.</p> <p>Rebuild time depends on the complexity of the graphics and orders used. This may be 30 seconds or longer.</p> <p>Order stream can overflow the internal buffer causing loss of part of a redisplayed chart.</p>
Graphics coordinates	Determined by hardware and application.	Scaled to fit current display width, height, and aspect ratio. Text may be shifted with respect to graphics when alphanumeric data overlays graphics data.
Line style	Determined by hardware and application.	Provided by VDI and may not match.

Figure 2-3 (Part 1 of 4). Graphics Display Differences

Function	IBM 5292-2	Personal Computer
Line style mapping	Determined by hardware and application.	Specified during configuration.
Color mapping	Determined by hardware and application.	Specified during configuration for personal computer displays with fewer than eight colors available.
Polygon fill	<p>Reference line: vertical; follow polygon edge; follow +45° from vertical; follow -45° from vertical.</p> <p>Fill mode: solid boundary and style specified in <i>set style order</i>, solid boundary only, fill with style specified in <i>set style order</i>, boundary only with style specified in <i>set style order</i>.</p>	<p>Reference line: not supported by VDI.</p> <p>Fill mode: solid boundary and style specified in <i>set style order</i> and current line style; solid boundary only; fill with style specified in <i>set style order</i> and current line style; boundary only with style specified in <i>set style order</i> and current line style.</p>
Scanline data	Determined by hardware and application.	Scaled horizontally and vertically to match current display width. This may cause bunched or skipped lines.

Figure 2-3 (Part 2 of 4). Graphics Display Differences

Function	IBM 5292-2	Personal Computer
Set line weight order	Determined by hardware and application.	Not supported.
Status line control	Always displayed.	May be turned on and off by entering Local Select 2.
Styled line	Does not write missing or offline segment (area between dashes not painted).	Missing line segments may be painted with background color.
Text attributes and colors	Determined by hardware and application.	May appear different when in graphics state due to color characteristics of the personal computer hardware.
Write background	Uses current line style and writing mode.	Clears and then paints display with solid line style and replace writing mode.
Write polymarker	Determined by hardware and application.	Always uses replace function.

Figure 2-3 (Part 3 of 4). Graphics Display Differences

Function	IBM 5292-2	Personal Computer
XOR and OR writing modes	Determined by hardware and application.	Boolean logic is performed on the color indexes. VDI uses different index values for color selection from the 5292-2. This can result in different output colors.
Blink, underscore, and column separators	Determined by hardware and application.	Not supported in graphics state.
Vertical scaling factor	Determined by hardware and application.	Can be altered by Local Select 3.
Select modes	Determined by hardware and application.	Supported for Erase Graphics Display and End Graphics processing.

Figure 2-3 (Part 4 of 4). Graphics Display Differences

Display Specifications

The following table compares the specifications of the IBM 5292-2 color display station with the combinations of displays and adapters available for personal computers.

Display Number/ Adapter	Resolution	Colors	CPL
5292-2	480 by 288	8 of 512	80
5151 EGA	640 by 350	4 pixel styles	80
5153 CGA	640 by 200 320 by 200	2 4 of 16 (see Note 2)	80 40
5153 EGA	320 by 200 640 by 200	16 (see Note 3) 16 (see Note 3)	40 80
5154 EGA	640 by 350 640 by 350	4 of 64 16 of 64 (see Notes 3 and 4)	80 80

Notes:

1. *All displays have 25 lines (status line plus 24 rows of text).*
2. *This combination has four palettes of three colors plus background. The colors cannot be individually selected.*
3. *Data stream limits display to eight colors on any display.*
4. *EGA storage expansion option and modules (up to 128K) are required for additional color support.*

Figure 2-4. Display Specifications

Chapter 3. Using Printers

Introduction	3-2
Forms Handling Default Settings	3-3
EBCDIC to ASCII Translation Table for Printers	3-6
5219 Printer Commands	3-8
New Printer Commands	3-17
5224 Printer Commands	3-19

Introduction

This chapter contains information about how the following IBM Personal Computer Printers handle forms:

- IBM 5152 Graphics Printer
- IBM 5201 Quietwriter
- IBM 5216 Wheelprinter
- IBM 4201 Proprinter

For example, the default for the maximum paper length depends on which printer you specify. You can specify settings for forms handling other than the default settings by using the information in this chapter.

Forms Handling Default Settings

The following tables tell you the default for forms handling on IBM printers. Figure 3-1 lists the default settings for the IBM 5152, 4201, 5201, and 5216 Printers. Figure 3-2 lists the default settings for the IBM 5219, 5256, and 5224 System/36 Printers.

Printer Specification	IBM 5152	IBM 4201	IBM 5201	IBM 5216
Print line length (inches)	8.0	8.0	13.2	13.2
Paper width: maximum continuous form (inches)	10.0	10.0	15.0	14.9
Paper width: maximum single sheet (inches)	N/A	11.0	15.0	15.4
Paper width: minimum continuous form (inches)	4.0	3.0	3.0	3.2
Paper length: maximum (inches)	N/A	N/A	N/A	15.0
Lines per inch (LPI)	6 or 8	6 or 8	6 or 8	6 or 8
Characters per inch (CPI)	See Note 1	See Note 3	10	10
Characters per line (CPL)	See Note 2	See Note 4	132	132
Continuous forms	Yes	Yes	Yes	Yes

Figure 3-1 (Part 1 of 2). Forms Handling for Personal Computer Printers

Printer Specification	IBM 5152	IBM 4201	IBM 5201	IBM 5216
Single sheet forms	No	Yes	Yes	Yes
<p><i>Notes:</i></p> <ol style="list-style-type: none"> 1. <i>The 5152 Printer uses 10 CPI unless you select the 15 CPI option on the printer session operator panel.</i> 2. <i>The 5152 Printer prints 132 CPL (in compressed print mode) when you select the 15 CPI option on the printer session operator panel.</i> 3. <i>The 4201 Printer uses 10 CPI unless you select the 15 CPI option on the printer session operator panel.</i> 4. <i>The 4201 Printer prints 132 CPL (in compressed print mode) when you select the 15 CPI option.</i> 				

Figure 3-1 (Part 2 of 2). Forms Handling for Personal Computer Printers

Printer Specification	IBM 5219	IBM 5256	IBM 5224
Print line length (inches)	13.2	13.2	13.2
Paper width: maximum continuous form (inches)	14.5	15.0	17.7
Paper width: maximum single sheet (inches)	15.4	14.5	N/A
Paper width: minimum continuous form (inches)	2.0	3.0	3.0
Paper length: maximum (inches)	14.33	14.0	12.5
Lines per inch (LPI)	(See Note 1)	6 or 8	6 or 8
Characters per inch (CPI)	(See Note 2)	10	10
Characters per line (CPL)	(See Note 3)	132	(See Note 4)
Continuous forms	Yes	Yes	Yes
Single sheet forms	Yes	No	Yes
<p><i>Notes:</i></p> <ol style="list-style-type: none"> <i>The 5219 prints 4, 5-1/3, 6, 8, 9.6, 12, 24, or 48 LPI with 1, 1-1/2, 2, or 3 spaces between lines. System/36 controls this option.</i> <i>The 5219 prints 10, 12, 15, or proportional-spaced CPI. System/36 controls this option.</i> <i>The 5219 prints 132, 158, or 198 CPL (varies if you select proportional spacing). System/36 controls this option.</i> <i>The 5224 Printer prints 198 CPL (in compressed print mode) when you select the 15 CPI option.</i> 			

Figure 3-2. Forms Handling for System/36 Printers

EBCDIC to ASCII Translation Table for Printers

The following tables translate the EBCDIC hex codes the System/36 printer recognizes into the ASCII hex codes Work Station Feature recognizes. Figure 3-4 shows the ASCII codes used by the personal computers for each of the EBCDIC codes used by the IBM 5219, 5224, and 5256 Printers. The “xx” shown in this figure represents a value that is different for different languages. Figure 3-3 shows the differences in code values.

EBCDIC Code Point													
IBM 5219 IBM 5256 EBCDIC	4A	4F	5A	5B	5F	6A	79	7B	7C	A1	C0	D0	E0
IBM 4201 IBM 5152 IBM 5201	9B	B3	21	24	AA	7C	60	23	40	7E	7B	7D	5C
	9B	00	21	24	AA	7C	60	23	40	7E	7B	7D	5C

RB3F026

Figure 3-3. EBCDIC to ASCII Printer Character Code Differences

		← First Hexadecimal Character →												
↑ Second Hexadecimal Character ↓		4	5	6	7	8	9	A	B	C	D	E	F	
	0	20	26	2D							xx	xx	xx	30
	1			2F		61	6A	xx		41	4A		31	
	2					62	6B	73		42	4B	53	32	
	3					63	6C	74		43	4C	54	33	
	4					64	6D	75		44	4D	55	34	
	5					65	6E	76		45	4E	56	35	
	6					66	6F	77		46	4F	57	36	
	7					67	70	78		47	50	58	37	
	8					68	71	79		48	51	59	38	
	9				xx	69	72	7A		49	52	5A	39	
	A	xx	xx	xx	3A					2D				
	B	2E	xx	2C	xx									
C	3C	2A	25	xx										
D	28	29	5F	27										
E	2B	3B	3E	3D										
F	xx	xx	3F	22										

RB3F025

Figure 3-4. EBCDIC to ASCII Translation Table for Printers

The code point at location CA (hex 2D) is only used for IBM 5219 Printer functions.

5219 Printer Commands

The commands System/36 uses to communicate with the 5219 Printer are explained in the System/36 documentation. Refer to the System/36 documentation to make any changes to the data stream. This section lists and explains only the printer commands that you use differently with Work Station Feature.

The first column of Figure 3-5 lists the hex value of each command. The name of each command and its description are in the second column.

Hex Code	Command Description
1A	<p><i>Unit Backspace (UBS):</i> This control is supported on personal computer printers, such as the IBM 5201 Quietwriter, that have the Relative Move Inline Backward control.</p>
2BC2nnvv	<p><i>Set Vertical Format (SVF):</i> The SVF control is converted to the ASCII control <i>Set Page Length (Esc/c)</i> with the appropriate parameters and sent to the attached printer. A maximum presentation lines (MPL) parameter of 127 is supported by Work Station Feature. An MPL parameter value greater than 127 causes an EC = 2 condition.</p> <p>If a 5216 is attached, the MPL divided by the lines per inch must not exceed 15 inches.</p> <p>If an Esc/c command is sent to the 5216 on other than a page boundary, the 5216 generates an extra line feed.</p> <p>The current line becomes the logical line.</p>
2BC6nnld	<p><i>Set Line Density (SLD):</i> This command is supported with all values of the line density (LD) parameter with the exception of 5.3 and 9.6 lines per inch (LPI). Work Station Feature rounds down to the nearest supported value of LPI.</p> <p>The 5216 Printer supports a maximum page depth of 15 inches. Work Station Feature recalculates page depth when it receives this control while a 5216 is attached. If the maximum page depth is exceeded, an exception condition (EC = 4) is detected and the page depth defaults to 15 inches.</p>

Figure 3-5 (Part 1 of 9). Printer Commands Description

Hex Code	Command Description
2BD1038 lid	<i>Set CGCS through Local ID (SCGL):</i> This control is not fully supported. 5219 Printer functions support two character sets, one for use by DP applications and one for use by WP applications. If a valid SCGL command is received, the DP table will become the active table.
2BD10601 gcgccpcp	<i>Set GCGID through GCID (SCG):</i> This control is not fully supported. If a valid SCG control with a Code Page Global ID (CPGID) parameter of 256 decimal is received, the WP table will become the active table. Otherwise, the DP table will be used.

Figure 3-5 (Part 2 of 9). Printer Commands Description

Hex Code	Command Description
<p>2BD10705 gfgffwfwa</p>	<p><i>Set FID through GFID:</i> Work Station Feature supports this command and all values for the GFID, FWD, and FA parameters. Work Station Feature uses the same SFG table the 5219 uses to determine the font style, pitch, and font width for a GFID received from the System/36. However, some of the fonts may not be available for the attached printer. The user must ensure that the font ID sent by the System/36 is available on the personal computer printer.</p> <p>Work Station Feature displays the hex value for each GFID received in the Output Data field on the operator panel.</p> <p>When the first printable graphic following a valid SFG is encountered, Work Station Feature sends the appropriate ASCII control codes to the attached printer, selects the desired font pitch, stops, and turns the Change Font indicator ON. The hex value identifying the GFID appears in the Output Data field. The user must then change the printwheel or font on the attached printer, make it ready, and then select the <i>Start</i> option on the control panel.</p> <p>You can specify during configuration that the attached personal computer printer does not require the user to change fonts. In this case, Work Station Feature will send a command to the printer to select the desired pitch.</p>

Figure 3-5 (Part 3 of 9). Printer Commands Description

Hex Code	Command Description
2BD2nn48 xxxxfc sddoddqq- dx	<p data-bbox="281 142 851 300"><i>Page Presentation Media (PPM):</i> Work Station Feature will support the Forms Control (FC) Source Drawer (SD), and Quality (Q) parameters. Other parameters will not be inspected.</p> <p data-bbox="281 329 877 451">Work Station Feature depends on the configuration to correctly define the type of paper feed hardware that can be attached to the printer.</p> <p data-bbox="281 483 872 760">If a source drawer is chosen by the print job that the personal computer printer is not capable of supporting, the PFT parameter of the Set Print Setup (SPSU) control will be overridden to force manual insertion. Work Station Feature will then display the Forms indicator in reverse image with one of the following values in the Output Data field:</p> <ul data-bbox="281 792 792 885" style="list-style-type: none"> 01 Feed from drawer 1 02 Feed from drawer 2 0E Feed from the envelope hopper <p data-bbox="281 914 888 1068">If the PFT parameter of the SPSU control was overridden, a Change Setup message will indicate when the application returns to the paper feed technique prior to the manual insertion override.</p> <p data-bbox="281 1101 888 1222">If the paper feed technique is continuous tractor and a change to the source drawer is requested, Work Station Feature will stop and display the Change Setup</p>

