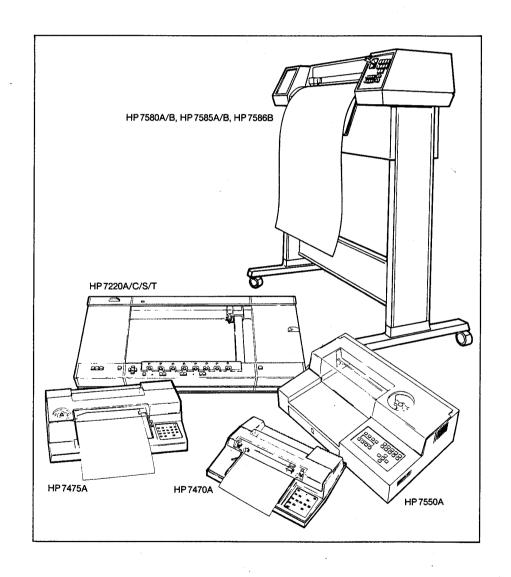
HP-GL Programmer's Reference Manual



```
20 PRINT "DF; IP-7387,-10142,7387,10142"
   PRINT "SP1; CS3; PA1016, 1016, PD1747, 7682"
58 PRINT "LB38 Degreesn; PA1747, 7682" \
/68 PRINT "D199.8.-7.3; LB49 Degreesn"
70 PRINT "PU6761,6232;DI5.15,99.9;CP0,-1"
   PRINT "L014; LB212, 41 N; PR6705, 5154"
90 PRINT "DI17.7,98.4;CP0,-1"
100 PRINT "PD2112,5797"
110 PRINT "AA3948,6172,43.342,5"
120 PRINT "884653,5305,-60.96,5"
130 PRINT "LT-6,7.2;PD4653,5303"
148 PRINT "L016; LB310.00A"
```

HP-GL Programmer's Reference Manual



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This manual provides information to aid in the design of hardware, firmware, or software for use with the HP family of HP-GL plotters. Its goal is to show the similarities and differences between all plotter models and to provide the information needed to define the HP-GL instruction subset and general syntax that is compatible with any given combination of these plotters.

Before using the manual, please note the following items.

- Plotter models currently in production are shown in boldface type throughout this manual to differentiate them from obsolete models. Prior knowledge of HP-GL is assumed.
- Descriptions of the HP 7090 pertain only to its HP-GL plotting functions. The HP 7090 performs as a digital plotter and as an analog-to-digital measuring instrument.
- The term HP 758X denotes the following HP plotter models in any series: 7580, 7585, or 7586. HP 758XA denotes the 7580A and 7585A; HP 758XB denotes the 7580B, 7585B, and 7586B.
- Words typed in SMALL BOLDFACE TYPE are switches found on the plotter. BOLD CONDENSED type denotes a single ASCII character which should be sent to the plotter.

Following is a list of pertinent manuals recommended for use in conjunction with this manual. They should be used as memory refreshers and to determine characteristics such as front-panel operation and parameter ranges of device-control instructions.

HP Plotter	Manual Title	Part Number
7090A	Interfacing and Programming Manual	07090-90001
7090A	Operator's Manual	07090-90002
7220 A ,S	Operating and Programming Manual	07220-90002
7220C,T	Operating and Programming Manual	07220-90003
7225A/17601A	Operating and Programming Manual	17601-90000
7225B/17601A	Operating and Programming Manual	17601-90006
7225A,B/17603A	Operating and Programming Manual	17603-90002
7225A/17604A	Operating and Programming Manual	17604-90000
7240 A	Operating and Programming Manual	07240-90000

Introduction

Plotter Manuals

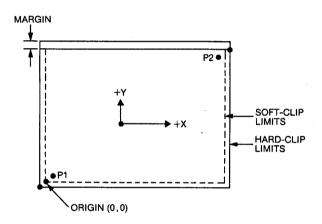
Plotter Manuals (Continued)

HP Plotter	Manual Title	Part Number
7245 A	Operating and Programming Manual	07245-90001
7245B	Operating and Programming Manual	07245-90010
7470A	Interfacing and Programming Manual	07470-90001
7470A	Operator's Manual	07470-90002
7475A	Interfacing and Programming Manual	07475-90001
7475A	Operation and Interconnection Manual	07475-90002
7550A	Interfacing and Programming Manual	07550-90001
7550A	Operation and Interconnection Manual	07550-90002
7580A/7585A	Interfacing and Programming Manual	07580-90014
7580A/7585A	Operator's Manual	07580-90013
*7580B/7585B	Interfacing and Programming Manual	07580-90024
*7580B/7585B	Operator's Manual	07580-90023
**7580B/ 7585B/7586B	Interfacing and Programming Manual	07580-90034
**7580B/ 7585B/7586B	Operator's Manual	07580-90033
9872 A	Interfacing and Programming Manual	09872-90003
9872B,S	Operating and Programming Manual	09872-90008
9872C,T	Operating and Programming Manual	09872-90011

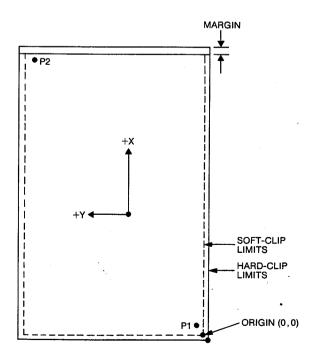
^{*}For HP 7580B and 7585B plotters with serial prefix numbers 2309, 2331, 2334, and 2335. **For HP 7580B, 7585B, and 7586B plotters with serial prefix numbers 2402 and above.

