TEXAS INSTRUMENTS

tiga Interface

Art

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TEXAS
INSTRUMENTS

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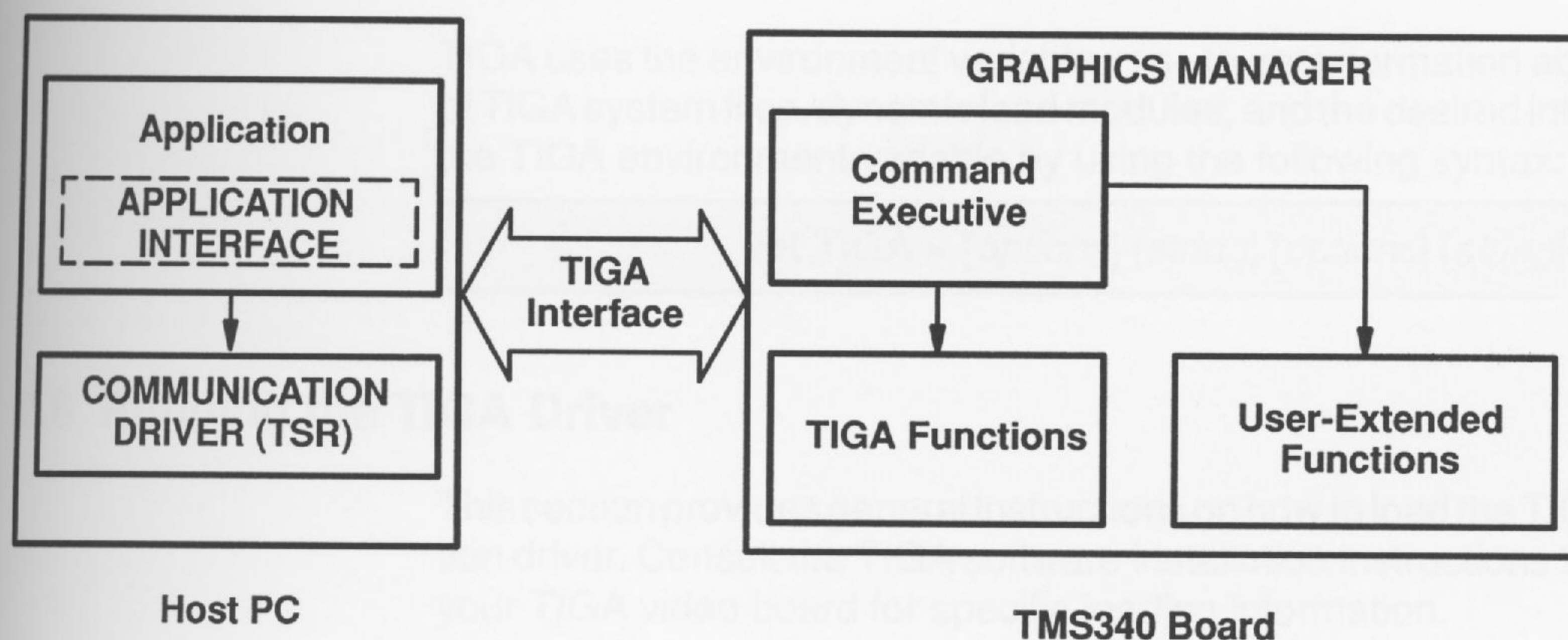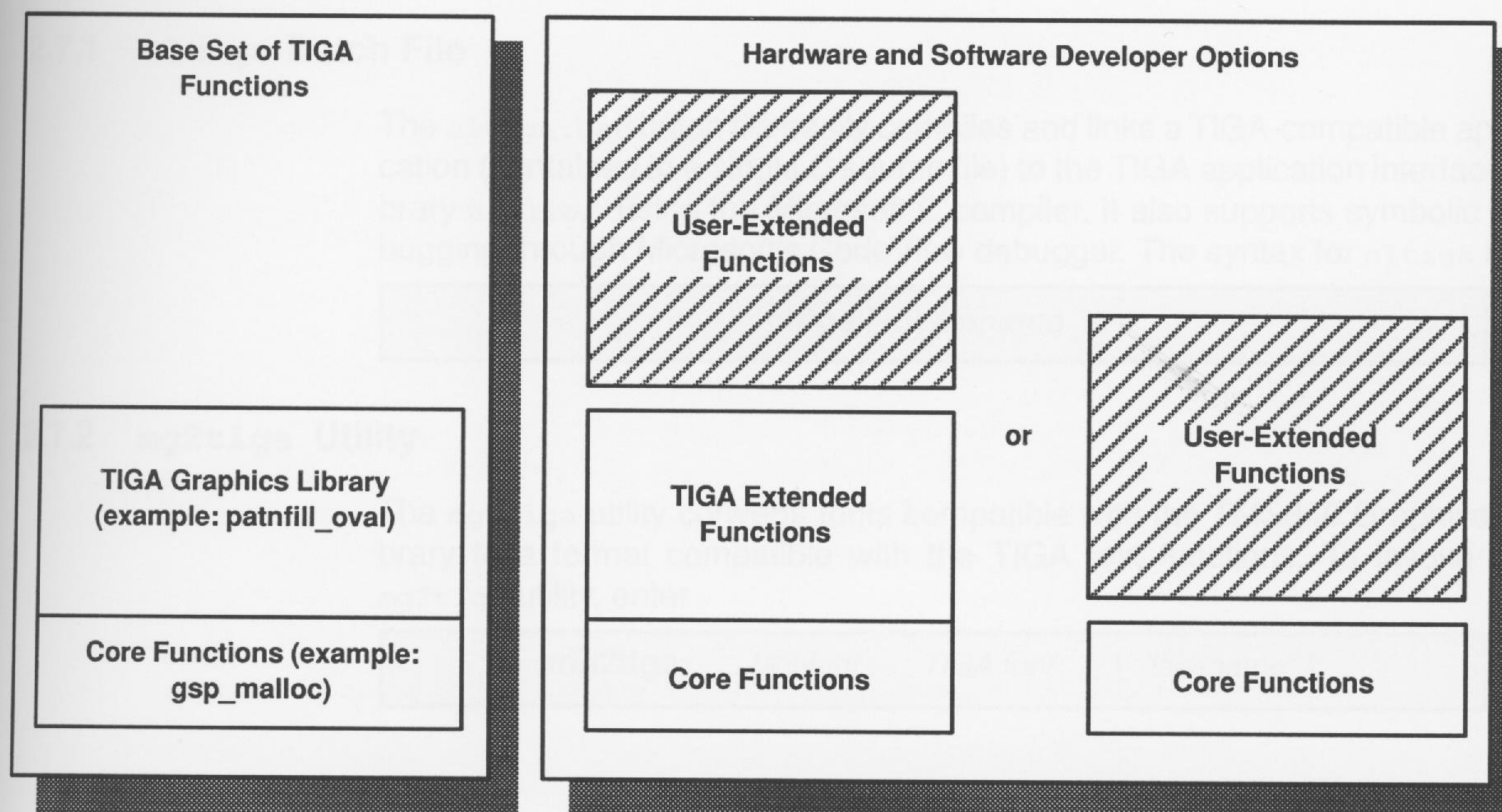# Chapter 1. Introduction

Figure 1–1. Block Diagram

Figure 1–2. Function Configuration Options

Chapter 2. Getting Started

2.5 The TIGA Environment Variable

TIGA uses the environment variable TIGA to get information about the location of TIGA system files, dynamic load modules, and the desired interrupt level. Set the TIGA environment variable by using the following syntax:

> **set TIGA** = [*options*] [*string*] [*options*] [*string*]

2.6 Running the TIGA Driver

This section provides general instructions on how to load the TIGA communication driver. Consult the TIGA software installation instructions that accompany your TIGA video board for specific loading information.

To load TIGA, enter this at the MS-DOS prompt:

> **tigacd** [*options*]

2.7.1 cltiga Batch File

The cltiga.bat batch file easily compiles and links a TIGA-compatible application (contained in a single C source file) to the TIGA application interface library ai.lib, using the Microsoft C compiler. It also supports symbolic debugging through Microsoft's CodeView debugger. The syntax for cltiga is

> **cltiga** [–d] *filename*

2.7.2 mg2tiga Utility

The mg2tiga utility converts fonts compatible with the TMS340 Graphics Library to a format compatible with the TIGA text functions. To invoke the mg2tiga utility, enter

> **mg2tiga**   *MG font*   *TIGA font*   [*"facename"*]

Chapter 3. Application Interface

3.1.1 Host-PC Development Tools

Compiler/Assembler	Version	Operating System
Microsoft C Compiler	5.0 or higher	DOS (real mode)
Microsoft Macro Assembler	5.0 or higher	DOS (real mode)
MetaWare High-C Compiler	1.5 or higher	PharLap DOS Extender
Microway NDP C-386 Compiler	2.0 or higher	PharLap DOS Extender

Table 3–1. Include Files for PC Development

	Microway NDP C-386	MetaWare High C 386	Microsoft C (all models)	Microsoft Assembler
tiga.*	tiga.ndp	tiga.hch	tiga.h	tiga.inc, tiga_sm.inc
extend.*	extend.pl	extend.pl	extend.h	extend.inc
typedefs.*	typedefs.pl	typedefs.pl	typedefs.h	typedefs.inc

Table 3–2. AI Libraries Development Tools

TIGA AI Library	Description	Development Tools	Memory Models
ai.lib	Far code references, Far data references	Microsoft C 5.0 or higher, Microsoft Macro Assembler	small, medium, compact, large, huge
ai_com.lib	Near code references, Far data references	Microsoft C 5.0 or higher, Microsoft Macro Assembler	compact
hcai.lib	Near code references, Near data references	MetaWare High C	not applicable
ndpai.lib	Near code references, Near data references	Microway NDP C	not applicable

Table 3–3. Include Files for TIGA-Extended Function Development

	TMS340 C	TMS340 Assembler
gsptiga.*	gsptiga.h	gsptiga.inc
gspextnd.*	gspextnd.h	gspextnd.inc
gsptypes.*	gsptypes.h	gsptypes.inc
gspglobs.*	gspglobs.h	gspglobs.inc
gspreg.*	gspreg.h	gspreg.inc
gspmac.lib	–	gspmac.lib

Table 3–4. Graphics System Initialization Functions

Function	Description	Type
aux_command	Execute auxiliary command	Host
function_implemented	Return if function is implemented	Core
get_config	Return hardware configuration information	Core
get_modeinfo	Return graphics mode information	Host
get_videomode	Return current video mode	Host
gsp_execute	Execute a COFF program	Host
install_primitives	Install extended graphics library functions	Host
install_usererror	Install user error handler	Host
loadcoff	Load COFF file	Host
set_config	Set hardware configuration	Core
set_timeout	Set timeout delay value	Host
set_videomode	Set video mode	Host
setup_hostcmd	Initialize call-back environment	Host
synchronize	Synchronize host and TMS340 communications	Host
tiga_set	Open/close/query communication driver	Host

Table 3–5. Clear Functions

Function	Description	Type
clear_frame_buffer	Clear frame buffer	Core
clear_page	Clear current drawing page	Core
clear_screen	Clear screen	Core

Table 3–6. Graphics Attributes Control Functions

Function	Description	Type
cpw	Compare point to clipping window	Core
get_colors	Return foreground and background colors	Core
get_env	Return graphics environment information	Ext
get_pmask	Return plane mask	Core
get_ppop	Return pixel-processing operation code	Core
get_transp	Return transparency flag	Core
get_windowing	Return window-clipping mode	Core
set_bcolor	Set background color	Core
set_clip_rect	Set clipping rectangle	Core
set_colors	Set foreground and background colors	Core
set_draw_origin	Set drawing origin	Ext
set_fcolor	Set foreground color	Core
set_patn	Set current pattern address	Ext
set_pensize	Set pen size	Ext
set_pmask	Set plane mask	Core
set_ppop	Set pixel-processing operation code	Core
set_transp	Set transparency mode	Core
set_windowing	Set window-clipping mode	Core
transp_off	Turn transparency off	Core
transp_on	Turn transparency on	Core

Table 3–7. Palette Functions

Function	Description	Type
get_nearest_color	Return nearest color in palette	Core
get_palet	Read entire palette	Core
get_palet_entry	Return single palette entry	Core
init_palet	Initialize palette	Core
set_palet	Set multiple palette entries	Core
set_palet_entry	Set single palette entry	Core

Table 3–8. Graphics Drawing Functions (Continued)

Function	Description	Type
draw_line	Draw straight line	Ext
draw_oval	Draw ellipse outline	Ext
draw_ovalarc	Draw ellipse arc	Ext
draw_piearc	Draw ellipse pie arc	Ext
draw_point	Draw single pixel	Ext
draw_polyline	Draw list of lines	Ext
draw_rect	Draw rectangle outline	Ext
fill_convex	Draw solid convex polygon	Ext
fill_oval	Draw solid ellipse	Ext
fill_piearc	Draw solid ellipse pie slice	Ext
fill_polygon	Draw solid polygon	Ext
fill_rect	Draw solid rectangle	Ext
frame_oval	Draw oval border	Ext
frame_rect	Draw rectangular border	Ext
move_pixel	Copy pixel to value	Ext
patnfill_convex	Fill convex polygon with pattern	Ext
patnfill_oval	Fill oval with pattern	Ext
patnfill_piearc	Fill pie slice with pattern	Ext
patnfill_polygon	Fill polygon with pattern	Ext
patnfill_rect	Fill rectangle with pattern	Ext
patnframe_oval	Fill oval frame with pattern	Ext
patnframe_rect	Fill rectangular frame with pattern	Ext
patnpen_line	Draw line with pen and pattern	Ext
patnpen_ovalarc	Draw oval arc with pen and pattern	Ext
patnpen_piearc	Draw pie arc with pen and pattern	Ext
patnpen_point	Draw point with pen and pattern	Ext
patnpen_polyline	Draw polyline with pen and pattern	Ext
pen_line	Draw line with pen	Ext
pen_ovalarc	Draw oval arc with pen	Ext