Figure 3-5 (Part 4 of 9). Printer Commands Description

Hex Code	Command Description
(continued)	<p>indicator in reverse image, with the new source drawer value in the Output Data field as follows:</p> <p>01 Feed from drawer 1 02 Feed from drawer 2</p> <p>When table driven printer support is used, the decision to override the PFT parameter of the SPSU control depends on what was specified during configuration <i>and</i> what functions were defined in the printer function table. For example, to select and feed envelopes, the user must answer <i>yes</i> to the envelope question during configuration, and also enter in the printer function table the ASCII control code sequence to select envelopes at the attached printer.</p>
2BD20415 ldld	<p><i>Set Single Line Distance (SSLD):</i> This control is supported with the exception of 5.3, 9.6, and 48 LPI and one line per centimeter. Work Station Feature uses the next smaller supported value of LD if one of these values is received. If no smaller value exists, then the next larger supported value is used.</p> <p>The 5216 Printer supports a maximum page depth of 15 inches. With the 5216 Printer attached, Work Station Feature recalculates the page depth when this control is received. If the maximum page depth is exceeded, an exception condition (EC = 4) is detected and the page depth defaults to 15 inches.</p>

Figure 3-5 (Part 5 of 9). Printer Commands Description

Hex Code	Command Description																		
2BD20429 00cp	<p data-bbox="269 139 901 293"><i>Set Character Distance (SCD)</i>: All values of the parameter for this command are supported. If no change to the current font width results from the SCD parameter value, the control is ignored.</p> <p data-bbox="269 326 901 695">When the first printable graphic following a valid SCD is encountered, Work Station Feature selects the proper pitch at the personal computer printer, stops, returns a Printer Not Ready message to System/36, and turns the Change Font indicator ON. Prompting occurs, depending on the configuration. The user must change the printwheel or font on the attached printer, make it ready, and then select the <i>Start</i> option on the operator panel.</p> <p data-bbox="269 727 901 816">The GFID values displayed in the Output Data field for valid CD parameter values are:</p> <table border="1" data-bbox="269 849 901 1125"> <thead> <tr> <th data-bbox="269 849 497 914"><i>CD Parameter (Hex)</i></th> <th data-bbox="503 849 700 914"><i>Action Selected</i></th> <th data-bbox="705 849 901 914"><i>GFID Value (Hex)</i></th> </tr> </thead> <tbody> <tr> <td data-bbox="269 946 348 971">000A</td> <td data-bbox="503 946 604 971">10 CPI</td> <td data-bbox="705 946 753 971">0B</td> </tr> <tr> <td data-bbox="269 979 348 1003">000B</td> <td data-bbox="503 979 700 1036">Proportional spacing</td> <td data-bbox="705 979 753 1003">9E</td> </tr> <tr> <td data-bbox="269 1044 348 1068">000C</td> <td data-bbox="503 1044 604 1068">12 CPI</td> <td data-bbox="705 1044 742 1068">57</td> </tr> <tr> <td data-bbox="269 1076 348 1101">000F</td> <td data-bbox="503 1076 604 1101">15 CPI</td> <td data-bbox="705 1076 753 1101">DF</td> </tr> <tr> <td data-bbox="269 1109 348 1133">00FF</td> <td data-bbox="503 1109 604 1133">10 CPI</td> <td data-bbox="705 1109 753 1133">0B</td> </tr> </tbody> </table>	<i>CD Parameter (Hex)</i>	<i>Action Selected</i>	<i>GFID Value (Hex)</i>	000A	10 CPI	0B	000B	Proportional spacing	9E	000C	12 CPI	57	000F	15 CPI	DF	00FF	10 CPI	0B
<i>CD Parameter (Hex)</i>	<i>Action Selected</i>	<i>GFID Value (Hex)</i>																	
000A	10 CPI	0B																	
000B	Proportional spacing	9E																	
000C	12 CPI	57																	
000F	15 CPI	DF																	
00FF	10 CPI	0B																	

Figure 3-5 (Part 6 of 9). Printer Commands Description

Hex Code	Command Description
2BD2nn40 wdwddpdp	<p data-bbox="327 152 923 457"><i>Set Presentation Page Size (SPPS):</i> This control is supported; however, the depth parameter is converted to lines per page and sent to the attached printer via the ASCII Esc/C (set page length) command. The width parameter is converted to column positions and maintained by Work Station Feature. The width remains the same if the character pitch is changed.</p> <p data-bbox="327 493 912 701">The 5216 Printer supports a maximum page depth of 15 inches. With the 5216 Printer attached, Work Station Feature posts an exception condition (EC = 4) if a depth value greater than 15 inches is received and causes the depth value to default to 15 inches.</p>
2BD2nn49 tmtmbmbm	<p data-bbox="327 721 934 841"><i>Set Vertical Margins (SVM):</i> This control is supported except that the top margin (TM) parameter is rounded off to the nearest 1/48 of an inch.</p> <p data-bbox="327 876 908 1182">No comparison between the TM value and either the LPI density or page depth is made on processing the SVM control. However, a TM value less than a single line distance or greater than the page depth results in an exception condition (EC = 1) during the processing of a form feeding condition (due to a form feed command or an auto page-ending condition).</p>

Figure 3-5 (Part 7 of 9). Printer Commands Description

Hex Code	Command Description												
2BD2nn4C xxpfxssi	<p data-bbox="277 142 880 451"><i>Set Printer Setup (SPSU):</i> When this control is received by Work Station Feature and the specified setup is different from the current one, the program stops, turns the Ready indicator OFF, sends a Printer Not Ready message to System/36, turns the Change Setup indicator ON, and displays a code for the PFT parameter received with this control. The codes displayed are:</p> <table data-bbox="277 483 863 667"> <thead> <tr> <th data-bbox="277 483 359 542"><i>PFT Value</i></th> <th data-bbox="362 483 543 542"><i>Output Data Code</i></th> <th data-bbox="546 483 774 542"><i>Feed Selection Description</i></th> </tr> </thead> <tbody> <tr> <td data-bbox="277 574 317 602">01</td> <td data-bbox="362 574 423 602">01</td> <td data-bbox="546 574 682 602">Manual</td> </tr> <tr> <td data-bbox="277 607 317 634">02</td> <td data-bbox="362 607 423 634">02</td> <td data-bbox="546 607 682 634">Tractor</td> </tr> <tr> <td data-bbox="277 639 317 667">03</td> <td data-bbox="362 639 423 667">03</td> <td data-bbox="546 639 863 667">Automatic cut sheet</td> </tr> </tbody> </table> <p data-bbox="277 699 852 821">The operator must manually change the sheet feed method and then select the <i>Start</i> option on the operator panel. The program defaults to tractor feed.</p> <p data-bbox="277 854 873 976"><i>Note:</i> When the first SPSU is received, the setup specified is assumed to be the current one and no operator intervention is requested.</p>	<i>PFT Value</i>	<i>Output Data Code</i>	<i>Feed Selection Description</i>	01	01	Manual	02	02	Tractor	03	03	Automatic cut sheet
<i>PFT Value</i>	<i>Output Data Code</i>	<i>Feed Selection Description</i>											
01	01	Manual											
02	02	Tractor											
03	03	Automatic cut sheet											
2BD4nn0A 016p	<p data-bbox="277 990 817 1110"><i>Begin Underscore (BUS):</i> When this command is active, the Set Character Density (with proportional spacing) command is ignored.</p>												

Figure 3-5 (Part 8 of 9). Printer Commands Description

Hex Code	Command Description
2BD4nn72 chbp g'gc'ccpcp	<i>Begin Overstrike (BOS)</i> : When this command is active, the Set Character Density (with proportional spacing) command is ignored.

Figure 3-5 (Part 9 of 9). Printer Commands Description

New Printer Commands

The ASCII Transparent Data command is supported for all System/36 printers (5219, 5256, and 5224/25).

The first column of Figure 3-6 lists the hex value of the command. The name of the command and its description are in the second column.

Hex Code	Command Description
03	<p data-bbox="239 175 861 389"><i>ASCII Transparent Data (TRNA)</i>: Work Station Feature supports this command within a printer data stream, allowing a block of data to be transmitted from System/36 directly to the attached personal computer printer without conversion or inspection.</p> <p data-bbox="239 418 888 609">TRNA is a grouping control character that you use with a 1-byte parameter to denote the start of a transparent data stream. The parameter is a binary count of the number of bytes of transparent data (not including the count byte). The format for this command is:</p> <p data-bbox="239 638 462 665">TRNA NN data</p> <p data-bbox="239 698 888 820">Any value of the count parameter NN is valid. A count of 00 results in no operation. Work Station Feature treats data following a 00 count in nontransparent mode.</p> <p data-bbox="239 852 792 917">TRNA does not affect the internally maintained presentation position (PP).</p> <p data-bbox="239 950 888 1031">A command to clear the print buffers resets the transparent mode at any point within the transfer.</p>

Figure 3-6. New Printer Commands

5224 Printer Commands

This section lists 5224 commands that Work Station Feature does not support. You may need to check the applications you use to see if they use these commands.

All other 5224 commands are fully supported by Work Station Feature printer sessions functioning as 5224 printers. See the System/36 documentation for other 5224 commands.

Hex Code	Command Description
2843yz	<i>Set Attribute (SA)</i> : Specifies the print speed and the number of passes the printer uses to print a line.
2BFEnnmee il...in	<i>Load Alternate Character (LAC)</i> : Loads character images at specified EBCDIC addresses. This command is used by the System/36 Business Graphics Utility and the Advanced Printer Facility. Output from these programs cannot be printed by a Work Station Feature printer session.
35nn	<i>Transparent (TRN)</i> : Allows printing of characters with values of hex 00 through 3F.

Chapter 4. Using the Printer Function Table Setup Program

Introduction	4-2
PFTs Provided by Work Station	
Feature	4-4
DEFAULT.PFT	4-4
IBM4202.PFT	4-4
IBM3812.PFT	4-4
Creating a Printer Function Table	4-5
Entering Control Sequences	4-7
Variable N	4-8
Determining the Format of Variable N	4-10
Defining Printer Functions	4-10
Initialization and Reset	4-11
Start of Document Initialization	4-11
End of Document Reset	4-12
Vertical/Horizontal Spacing	4-13
Vertical Line Spacing	4-13
Horizontal Character Spacing ..	4-15
Horizontal Relative Movement .	4-16
Proportional Space Mode and Justification	4-16
Highlighting	4-17
Paper and Page Options	4-17
Paper Handling	4-17
Page Length	4-19
Carriage Return and Line Feed .	4-19
Type Styles and Character Sets ...	4-20
Default Type Style	4-21
Individual Type Style	4-21
Group Type Styles	4-21
Function Selection Tests	4-22
Function Selection Test Responses	4-23

Introduction

The Printer Function Table (PFT) describes the functional characteristics of the personal computer printer to Work Station Feature.

The following table lists the personal computer printers supported by Work Station Feature for each of the supported System/36 printers.

5224	5219	5256	Personal Computer Printer
Yes	No	Yes	IBM 4201 Proprinter
Yes	Yes	Yes	IBM 5201 Quietwriter
Yes	Yes	Yes	IBM 5216 Wheelwriter
Yes	No	Yes	IBM 5152 Graphics Printer Model 2
Yes	Yes	Yes	User-defined printer

If you want to use an IBM 3812 or 4202 Printer, or a printer not supported by Work Station Feature, you must include a printer function table in the printer session profile. The Printer Function Table Setup program allows you to define this table.

The PFT setup program is intended for use by programmers, technicians, or experts on printer functions. If the technical information for your printer is not available, contact the printer dealer or manufacturer for assistance.

You may find it helpful to copy the PFT worksheet, PFTWS.PRN, to your printer and use it to help you prepare for the PFT setup program.

While you are creating or revising a PFT, you can run tests to determine the operation and characteristics of the printer. When you run the first test, the PFT setup program automatically runs a test to determine if a Form Feed control must be output at the end of each print test for you to see the results of each test.

Work Station Feature may not require or use all the functions provided by the printer. Also, Work Station Feature does not use all the functions provided by the setup program itself.

The following functions are supported by Work Station Feature:

- Initialization and reset
- Vertical line spacing
- Indexing functions
- Horizontal character spacing
- Horizontal relative movement
- Proportional space mode and justification
- Paper length
- Carriage return and line feed
- Type styles and character sets

These functions are not supported:

- Highlighting (System/36 uses backspace and overstrike to print bold)
- Collating
- Paper sensor
- Paper positioning
- Left margin control
- Print element selection
- Pause control (can be specified during configuration)

PFTs Provided by Work Station Feature

Work Station Feature provides the following tables:

DEFAULT.PFT

This table allows printing of simple output (no changes in pitch, type style, and so on). You may be able to use this table initially to define your printer. If you need to create a PFT for more complex functions, you can copy this PFT and modify as necessary.

IBM4202.PFT

This PFT supports the IBM 4202 Proprinter XL.

IBM3812.PFT

This PFT supports the IBM 3812 Pageprinter. If you have a 3812, you must use this PFT. You cannot recreate this table with the setup program, or create a new table to support the 3812. However, you can view this table to understand the information you specify for your page printer.

If you have an IBM 3812 Pageprinter, do not modify the Type Styles/Character Sets portion of this table.

Creating a Printer Function Table

Use this procedure to create a PFT:

1. If you have a serial printer, use the DOS MODE command to direct the printer output to the serial port before you run the PFT setup program. At the DOS prompt, type the following commands, pressing Enter at the end of each line.

```
MODE COM1:1200,n,8,1,p  
MODE LPT1:=COM1
```

The baud rate and other parameters on the COM1 line vary depending on the type of printer. See your printer manual for exact information.

2. Link to the virtual disk #IWPCLD4. (See “Linking to the Virtual Disk” in the *User’s Guide*, if necessary.)
3. To start the program, type PFTSETUP and press Enter.
4. Select the option to create a table.
5. A display of information appears. Read the information, then press Enter to continue.
6. Enter a PFT filename. You can use one from the list in “PFTs Provided by Work Station Feature” on page 4-4 or create a new PFT. (Use the edit option if you need to make changes to a PFT you have created.)
7. The Revise Printer Function Table menu appears. Choose the option you want to define.

8. The program prompts you for all necessary information about printer functions. See “Defining Printer Functions” on page 4-10 for a description of each printer function. See “Entering Control Sequences” on page 4-7 for information on entering control sequences in the PFT.

Refer to your printer manual for the correct terminology for each function. Study the functions and the concepts described to determine the appropriate use or need for each PFT item.

9. After you finish defining functions, run the Function Selection Tests (see “Function Selection Tests” on page 4-22).
10. Update the session profile to use the PFT (see Chapter 2 in the *User’s Guide*).