The Plotter Coordinate System

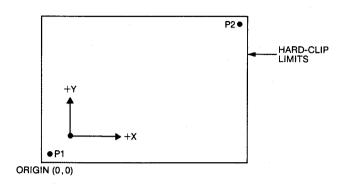
The plotting surface of all HP plotters is a Cartesian coordinate system that is scaled in plotter units. The plotter unit is the smallest possible addressable move and is 0.025 mm (approximately 0.001 in.) in length. The orientation of the X- and Y-axes, the locations of the origin point, and the default location of scaling points P1 and P2 are shown in the following diagrams. The paper is shown as though you were facing the front of the plotter and looking down on it. Default coordinate values for P1 and P2 and the plotter-unit range within the mechanical (hard-clip) limits of each plotter are included in the table entitled Plotting Areas and Default P1, P2 Locations.



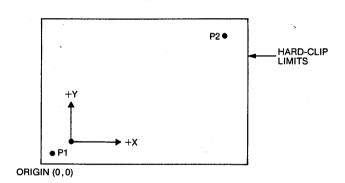
HP 7090A

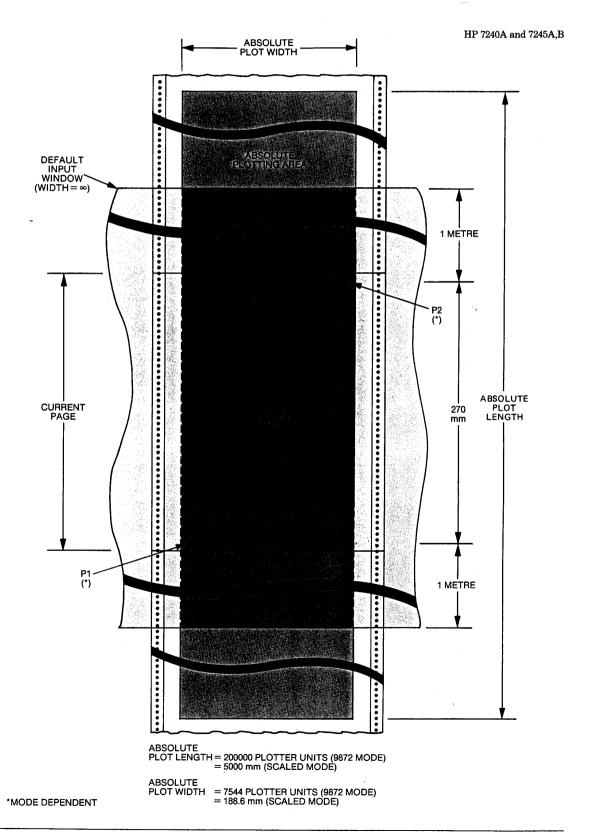


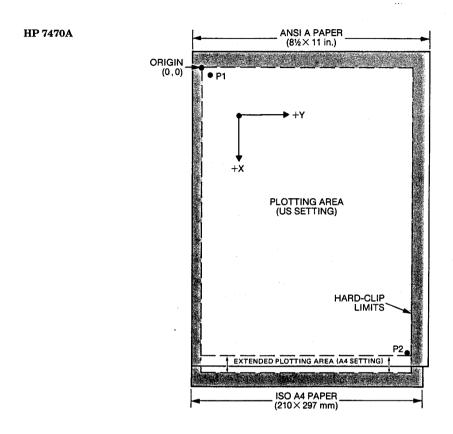


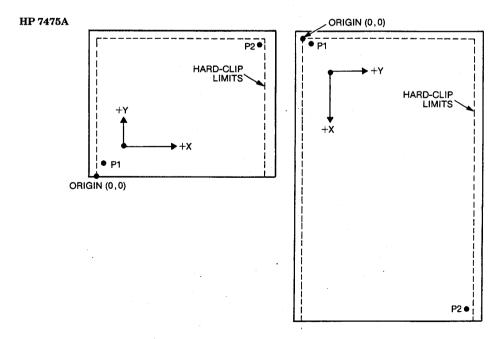


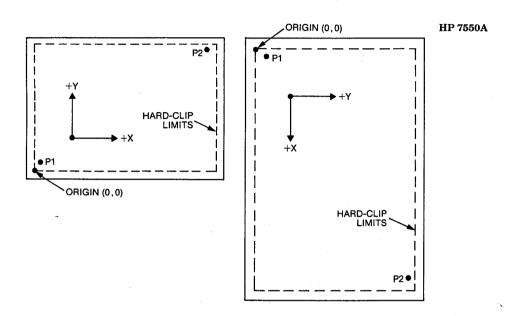
HP 7225A,B (17601A, 17603A, and 17604A)