Table 3–8. Graphics Drawing Functions (Continued)

Function	Description	Type
pen_piearc	Draw pie arc with pen	Ext
pen_point	Draw point with pen	Ext
pen_polyline	Draw polyline with pen	Ext
put_pixel	Assign value to pixel	Ext
seed_fill	Fill region with color	Ext
seed_patnfill	Fill region with pattern	Ext
styled_line	Draw styled line	Ext
styled_oval	Draw styled oval	Ext
styled_ovalarc	Draw styled oval arc	Ext
styled_piearc	Draw styled pie arc	Ext

Table 3–9. Poly Drawing Functions

Function	Description	Type
draw_polyline	Draw polyline	Ext
fill_convex	Draw solid convex polygon	Ext
fill_polygon	Fill polygon	Ext
patnfill_convex	Pattern fill convex polygon	Ext
patnfill_polygon	Pattern fill polygon	Ext
patnpen_polyline	Pattern pen polyline	Ext
pen_polyline	Pen polyline	Ext

Table 3–10. Pixel Array Functions

Function	Description	Type
bitblt	Transfer bit-aligned block	Ext
decode_rect	Decode rectangular image	Ext
encode_rect	Encode rectangular image	Ext
set_dstbm	Set destination bitmap	Ext
set_srcbm	Set source bitmap	Ext
swap_bm	Swap source and destination bitmaps	Ext
zoom_rect	Zoom source rectangle	Ext

Table 3–11. Text Functions

Function	Description	Type
delete_font	Remove a font from font table	Ext
get_fontinfo	Return installed font information	Core
get_textattr	Return text-rendering attributes	Ext
get_text_xy	Return text x-y function	Core
in_font	Verify characters in font	Ext
init_text	Initialize text-drawing environment	Core
install_font	Install font into font table	Ext
select_font	Select an installed font	Ext
set_textattr	Set text-rendering attributes	Ext
set_text_xy	Set text x-y position	Core
text_out	Render ASCII string	Core
text_outp	Render ASCII string at current x-y position	Core
text_width	Return width of ASCII string	Ext

Table 3–12. Graphics Cursor Functions

Function	Description	Type
get_curs_state	Return current cursor state	Core
get_curs_xy	Return current cursor position	Core
set_curs_shape	Set current cursor shape	Core
set_curs_state	Make cursor visible/invisible	Core
set_curs_xy	Set current cursor position	Core
set_cursattr	Set current cursor attributes	Core

Table 3–13. Graphics Utility Functions

Function	Description	Type
cvxyl	Convert x-y address to linear address	Core
get_pixel	Return pixel value	Ext
get_wksp	Return workspace information	Core
lmo	Return leftmost one bit number	Core
peek_breg	Read from B-file register	Core
poke_breg	Write to B-file register	Core
rmo	Return rightmost one bit number	Core
set_wksp	Set workspace information	Core

Table 3–14. Handle-Based Memory Management Functions

Function	Description	Type
gsph_alloc	Allocate memory block	Core
gsph_calloc	Allocate and clear memory	Core
gsph_compact	Invoke memory compaction routine	Core
gsph_deref	Return pointer to memory block referenced by handle	Core
gsph_falloc	Allocate memory block with associated function	Core
gsph_fcalloc	Allocate and clear memory with associated function	Core
gsph_findhandle	Return handle to specified memory address	Core
gsph_findmem	Return type of memory	Core
gsph_free	Free block of memory	Core
gsph_init	Initialize all user memory and compact all segments	Core
gsph_maxheap	Return size of largest block without compaction	Core
gsph_memtype	Set characteristics of memory block	Core
gsph_realloc	Reallocate block of memory	Core
gsph_totalfree	Return size of largest block with compaction	Core

Table 3–15. Pointer-Based Memory Management Functions

Function	Description	Type
get_offscreen_memory	Return offscreen memory blocks	Core
gsp_calloc	Clear and allocate TMS340 memory	Core
gsp_free	Free TMS340 memory from allocation	Core
gsp_malloc	Allocate TMS340 memory	Core
gsp_maxheap	Return largest free block	Core
gsp_minit	Reinitialize dynamic memory pool	Core
gsp_realloc	Reallocate TMS340 memory	Core

Table 3–16. Data Input /Output Functions

Function	Description	Type
cop2gsp	Copy from coprocessor memory to TMS340 memory	Core
field_extract	Extract field from TMS340 memory	Core
field_insert	Insert field into TMS340 memory	Core
gsp2cop	Copy from TMS340 memory to coprocessor memory	Core
gsp2gsp	Transfer data within TMS340 memory	Core
gsp2host	Move data from TMS340 memory to host memory	Host
gsp2hostxy	Copy rectangular memory area from TMS340 to host	Host
host2gsp	Move data from host memory to TMS340 memory	Host
host2gspxy	Copy rectangular memory area from host to TMS340	Host

Table 3–17. Extensibility Functions

Function	Description	Type
create_alm	Create absolute load module	Host
create_esym	Create external symbol table file	Host
flush_esym	Flush external symbol table file	Host
flush_extended	Flush all user extensions	Host
get_isr_priorities	Return interrupt service routine priorities	Core
install_alm	Install absolute load module	Host
install_primitives	Install extended drawing functions	Host
install_rlm	Install relocatable load module	Host
set_module_state	Set state of loaded module	Core
sym_flush	Flush relocatable load module symbols	Core

Table 3–18. Interrupt Handler Functions

Function	Description	Type
get_vector	Return address at TMS340 trap vector	Core
page_busy	Return status of page flipping	Core
page_flip	Flip display and drawing pages	Core
set_interrupt	Set interrupt handler	Core
set_vector	Set contents of TMS340 trap vector	Core
wait_scan	Wait for scan line	Core

Chapter 4. Core Functions

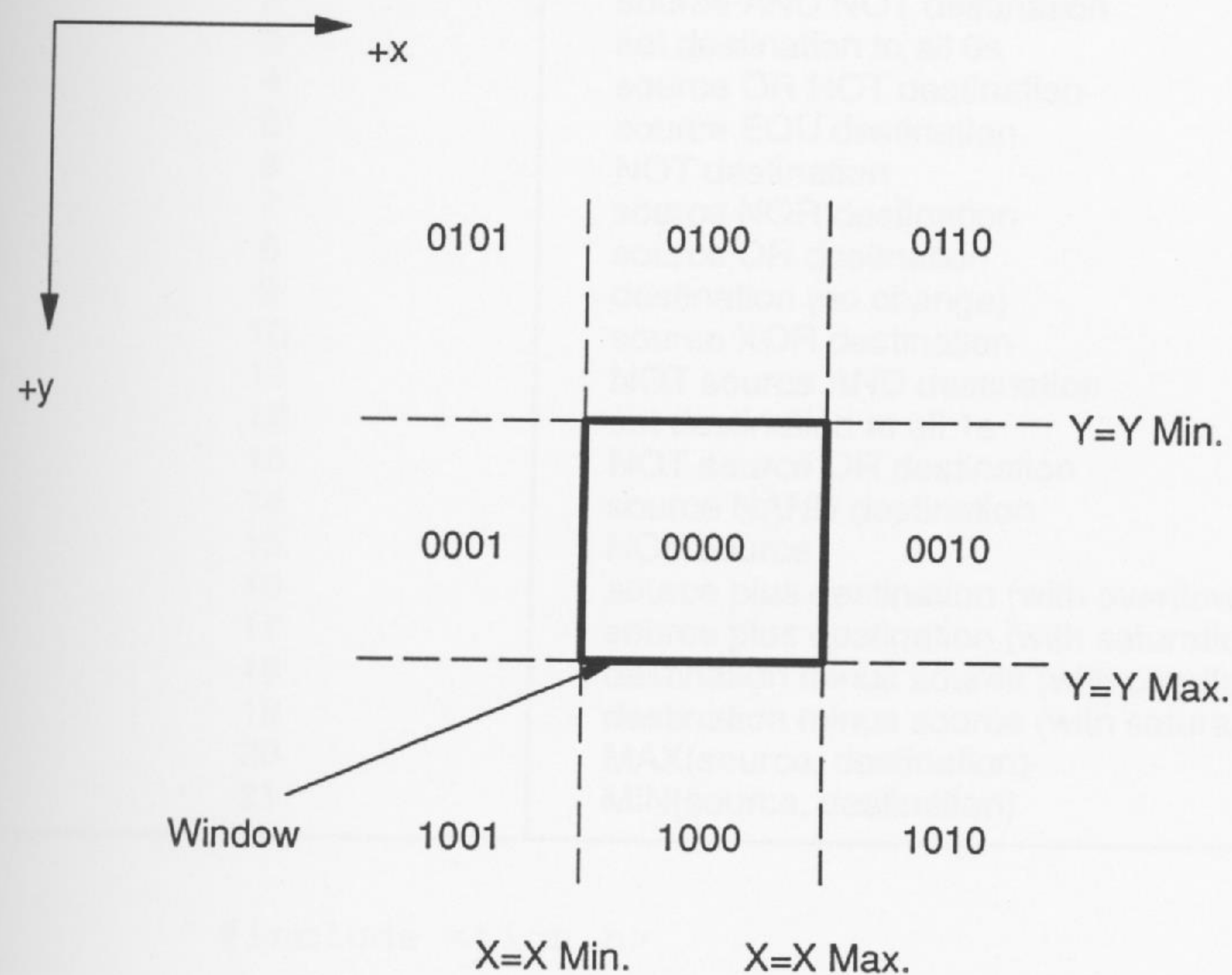*Syntax*

```
#include <tiga.h>

short cpw(x, y)
  short x, y;     /* pixel coordinates                              */
```

Figure 4–1. Outcodes for Lines Endpoints

Syntax
```
#include <tiga.h>

unsigned short get_ppop()
```

Table 4–1. Pixel-Processing Operations

PPOP Code	Description
0	replace destination with source
1	source AND destination
2	source AND NOT destination
3	set destination to all 0s
4	source OR NOT destination
5	source EQU destination
6	NOT destination
7	source NOR destination
8	source OR destination
9	destination (no change)
10	source XOR destination
11	NOT source AND destination
12	set destination to all 1s
13	NOT source OR destination
14	source NAND destination
15	NOT source
16	source plus destination (with overflow)
17	source plus destination (with saturation)
18	destination minus source (with overflow)
19	destination minus source (with saturation)
20	MAX(source, destination)
21	MIN(source, destination)

Syntax
```
#include <tiga.h>

void init_palet()
```

Description The init_palet function initializes the first 16 entries of the palette to the EGA default colors:

Index	Color
0	black
1	blue
2	green
3	cyan
4	red
5	magenta
6	brown
7	light gray
8	dark gray
9	light blue
10	light green
11	light cyan
12	light red
13	light magenta
14	yellow
15	white

Syntax

```
#include <tiga.h>
#include <typedefs.h>

void set_curs_shape(shape);
  PTR shape;
```

Example   Example masks for a simple crosshair cursor:

```
11111111111          00000000000
11110001111          00000000000
11110001111          00000100000
11110001111          00000100000
10000000001          00000100000
10000100001          00000100000
10000000001          00111011100
11110001111          00000100000
11110001111          00000100000
11110001111          00000100000
11111111111          00000000000
                     00000000000
```