Entering Control Sequences

A control sequence is a sequence of hex values that instruct the printer to perform a specific function or print a particular output. Use these rules when entering control sequences:

- Use 2 hex digits for each byte to be sent to the printer.
- Leave one space between each pair of hex digits.
- Use either upper or lowercase letters.
- Enter a maximum of 41 characters, including spaces, in the first field of a control sequence (14 bytes of hex values).
- Enter a maximum of 59 characters, including spaces, in the continuation field (20 bytes of hex values).
- Use a variable placeholder (n or N) separated by a space, if a printing function can be changed at print time by specifying a variable to the printer.
- Multiple controls can be used in one control sequence. However, you can only use one *variable n* per sequence.
- Do not enter a *variable n* as the first byte of a control sequence.

For example, if your printer manual specifies Esc/e for a particular function, type **1B 45** (1B is the ASCII hex value for Esc, and 45 is the value for e).

Note: If a control sequence sets a printer mode that affects the operation of other control sequences, be sure to reset this mode in the affected sequences.

Variable N

Each printer interprets the value for *variable n* differently. The interpretation is based on this algorithm:

(Value sent to printer +/- offset) * x/y = n

where:

Maximum value determines the type of encoding and number of bytes to send to the printer (the *value*, or *variable n*, in the algorithm). See your printer manual for the maximum decimal value allowed for each *variable n*. For example, if your printer manual defines a control in which a value of zero is equal to a parameter value of hex 40 (decimal 64), and a maximum number of units supported by the control is hex 0F (decimal 15), then the maximum value of *n* is 79. Or, if your printer manual defines a control sequence, such as Esc/US/n, where n-1 is the value used by the printer and the value of *n* cannot exceed hex 7E (decimal 126), then the maximum value of *n* is 126.

Offset added or subtracted by printer provides a way to enter a decimal number that the printer adds to or subtracts from the *variable n* when it receives the control sequence. For some printers, the value of *n* must be adjusted before being sent to the printer, because the printer performs an adjustment on the value. For example, if your printer manual states $n + 1$ is the value used by the printer, then the offset is 1 and is added to the variable. Or, if your printer manual specifies a chart where a value of zero equates to a parameter of hex 40 (decimal 64), then the offset is 64, which is subtracted from the variable.

Control increments (x/y inches) represent a scaling factor used to convert the value of *variable n* to inches. For some printers, the value of *n* must be defined in fractions of an inch. For example, if $x/y = 1/72$, the variable represents units of $1/72$ inch.

When $x/y = 1/1$, the variable represents units of 1 inch, and the algorithm is simplified to this:

(value sent to the printer +/- offset) = n

If your printer manual defines *n* (or *n* times a fraction) as the value used by the printer (for example, $n/72$), the offset is zero. The algorithm simplifies to this:

(value sent to the printer * x/y) = n

Determining the Format of Variable N

Each *variable n* must be in a specific format for the printer. The PFT setup program helps you specify the format. When you press Enter in a menu that has just been modified, and that defines a *variable n*, the PFT setup program tests *variable n* on the printer. You then examine printed output and respond to questions on the display. These responses determine the value of *variable n*. If necessary, you can redefine the control sequence and press Enter again to determine the type of variable. If none of the tests provides the correct result, Work Station Feature cannot use the function on your printer.

Defining Printer Functions

The Revise Printer Function Table menu lists the control sequences you can define for printer functions:

- Initialization and reset
- Vertical/Horizontal spacing
- Highlighting
- Paper/Page options
- Type styles/Character sets
- User-defined controls

Work Station Feature does not support user-defined controls.

Initialization and Reset

The PFT setup program allows you to define Start of Document Initialization and End of Document Reset.

Start of Document Initialization

The PFT setup program sends the control sequence for Start of Document Initialization to the printer before every test. Work Station Feature uses this control sequence when a printer session is first started or when a printer session is resumed after having been suspended. You may define a control in the Start of Document control sequence or set a printer switch to set each of the following conditions:

Vertical Units	Units defined for the Variable Line Spacing control.
Line Spacing	6 lines per inch.
Pitch	10 pitch.
Carriage Return	With no line feed. If a carriage return cannot be achieved without a line feed, zero index carriage return (ZICR) is not supported. In addition, line spacing may always be incorrect if the sequence carriage return line feed causes an extra line feed.
Line Feed	Perform a line feed with no carriage return.
Turn Off	Superscript, Subscript, Underline, Overstrike, Bold, PSM, Justification.

Character Set	Default of the printer. Set to PC character set 2 if the printer supports it.
Printing Mode	Bidirectional or unidirectional mode depending on the printer.
Color	Black.
Line Length	Maximum supported by the printer.
Page Length	11 inches.

End of Document Reset

Work Station Feature uses the control sequence for End of Document Reset when a printer is suspended with the *Suspend* option (see the printer chapters in the *User's Guide*). You should define controls, where applicable, in this control sequence to reset the following values for the printer when it is used in personal computer mode:

- Vertical units
- Line spacing (in default vertical units)
- Carriage return status
- Line feed status
- Page length
- Left margin
- Printer font (pitch, type style)
- Printer character set
- Portrait/Landscape status
- Color
- Printing mode

Vertical/Horizontal Spacing

The Vertical/Horizontal Spacing option allows you to define these functions:

- Vertical line spacing
- Horizontal character spacing
- Horizontal relative movement
- Proportional space mode and justification

Vertical Line Spacing

Vertical line spacing is a measure of the distance between printed lines. You can define vertical line spacing by lines per inch (LPI), variable line spacing (VLS), or with indexing functions.

Work Station Feature uses the controls for 6 or 8 LPI. Otherwise, the VLS control is used. VLS must be defined to support 4, 12, and 24 LPI. If your printer has specific controls for 6 and 8 LPI, you should define all control sequences for LPI, VLS, and indexing functions.

Lines per Inch

The most common vertical line spacing is 6 or 8 LPI. Work Station Feature supports 4, 6, 8, 12, and 24 LPI. You can define one control sequence to set 6 LPI and one to set 8 LPI.

Variable Line Spacing

A VLS control sets the vertical line spacing to a variable value. Some printer manuals refer to VLS as Line Feed Pitch. Check your printer manual, especially if a variable increment is allowed, for the function that controls vertical motion.

If you define a VLS, try multiples of $1/48$ first. Otherwise, use multiples of $1/24$. If you cannot use multiples of $1/24$, use the smallest increment of vertical spacing supported by the printer. Common values are $1/48$, $1/72$, and $1/96$.

You can also use VLS to achieve 1.5 line spacing.

Indexing Functions

The Begin/End Superscript/Subscript controls function on all feed devices. On some printers, these controls move the print position up or down $1/2$ line spaces. Other printers create superscripts and subscripts by compressing the height of the characters. If your printer can only print superscripts and subscripts in one pitch, do not define these controls.

Work Station Feature does not support $1/2$ Index Up (reverse), $1/2$ Index Down (forward), or Reverse Index. These controls move the print position up or down $1/2$ the active line spacing.

Horizontal Character Spacing

Horizontal character spacing refers to the number of characters in a horizontal inch of printing. You can set up Horizontal Character Spacing as either a pitch value or with Horizontal Motion Index (HMI). The value of a pitch is determined by the width of the characters and how far apart they are spaced on the printed page. For example, 10 pitch refers to 10 characters in a horizontal inch. Work Station Feature supports 10, 12, 15, and 17 pitches. Work Station Feature does not support 5 and 8.55 pitches. Proportional Spacing Mode (PSM) is supported with the HMI control.

Some printers use the HMI control to support pitch. HMI causes the print element to move the appropriate increment to position the characters. If you define an HMI, try multiples of 1/60 inch. If you cannot use these multiples, use the smallest spacing supported by the printer. Common values are 1/60 and 1/120 inch.

For each pitch in a print job, Work Station Feature first checks for a defined pitch control sequence. If it is defined, the active pitch is set accordingly. Otherwise, Work Station Feature sets the defined pitch control nearest to the one received. If no pitch control sequence is defined, Work Station Feature prompts the user to perform a physical font change at the attached printer.

HMI is also used to justify and space text proportionally.

Horizontal Relative Movement

The Horizontal Relative Movement (HRM) controls move the print position backwards or forwards relative to the current print position. Some printer manuals refer to HRM as Horizontal Cursor Positioning. Find the function in your printer manual that moves the horizontal print position relative to the current position.

If possible, define control sequences for forward and backward relative movement. Try multiples of 1/60 inch first. Otherwise, use the smallest increment of horizontal spacing supported by the printer. Common values are 1/120 and 1/240 inch.

The Forward Relative Movement control can be used to justify and space text proportionally. The Backward Relative Movement control can be used to unit backspace in PSM mode.

Proportional Space Mode and Justification

You must define HMI or HRM controls to space text proportionally and to space words evenly on a justified line. Otherwise, PSM is not supported.

For 5219 functions, you must define HMI and forward HRM. If you want to use unit backspacing, you must define backward HRM.

Highlighting

Work Station Feature does not support Begin Emphasis/End Emphasis controls. The System/36 uses backspace and overstrike to print bold in 5219 print jobs.

Paper and Page Options

The paper sources defined during configuration can be supported by defining paper handling and page length controls in the PFT setup program. Work Station Feature does not support the Set Left Margin, Carriage Return/Line Feed, Multiple Copies, or Landscape Paper Handling controls. If your printer does not have advanced paper handling capabilities, Work Station Feature provides default values for the controls that are not specifically defined.

Paper Handling

To control the paper source requested by a print job, Work Station Feature uses the control sequences for Bottom, Top, and Envelope Tray Select and Feed for paper feed; and the Automatic Cut Sheet option for ejecting sheets without paper feed. Work Station Feature does not support the controls for Manual Feed Select, Continuous Feed Select, Ignore Paper End Sensor, Enable Paper End Sensor, Manual Cut Sheet, and Collate.

Some printers require two controls for the paper (or envelope) feed function: one for paper tray selection and one for loading paper from that tray. In this case, define both controls in the control sequence.

If the printer has an automatic sheet-feed device, define all five paper feed items if possible. If the printer supports a paper feed such as single-drawer automatic sheet feed, but does not define a control sequence to select or feed paper from that paper feed, define a null (hex 00) for that paper feed.

The select and feed controls in the Paper Handling menu can be defined for the bottom, top, and envelope tray. This control causes a sheet of cut paper (or envelope) to be fed into the printer from the specified tray. If the print job indicates that one of these trays is to be used, and no control is defined, Work Station Feature uses the Manual Feed Select control.

The Manual Feed Select control allows the automatic sheet-feed device to accept a manually inserted sheet of paper through the manual insertion gate. The printer must stop printing to accept the manually fed sheet.

Work Station Feature assumes that continuous forms feed is available.

If the Eject Sheet With Paper Feed (automatic cut sheet) control is defined, Work Station Feature assumes the paper feed controls eject the current page and feed the next page.

If the Eject Sheet Without Paper Feed (manual cut sheet) control is defined, Work Station Feature outputs this control at the end of each manually inserted page. If no control is defined, Work Station Feature assumes the manual feed select control ejects the current page and stops the printer for the next manually inserted page.

Run the print test for continuous feed select on a continuous forms feed. Run the print tests for bottom, top, and envelope trays on an automatic feed. Run the print test for manual paper feed insertion on a manual feed or an automatic feed with a manual insertion gate.

Page Length

Work Station Feature uses the page length controls to set the length of the page. You must specify the page length controls with one of the options (inches or lines).

If page length controls are not defined, or the page length exceeds the maximum values allowed for the supported page length controls, Work Station Feature indexes the printer as closely as possible to the end of each page.

Carriage Return and Line Feed

Work Station Feature uses the carriage return controls for continuous forms, manual feed, and automatic feed devices to return the active left margin on each device. It also uses these controls to make multiple printing passes on a line. For example, a separate printing pass is used to overstrike or underline text.

Work Station Feature uses the line feed controls for the three paper handling devices to index the printer one line spacing on each device.

If the printer does not support ZICR and indexes two line spacings using both the carriage return and line feed control sequences, do not define a line feed control sequence. Otherwise, define both control sequences.

Type Styles and Character Sets

Type style defines the appearance (font) and pitch of characters. For example, Gothic characters look different from characters printed in a commonly used type style such as Prestige Elite. You can define default, individual, and group type styles.

For each individual and group type style definition, you can select a personal computer character set.

When you print, all type styles not defined use the default type style definition. The default definition selects a personal computer character set.

Character sets are defined groups of graphic characters. For example, a character set can include a through z, A through Z, 0 through 9, and other print characters.

You can redefine PC character sets 2 through 9.

If the printer has removable print elements, such as a printwheel, you can define a character set to match those on a print element, then associate the character set with a type style number.

You can also define a character set to include characters that can be constructed from those on the print element. For example, if the print element has a tilde, you can define the *n tilde* character as *n backspace tilde*.

Work Station Feature does not support Slot Selection Definition.

Default Type Style

Type style definitions allow you to specify the controls that select the type styles and character sets supported by your printer. Type styles are defined with initial and ending control sequences for the personal computer character set. The initial control sequence selects the print element for a type style and a character set. The ending control sequence is optional. Work Station Feature outputs this sequence before selecting a new type style or character set.

Individual Type Style

An individual type style definition can be defined to select a type style and associated character sets. Use an individual definition to define a type style that can only be selected using unique control sequences for each print element.

Group Type Styles

You can define a group type style to select a group of type styles and associated character sets on the printer. Each group type style definition is assigned a group type style identifier. There are 26 identifiers (A through Z). Use a group type style definition to define a group of type styles that are selected through common control sequences. For example, you can define a group type style definition for a print element that supports the personal computer character set and Courier type style in 10, 12, and 15 pitch. The corresponding type style numbers you would type in the definition would be 11, 85, and 223.

Function Selection Tests

After you create or revise a PFT, run the function selection tests to verify the print functions you defined in the table. The tests also determine if the following functions are supported:

- Mid-line pitch change
- Pitch
- Form feed (continuous paper only)
- PSM

Use this procedure to run the tests:

1. Choose the Function Selection Test option from the main menu.
2. Select a test.
3. Prepare the printer as directed by the test.
4. The test will print samples. Answer the questions on the display according to the output from the printer.

When more than one example is printed, choose the first one that provides the appearance you want.

5. If none of the printed results appear as you want, choose the example that is closest. Or, you can redefine the control sequence for the function.
6. If you decide to redefine any controls, run the tests again.

Note: If a control that is not defined is used in a test, the test is printed without that control.

If you do not run the tests, the PFT setup program prompts you to run them before you exit the program. Run the tests to ensure that you have the full capabilities of the printer. If you do not, the PFT setup program provides a default for each function. However, you may not have the full capabilities of the printer.

Function Selection Test Responses

This section describes how your responses correspond to the way Work Station Feature uses the values defined in the PFT.

Superscript/Subscript Test

The Begin/End Superscript/Subscript controls are used.

Underline Test

A ZICR and underlines are used.

Form Feed Test (continuous forms only)

Only if the page length (inches) or page length (lines) control sequence is defined:

- Y** The page length and form feed controls are used to eject continuous forms.
- N** The carriage return/line feed controls are used to eject continuous forms.

Backspace Test

- Y** The backspace control (hex 08) is used to backspace.
- N** If the HRM backward control is defined, it is used to backspace.

The following tests determine how the printer uses pitches.

Mid-line Pitch Change Test (1)

- Y** Mid-line pitch changes and ZICR are supported.
- N** Mid-line pitch change test (2) is run.

Mid-line Pitch Change Test (2)

- Y** Mid-line pitch changes are not supported and ZICR is supported.
- N** Mid-line pitch change test (3) is run.

Mid-line Pitch Change Test (3)

- Y** Mid-line pitch changes are supported and ZICR is not supported.
- N** Mid-line pitch changes and ZICR are not supported.

Pitch Test (1): Only if the left margin (columns) control sequence is defined:

- Y** Setting the left margin to column 0 means “do not change the margin.” In this case, the adjust offset in the set left margin (columns) control is changed by adding 1.
- N** Setting the left margin to column 0 means column 0 and no table changes are made.

PSM Test (1)

If the HMI control sequence is defined:

1. This test is not applicable for Work Station Feature.
2. If PSM is supported, HMI defines distance between characters.
3. PSM is not supported.

If the HRM control is defined:

- Y** PSM is supported by activating PSM print elements. It is assumed the PSM print elements define the escape for each character.
- N** PSM is not supported via PSM print elements.

PSM Test (2)

If the HMI or HRM and Underline controls are defined:

- Y** Underline controls are used to underline PSM characters.
- N** ZICR and underlines are used to underline PSM characters.

Cursor Draw (Box) Characters Tests

If ZICR is not supported, a single pass is used to print box characters.

If ZICR is supported:

Cursor Draw (Box) Characters Test (1)

Y Cursor Draw (Box) Characters test (2) is run.

N A single pass is used to print box characters.

Cursor Draw (Box) Characters Test (2)

Y A single pass is used to print box characters.

N A separate pass is used to print box characters.

Chapter 5. Graphics Support

Introduction	5-2
Fully Supported and No-op Orders	5-2
Graphics Orders Support	5-3
Modified Orders	5-5
Graphics Control Orders	5-5
Graphics Display On Order (93)	5-6
Graphics Display Off Order (94)	5-7
Graphics Set Orders	5-8
Set Color Table Order (B4)	5-8
Set Color Order (B0)	5-12
Set Style Order (B1)	5-14
Set Function Order (B3)	5-18
Set Fill Mode Order (B7)	5-21
Graphics Draw Orders	5-25
Write Background Order (A3)	5-25
Read Orders	5-27
Read Status Order (80)	5-27
Printer Orders	5-31
IEEE-488 Interface Orders	5-32
IEEE-488 Data Follows Order (E0)	5-33
Take Control Asynchronously Order (E1)	5-35
Go To Standby Order (E2)	5-36
Interface Clear Order (E5)	5-37

Introduction

This chapter lists the orders used to build the graphics data stream. The orders used by System/36 to communicate with graphics work stations such as the IBM 5292 Model 2 (5292-2) color graphics display station are completely documented in the *IBM 5250 Information Display System Functions Reference Manual*. Refer to this manual to make any changes to the data stream.

Although all the orders are listed here, only the orders that Work Station Feature uses differently from the 5292-2 are described.

This chapter lists all orders first. Subsequent sections list groups of orders (such as graphics control orders) and contain descriptions of any orders that Work Station Feature supports differently from the 5292-2.

Fully Supported and No-op Orders

CAUTION

The personal computer operates at speeds unrelated to the 5292-2, making operation with the *suppress pacing response* order unpredictable.

This chapter lists fully supported and no-op orders. Work Station Feature checks all no-op orders for correct 5292-2 format and context and posts a message if it detects an error.

Graphics Orders Support

The following table lists the graphics orders used to change the graphics data stream.

Order Name	Graphic Byte (Hex)	Program Action
Define Shield Area	A6	No-op order
Draw Polyline	A0	Fully supported
Draw Scanline	A1	Fully supported
End of Data	92	Fully supported
End Graphics	95	Fully supported
End Graphics Block	90	Fully supported
Fill Polygon	A5	Fully supported
Go To Standby	E2	Modified
Graphics Display On	93	Modified
Graphics Display Off	94	Modified
IEEE-488 Data Follows	E0	Modified
Interface Clear	E5	Modified
Load Printer A/N Color Mix Table	C2	No-op order
Load Printer Graphics Mix Table	C3	No-op order
More Data to Come	91	Fully supported
Printer Data Follows	C0	P1 error (printer not attached)
Read Status	80	Modified
Remote Disable	E4	No-op order

Figure 5-1 (Part 1 of 2). Graphics Orders

Order Name	Graphic Byte (Hex)	Program Action
Remote Enable	E3	No-op order
Display Copy	C1	P1 error (printer not attached)
Set Address	D1	Modified
Set Color	B0	Modified
Set Color Table	B4	Modified
Set EOI Mode	D3	No-op order
Set Fill Mode	B7	Modified
Set Function	B3	Modified
Set Line Weight	B6	No-op order
Set Marker	B5	Fully supported
Set Printer Time-out	C4	No-op order
Set Style	B1	Modified
Set Style Offset	B2	No-op order
Set Talker Time-out	D2	Modified
Suppress Pacing Response	96	Fully supported
Take Control Asynchronously	E1	Modified
Write Background	A3	Modified
Write Polymarker	A4	Fully supported

Figure 5-1 (Part 2 of 2). Graphics Orders

Modified Orders

The modified graphics orders include the following:

- Graphics control orders
- Graphics set orders
- Graphics draw orders
- Read order
- Printer orders
- IEEE-488 interface orders

Graphics Control Orders

The following table lists the graphics controls orders:

Order Name	Graphics Byte (Hex)	Described
End Graphics Block	90	No
More Data to Come	91	No
End of Data	92	No
Graphics Display On	93	Yes
Graphics Display Off	94	Yes
End Graphics	95	No
Suppress Pacing Response	96	No

The description of each modified graphics control order follows. The hexadecimal value of each graphics control order is in parentheses after the name of the order.

Graphics Display On Order (93)

The *graphics display on order* turns on the graphics display. This allows the display station to display data from the graphics buffer.

Graphics display is on when a

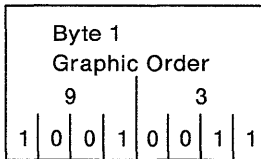
G (in reverse image) shows on the status line.

Work Station Feature enters the requested graphics state, sets the resolution, clears the display, and redraws any data in the graphics buffer using the orders in the graphics buffer. Any text that was on the display at the time the order was received is then added to the display.

Notes:

- 1. Shifting in and out of graphics state (with either the Local Select 0 key or a Hot Key sequence) may cause the size and exact location of text to change in relationship to graphics data.*
- 2. When the display is operating in 320 by 200 pixel mode, all text is displayed in 40 characters per row. Text beyond column 40 is not displayed.*

Format



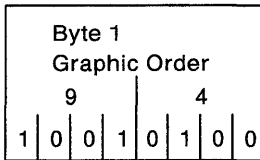
RB3F001

Graphics Display Off Order (94)

The *graphics display off* order turns off the graphics display. Graphics display is off when a G is shown (in normal image) on the status line.

The graphics state is reset and the program returns to the previous text state. Any data in the text buffer is displayed using the current display size and attributes. All graphics data in the VDI buffer is saved until the next *write background* order or you press Local Select Erase.

Format



RB3F002

Graphics Set Orders

The following table lists the graphics set orders.

Order Name	Graphics Byte (Hex)	Described
Set Color Table	B4	Yes
Set Color	B0	Yes
Set Style	B1	Yes
Set Style Offset	B2	No
Set Function	B3	Yes
Set Marker	B5	No
Set Line Weight	B6	No
Set Fill Mode	B7	Yes

The description of each modified graphics set order follows. The hexadecimal value of each graphics set order is in parentheses after the name of the order.

Set Color Table Order (B4)

The *set color table* order loads the display's color table with new color intensity values. Each 9-bit entry consists of three intensity bits for each primary color (red, green, and blue). This allows for intensities of 0 through 7 for each color. When supported by the graphics adapter, it provides up to 512 possible colors or shades. A value of 7 indicates the maximum intensity for a primary color.

This command is accepted and ignored when a personal computer display does not support a color table (for example, CGA or EGA with a monochrome display).

When display hardware supports a color table, the command is fully implemented, but the actual color displayed depends on the display hardware capabilities.

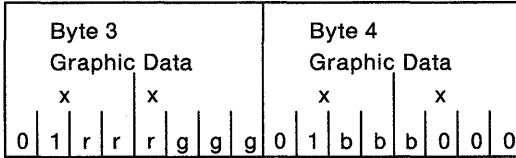
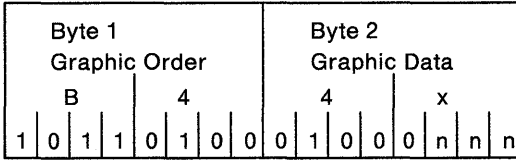
When display hardware supports less than eight colors but has color table support (for example, the base EGA), the mapping of the eight colors from System/36 to the color of the personal computer hardware is specified by graphics configuration.

Default Colors

The display's color table has the following default values:

3-Bit Color Index	Default Value (RRR GGG BBB)	Color Displayed
0	0 0 0 0 0 0 0 0	Black
1	1 1 1 0 0 0 0 0	Red
2	0 0 0 1 1 1 0 0	Green
3	0 0 0 0 0 0 1 1	Blue
4	1 1 1 0 0 0 1 1	Pink
5	1 1 1 1 1 1 0 0	Yellow
6	0 0 0 1 1 1 1 1	Turquoise
7	1 1 1 1 1 1 1 1	White

Format



RB3F003

Byte	Field Content	Field Definition
1	Hex B4	Order code
2	Table index (low 3 bits)	Index into display's color table
3, 4	New table value	<p>New value for display's color table entry specified by table index.</p> <p>Data byte format for entry change:</p> <p>01RRRGGG</p> <p>R = red intensity and G = green intensity.</p> <p>01BBB000</p> <p>B = blue intensity.</p>
5-n	...	Additional index/value bytes
n+1	Hex 92	End of data order

Applicable Draw Orders

The following draw orders are applicable to this order:

- Draw Polyline
- Draw Scanline
- Fill Polygon
- Write Background
- Write Polymarker

Personal Computer Mapping

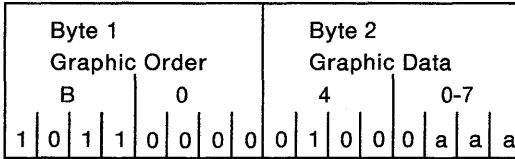
The virtual device interface (VDI) color table index value is mapped to the installation requested value. The red, blue, and green values are scaled to fit the VDI requirements of 0 to 100 percent.

Set Color Order (B0)

The *set color* order specifies the color index to be used for subsequent draw orders.

The default color index is 7.

Format



RB3F004

Byte	Field Content	Field Definition
1	Hex B0	Order code
2	Graphics data	The binary value of bits aaa specifies the color index (0 through 7) to be used for subsequent draw orders.

Applicable Draw Orders

The following draw orders are applicable to this order:

- Draw Polyline
- Draw Scanline
- Fill Polygon
- Write Polymarker

Example

The following graphics order and data byte set the display color to color index 3 for subsequent draw orders:

Byte 1								Byte 2								
Graphic Order								Graphic Data								
B				0				4				3				
1	0	1	1	0	0	0	0	0	1	0	0	0	0	0	1	1

RB3F005

Note: The color value is used as an index into a table of selected colors, which is supplied as part of Work Station Feature. This color applies to all subsequent graphics objects except text, which gets its color from its field attributes.

Set Style Order (B1)

The *set style* order specifies the line style to be used for subsequent draw orders.

The default is a solid line.

Format

Byte 1 Graphic Order								Byte 2 Graphic Data								Byte 3 Graphic Data							
B				1				4				x				4				x			
1	0	1	1	0	0	0	1	0	1	0	0	a	a	a	a	0	1	0	0	b	b	b	b

Byte 4 Graphic Data								Byte 5 Graphic Data							
4				x				4				x			
0	1	0	0	c	c	c	c	0	1	0	0	d	d	d	d

RB3F

Byte	Field Content	Field Description
1	B1	Order code
2	Segment A	Length (binary value of the aaaa bits; number of PELs) of the first visible segment of the line style.
3	Segment B	Length of the first unchanged segment (binary value of the bbbb bits; number of PELs) that follows the first visible segment.
4	Segment C	Length of the second visible segment (binary value of the cccc bits; number of PELs) of the line.
5	Segment D	Length of the second unchanged segment (binary value of the dddd bits; number of PELs) that follows the second visible segment.

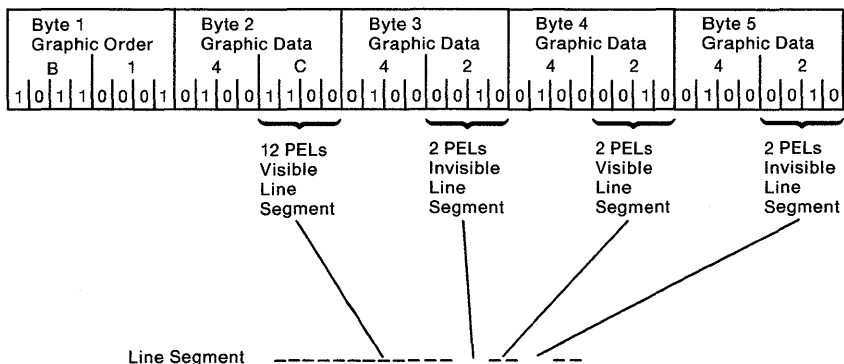
Applicable Draw Orders

The following draw orders are applicable to this order:

Draw Polyline
Fill Polygon

Example

The following graphics order and graphics data set the line style as shown below on a blank background.



RB3F043

Personal Computer Mapping

The VDI line style is set according to the segment specifications described above and the selections made during execution of the graphics configuration program. The VDI supported line styles are shown in Figure 5-2.