MASKDATA   **SHAPEDATA**
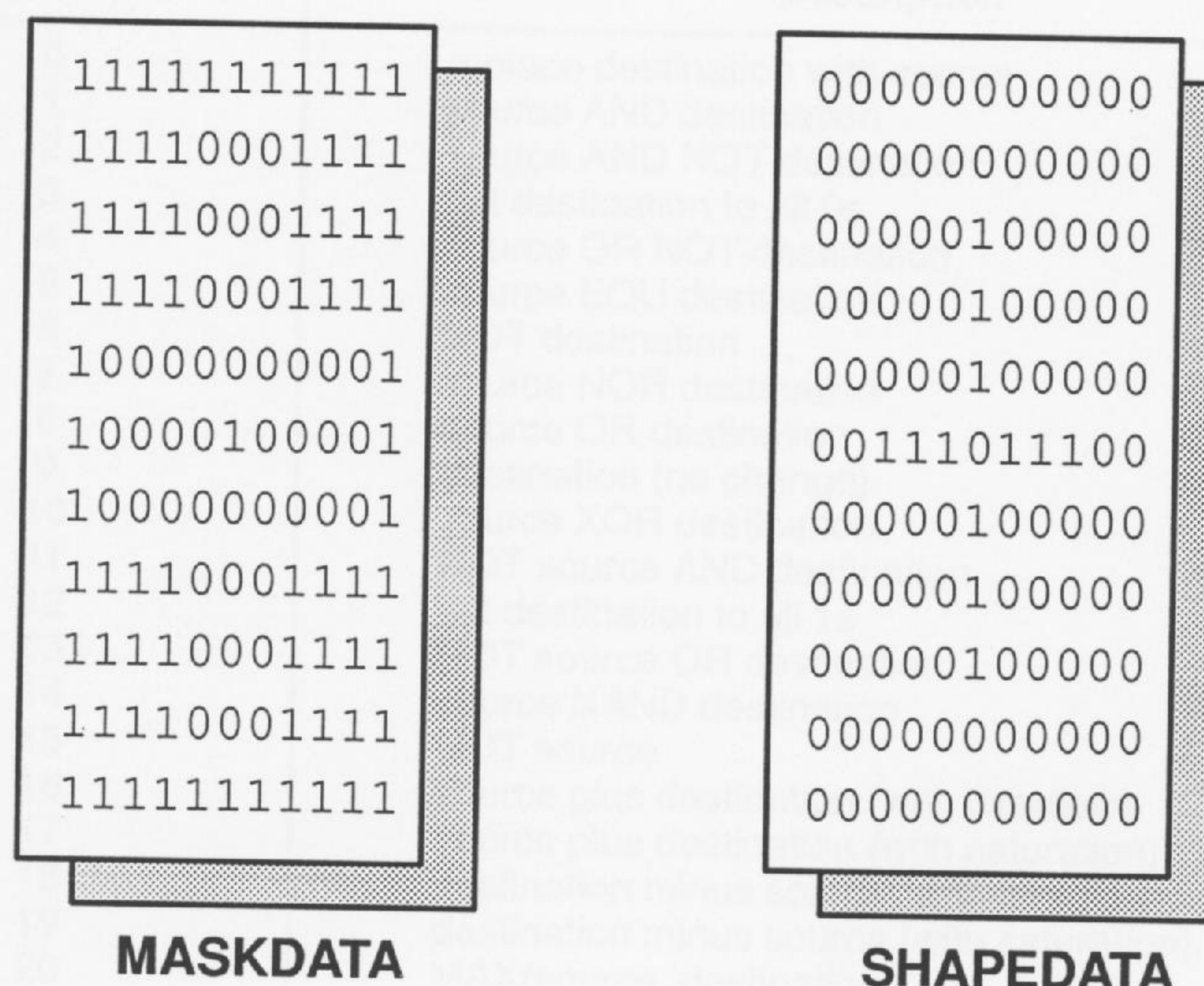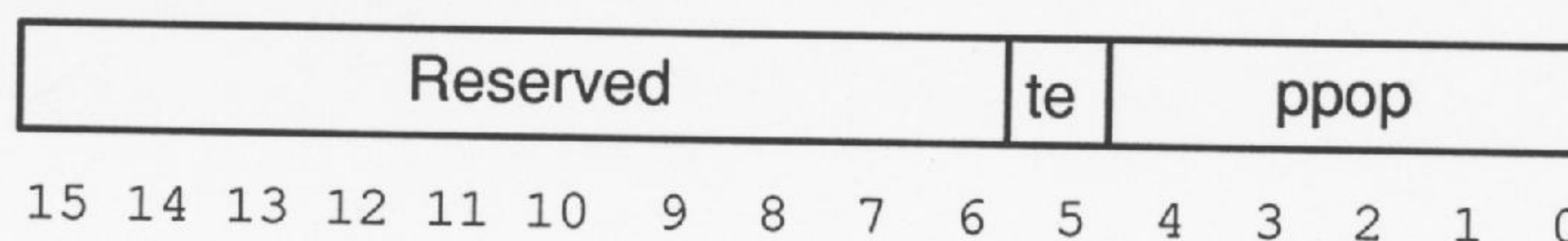
Syntax

```
#include <tiga.h>

void set_cursattr(shape_c, mask_c, shape_a, mask_a)
  unsigned long shape_c;   /* shape (foregnd.) curs. color */
  unsigned long mask_c;    /* mask (backgnd.) cursor color */
  unsigned short shape_a;  /* cursor shape attributes      */
  unsigned short mask_a;   /* cursor mask attributes       */
```

Description   The set_cursattr function changes the display attributes of the current active cursor. Only the attributes for the cursor currently selected are modified.

The shape_c and mask_c arguments specify the shape (foreground) and mask (background) colors, respectively. The values specified by these arguments are replicated by the current pixel size before use by the cursor routines. The mask_a and shape_a arguments define the raster op and transparency modes used when drawing the cursor on the screen. Each is a 16-bit value with bit fields defined as follows:

Reserved											te	ppop			
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Syntax
```
#include <tiga.h>

void set_ppop(ppop)
   short ppop;              /* pixel processing operation code  */
```

Table 4–2. *Pixel-Processing Operations*

PPOP Code	Description
0	replace destination with source
1	source AND destination
2	source AND NOT destination
3	set destination to all 0s
4	source OR NOT destination
5	source EQU destination
6	NOT destination
7	source NOR destination
8	source OR destination
9	destination (no change)
10	source XOR destination
11	NOT source AND destination
12	set destination to all 1s
13	NOT source OR destination
14	source NAND destination
15	NOT source
16	source plus destination (with overflow)
17	source plus destination (with saturation)
18	destination minus source (with overflow)
19	destination minus source (with saturation)
20	MAX(source, destination)
21	MIN(source, destination)

Chapter 5. Extended Graphics Library Functions

There are no illustrations or tables in this chapter.

Chapter 6. Graphics Library Conventions

Table 6–1. Geometric Types

Function Name	Geometric Type
line	A straight line
oval	An ellipse in standard position (major and minor axes aligned with the x-y coordinate axes)
ovalarc	An arc from an ellipse in standard position
point	A single point
polygon	A filled region bounded by a series of connected straight edges
polyline	A series of connected straight lines
piearc	A pie-slice-shaped wedge bounded by an arc (from an ellipse in standard position) and two straight edges (connecting the ends of the arc to the center of the ellipse)
rect	A rectangle with vertical and horizontal sides
seed	A pixel of a particular color designating a connected region of pixels of the same color

Table 6–2. Rendering Styles

Function Name	Rendering Style
draw	Draws a pixel-thick line, arc, or outline with the current foreground color.
styled	Similar to draw except that the line, arc, or outline is drawn using a repeating 32-bit line-style pattern that is rendered in the current foreground and background colors. Alternately, background pixels in the pattern are skipped.
pen	Traces a line or curve with a rectangular drawing pen, and fills the area swept out by the pen with the current background color.
patnpen	Similar to pen except that the area swept out by the pen is filled with a 16-by-16 area-fill pattern in the current foreground and background colors.
fill	Fills the interior of an object with the current foreground color.
patnfill	Similar to fill except that the object is filled with a 16-by-16 area-fill pattern in the current foreground and background colors.
frame	Fills a frame with the current foreground color. The area enclosed by the frame is not modified.
patnframe	Similar to frame except that the frame is filled with a 16-by-16 area-fill pattern in the current foreground and background colors.

Table 6–3. Checklist of Available Geometric Types and Rendering Styles

Geometric Type	Rendering Style							
	draw	styled	pen	patnpen	fill	patnfill	frame	patnframe
line	√	√	√	√				
oval	√	√			√	√	√	√
ovalarc	√	√	√	√				
piearc	√	√	√	√	√	√		
point	√		√	√				
polygon					√	√		
polyline	√		√	√				
rect	√				√	√	√	√
seed					√	√		

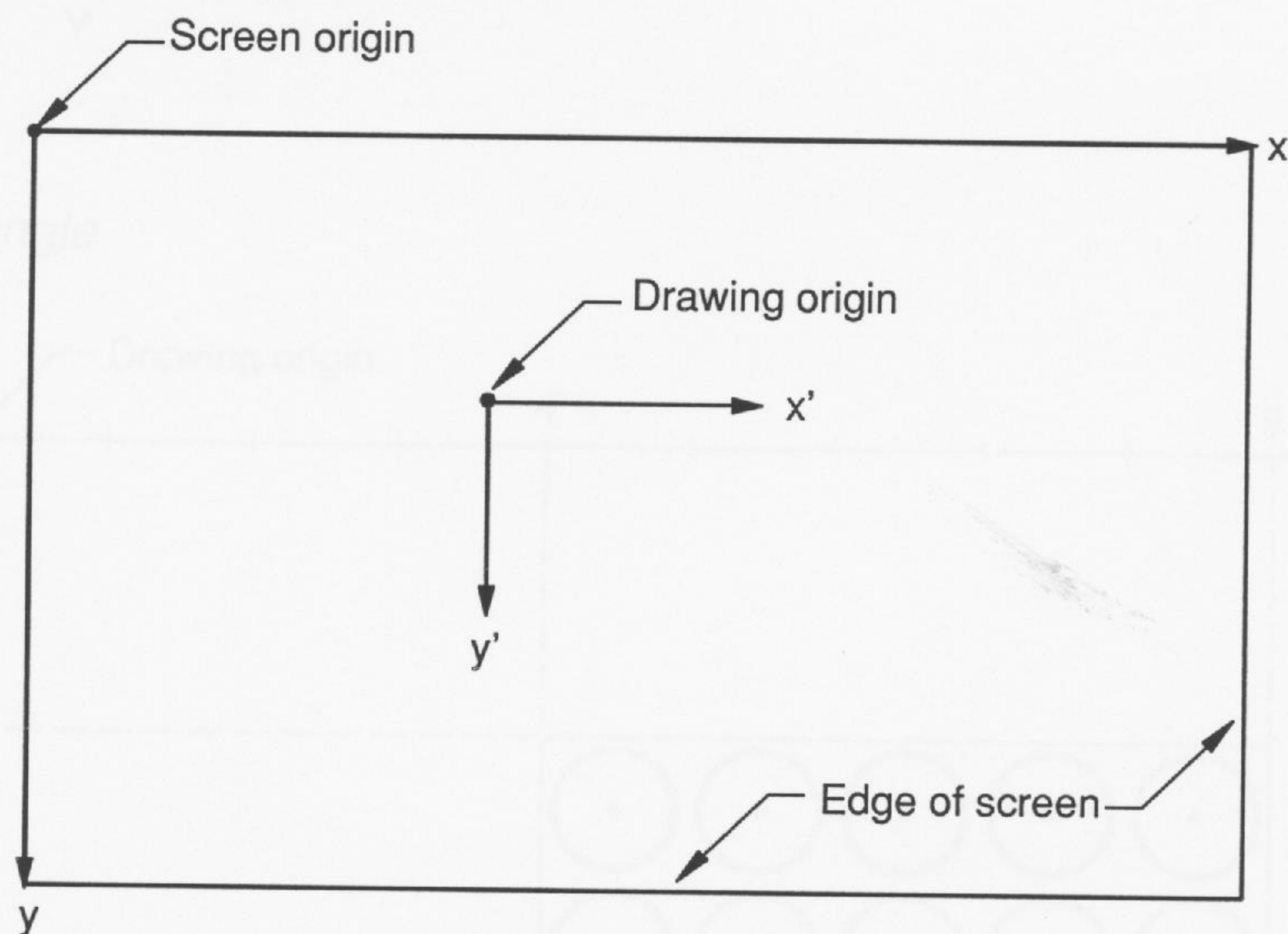*Figure 6–1.* Screen Coordinates and Drawing Coordinates

Figure 6–2. Mapping of Pixels to Coordinate Grid
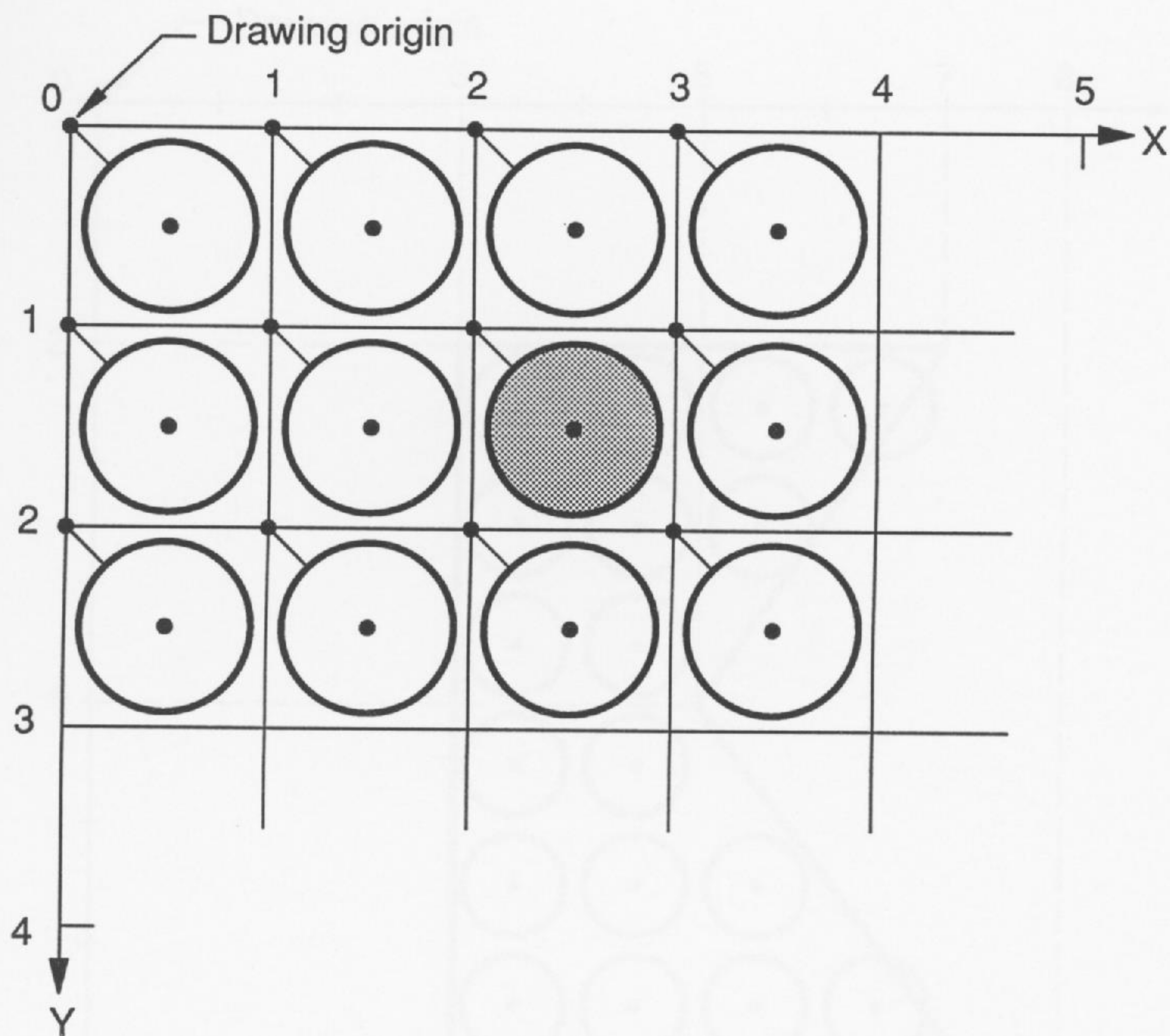

Figure 6–3. A Filled Rectangle
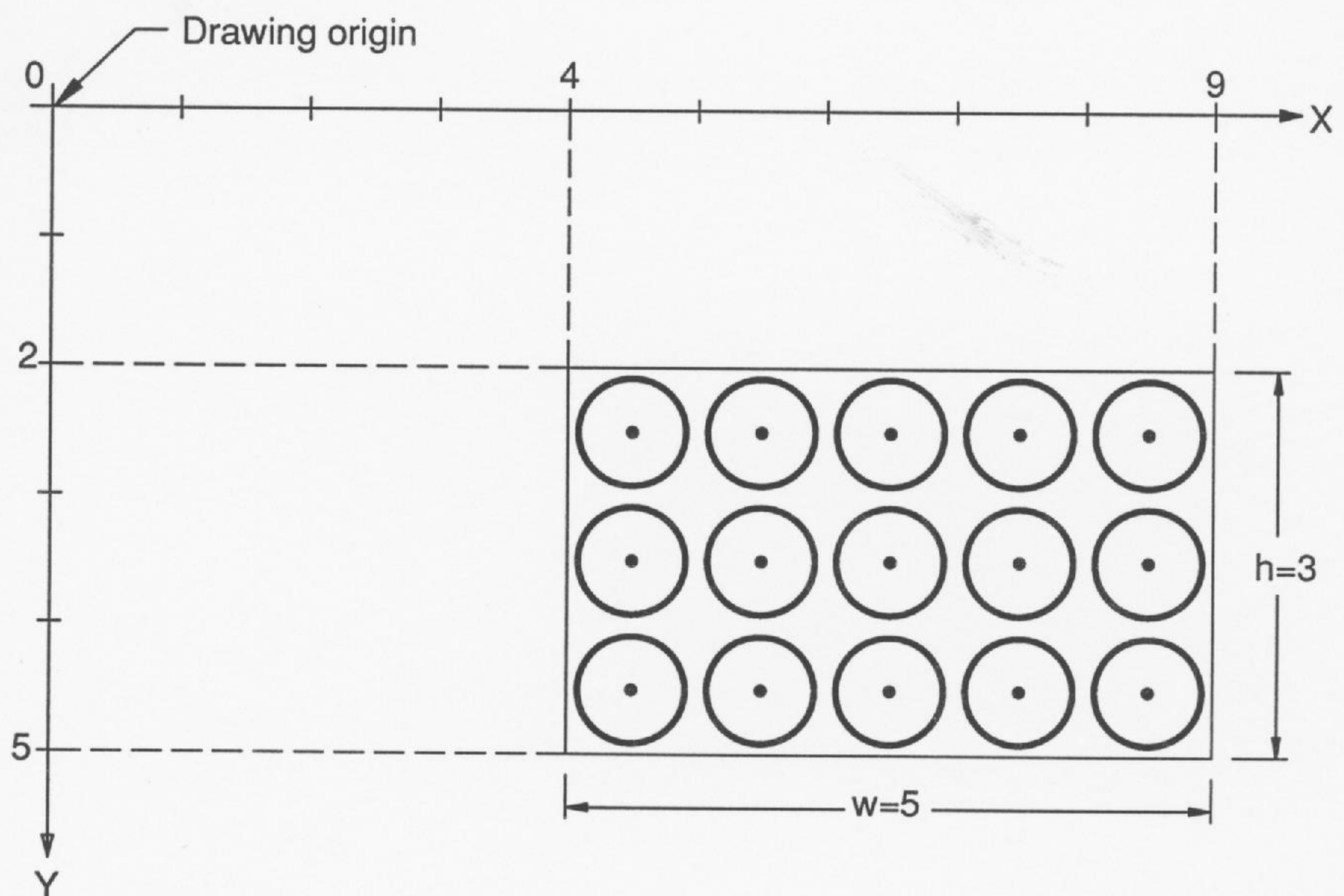
Figure 6–4. A Filled Polygon
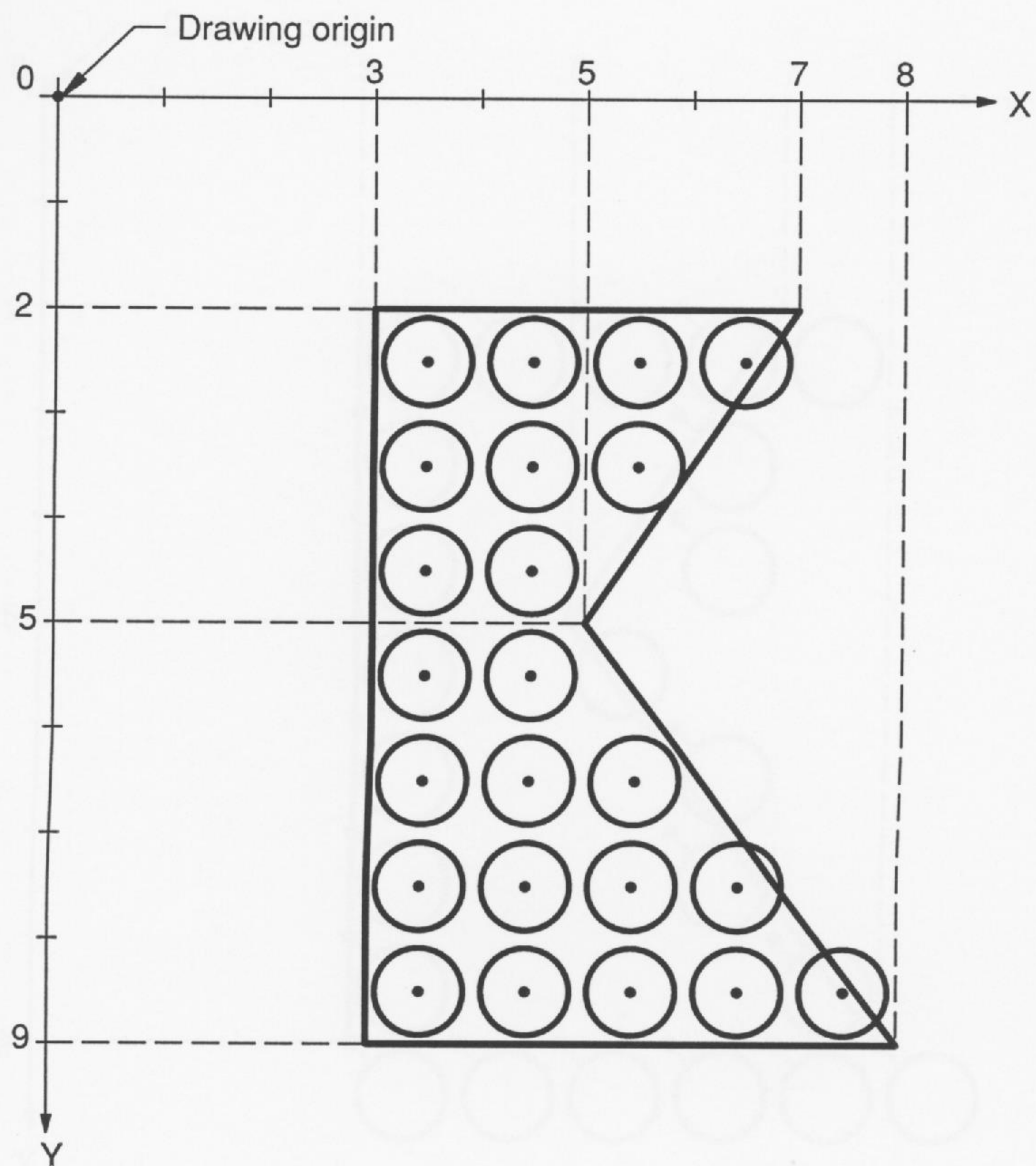
Figure 6–5. An Outlined Polygon
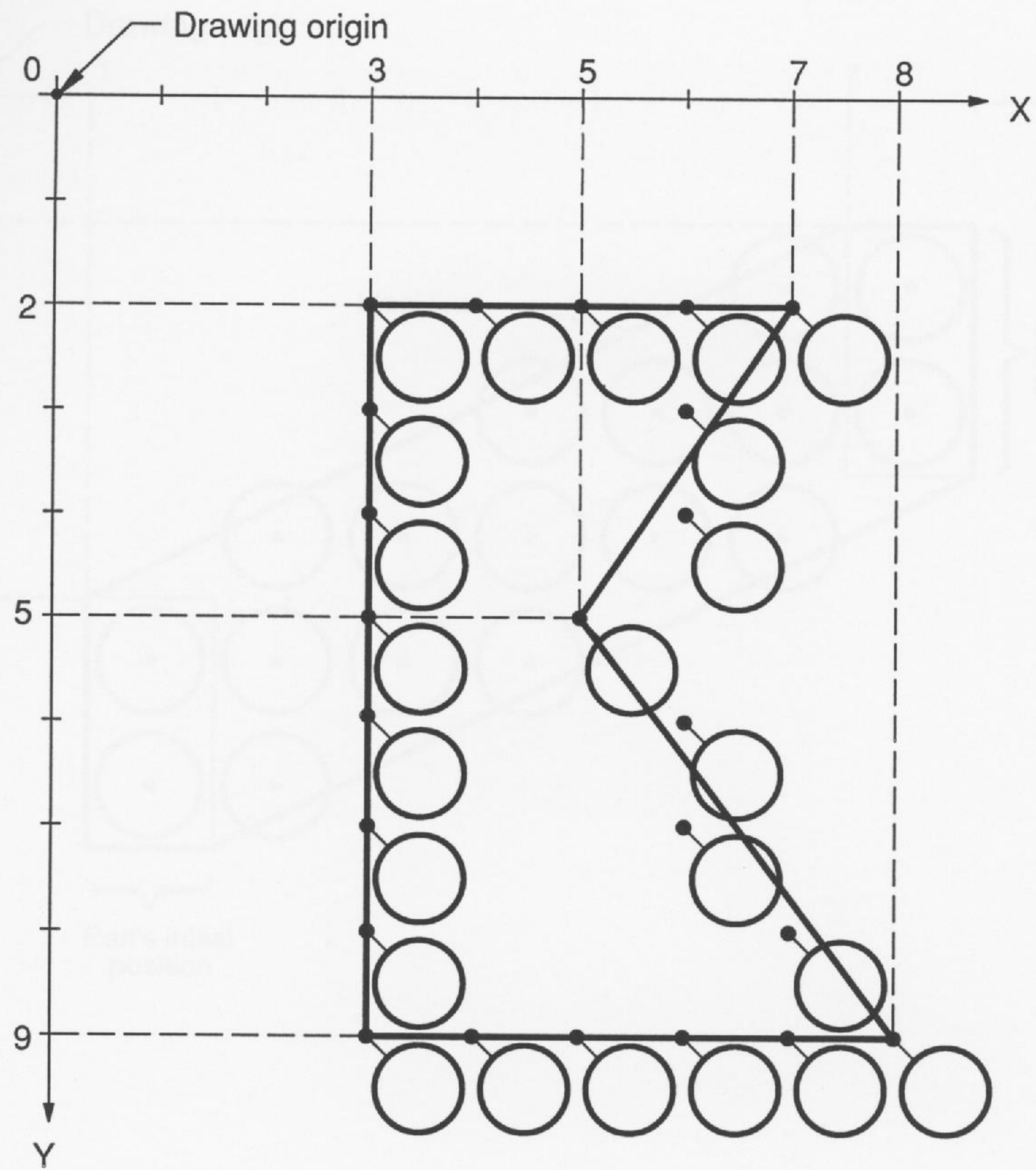
Figure 6–6. A Line Drawn by a Pen
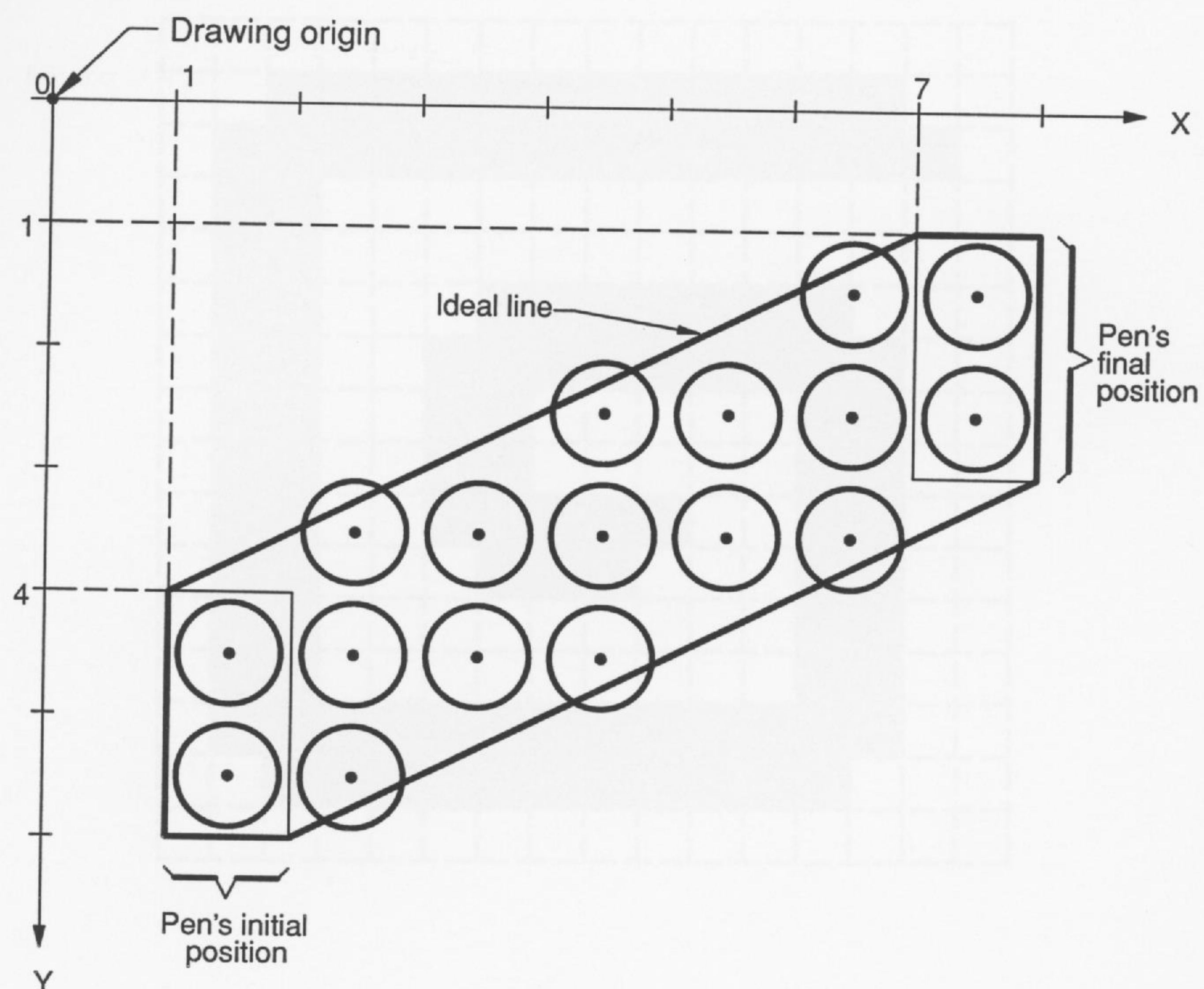
Figure 6–7. A 16-by-16 Area-Fill Pattern
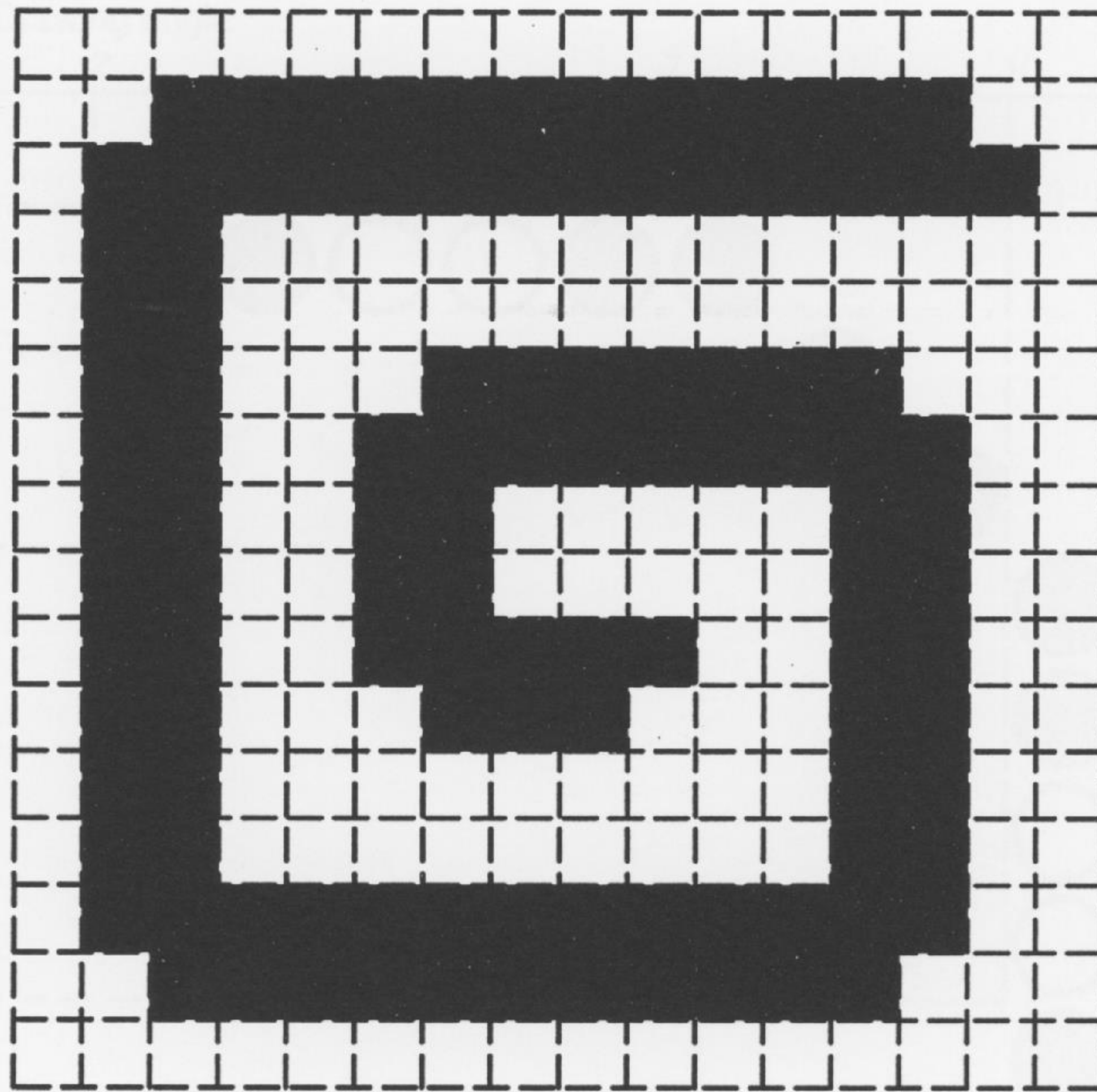
Figure 6–8. Three Connected Styled Lines