Style	Description
0	Invisible
1	Solid
2	Long dash
3	Dotted
4	Dash dotted
5	Medium dash
6	Dash with two dots
7	Short dash

Figure 5-2. VDI Line Styles

Set Function Order (B3)

The *set function* order determines how subsequent draw orders are combined with the existing picture. This order allows you to specify whether you draw over an existing picture (replace), or combine the existing picture color with the color you are drawing to display a different color.

The default is to replace the existing color with the color you are drawing.

Format

Byte 1 Graphic Order								Byte 2 Graphic Data							
B				3				4				x			
1	0	1	1	0	0	1	1	0	1	0	0	0	0	a	a

RB3F008

Byte	Field Content	Description
1	Hex B3	Order code
2	Function (low 2 bits)	Drawing logical operator 00 Ignored by the personal computer 01 OR: The color you are drawing is combined with the existing color using OR logic. 10 XOR: The color you are drawing is combined with the existing color using exclusive OR logic. 11 REPLACE: The color you are drawing replaces the existing color.

Applicable Draw Orders

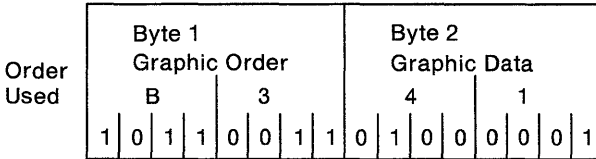
The following draw orders are applicable to this order:

- Draw Polyline
- Draw Scanline
- Fill Polygon

Example

If you are drawing a red line and encounter an existing white PEL, the resulting color, assuming default colors, is:

```
OR      0 1 0      (Color index 2)
        1 1 0      (Color index 6)
        -----
        1 1 0      Resulting color index
```



RB3F009

Personal Computer Mapping

The virtual device interface supports the same writing modes as the 5292-2, but handles the writing of styled lines differently. See Chapter 2, "Display Characteristics."

Set Fill Mode Order (B7)

The *set fill mode* order establishes the fill mode control information that is used with the *fill polygon* order.

The default values are:

Bits	Value	Description
aa	00	Ignored.
bb	00	Draw a solid edge and fill interior with style.
cccccc	000000	Ignored.

Format

Byte 1 Graphic Order								Byte 2 Graphic Data				Byte 3 Graphic Data											
B				7				4		x		x				x							
1	0	1	1	0	1	1	1	0	1	0	0	a	a	b	b	0	1	c	c	c	c	c	c

RB3F010

Byte	Field Content	Description
1	Hex B7	Graphics order
2, 3	Fill control	<p>Control information for area fill.</p> <p>aa bits Ignore.</p> <p>bb bits 00 Draw solid boundary line and fill with style specified in <i>set style</i> order.</p> <p>bb bits 01 Draw solid boundary line.</p> <p>bb bits 10 Fill interior with style specified in <i>set style</i> order.</p> <p><i>Note: Fill interior includes the edge.</i></p> <p>bb bits 11 Draw boundary with style specified in <i>set style</i> order.</p>

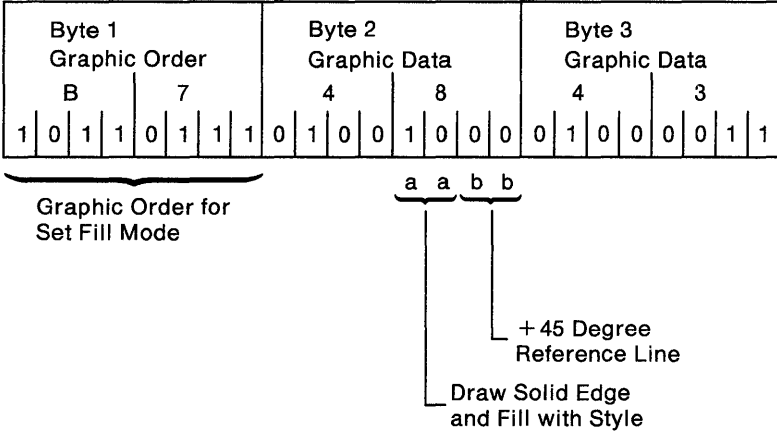
Applicable Draw Orders

The following draw order is applicable to this order:

Fill Polygon

Example

The following graphics order and graphics data result in drawing a solid boundary line and filling the interior with the style defined by the *set style* order in effect when the *fill polygon* order is issued.



RB3F011

Personal Computer Mapping

Control byte 1, bb bits and control byte 2, cccccc bits are ignored. A fill pattern, if requested, is based on the current line style.

VDI Line Style	VDI Fill Pattern
0	Hollow
1	Solid
2	Wide-spaced 45° lines crossed with - 45° lines
3	Wide-spaced 45° lines
4	Medium-spaced 45° lines
5	Medium-spaced 45° lines crossed with - 45° lines
6	Narrow-spaced 45° lines
7	Narrow-spaced 45° lines crossed with - 45° lines

Graphics Draw Orders

The following table lists the graphics draw orders.

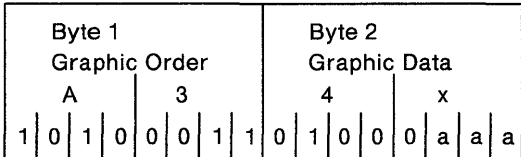
Order Name	Graphics Byte (Hex)	Described
Write Background	A3	Yes
Draw Polyline	A0	No
Draw Scanline	A1	No
Write Polymarker	A4	No
Fill Polygon	A5	No
Define Shield Area	A6	No

The description of each modified graphics draw order follows. The hexadecimal value of each graphics draw order is in parentheses after the name of the order.

Write Background Order (A3)

The *write background* order is used to erase the graphics display by using the specified background color.

Format



RB3F012

Byte	Field Content	Description
1	Hex A3	Graphics order.
2	Background color	The binary value of the aaa bits is the color index this order uses when it writes the background.

Applicable Draw Orders

The following draw order is applicable to this order:

Set Color Table

Example

The entire graphics display is changed to the color indicated by an index of 1 in the color table.

Byte 1								Byte 2							
Graphic Order								Graphic Data							
A				3				4				6			
1	0	1	0	0	0	1	1	0	1	0	0	0	1	1	0

RB3F013

The color specified by the color index of the System/36 color table covers the entire graphics area of the display.

Read Orders

The following table lists the order described in this section.

Order Name	Graphics Byte (Hex)	Described
Read Status	80	Yes

The description of the modified graphics read order follows. The hexadecimal value of the graphics read order is in parentheses after the name of the order.

Read Status Order (80)

The *read status* order prepares graphics status information to be read by System/36. The information is in the alphanumeric display buffer at the address specified by the two bytes that follow the order.

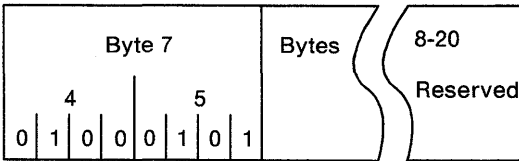
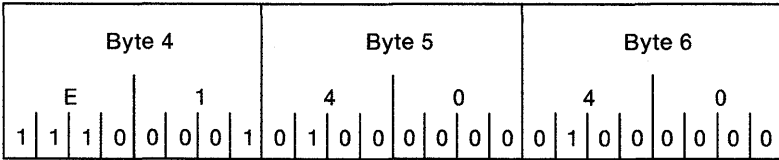
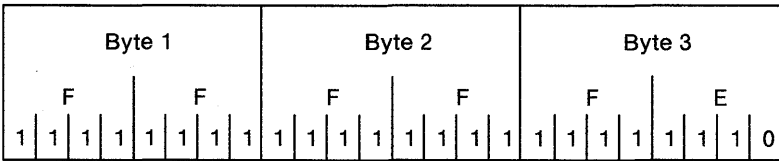
Format

Byte 1 Graphic Order	Byte 2 Graphic Data	Byte 3 Graphic Data
8 0	x x	x x
1 0 0 0 0 0 0 0	0 1 a a a a a a	0 1 a a a a a a

RB3F014

Byte	Field Content	Description
1	Hex 80	Graphics order
2, 3	Graphics data	The last six bits of the two data bytes form an offset between 0 and 1919 (0 corresponds to row 1, column 1), where the status information is written in the alphanumeric display buffer.

The 20 bytes of read status data have the following format:



RB3F015

Byte	Status Data Description
1, 2	2-byte error code of the last graphics error detected. These codes are described in <i>User's Guide</i> .
3	Model Identification: <i>Hex Value Model</i> FF 5292-2 or Work Station Feature
4	Graphics Level Number: <i>Hex Value Description</i> F1 5292-2 Level 1 F2 5292-2 Level 2 E1 Work Station Feature
5	Attached Printer Type: <i>Hex Value Description</i> 80 Not able to identify printer. Printer support is not provided.
6, 7	When an error is detected, this 2-byte value represents a 1-byte offset into the graphics buffer to the last byte processed. <i>Hex Value Error Status</i> FFFF No error pending 4x4y Error pending; error buffer offset of xy (for example, hex 4045 is sixth byte).
8-20	Reserved (hex 40).

Figure 5-3 (Part 1 of 2). Read Status Bytes

Byte	Status Data Description
<p><i>Notes:</i></p> <ol style="list-style-type: none"> <li data-bbox="101 203 877 381">1. <i>The complete 20 bytes of status data may not always be written. Data written to the display buffer for a read status order terminates when all 20 bytes are written, when the end of the display display has been reached, or when a field attribute has been reached.</i> <li data-bbox="101 414 888 479">2. <i>All data written to the display buffer as a result of a read status order are encoded above hex 3F.</i> <li data-bbox="101 511 845 576">3. <i>All pending errors are cleared when a read status order has been received.</i> 	

Figure 5-3 (Part 2 of 2). Read Status Bytes

Printer Orders

Work Station Feature does not support the printer in graphics mode.

The following table lists the printer orders.

Order Name	Graphics Byte (Hex)	Described
Printer Data Follows	C0	Causes P1 error
Display Copy	C1	Causes P1 error
Load Printer A/N Color Mix Table	C2	No
Load Printer Graphics Color Mix Table	C3	No
Set Printer Time-out	C4	No

IEEE-488 Interface Orders

The following table lists the IEEE-488 interface orders.

Note: The description of the IEEE-488 orders assumes you understand the IEEE-488 standards and the 9914 Adapter.

Order Name	Graphics Byte (Hex)	Described
Set Address	D1	Yes
Set Talker Time-out	D2	Yes
Set EOI Mode	D3	No
IEEE-488 Data Follows	E0	Yes
Take Control Asynchronously	E1	Yes
Go To Standby	E2	Yes
Remote Enable	E3	No
Remote Disable	E4	No
Interface Clear	E5	Yes

Figure 5-4. IEEE-488 Local Command Orders

The System/36 data stream is in IEEE-488 format and the plotter is attached via the RS-232-C interface. Work Station Feature handles the conversion.

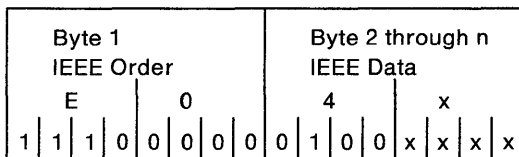
The description of each modified IEEE-488 interface order follows. The hexadecimal value of each order is in parentheses after the name of the order.

IEEE-488 Data Follows Order (E0)

The *IEEE-488 data follows* order sends passthrough data directly to an IEEE-4888 device. Data following this order is passed through until an End of Data is encountered. If the data spans blocks, use the *more data to come* order. See the *IBM 5250 Information Display System Functions Reference* for more information.

IEEE-488 data follows order passthrough data following a *take control asynchronously* order and preceding a *go to standby* order is processed as interface messages. All other *IEEE-488 data follows* order passthrough data is processed as device dependent messages and is sent to the IEEE-488 device.

Format



RB3F016

Byte	Field Content	Description
1	Hex E0	Data follows order
2, 3	IEEE-488 data	Passthrough data pair 1
4, 5	IEEE-488 data	Passthrough data pair 2
6, n	IEEE-488 data	Additional passthrough data pairs
n + 1	Hex 92	End of data order

Notes:

1. *The interface messages (IM) data is the data that configures the listeners and talkers on the IEEE-488 bus.*
2. *The device dependent messages (DDM) data is the data associated with a particular plotter.*
3. *This description of IEEE-488 orders assumes an understanding of the IEEE-488 standards and the 9914 Adapter.*

Example

This example shows a valid IEEE-488 order sequence. IEEE-488 set orders must have been previously received and processed.

E5 E3 E1 E0 (IM) 92 E2 E0 (DDM) 92

Personal Computer Mapping

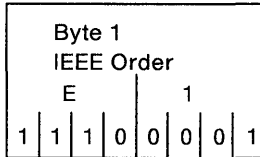
This order is used to process IEEE-488 data transmissions. All interface data is captured and checked for proper IEEE-488 syntax and device configurations. All other data is considered plotter data and is passed directly to the plotter.

Note: If the plotter address contained in the interface message data does not match the address specified in the configuration file, an E1 error occurs when attempting to send data to the plotter.

Take Control Asynchronously Order (E1)

The *take control asynchronously order* sends the *take control asynchronously auxiliary* command to the IEEE-488 adapter.

Format



RB3F017

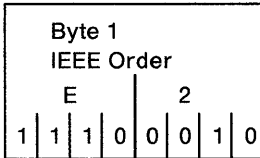
Personal Computer Mapping

This order defines the start of the interface message data stream.

Go To Standby Order (E2)

The *go to standby* order sends the *go to standby auxiliary* command to the IEEE-488 adapter.

Format



RB3F018

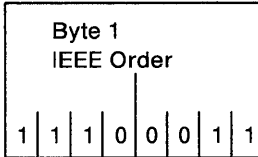
Personal Computer Mapping

This order marks the end of the interface message data stream.

Interface Clear Order (E5)

The *interface clear* order sends an *interface clear auxiliary* command to the IEEE-488 adapter.

Format



RB3F019

Personal Computer Mapping

This order removes the Work Station Feature talker from the interface and performs the *take control asynchronously* order function.

(

(

(

Appendix A. Translation Tables

Introduction	A-2
IBM 5250 EBCDIC Character Set	A-2
EBCDIC to ASCII Conversion Table for Displays	A-4
IBM Personal Computer ASCII Character Set Table	A-6
IBM Personal Computer Printer Character Conversion	A-7
Decimal to Hexadecimal Conversion ..	A-8

Introduction

This appendix contains the tables you use to translate hex codes.

Note: This appendix is intended for experienced programmers.

IBM 5250 EBCDIC Character Set

The IBM 5250 Display Station uses the character set shown in the following figure for personal computer codepage 437. The 437 codepage is the standard set of characters used on United States personal computers.

← First Hexadecimal Character →

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
0						&	-						{	}	\	0	
1							/		a	j	~		A	J		1	
2									b	k	s		B	K	S	2	
3									c	l	t		C	L	T	3	
4									d	m	u		D	M	U	4	
5									e	n	v		E	N	V	5	
6									f	o	w		F	O	W	6	
7									g	p	x		G	P	X	7	
8									h	q	y		H	Q	Y	8	
9										·	r	z		I	R	Z	9
A						¢	!	!	:								
B						.	\$,	#								
C		*-				<	*	%	@								
D						()	-	,								
E		-				+	;	>	=								
F		■				|	┌	?	"								

← Second Hexadecimal Character →

Legend:

RB3F042



These codes are reserved for use by IBM. Blank positions are invalid and may or may not print a character.



These codes are used for display attributes.

For example:

An **A** in the EBCDIC character set is equivalent to hexadecimal C1.

Figure A-1. 5250 EBCDIC Character Set Table

EBCDIC to ASCII Conversion Table for Displays

The following table aids in converting the 5250 EBCDIC (hexadecimal) characters to the IBM Personal Computer ASCII (hexadecimal) characters:

← First Hexadecimal EBCDIC Character →

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	00	10	FF	FF	20	26	2D	ED	ED	F8	E6	9B	7B	7D	5C	30
1	01	11	FF	FF	20	82	2F	90	61	6A	7E	9C	41	4A	20	31
2	02	12	FF	FF	83	88	83	88	62	6B	73	9D	42	4B	53	32
3	03	13	FF	FF	84	89	8E	89	63	6C	74	9E	43	4C	54	33
4	04	14	FF	FF	85	8A	85	8A	64	6D	75	9F	44	4D	55	34
5	05	15	FF	FF	A0	A1	A0	A1	65	6E	76	15	45	4E	56	35
6	06	16	FF	FF	A6	8C	A6	8C	66	6F	77	14	46	4F	57	36
7	07	17	FF	FF	86	8B	8F	8B	67	70	78	AC	47	50	58	37
8	08	18	FF	FF	87	8D	80	8D	68	71	79	AB	48	51	59	38
9	09	19	FF	FF	A4	E1	A5	60	69	72	7A	00	49	52	5A	39
A	0A	1A	FF	FF	9B	21	7C	3A	AE	A6	AD	AA	2D	F2	FD	00
B	0B	1B	FF	FF	2E	24	2C	23	AF	A7	A8	B3	93	96	93	96
C	0C	1C	FF	FF	3C	2A	25	40	00	91	00	00	94	81	99	9A
D	0D	1D	FF	FF	28	29	5F	27	F3	00	18	00	95	97	95	97
E	0E	1E	FF	FF	2B	3B	3E	3D	00	92	00	27	A2	A3	A2	A3
F	0F	FE	FF	FF	B3	AA	3F	22	F1	0F	00	CD	A7	98	A7	00

↑ Second Hexadecimal EBCDIC Character ↓

RB3F028

Figure A-2. EBCDIC to ASCII Character Conversion Table

For example: EBCDIC hex **C1** is equivalent to ASCII hex **41**.

IBM Personal Computer ASCII Character Set Table

The IBM Personal Computer uses the character set shown in the following table:

		← First Hexadecimal Character →															
		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Second Hexadecimal Character	0	BLANK (NULL)	▶	BLANK (SPACE)	0	@	P	'	p	Ç	É	á	▒	␣	∞	≡	
	1	☺	◀	!	1	A	Q	a	q	ü	æ	í	▒	␣	β	±	
	2	☹	↕	"	2	B	R	b	r	é	Æ	ó	▒	␣	γ	≥	
	3	♥	!!	#	3	C	S	c	s	â	ô	ú	▒	␣	π	≤	
	4	♦	¶	\$	4	D	T	d	t	ä	ö	ñ	▒	␣	Σ	∫	
	5	♣	§	%	5	E	U	e	u	à	ò	Ñ	▒	␣	σ	∫	
	6	♠	■	&	6	F	V	f	v	â	û	<u>a</u>	▒	␣	μ	÷	
	7	•	↕	'	7	G	W	g	w	ç	ù	◊	▒	␣	τ	≈	
	8	◼	↑	(	8	H	X	h	x	ê	ÿ	ı	▒	␣	Φ	°
	9	○	↓	)	9	I	Y	i	y	ë	Ö	⌈	▒	␣	Θ	•
	A	◉	→	*	:	J	Z	j	z	è	Ü	⌋	▒	␣	Ω	•	
	B	♂	←	+	;	K	[	k	{	ï	ç	½	▒	␣	δ	√
	C	♀	└	,	<	L	\	l	|	î	£	¼	▒	␣	∞	n	
	D	♪	↔	-	=	M	]	m	}	ì	¥	ì	▒	␣	φ	²
	E	♫	▲	.	>	N	^	n	~	Ä	℞	«	▒	␣	€	■	
	F	☼	▼	/	?	O	-	o	△	Å	f	»	▒	␣	∩	BLANK (FF)	

RB3F02C

Figure A-3. IBM Personal Computer ASCII Character Set Table

For example: hex 41 is equivalent to the ASCII character A.

IBM Personal Computer Printer Character Conversion

Some of the characters supported by the 5250 display stations are not supported by personal computer printers. Therefore, you must convert those IBM 5250 characters that cannot be printed by the personal computer printer. The characters you convert are described in Chapter 3, "Using Printers." The characters that print are described below.

- Standard alphabetic and special characters have an ASCII equivalent and print normally. These include:

```
abcdefghijklmnopqrstuvwxyz  
ABCDEFGHIJKLMNOPQRSTUVWXYZ  
0123456789  
-=!@#$%&*()[ ]_+'";:/\?.,{}  
<>(space)
```

- Text control characters, such as tabs and carriage returns, print.
- When you press a PrtSc key or a Print key, Work Station Feature checks the hexadecimal value of all ASCII characters (see the "IBM Personal Computer ASCII Character Set Table") on the display. Work Station Feature limits the printing of character graphics to those characters that have a value less than or equal to 7E. All other characters print as blanks.

If you attach a printer capable of printing characters with a hexadecimal value greater than 7E and specify the attached printer type during the execution of the configuration program, Work Station Feature automatically changes the limit to allow the additional characters to print.

Decimal to Hexadecimal Conversion

The following tables aid in converting decimal values to hexadecimal values:

	First Decimal Digit(s)												
Second Decimal Digit	0	1	2	3	4	5	6	7	8	9	10	11	12
0	0	A	14	1E	28	32	3C	46	50	5A	64	6E	78
1	1	B	15	1F	29	33	3D	47	51	5B	65	6F	79
2	2	C	16	20	2A	34	3E	48	52	5C	66	70	7A
3	3	D	17	21	2B	35	3F	49	53	5D	67	71	7B
4	4	E	18	22	2C	36	40	4A	54	5E	68	72	7C
5	5	F	19	23	2D	37	41	4B	55	5F	69	73	7D
6	6	10	1A	24	2E	38	42	4C	56	60	6A	74	7E
7	7	11	1B	25	2F	39	43	4D	57	61	6B	75	7F
8	8	12	1C	26	30	3A	44	4E	58	62	6C	76	80
9	9	13	1D	27	31	3B	45	4F	59	63	6D	77	81

RB3F020

Figure A-4. Decimal to Hexadecimal Conversion

		First Decimal Digit(s)												
		13	14	15	16	17	18	19	20	21	22	23	24	25
Second Decimal Digit	0	82	8C	96	A0	AA	B4	BE	C8	D2	DC	E6	F0	FA
	1	83	8D	97	A1	AB	B5	BF	C9	D3	DD	E7	F1	FB
	2	84	8E	98	A2	AC	B6	C0	CA	D4	DE	E8	F2	FC
	3	85	8F	99	A3	AD	B7	C1	CB	D5	DF	E9	F3	FD
	4	86	90	9A	A4	AE	B8	C2	CC	D6	E0	EA	F4	FE
	5	87	91	9B	A5	AF	B9	C3	CD	D7	E1	EB	F5	FF
	6	88	92	9C	A6	B0	BA	C4	CE	D8	E2	EC	F6	
	7	89	93	9D	A7	B1	BB	C5	CF	D9	E3	ED	F7	
	8	8A	94	9E	A8	B2	BC	C6	D0	DA	E4	EE	F8	
	9	8B	95	9F	A9	B3	BD	C7	D1	DB	E5	EF	F9	

RB3F021

Figure A-5. Decimal to Hexadecimal Conversion

For example: decimal **132** is equivalent to hex **84**.

(

4

4

Appendix B. Graphics Files Provided with Work Station Feature

Introduction	B-2
Program Files	B-2
Virtual Device Interface Files	B-3
Graphics Configuration Files	B-5

Introduction

This appendix lists the graphics-specific files included on the virtual disk #IWPCLD4.

Program Files

WFGRAPH.COM

This is the main graphics program. It is loaded by STARTWSF at Work Station Feature initialization time. It initializes graphics by reading the session configuration file (if one is used), and checks the personal computer environment to see if the hardware and VDI is compatible with that requested by the configuration file. If initialization was successful for each session requested, this program is then ended but remains resident in storage. WFGRAPH detects events occurring in Work Station Feature that are pertinent to graphics processing and routes control to the appropriate routines or programs.

WFGRVDI.COM

The is the interface between WFGRAPH and VDI. WFGRAPH detects graphics data streams arriving from System/36 and decodes them into a form more compatible with VDI. The decoded graphics orders are then passed to WFGRVDI, which performs additional processing on the orders to make them compatible with the VDI device driver that is initialized. VDI then displays the result on the work station display.

WFGRDOS.COM

The program keeps DOS in a consistent state while a graphics session is active. Upon detecting a graphics data stream from the System/36, WFGGRAPH checks to see if WFGRDOS is running. If it is not, an information display appears that requests you to start WFGRDOS in personal computer mode. When WFGRDOS is started, graphics processing can continue.

Virtual Device Interface Files

INIT_VDI.EXE

This is the VDI initialization program. It initializes the personal computer for graphics processing with the VDI device driver specified in the CONFIG.SYS file.

VDI.SYS

This is the main VDI program. It uses the initialized device driver to determine how it should interact with the personal computer to display graphics on the personal computer, through the display adapter to the monitor.

VDIDY004.SYS

This is the device driver for the monitor/display adapter combination of 5153 Color Display/CGA, 320 by 200 resolution.

VDIDY006.SYS

This is the device driver for the monitor/display adapter combination of 5153 Color Display/CGA, 640 by 200 resolution.

VDIDY010.SYS

This is the device driver for the monitor/display adapter combination of 5154 Enhanced Color Display/EGA, 640 by 350 resolution.

VDIDY00D.SYS

This is the device driver for the monitor/display adapter combination of 5153 Color Display/EGA, 320 by 200 resolution.

VDIDY00E.SYS

This is the device driver for the monitor/display adapter combination of 5153 Color Display/EGA, 640 by 200 resolution.

VDIDY00F.SYS

This is the device driver for the monitor/display adapter combination of 5151 Monochrome Display/EGA, 640 by 350 resolution.

Graphics Configuration Files

WFGCNFG.EXE

This program allows you to tailor your graphics session profiles further.

WFGPAN.CTL

This file contains display control data for the WFGCNFG configuration program.

WFGPAN.MRI

This file contains display format data for the WFGCNFG configuration program.

WFGHLP.CTL

This file contains display control data for the WFGCNFG configuration program help text.

WFGHLP.MRI

This file contains display format data for the WFGCNFG configuration program help text.

(

Glossary

adapter. The part of a device or feature required to attach it to a processing unit.

address. The number assigned to a device or to a location in storage.

alarm. An audible tone at a display or printer that is used to get the operator's attention.

align. To bring into or be in line with another or with others. For example, to line up numbers on the decimal point.

allocate. To assign a resource, such as a disk(ette) file, to perform a particular task.

alphabetic. Of, relating to, or employing an alphabet.

alphabetic keys. The letter keys a through z, blank, comma, period, and hyphen.

alphanumeric. (1) Consisting of both letters and numbers and often other symbols (such as punctuation marks and mathematic symbols).
(2) Capable of using alphameric characters.

alt state. The definition of a key when pressed in conjunction with the Alt key.

alternate shift state. A method of operation that causes keys to be entered as characters or functions (for example, the Backspace key is represented as the clear function when the Alt key is held down). See also *nonshifted state* and *shifted state*.

application program. A program used to perform a particular data processing task such as payroll.

ASCII. American Standard Code for Information Interchange. The standard code using a coded character set consisting of 7-bit coded characters (8 bits including parity check) used for information interchange among data processing systems, data communications systems, and associated equipment. The ASCII set consists of control characters and graphic characters.

aspect ratio. The ratio of the width of the data to its height as it appears on the display.

asynchronous. A method of data communication in which information is sent at irregular intervals.

attribute. The properties associated with the use of a device.

authorize. To allow a user to communicate with or make use of an object, resource, or function.

autoconfiguration. The automatic arrangement of the parts of a computer.

AUTOEXEC.BAT file. A batch file that contains DOS commands or program names that are executed automatically after DOS is started.

back up. To copy information, usually onto a diskette for safekeeping.

backspace. To move back a position along a row.

base state. The definition of a key when pressed alone.

batch file. A file containing one or more commands that DOS executes one at a time. All batch files must have the extension of .BAT.

beep. See *alarm*.

bisynchronous. A character-oriented, half-duplex data-communications protocol.

bit. The basic unit of computer information, such as 0 or 1.

BSC. Binary synchronous communications. See *bisynchronous*.

buffer. A temporary storage unit that accepts data at one rate and delivers it at another rate.

byte. The amount of storage required to represent one character; a byte is eight bits.

card. An adapter card that is installed in the personal computer to enable it to be connected to another device or to increase the size of the computer's storage.

caret. A wedge-shaped mark which indicates the place where a character is to be inserted.

CGA. Color graphics adapter.

character codes. The ASCII or EBCDIC values assigned to the symbols or functions that are used by the personal computer or System/36.

character set. A set or style of alphabetic, numeric, and special characters that can be displayed or printed by the personal computer or System/36.

codepage. A set of characters.

column. The character position within a print line or on a display. The positions are numbered

from 1, by 1 starting at the leftmost character position and extending to the rightmost position.

column separator. The character symbol displayed at the beginning and end of each column in an input field.

concurrent. Occurring at the same time.