Table 6–4. Boolean Pixel-Processing Operation Codes

PPOP Code	Description
0	replace destination with source
1	source AND destination
2	source AND NOT destination
3	set destination to all 0s
4	source OR NOT destination
5	source EQU destination
6	NOT destination
7	source NOR destination
8	source OR destination
9	destination (no change)
10	source XOR destination
11	NOT source AND destination
12	set destination to all 1s
13	NOT source or destination
14	source NAND destination
15	NOT source

Table 6–5. Arithmetic Pixel-Processing Operation Codes

PPOP Code	Description
16	source plus destination (with overflow)
17	source plus destination (with saturation)
18	destination minus source (with overflow)
19	destination minus source (with saturation)
20	MAX(source, destination)
21	MIN(source, destination)

Chapter 7. Bit-Mapped Text

Table 7–1. Text-Related Functions

Function	Description	Type
delete_font	Remove a font from font table	Ext
get_fontinfo	Return installed font information	Core
get_textattr	Return text-rendering attributes	Ext
get_text_xy	Return text x-y position	Core
in_font	Verify characters in font	Ext
init_text	Initialize text-drawing environment	Core
install_font	Install font into font table	Ext
select_font	Select an installed font	Ext
set_textattr	Set text rendering attributes	Ext
set_text_xy	Set text x-y position	Core
text_out	Render ASCII string	Core
text_outp	Render ASCII stirng at current x-y position	Core
text_width	Return width of an ASCII string	Ext

Figure 4–1. Bit-Mapped Font Parameters
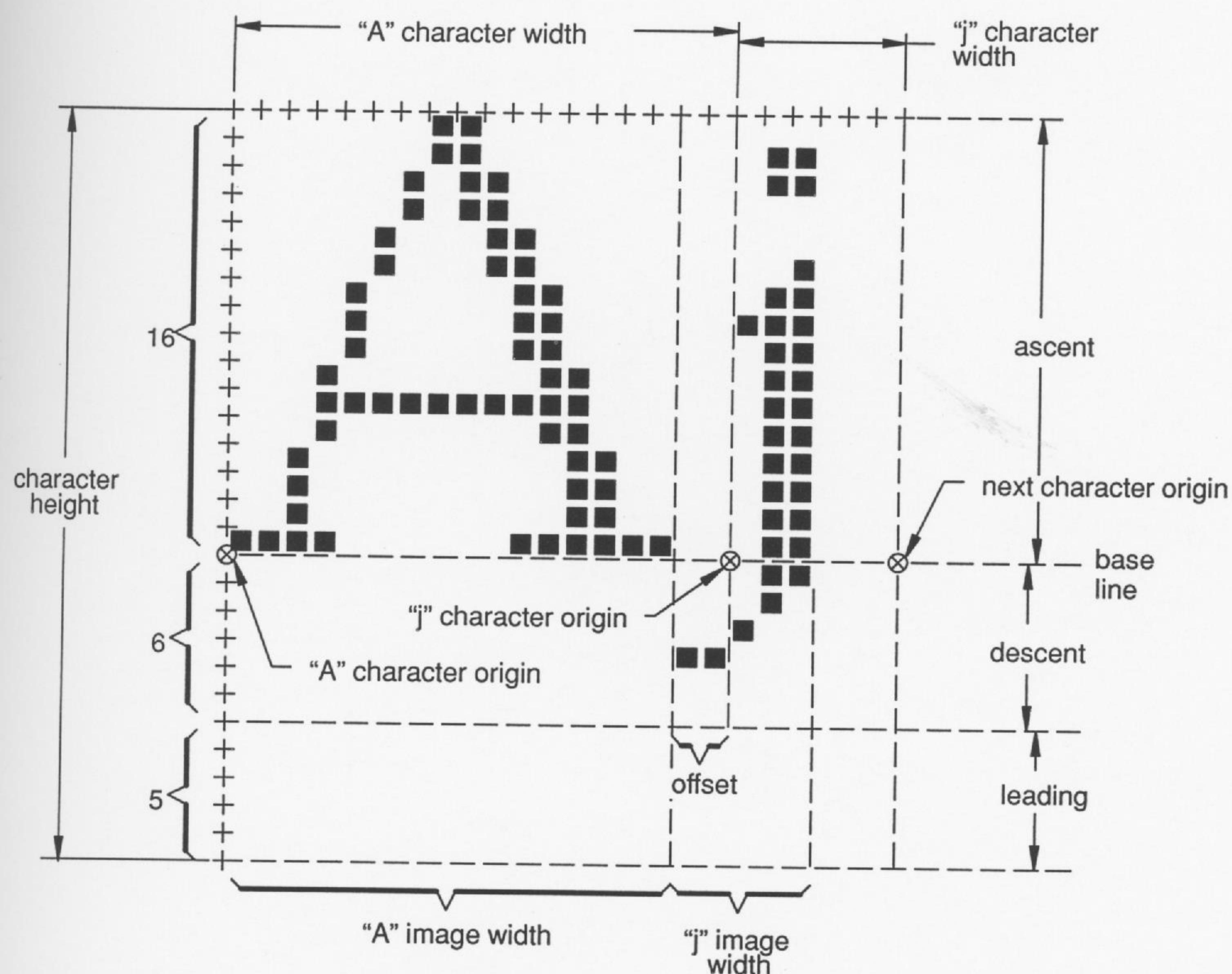
Figure 7–2. Data Structure for Bit-Mapped Fonts