CONFIG.SYS. A personal computer file that contains the device driver assignments required for graphics support.

CONFIG.S36. A personal computer file that contains special user information for PC Support/36 programs. This file allows you to customize PC Support/36 for personal needs or preferences.

configuration. (1) The group of machines, devices, and programs that make up a data processing system. (2) The identification of a particular set of options for a data processing system.

configure. (1) To connect the devices, work stations, programming, and System/36 to each other by using addresses. (2) To indicate the hardware configuration and/or desired options to a program.

control panel. A panel that contains lights (to observe the status) and switches (to operate) on a device or a system.

control sequence. A sequence of hex values that instruct a printer to perform a function or print a particular output.

controller. A device used to coordinate and control the operation of one or more devices.

convenience printer. A session printer that has the System/36 discard information when the

printer session is no longer communicating with the System/36. Contrast with *network printer*.

CPI. Characters per inch.

cursor. A movable marker (such as an underline or a block) on the display used to indicate to the operator where to type the next character.

cursor location. The row (1 through 24) and column (1 through 80) at which the cursor is located.

customization. Changing a default set of information to suit your needs or preferences.

data. All information entered into or used by the computer.

data stream. The sequence of characters being transmitted over a communications line.

DP. Data processing.

default value. A value stored in the system that is used if no other value is specified.

delete. To remove. For example, to erase a file.

device. The generic term for a piece of equipment or mechanism; for example, the personal computer display or attached printer.

device address. The unique number assigned to a device that enables it to communicate with other devices in a system.

device driver. A program used to control the operation of an output device.

diagnostic. Pertaining to the investigation of the cause of an error.

diagram. A line drawing made to show the location of objects.

digit. Any of the numbers from 0 through 9.

directory. A list of files contained on a disk(ette).

disable. To prevent a unit of a data processing system from operating with the rest of the system.

disk. A round flat plate coated with a magnetic substance on which data from a computer is stored.

diskette. A thin, flexible magnetic plate that is permanently sealed in a protective cover.

display. (1) The part of a display station on which information is displayed. (2) A display, similar to a television screen, used to display characters.

display station. A device that includes a keyboard from which an operator can send information to the system and a display on which an operator can see the information sent to or received from the system. See also *work station*.

DOS. Disk Operating System. A program that works with the processing unit and the disk or diskette drive to control the flow of data.

download. To copy files from a system computer to a work station.

drive. The electromechanical device which records and reads the information that is stored on a disk(ette).

drive identifier. A letter that identifies a drive; for example, C refers to the personal computer hard drive.

EBCDIC. (1) Extended Binary-Coded Decimal Interchange Code. A set of 256 8-bit characters. (2) A set of standards for data transmission.

EGA. Enhanced graphics adapter.

emulated control panel. The display used on the personal computer to imitate the operator panel of the IBM 5129, 5224, and 5256 Printers. This panel allows you to control the personal computer printer from the display without using the printer controls.

error code. A hexadecimal value that identifies a condition that interferes with normal operations.

error message. A indication on the display that an error has been detected.

execution. The process of carrying out the instructions of a computer program by a computer.

file. A collection of records of information that you create, group, and access by file name.

fixed disk. See *hard disk*.

font. An assortment of type all of one size and style.

format. (1) (noun) The specific arrangement of information. (2) (verb) To arrange information in a specific way.

formatted display. A display with fields established for specific information.

forms. The paper used in printers (for example, single sheet, continuous forms, and envelopes).

function keys. (1) Personal computer keys F1 through F10, whose functions are assigned by the

operating system or application program. (2) A key that requests an action but does not display a character. The cursor movement keys are examples of function keys.

function control keys. See *function keys*.

gateway. A means of access.

global. Pertaining to all items or aspects.

graphics. Pictures.

graphics-capable. The ability to display or print pictures.

hard disk. A disk of rigid material with a magnetic coating used for mass storage of data.

hardware. The equipment that makes up a data processing system. Contrast with *software*.

help text. A display aid that provides the operator with an explanation of a message that has been received or allows an operator to request information on how to use a key, menu, or parameter.

hex. See *hexadecimal*.

hexadecimal. A numbering system with a base of 16. Valid digits range from 0 through 9 and A (ten) through F (fifteen).

home position. (1) The first input position of the first input field on the display of a display station. (2) The position (far left) to which the print head moves after the Stop switch has been pressed and the printer has been turned on.

Hot Key sequence. A keying sequence that allows you to change sessions.

IBM Token-Ring Network. A type of network in which there is no network controller.

IBM Token-Ring router. See *router*.

ID. Identification.

IEEE. Institute of Electrical and Electronic Engineers.

II. Input Inhibited. The Input Inhibited indicator used by Work Station Feature.

IM. See *insert mode*.

increment. To increase by a specified amount.

initialize. To prepare for use; for example, to format a diskette and to initialize registers and program variables to the condition previously determined by a program.

initiate. To cause something to start.

input. Data to be processed.

input field. An area on the display in which an operator enters data. Input fields are either blank on the display or contain default information. There may be a prompt before the input field.

insert mode. The mode of operation that allows characters to be placed between the characters already on the display when a character key is pressed. Characters are inserted at the location identified by the cursor.

install. To put necessary files and programs in the correct location for use.

integrity. Without corruption or loss.

interface. The machinery and programs that permit the exchange of information between computers or devices.

interrupt level. A path used to get the processing unit's immediate attention.

IPL. (1) Initial program load. (2) To perform an IPL.

I/O. Input/output.

I/O address. See *device address*.

justify. To adjust text to be even with the left and right margins.

KB. Keystroke buffering. The display indicator used to show the operator when keystrokes are saved.

K. Kilobyte. 1024 bytes of information.

keyboard layout. The arrangement and functions of the keys on a keyboard.

keyboard customization file. The file that contains a keyboard layout.

keyboard style. A group of keyboard functions; for example, a 5250-style keyboard's keys perform 5250 functions.

keyboard type. The physical keyboard.

keystroke. The act of pressing a key on a keyboard.

KS. Keyboard shift. The display indicator used to show the operator when the keyboard is in shifted state.

LAN. Local area network. A Set of hardware and software which allows several computers to exchange information.

line. The cable from the System/36 computer or controller to which one or more work stations are attached.

line style. The way lines are drawn on the display; for example, a dotted line.

link. To set up access to.

LINK36.BAT. The personal computer file that allows the personal computer to access the System/36 virtual disk.

listener. An IEEE-488 device unit that receives information from the talker.

load. To move data or programs into storage.

lowercase mode. The keyboard is in lowercase mode when the Shift keys are not pressed and the Shift Lock and Caps Lock functions are unlocked.

LPI. Lines per inch.

memory. See *storage*.

memory expansion. Hardware and/or software that increase the amount of storage.

monitor. The device that displays information.

monochrome. Made with a single color.

MW. Message waiting. The display indicator that shows the operator when a message received from the System/36 is waiting to be displayed.

network printer. A session printer that allows System/36 programs to create output for it, even

if the printer session is not communicating with the System/36.

nonshifted state. A method of operation that causes keys to be entered as characters or functions similar to when a typewriter's shift key is not held down (for example, the **a** is represented as **a**). See also *alternate state* and *shifted state*.

normal image. The display attribute that causes characters to be displayed as light characters on a dark background.

null character. A blank (no character) that is displayed as a result of zeros occupying a character position in the buffer.

numeric. Referring to any of the numbers 0 through 9.

numeric keys. The characters 0 through 9, blank, comma, period, plus, and minus.

offline. The state of not being controlled by or directly communicating with a System/36.

offset. A specified distance from the beginning.

operator panel. See *emulated control panel*.

order. The value of a hex byte which controls the graphics data stream.

palette. A selection of colors available for use in graphics processing.

paper feed hardware. Equipment that allows the entry of forms to a printer. See also *forms*.

parallel printer. A printer that must be connected through the printer ports (LPTn on a personal computer). Contrast with *serial printer*.

parameter. A value supplied to a program that is used as input or controls the actions of the program.

passthrough. A method by which a terminal or personal computer connected to one System/36 can establish a session on a different System/36.

password. A code you must enter before you can access specific programs.

path. The sequence of directories designated for DOS to search when looking for a program.

PC Support/36 configuration file. See *CONFIG.S36*.

PC text assist. A personal computer program which runs as part of PC Support/36 Organizer to enhance the processing and performance of the Displaywrite/36 edit display.

personal computer. Any of the IBM Personal Computers that can attach to System/36 with an IBM Token-Ring Network.

personal computer mode. The method of operation which allows the personal computer to perform DOS functions independently of the System/36 when attached to function as a 5250 work station.

PEL. Picture element. The smallest addressable unit of a graphics session. Also referred to as *pixel*.

PFT. Printer function table.

pitch. The number of characters per inch.

pixel. An element of a picture.

playback sequence. A series of characters and/or functions assigned to a key.

plotter. An output device that graphically records data in two dimensions (length and width) on paper.

print buffer. A storage area within the printer where characters to be printed are temporarily stored.

print head. The part of the printer that strikes the ribbon to print characters on the paper forms.

printer. A device that provides printed output.

printer function table. A file containing information that defines a printer to Work Station Feature.

printwheel. The element used to create the impressions printed by the IBM 5216 Wheelprinter.

processing unit. The part of a computer that operates on data.

profile. (1) Data file that describes the features of a user, program, or device. (2) A table of attributes containing information such as session numbers, session types, keyboard selection, and so forth.

program. A sequence of instructions for a computer.

program diskette. A diskette which contains programs to be executed on the personal computer. For example, the Work Station Feature Program Licensed Program Diskette.

prompt. A displayed request for information or operator action.

protocol. A series of rules for transferring data.

recovery procedure. The action performed by the operator when an error message appears on the display.

remote. Not directly attached to.

resolution. The visual quality of the display.

restart. Loading and executing the operating system. This is accomplished by pressing the Alternate, Control, and Delete key sequence (or by turning the personal computer off, then on, if necessary). This causes the restart record to be read into storage and given control.

reverse image. A method of highlighting where the character color on the display and the background color are swapped. For example, in place of green on black, the characters appear as black on green.

right adjust. To position characters within a field to the rightmost position of the field.

root directory. The directory on a disk(ette) that contains the list of files stored on that disk(ette). If there is more than one directory on the disk(ette), the root directory also contains the names of each of the other directories. This directory is established when the disk(ette) is formatted.

rotation Hot Key. A Hot Key sequence that switches to the next session (sequentially or as defined).

router. A set of PC Support/36 programs that manage communication between a personal computer and System/36.

row. The horizontal arrangement of characters on a display.

SA. System Available. The System Available indicator used with Work Station Feature.

scan code. A numeric representation of a key's location on a keyboard.

SCS. System Network Architecture (SNA) control string.

SDLC. Synchronous data link control.

serial printer. A printer that must be attached to an asynchronous communications port (COMn on a personal computer). Contrast with *parallel printer*.

session. (1) The period of time in which the System/36 and one of the devices are communicating. (2) The logical connection between the System/36 and a work station. The session may be established for a display station or for a printer.

shift state. The definition of a key when pressed in conjunction with a Shift key. This state also occurs in Shift Lock, Caps Lock, and Num Lock states.

shifted mode. A method of operation that causes keys to be entered as a character or function similar to when a typewriter's shift key is held down (for example, an **a** represented as **A**.) See also *alternate state* and *nonshifted state*.

sign on. To establish your identity to the System/36

sign-on display. The display that prompts the user to enter the appropriate sign-on command.

signed numeric. A format control used to specify that the units position of the field is reserved for the sign (usually blank for positive and minus for negative).

signed numeric field. A numeric field that has a character in it to identify it as having either a positive or negative value.

software. The programs, procedures, and rules that are stored as data but control the operation of a computer. Contrast with *hardware*.

spool. To place in a queue for processing at a later time.

spool file. A file containing spooled information.

status. A condition. For example, the status of a personal computer, a printer, or a job.

status line. The 25th (or bottom) row on the display of the personal computer, which is used to display the condition of the session.

storage. The devices used to store data within the personal computer.

subconsole. A display station that controls a printer or printers.

synchronous. A type of data communications protocol that transmits data according to a precisely timed clock pulse.

system. A computer and its devices and programs.

system operator. A person who uses a display station which is designated as the system device to activate certain system functions and control and monitor system operation.

system reset. See *restart*.

system time. The time of day as recognized by a system.

system unit. The part of the personal computer that contains the processing unit.

table. A list of data in which each item can be uniquely identified.

talker. An IEEE-488 device unit that provides data to the listener.

template. A pattern to help the user identify the location of keys on a keyboard.

terminate. Bring to an end.

toggle. To operate a device (switch) that stays in the operated position until operated a second time.

tractor. A printer attachment for the handling of continuous forms paper.

type ahead. To enter a keystroke before the previous one has been recorded.

type style. The appearance of printed characters.

underscore. To draw a line under.

uppercase. Capital letters.

uppercase mode. The method of operation that causes alphabetic characters to be displayed as capital letters and all other keys in the typewriter area to be displayed as the character shown on the upper portion of these keys.

variable n. A placeholder for a printing function that can be changed at print time.

VDI. Virtual device interface.

virtual device. The type of device whose characteristics the personal computer assumes when directed to do so by the operating system.

virtual disk(ette). A portion of a disk attached to the System/36 that can be used like a personal computer disk(ette). A virtual diskette has a capacity of up to 320 K. A virtual disk has a capacity of up to 32 MB.

work station. An input/output device consisting of a display station and/or printer that allows you to send and receive information from a System/36.

work station address. The address assigned to a local work station attached via twinax cable which enables the System/36 to communicate with it.

work station controller. See *controller*.

working diskette. The program diskette, which contains all the programs necessary to perform one or more tasks and is used routinely.

WP. Word processing.

writing mode. A graphics function that defines the appearance of the background of a line or drawing.

ZICR. Zero index carriage return.