Header
Pattern table
Location table
Offset/width table

Figure 7–3. Bit-Mapped Font Representation

Row pitch

Characters not shown

Character height
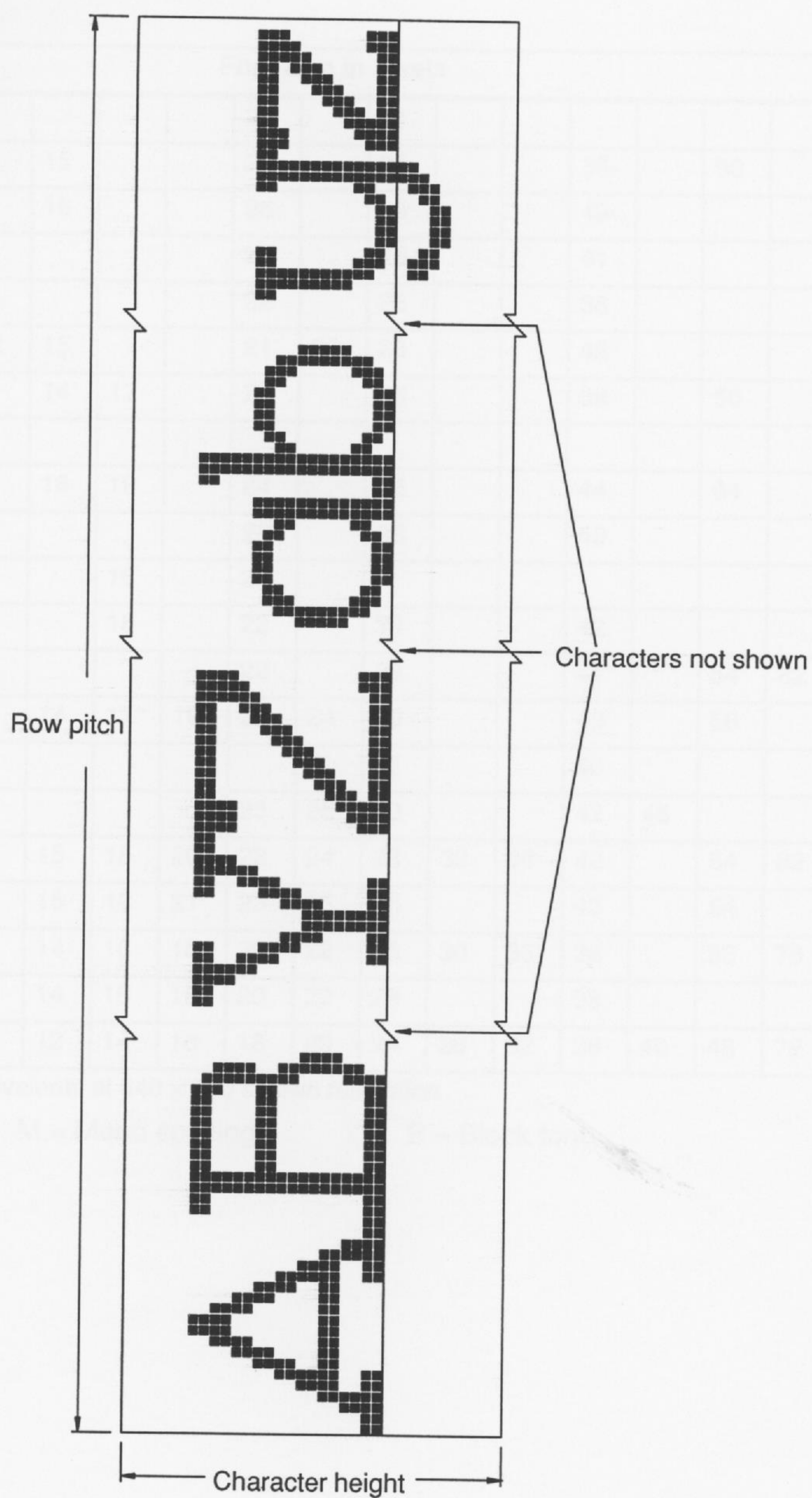
Table 7–2. Font Database Summary

Font Name					Font Size in Pixels											Type†
	05	09	10	12	14	16	18	20	24	28	32	36	40	48	72	
Arrows							25		31							M
Austin		11		15			20		25			38		50		P
Corpus Christi		15		16			26		29			49				M
Devonshire							23		28			41				P
Fargo							22		26			38				P
Galveston			12	15			21	22	28			42				P
Houston				14	17		20		26			38		50		P
Luckenbach	07															P
Math				16	19		24		32			44		64		P
San Antonio							22		28			40				P
System					16		24									B
Tampa					18		22		30			42				P
TI Art Nouveau							22		28			41		54	82	P
TI Bauhaus		11		14	17	19	22	24	28			43		56		P
TI Cloister									27			40				P
TI Dom Casual							23	25	30			42	46			P
TI Helvetica		11		15	18	20	22	24	28	32	36	42		54	82	P
TI Park Avenue				15	18	21	23	25	28			43		54		P
TI Roman		11		14	16	18	20	22	26	30	33	38		52	78	P
TI Typewriter Elite		11		14	16	18	20	22	26			38				M

Point size equivalents at 640 × 480 screen resolution

† P = Proportional spacing   M = Mono spacing   B = Block font

Table 7–3. Installable Font Names

Font Name	Font Filename (all have `.fnt` extension)
Arrows font sizes 25 and 31:	arrows25, arrows31
Austin font sizes 11 through 50:	austin11, austin15, austin20, austin25, austin38, austin50
Corpus Christi font sizes 15 through 49:	corpus15, corpus16, corpus26, corpus29, corpus49
Devonshire font sizes 23 through 41:	devons23, devons28, devons41
Fargo font sizes 22 through 38:	fargo22, fargo26, fargo38
Galveston font sizes 12 through 42:	galves12, galves15, galves21, galves22, galves28, galves42
Houston font sizes 14 through 50:	houstn14, houstn17, houstn20, houstn26, houstn38, houstn50
Luckenbach font size 7:	lucken07
Math font sizes 16 through 64:	math16, math19, math24, math32, math44, math64
San Antonio font sizes 22 through 40:	sanant22, sanant28, sanant40
System font sizes 16 and 24	sys16, sys24
Tampa font sizes 18 through 42:	tampa18, tampa22, tampa30, tampa42
TI Art Nouveau font sizes 22 through 82:	ti_art22, ti_art28, ti_art41, ti_art54, ti_art82
TI Bauhaus font sizes 11 through 56:	ti_bau11, ti_bau14, ti_bau17, ti_bau19, ti_bau22, ti_bau24, ti_bau28, ti_bau43, ti_bau56
TI Cloister font sizes 27 and 40:	ti_clo27, ti_clo40
TI Dom Casual font sizes 23 through 46:	ti_dom23, ti_dom25, ti_dom30, ti_dom42, ti_dom46
TI Helvetica font sizes 11 through 82:	ti_hel11, ti_hel15, ti_hel18, ti_hel20, ti_hel22, ti_hel24, ti_hel28, ti_hel32, ti_hel36, ti_hel42, ti_hel54, ti_hel82
TI Park Avenue font sizes 15 through 54:	ti_prk15, ti_prk18, ti_prk21, ti_prk23, ti_prk25, ti_prk28, ti_prk43, ti_prk54
TI Roman font sizes 11 through 78:	ti_rom11, ti_rom14, ti_rom16, ti_rom18, ti_rom20, ti_rom22, ti_rom26, ti_rom30, ti_rom33, ti_rom38, ti_rom52, ti_rom78
TI Typewriter Élite font sizes 11 through 38:	ti_typ11, ti_typ14, ti_typ16, ti_typ18, ti_typ20, ti_typ22, ti_typ26, ti_typ38

ARROWSxx

Spacing:	Monospace
Derivation:	Original character set, no typesetter's equivalent
Description:	Graphic accents, arrows, and symbols suitable for use in memos, transparencies, posters, flyers, and newsletters.
Sizes:	25 and 31 pixels

AUSTINxx

Spacing: Proportional
Derivation: Original typeface, no typesetter's equivalent
Description: An upright, bold-weight, sans-serif typeface. Suited to many purposes. Smaller sizes serve well for general usage as body text or headings, while larger sizes are ideal for headlines and titles.
Sizes: 11, 15, 20, 25, 38, and 50 pixels

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
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1			!	1	A	Q	a	q								
2			"	2	B	R	b	r								
3			#	3	C	S	c	s								
4			$	4	D	T	d	t								
5			%	5	E	U	e	u								
6			&	6	F	V	f	v								
7			'	7	G	W	g	w								
8			(	8	H	X	h	x								
9			)	9	I	Y	i	y								
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CORPUS__CHRISTIxx

Spacing: Monospace
Derivation: Original character set, no typesetter's equivalent
Description: Designed as a terminal display font. 16-pixel size renders a 'standard' 80-column display at 640 x 480 resolution. 29-pixel renders a 40-column display at the same resolution. Light- to bold-weight, depending on size.
Sizes: 15, 16, 26, 29, 49 pixels

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
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1			!	1	A	Q	a	q								
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8			(	8	H	X	h	x								
9			)	9	I	Y	i	y								
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DEVONSHIRExx

Spacing: Proportional
Derivation: Original character set, no typesetter's equivalent
Description: A light-weight, stylized serif typeface. Elongated ascenders and descenders distinguish this font. Suitable for invitations, newsletters, flyers, or anything requiring a formal appearance.
Sizes: 23, 28, and 41 pixels

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
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FARGOxx

Spacing: Proportional
Derivation: Original character set, no typesetter's equivalent
Description: An upright, medium-weight serif face. Small sizes suited for diagrams and labels. Larger sizes are well suited to headlines and posters.
Sizes: 22, 26, and 38 pixels

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
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1			!	1	A	Q	a	q								
2			"	2	B	R	b	r			¢					
3			#	3	C	S	c	s								
4			$	4	D	T	d	t								
5			%	5	E	U	e	u								
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7			'	7	G	W	g	w								
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GALVESTONxx

Spacing: Proportional
Derivation: Original character set, no typesetter's equivalent
Description: An upright, bold-weight serif face. Suited to many purposes. Smaller sizes serve well for general usage as body text or headings, while larger sizes are ideal for headlines and titles.
Sizes: 12, 15, 21, 22, 28, and 42 pixels

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
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HOUSTONxx

Spacing: Proportional
Derivation: Original character set, no typesetter's equivalent
Description: An upright, light- to medium-weight serif typeface. Suited to many purposes. Smaller sizes serve well for general usage as body text or headings while larger sizes are ideal for headlines and titles.
Sizes: 14, 17, 20, 26, 38, and 50 pixels

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p								
1			!	1	A	Q	a	q								
2			"	2	B	R	b	r								
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LUCKENBACHxx

Spacing: Proportional
Derivation: Original character set, no typesetter's equivalent
Description: Designed as the smallest legible font at 640 x 480 resolution. Useful
                for diagrams or any other task requiring very small text.
Sizes: 07 pixels

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
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1			!	1	A	Q	a	q								
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6			&	6	F	V	f	v								
7			'	7	G	W	g	w								
8			(	8	H	X	h	x								
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MATHxx

Spacing: Proportional
Derivation: Original character set, no typesetter's equivalent
Description: Math and Greek symbols, including subscripts and superscripts.
             Light- to medium-weight, depending on size.
Sizes: 16, 19, 24, 32, 44, and 64 pixels

→αστε ιν ρθιντινλ Φετεθμινεσ τηε λοθμ τυρολθα｜ τακεσ. →ηε σεωεψτιον ολ α ψονλθξοξσ τυρελαψε, τ Υξαιωιτυ ανφ σξιταβιωιτυ

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SAN__ANTONIOxx

Spacing: Proportional
Derivation: Original character set, no typesetter's equivalent
Description: A serif typeface with hollow (commonly called 'in-line') uprights. Distinctive and semi-formal in appearance, ideal for memos, newsletters, flyers, and headings.
Sizes: 22, 28, and 40 pixels

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
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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	å	û	ª	╢	╞	╓	µ	÷
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TAMPAxx

Spacing: Proportional
Derivation: Original character set, no typesetter's equivalent
Description: A bold- to medium-weight serif typeface. Small sizes suited for diagrams and labels. Larger sizes are well suited to headlines and posters.
Sizes: 18, 22, 30, and 42 pixels

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
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5			%	5	E	U	e	u								
6			&	6	F	V	f	v								
7			'	7	G	W	g	w								
8			(	8	H	X	h	x								
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TI__ART__NOUVEAUxx

Spacing: Proportional
Derivation: Art Nouveau
Description: A bold-weight, stylized serif typeface. Very ornate; perfect for flyers, posters, and newsletters.
Sizes: 22, 28, 41, 54, and 82 pixels

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
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TI_BAUHAUSxx

Spacing: Proportional
Derivation: Bauhaus Medium
Description: A medium-weight san-serif typeface. General purpose font suited to all uses. Commonly seen on business cards, letterheads, magazines, and other publications.
Sizes: 11, 14, 17, 19, 22, 24, 28, 43, 56 pixels

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
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6			&	6	F	V	f	v			¶					
7			'	7	G	W	g	w			ß			◇		
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TI_CLOISTERxx

Spacing:	Proportional
Derivation:	Cloister Black
Description:	A highly stylized, bold-weight 'Olde English' typeface. Best suited for invitations, posters, and flyers. Very decorative.
Sizes:	27 and 40 pixels

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p						~		
1			!	1	A	Q	a	q						~		
2			"	2	B	R	b	r								
3			#	3	C	S	c	s								
4			$	4	D	T	d	t								
5			%	5	E	U	e	u								
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9			)	9	I	Y	i	y								
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TI__DOM__CASUALxx

Spacing: Proportional
Derivation: Dom Casual
Description: A bold-weight semi-cursive typeface. Distinctive and informal. Ideal for newsletters, posters, and flyers.
Sizes: 23, 25, 30, 42, and 46 pixels