Index

A

abbreviated terms vii
adapter specifications 2-20
ASCII table for
 displays A-6
ASCII transparent
 data 3-18
attribute appearances 2-2
 color display 2-9
 monochrome
 displays 2-3
 with graphics
 adapters 2-9
attribute command 3-19
audience, intended viii
automatic cut sheet 4-18

B

backspace test 4-24
backspace, unit
 command 3-9
begin overstrike
 command 3-17
begin underscore
 command 3-16
blink attribute 2-19

C

carriage return 4-19
CGA specifications 2-20
CGCS through local ID
 command 3-10
character appearance
 personal computer 2-15
 System/36 2-15
character code differences,
 printer 3-6
character conversion,
 printer A-7
character distance
 command 3-14
character sets
 ASCII A-6
 DP and WP 3-10
 EBCDIC A-2
 in PFT 4-20
 5219 3-10
codepage 437 A-2
color display
 attributes 2-9
color mapping
 function 2-17
column separators 2-19
compressed print 3-4, 3-5
configuring Work Station
 Feature 1-3
continuous forms 3-3, 3-5
control sequence,
 defined 4-7
control sequences in
 PFT 4-10

- carriage return and line feed 4-19
- character sets 4-20
- end of document
 - reset 4-12
- highlighting 4-17
- horizontal character spacing 4-15
 - horizontal motion index 4-15
 - horizontal relative movement 4-16
 - justification 4-16
 - pitch 4-15
 - proportional space mode 4-16
- page length 4-19
- paper handling 4-17
 - automatic cut sheet 4-18
 - eject sheet with paper feed 4-18
 - eject sheet without paper feed 4-18
 - manual cut sheet 4-18
 - manual feed select 4-18
- start of document initialization 4-11
 - carriage return 4-11
 - character set 4-12
 - color 4-12
 - line feed 4-11
 - line length 4-12
 - line spacing 4-11
 - page length 4-12
 - pitch 4-11
 - printing mode 4-12
 - turn off 4-11
 - vertical units 4-11
- type styles 4-20
 - default 4-21
 - group 4-21
 - individual 4-21
 - vertical/horizontal spacing 4-13
 - indexing functions 4-14
 - lines per inch 4-13
 - variable line spacing 4-14
 - vertical line spacing 4-13
- controller 1-2
- CPI 3-3, 3-5
- CPL 3-3, 3-5
- cursor draw characters tests 4-26

D

- data security xii
- decimal to hexadecimal conversion A-8
- default type style 4-21
- DEFAULT.PFT 4-4
- displays
 - ASCII character set A-6
 - attributes 2-2
 - character appearance 2-15
 - EBCDIC character set A-2
 - EBCDIC to ASCII conversion A-4
 - specifications 2-20
- DOS
 - manual viii
 - required knowledge viii
 - required version 1-8
 - storage requirements 1-10
- DP character set 3-10

E

EBCDIC character set for displays A-2
EBCDIC to ASCII
 display translation A-4
 printer character code differences 3-6
 printer translation 3-7
EGA specifications 2-20
EGA storage
 expansion 2-20
eject sheet
 with paper feed 4-18
 without paper feed 4-18
emulators, difference in
 Work Station Feature 1-2
end of document reset 4-12

F

FID through GFID
 command 3-11
form feed test 4-23
forms handling
 compressed print 3-4, 3-5
 continuous forms 3-3, 3-5
 CPI 3-3, 3-5
 CPL 3-3, 3-5
 in PFT 4-17
 LPI 3-3, 3-5
 paper length 3-3, 3-5
 paper width 3-3, 3-5
 personal computer printers 3-3
 print line length 3-3, 3-5

proportional spacing 3-5
single sheet forms 3-4, 3-5
System/36 printers 3-3, 3-5
function selection tests 4-22
 backspace 4-24
 cursor draw characters 4-26
 form feed 4-23
 mid-line pitch change 4-24
 pitch 4-24
 PSM 4-25
 superscript/subscript 4-23
 underline 4-23

G

GCGID through GCID 3-10
go to standby order 5-36
graphics adapter specifications 2-20
graphics adapters 2-9
graphics control orders 5-5
graphics coordinates function 2-16
graphics data stream, building 5-2
graphics display control 2-16
graphics display off order 5-7
graphics display on order 5-6
graphics draw orders 5-25
graphics functions 2-15

- blink, underscore, and column separators 2-19
- color mapping 2-17
- graphics
 - coordinates 2-16
 - graphics displays 2-16
 - line style 2-16
 - line style mapping 2-17
 - polygon fill 2-17
 - scanline data 2-17
 - select modes 2-19
 - set line weight
 - order 2-18
 - status line control 2-18
 - styled line 2-18
 - text attributes and colors 2-18
 - vertical scaling
 - factor 2-19
 - write background 2-18
 - write polymarker 2-18
 - XOR and OR writing
 - modes 2-19
- graphics limitations ix
- graphics orders
 - fully supported and no-op orders 5-2
 - graphics control orders 5-5
 - graphics display
 - off 5-7
 - graphics display
 - on 5-6
 - graphics draw
 - orders 5-25
 - write
 - background 5-25
 - graphics set orders 5-8
 - set color 5-12
 - set color table 5-8
 - set fill mode 5-21
 - set function 5-18
 - set style 5-14
- IEEE-488 interface
 - orders 5-32
 - go to standby 5-36
 - IEEE-488 data
 - follows 5-33
 - interface clear 5-37
 - take control
 - asynchronously 5-35
 - modified orders 5-5
 - printer orders 5-31
 - read orders 5-27
 - read status 5-27
 - supported orders 5-3
- Graphics Printer, 5152
 - Model 2 4-2
- graphics program and data files
 - configuration B-5
 - program files B-2
 - VDI files B-3
- graphics session with
 - plotter, requirements 1-8
- graphics set orders 5-8
- group type styles 4-21

H

- hardware requirements
 - graphics with
 - plotter 1-8
 - personal computer 1-6
 - printer session 1-7
 - System/36 1-4
- hex codes
 - color attributes 2-9
 - monochrome
 - attributes 2-3
 - translation tables A-1
- hexadecimal to decimal
 - conversion A-8
- highlighting 4-17

horizontal character
spacing 4-15
horizontal relative
movement 4-16

I

IBM3812.PFT 4-4
IBM4202.PFT 4-4
IEEE-488 data follows
order 5-33
IEEE-488 interface
orders 5-32
indexing functions 4-14
individual type style 4-21
intended audience viii
interface clear order 5-37

J

justification 4-16

L

LAC command 3-19
line density command 3-9
line feed 4-19
line style function 2-16
line style mapping
function 2-17
line style, set 5-14
load alternate character
command 3-19
Local Select mode 2-15
LPI
default 3-3, 3-5
in PFT 4-13

M

manual cut sheet 4-18
manual feed select 4-18
mid-line pitch change
test 4-24
monochrome display
attributes 2-3
multiple printing
passes 4-19

O

OR logic 5-19
OR writing mode 2-19
organization of manual x
output data field 3-11
overstrike command 3-17

P

page length 4-19
page presentation media
command 3-12
paper handling 4-17
paper length 3-3, 3-5
paper width 3-3, 3-5
PC character set 4-20
PC text assist 1-3
personal computer
requirements 1-6
PFTs provided by Work
Station Feature
DEFAULT.PFT 4-4
IBM3812.PFT 4-4
IBM4202.PFT 4-4

- PFTWS.PRN 4-2
- pitch 4-15
- pitch tests 4-24
- plotters
 - restrictions 1-8
 - supported 1-8
- polygon fill function 2-17
- presentation page size
 - command 3-15
- print line length 3-3, 3-5
- printer character code
 - differences 3-6
- printer forms handling 3-3, 3-5
- printer function table setup
 - program
 - control sequences 4-7
 - variable n 4-8
 - creating a PFT 4-5
 - defining functions 4-10
 - carriage return 4-19
 - character sets 4-20
 - end of document
 - reset 4-12
 - highlighting 4-17
 - horizontal relative movement 4-16
 - indexing
 - functions 4-14
 - justification 4-16
 - line feed 4-19
 - lines per inch 4-13
 - page length 4-19
 - paper handling 4-17
 - proportional space
 - mode 4-16
 - start of document
 - initialization 4-11
 - type styles 4-20
 - variable line spacing 4-14
 - vertical line spacing 4-13
- function selection
 - tests 4-22
- horizontal character spacing 4-15
- nonsupported
 - functions 4-3
- provided PFTs 4-4
- supported functions 4-3
 - when to use 4-2
 - worksheet 4-2
- printer function
 - terminology 4-6
- printer graphics
 - orders 5-31
- printer session hardware
 - requirements 1-7
- printer setup
 - command 3-16
- printers
 - character
 - conversion A-7
 - EBCDIC to ASCII translation 3-6
 - forms handling 3-3, 3-5
 - new commands 3-17
 - transparent data 3-17
 - nonsupported
 - functions 4-3
 - supported 1-7, 4-2
 - supported functions 4-3
 - 5219 commands 3-8
 - 5224 commands 3-19
- program files ix
- proportional space
 - mode 4-16
- proportional spacing 3-5
- Proprinter, 4201 4-2
- PSM test 4-25
- publications, related viii, xi

Q

Quietwriter, 5201 4-2

R

read orders 5-27
 read status order 5-27
 related publications viii,
 xi
 required knowledge
 DOS viii
 System/36 viii
 Token-Ring
 Network viii
 requirements for Work
 Station Feature
 controller 1-2
 DOS 1-8
 graphics 1-8
 network 1-4
 personal computer
 hardware 1-6
 software 1-8
 storage 1-9
 printer 1-7
 System/36
 hardware 1-4
 software 1-5
 reset end of document 4-12

S

scanline data
 function 2-17
 security xii
 select modes 2-19
 set attribute
 command 3-19
 set CGCS through local ID
 command 3-10
 set character distance
 command 3-14
 set color order 5-12
 set color table order 5-8
 set FID through GFID
 command 3-11
 set fill mode order 5-21
 set function order 5-18
 set GCGID through
 GCID 3-10
 set line density
 command 3-9
 set line weight order 2-18
 set presentation page size
 command 3-15
 set printer setup
 command 3-16
 set single line distance
 command 3-13
 set style order 5-14
 set vertical format
 command 3-9
 set vertical margins
 command 3-15
 shortened terms vii
 single line distance
 command 3-13
 single sheet forms 3-4, 3-5
 software requirements
 personal computer 1-8
 System/36 1-5
 status line control 2-18

- storage expansion for
 - EGA 2-20
- storage requirements 1-9
- styled line function 2-18
- superscript/subscript
 - test 4-23
- support
 - personal computers 1-6
 - plotters 1-8
 - printers 1-7, 4-2
 - System/36 1-4
- supported graphics
 - orders 5-3
- System/36 and Work
 - Station Feature,
 - conflicting commands 1-3
- System/36
 - requirements 1-4

T

- take control
 - asynchronously
 - order 5-35
- text attributes and colors
 - function 2-18
- translation tables A-1
- transparent command 3-19
- transparent data
 - command 3-17, 3-18
- TRN command 3-19
- TRNA command 3-18
- type styles 4-20
 - default 4-21
 - group 4-21
 - individual 4-21

U

- underline test 4-23
- underscore attribute 2-19
- underscore command 3-16
- unit backspace
 - command 3-9
- user-defined printer 4-2
 - storage
 - requirement 1-10

V

- variable line spacing 4-14
- variable n 4-8
 - control increments 4-9
 - defined 4-7
 - determining format 4-10
 - maximum value 4-8
 - offset added or
 - subtracted by
 - printer 4-9
- VDI
 - buffer size 1-10
 - fill pattern 5-24
 - line style 5-24
 - program files B-3
 - program interface B-2
- vertical format
 - command 3-9
- vertical line spacing 4-13
- vertical margins
 - command 3-15
- vertical scaling factor 2-19
- vertical/horizontal
 - spacing 4-13

W

Wheelwriter, 5216 4-2
 work station controller 1-2
 Work Station Feature
 compatible personal
 computers 1-6
 configuring 1-3
 description viii, 1-2
 graphics limitations ix
 program files ix
 requirements 1-4
 security xii
 supported printers 1-7,
 4-2
 Work Station Feature and
 System/36, conflicting
 commands 1-3
 worksheet for PFT 4-2
 WP character set 3-10
 write background
 function 2-18
 write background
 order 5-25
 write polymarker
 function 2-18
 writing mode
 functions 2-19

X

XOR logic 5-19
 XOR writing mode 2-19

Numerics

3812 Pageprinter 4-2, 4-4
 PFT 4-4
 4201
 forms handling 3-3
 4201 Proprinter 4-2
 4202 Proprinter XL 4-2
 PFT 4-4
 5152
 forms handling 3-3
 5152 Graphics Printer
 Model 2 4-2
 5201
 forms handling 3-3
 5201 Quietwriter 4-2
 5216
 forms handling 3-3
 5216 Wheelwriter 4-2
 5219
 character sets 3-10
 forms handling 3-5
 5219 forms handling 3-3
 5219 printer commands 3-8
 begin overstrike 3-17
 begin underscore 3-16
 page presentation
 media 3-12
 set CGCS through local
 ID 3-10
 set character
 distance 3-14
 set FID through
 GFID 3-11
 set GCGID through
 GCID 3-10
 set line density 3-9
 set presentation page
 size 3-15
 set printer setup 3-16
 set single line
 distance 3-13

set vertical format	3-9	set attribute	3-19
set vertical		transparent	3-19
margins	3-15	5250 EBCDIC character	
unit backspace	3-9	set	A-2
5224 forms handling	3-3,	5256 forms handling	3-3,
3-5		3-5	
5224 printer commands		5292-2 specifications	2-20
load alternate		9914 adapter	5-32
character	3-19		

READER'S COMMENT FORM

Please use this form only to identify publication errors or to request changes in publications. Direct any requests for additional publications, technical questions about IBM systems, changes in IBM programming support, and so on, to your IBM representative or to your nearest IBM branch office. You may use this form to communicate your comments about this publication, its organization, or subject matter, with the understanding that IBM may use or distribute whatever information you supply in any way it believes appropriate without incurring any obligation to you.

- If your comment does not need a reply (for example, pointing out a typing error) check this box and do not include your name and address below. If your comment is applicable, we will include it in the next revision of the manual.

- If you would like a reply, check this box. Be sure to print your name and address below.

Please contact your nearest IBM branch office to request additional publications.

Name _____

Company or
Organization _____

Address _____

City	State	Zip Code
------	-------	----------

Phone Number _____
(Area Code)

Page Number(s):

Comment(s):

No postage necessary if mailed in the U.S.A.



NO POSTAGE
NECESSARY
IF MAILED IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS / PERMIT NO. 40 / ARMONK, NEW YORK

POSTAGE WILL BE PAID BY ADDRESSEE

International Business Machines Corp.

Information Development

Department 245

Rochester, Minnesota, U.S.A. 55901



Fold and tape. **Please do not staple.**

IBM



International Business Machines Corporation

Hwy 52 N.W. 37th Street
Rochester, Minnesota 55901

Order Number
SC21-9569-0

Printed in U.S.A.

SC21-9569-00