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
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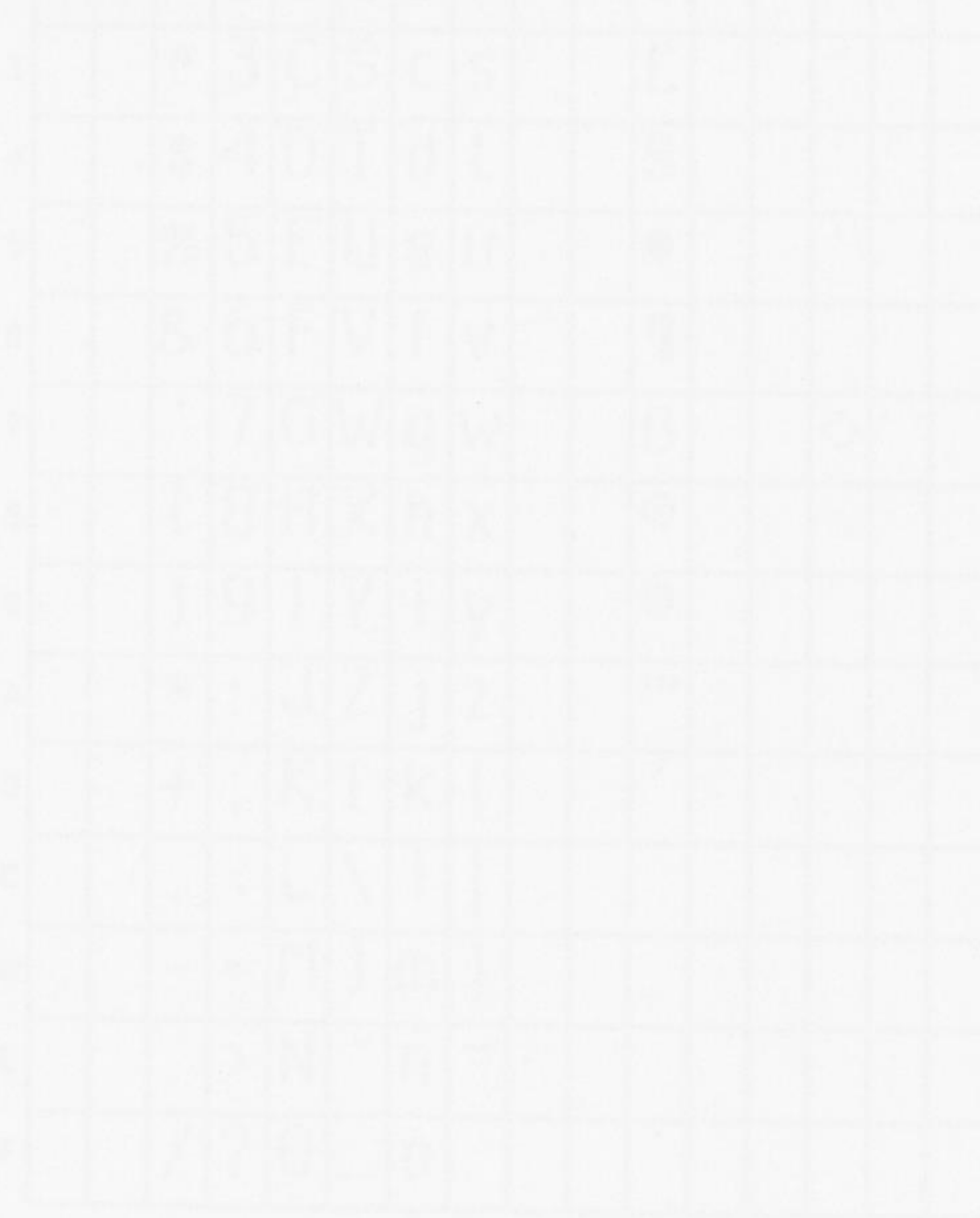
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TI__PARK__AVENUExx

Spacing: Proportional
Derivation: Park Avenue/Zapf Chancery
Description: A medium-weight, ornate cursive typeface. Suited to many purposes. Commonly seen on wedding invitations but appropriate wherever a 'formal' font is desired.
Sizes: 15, 18, 21, 23, 25, 28, 43, and 54 pixels

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
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TI_HELVETICAxx

Spacing: Proportional
Derivation: Helvetica
Description: A light-weight sans-serif typeface. Patterned after one of the most widely used typefaces in the United States. Appropriate for use in all business-related applications, particularly correspondence and newsletters.
Sizes: 11, 15, 18, 20, 22, 24, 28, 32, 36, 42, 54, and 82 pixels

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TI_ROMANxx

Spacing: Proportional
Derivation: Times-Roman
Description: A light- to medium-weight serif typeface. Patterned after the most widely used typeface in the United States and most English speaking countries. Appropriate for use in all business-related applications, particularly correspondence and newsletters.
Sizes: 11, 14, 16, 18, 20, 22, 26, 30, 33, 38, 52, and 78 pixels

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5			%	5	E	U	e	u			•			'		
6			&	6	F	V	f	v			¶					
7			'	7	G	W	g	w			ß			◇		
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TI__TYPEWRITER__ELITExx

Spacing: Monospace
Derivation: Typewriter Elite
Description: A light-weight serif typeface. Small sizes suited to correspondence
                and newsletters. Larger sizes perfect for labels and headlines.
Sizes: 11, 14, 16, 18, 20, 22, 26, and 38 pixels

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
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1			!	1	A	Q	a	q								
2			"	2	B	R	b	r								
3			#	3	C	S	c	s								
4			$	4	D	T	d	t								
5			%	5	E	U	e	u								
6			&	6	F	V	f	v								
7			'	7	G	W	g	w								
8			(	8	H	X	h	x								
9			)	9	I	Y	i	y								
A			*	:	J	Z	j	z								
B			+	;	K	[	k	{								
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The quick brown fox jumps over the lazy dog.

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Chapter 8. Extensibility

8.4.1 Command Number Format

User extensions that are installed in a DLM are identified by a unique command number. This command number consists of a 16-bit word split into the following fields, as Figure 8–1. shows:

Figure 8–1. Command Number Format
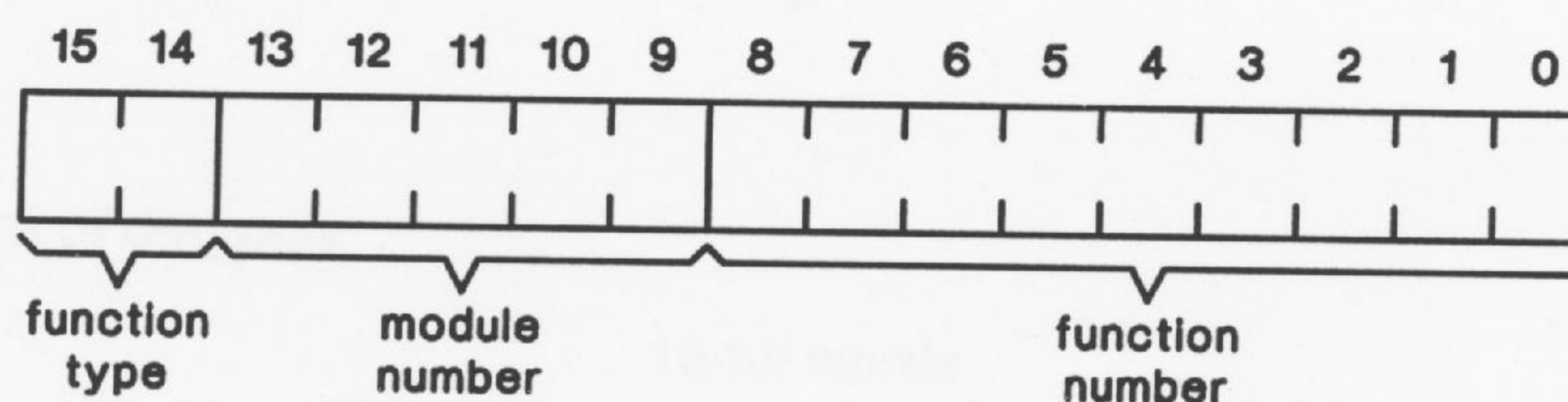
Table 8–1. Keyword Equivalent Types

Keyword	Microsoft C Equivalent Type
BYTE	8-bit unsigned char
WORD	16-bit unsigned short
DWORD	32-bit signed long
SWORD	16-bit signed short
DOUBLE	64-bit double floating-point

Figure 8–2. Data Structure of dm_cmd
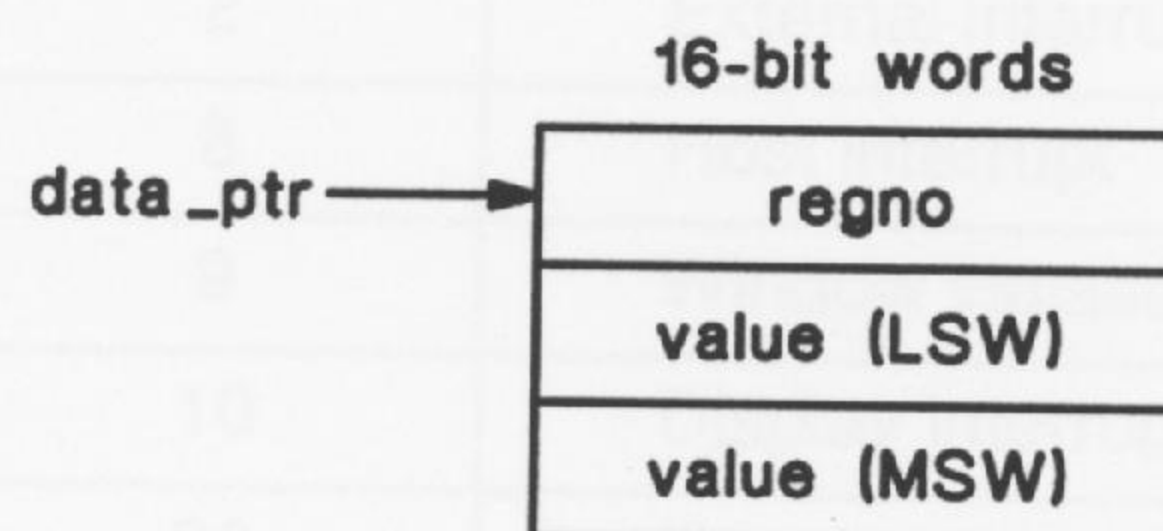
Figure 8–3. Data Structure of dm_psnd

16-bit words

data_ptr →	numpts × 4	
	pts[0].x	x coordinate of first point
	pts[0].y	y coordinate of first point
	pts[1].x	x coordinate of second point
	pts[1].y	y coordinate of second point
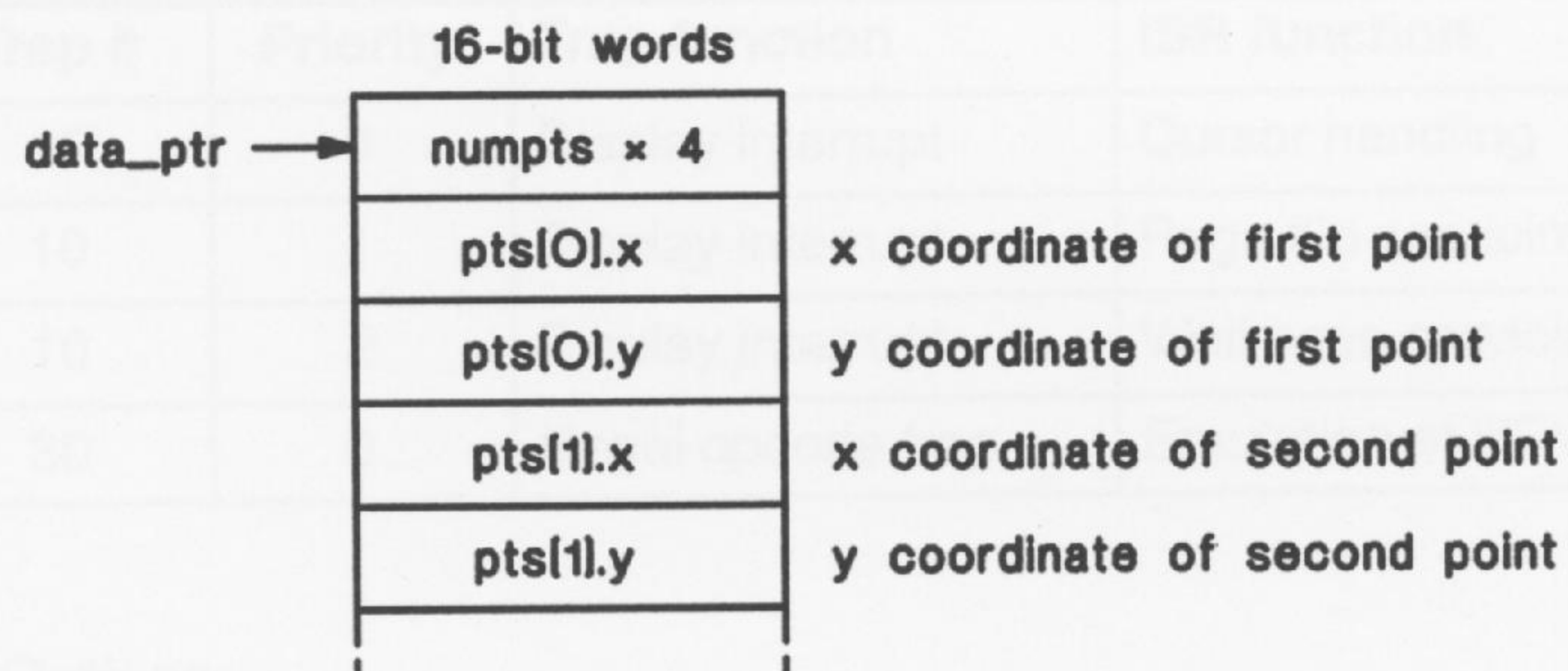
Figure 8–4. Data Structure of dm_poly

16-bit words

data_ptr →	total number of packets
	number of packets in a burst
	packets sent
	packets used
	start of packet 1
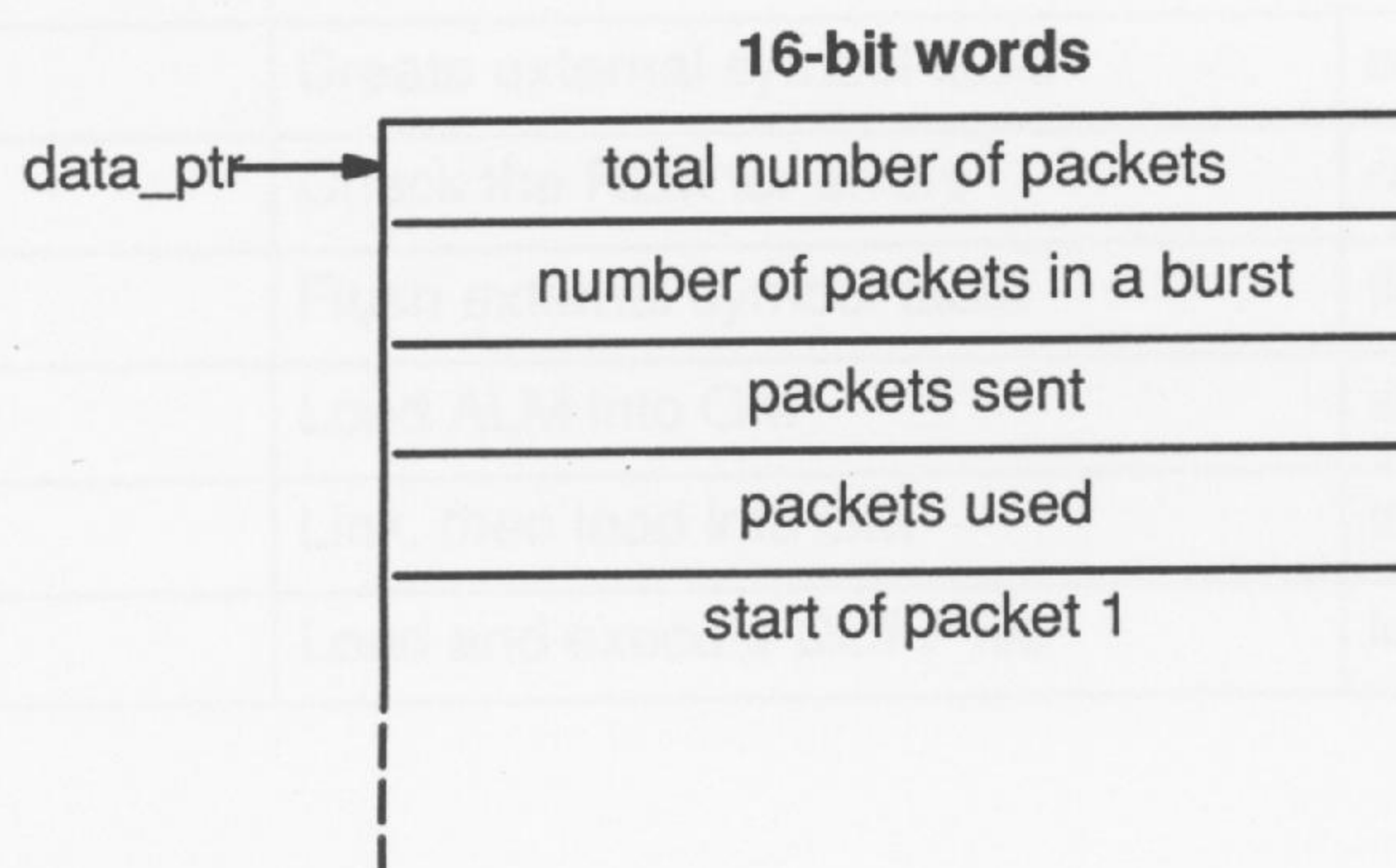
Table 8–2. Trap Vectors

Trap	Description	Mnemonic
1	External interrupt 1	X1
2	External interrupt 2	X2
8	Host interrupt	HI
9	Window violation interrupt	WV
10	Display interrupt	DI
30	Illegal opcode interrupt	ILLOP

Table 8–3. Interrupt Service Routines

Trap #	Priority	Trap function	ISR function
10	0	Display interrupt	Cursor handling
10	1	Display interrupt	Page flip servicing
10	2	Display interrupt	Wait scan servicing
30	0	Illegal opcode trap	Emulation of REV instruction

Table 8–4. Linking Loader Options

Option	Files	Description	Equivalent Function
-ca	RLMNAME, ALMNAME	Link, then create an ALM	create_alm
-cs	COFFNAME	Create external symbol table	create_esym
-ec	RLMNAME	Check the RLM for errors	none
-fs	SYMNAME	Flush external symbol table	flush_esym
-la	ALMNAME	Load ALM into GM	install_alm
-lr	RLMNAME	Link, then load into GM	install_rlm
-lx	COFFNAME	Load and execute COFF file	load_coff / gsp_execute

Appendix A Data Structures

A.1 MODEINFO Structure

Color Class	Color Description	Palette		Color Type		Pixel Value	
		R/W	Fixed	Color	Gray	Index	RGB
0	Gray scale	√			√	√	
1	Static gray		√		√	√	
2	Pseudo color	√		√		√	
3	Static color		√	√		√	
4	Direct color	√		√			√
5	True color		√	√			√

Appendix B Reserved Symbols

B.1 Reserved Functions

add_interrupt
add_module
del_all_modules
del_interrupt
del_module
get_memseg
get_module
get_msg
get_state
get_xstate
gm_is_alive
handshake
init_cursor
init_interrupts
init_video_regs
makename

oem_init
read_hstaddr
read_hstadrh
read_hstadrl
read_hstctl
read_hstdata
rstr_commstate
save_commstate
set_memseg
set_msg
set_xstate
write_hstaddr
write_hstadrh
write_hstadrl
write_hstctl
write_hstdata

B.2 TIGA Core Functions Symbols

IsrCStk
IsrEntryTable
IsrSrv
_CoreFunc
_CursorISR
_DEFAULT_PALET
_DefaultCursor
_DiTable
_IsrEnabled
_ModIntIoRegs
_Module
_NextDiEntry
_OutTTY
_PageFlipISR
_TrapVector
_WaitScanISR
_abort
_add_interrupt
_add_module
_ai_rev
_atexit
_c_int00
_cb_buffer
_cb_size
_check_dpyint
_clear_frame_buffer
_clear_page
_clear_screen
_comm_info
_config
_cpacket
_cpw
_csa
_curs_offset

_cvxyl
_default_setup
_del_all_modules
_del_interrupt
_del_module
_delay
_dm_clear_frame_buffer
_dm_clear_page
_dm_clear_screen
_dm_cpw
_dm_cvxyl
_dm_get_nearest_color
_dm_gsp2gsp
_dm_init_palet
_dm_lmo_dm_peek_breg
_dm_poke_breg
_dm_rmo
_dm_set_ai_rev
_dm_set_bcolor
_dm_set_cbbuf
_dm_set_clip_rect
_dm_set_colors
_dm_set_curs_shape
_dm_set_curs_state
_dm_set_cursattr
_dm_set_fcolor
_dm_set_palet_entry
_dm_set_pmask
_dm_set_ppop
_dm_set_text_xy
_dm_set_windowing
_dm_set_wksp
_dm_text_outp

B.2 TIGA Core Functions Symbols (Continued)

_envtext	_gsph_findmem
_envcurs	_gsph_free
_env	_gsph_init
_esym	_gsph_maxheap
_exit	_gsph_memtype
_field_insert	_gsph_realloc
_field_extract	_gsph_sinit
_flush_extended	_gsph_totalfree
_function_implemented	_handleBlock
_get_colors	_handleAlloc
_get_config	_handle
_get_curs_state	_handleGrow
_get_curs_xy	_hblock_handle
_get_fontinfo	_high_water_mark
_get_isr_priorities	_highlevel_minit
_get_module	_host_command
_get_nearest_color	_illop
_get_offscreen_memory	_init_cursor
_get_palet_entry	_init_interrupts
_get_palet	_init_ioreg_ptrs
_get_pmask	_init_palet
_get_ppop	_init_text
_get_state	_init_trap_vectors
_get_text_xy	_init_video_regs
_get_transp	_lastMP
_get_vector	_lastSeg
_get_windowing	_linmem
_get_wksp	_lmem
_getrev	_lmo
_gsp2gsp	_lowlevel_minit
_gsp_calloc	_main
_gsp_free	_makekey
_gsp_handle	_memcpy
_gsp_malloc	_memmove
_gsp_maxheap	_modeinfo
_gsp_minit	_monitorinfo
_gsp_realloc	_movmem
_gsph_alloc	_mpFree
_gsph_compact	_null_patn_line
_gsph_deref	_numMP
_gsph_falloc	_numSegs
_gsph_findhandle	_numstr

B.2 TIGA Core Functions Symbols (Continued)

_oemdata
_oemmsg
_offscreen
_pHCOUNT
_pHEBLNK
_pHESYNC
_pHSBLNK
_pHTOTAL
_pVCOUNT
_pVEBLNK
_pVESYNC
_pVSBLNK
_pVTOTAL
_page_busy
_page
_page_flip
_palet
_palloc
_pattern
_peek_breg
_poke_breg
_printf
_release_buffer
_rmo
_set_bcolor
_set_clip_rect
_set_colors
_set_config
_set_curs_shape
_set_curs_state
_set_cursattr
_set_dpitch
_set_fcolor
_set_interrupt
_set_module_state

_set_palet
_set_palet_entry
_set_pmask
_set_ppop
_set_text_xy
_set_vector
_set_windowing
_set_wksp
_setup
_srv_ipoly
_stack_size
_strcmp
_strcpy
_strlen
_sym_chk
_sym_close
_sym_flush
_sym_getstate
_sym_get
_sym_init
_sym_open
_sym_put
_sys16
_sys_memory
_sysfont
_text_out
_text_outp
_tmphandles
_transp_off
_transp_on
_video_enable
_wait_scan
cp_call
dm_call

B.3 TIGA Extended Graphics Library Symbols

_arc_draw
_arc_fill
_arc_pen
_arc_quadrant
_arc_quad
_arc_slice
_bitblt
_decode_rect
_delete_font
_dm_bitblt
_dm_draw_line
_dm_draw_oval
_dm_draw_ovalarc
_dm_draw_piearc
_dm_draw_point
_dm_draw_polyline
_dm_draw_rect
_dm_fill_convex
_dm_fill_oval
_dm_fill_piearc
_dm_fill_polygon
_dm_fill_rect
_dm_frame_oval
_dm_frame_rect
_dm_get_pixel
_dm_move_pixel
_dm_patnfill_convex
_dm_patnfill_oval
_dm_patnfill_piearc
_dm_patnfill_polygon
_dm_patnfill_rect
_dm_patnframe_oval
_dm_patnframe_rect
_dm_patnpen_line
_dm_patnpen_ovalarc
_dm_patnpen_piearc
_dm_patnpen_point
_dm_patnpen_polyline
_dm_pen_line

_dm_pen_ovalarc
_dm_pen_piearc
_dm_pen_point
_dm_pen_polyline
_dm_put_pixel
_dm_seed_fill
_dm_seed_patnfill
_dm_set_draw_origin
_dm_set_patn
_dm_set_pensize
_dm_styled_ovalarc
_dm_styled_oval
_dm_zoom_rect
_draw_eliparc
_draw_line
_draw_oval
_draw_ovalarc
_draw_piearc
_draw_point
_draw_polyline
_draw_rect
_encode_rect
_fill_convex
_fill_eliparc
_fill_oval
_fill_piearc
_fill_polygon
_fill_rect
_frame_oval
_frame_rect
_get_env
_get_pixel
_get_textattr
_in_font
_install_font
_move_pixel
_onarc
_patn_line

_patnfill_convex
_patnfill_oval
_patnfill_piearc
_patnfill_polygon
_patnfill_rect
_patnframe_oval
_patnframe_rect
_patnpen_line
_patnpen_ovalarc
_patnpen_piearc
_patnpen_point
_patnpen_polyline
_pen_eliparc
_pen_line
_pen_ovalarc
_pen_piearc
_pen_point
_pen_polyline
_put_pixel
_seed_fill
_seed_patnfill
_select_font
_set_draw_origin
_set_dstbm
_set_patn
_set_pensize
_set_srcbm
_set_textattr
_sin_tbl
_styled_line
_styled_oval
_styled_ovalarc
_styled_piearc
_swap_bm
_text_width
_trig_values
_zoom_rect