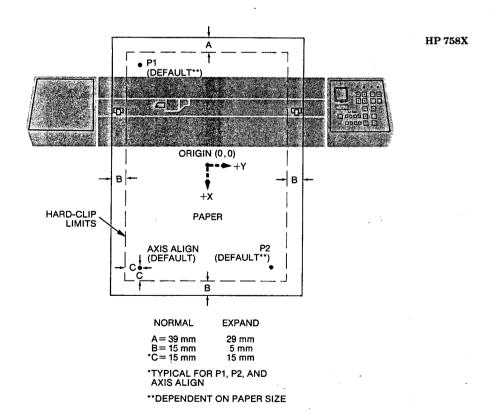












	Optional Switch Settings and/or	Default Scaling Points		Plotting Range		Maximum Plotting Area
HP Plotter	Paper Type/Size	P1 _x ,P1 _y	P2 _x ,P2 _y	X-axis	Y-axis	(X by Y)
7090A	ansi (A-size)	160,447	10210,7682	0 to 11 036	0 to 8087	275.9×202.18 mm (10.82×7.93 in.)
	ansi (B-size)	865,160	16140,10210	0 to 16735	0 to 11 036	418.38×275.9 mm (16.40×10.82 in.)
	ISO (A4-size)	514,348	10564,7583	0 to 11 722	0 to 7885	293.05×197.13 mm (11.49×7.73 in.)
	ISO (A3-size)	325,514	15600,10564	0 to 16 287	0 to 11 722	407.18×293.05 mm (15.96×11.49 in.)
7220A,C,S,T and 9872A,B,C,S,T	Sheet paper	520,380	15 720, 10 380	0 to 16 000	0 to 11 400	400×285 mm (15.75×11.2 in.)
7220S,T and	ENGLISH (sprocketed roll paper)	520,1020	15760,11180	0 to 16 000	0 to 11 400	400×285 mm (15.75×11.2 in.)
9872S,T	METRIC (sprocketed roll paper)	520,1140	15720,11140	0 to 16 000	0 to 11 400	400×285 mm (15.75×11.2 in.)
7225A,B/ 17601A,17603A, 17604A	A-size	328,279	10328,7479	0 to 11 420	0 to 8140	285×203 mm (11.2×8 in.)
7240A and 7245A,B	9872 mode (plotter units) (sprocketed roll paper)	200,200	7400,11000	0 to 7544	-39 800 to +51 000 (default window)	English Page $188.6 \times 279 \text{ mm}$ $(7.4 \times 11 \text{ in.})$ Metric Page
	scaled mode (millimetres) (sprocketed roll paper)	0,0	180,270	0 to 188.6	-1000 to +1270 (default window)	$188.6 \times 298.5 \text{ mm}$ $(7.4 \times 11.75 \text{ in.})$ Long Axis Plots $188.6 \text{ mm} \times 5 \text{ m}$ $(7.4 \text{ in.} \times 16.4 \text{ ft})$ with full paper return or $188.6 \text{ mm} \times 61 \text{ m}$ $(7.4 \text{ in.} \times 200 \text{ ft})$ without full paper return

7470A	us (A-size)	250,279	10250,7479	0 to 10 300	0 to 7650	257×191 mm (10.2×7.5 in.)
	A4 (A4-size)	250,279	10250,7479	0 to 10 900	0 to 7650	272×191 mm (10.7×7.5 in.)
7475A	US/A4 (A-size)	250,596	10250,7796	0 to 10365	0 to 7962	257.8×198.1 mm (10.15×7.8 in.)
	US/A3 (B-size)	522,259	15722,10259	0 to 16640	0 to 10365	413.9×257.8 mm (16.3×10.15 in.)
	MET/A4 (A4-size)	603,521	10603,7721	0 to 11 040	0 to 7721	274.6×192.1 mm (10.81×7.56 in.)
	MET/A3 (A3-size)	170,602	15370,10602	0 to 16158	0 to 11 040	401.9×274.6 mm (15.82×10.81 in.)
7550A	A-size	80,320	10080,7520	0 to 10170	0 to 7840	254.25×196 mm (9.97×7.68 in.)
	B-size	620 80	15820,10080	0 to 16 450	0 to 10170	411.25×254.25 mm (16.12×9.97 in.)
	A4-size	430,200	10430,7400	0 to 10870	0 to 7600	271.75×190 mm (10.65×7.45 in.)
	A3-size	380,430	15580,10430	0 to 15 970	0 to 10 870	399.25×271.75 mm (15.65×10.65 in.)
7580A,B NOTE: P1,P2	NORMAL (A-size)*	-2790,-4500	2790,4500	±3390	±5100	169.5×255 mm) (6.68×10.05 in.)
coordinate values for all	NORMAL (B-size)	-7100,-4500	7100,4500	±7700	±5100	385×255 mm (15.17×10.05 in.)
758X plotters are approximate. ■	NORMAL (C-size)	-9640,-7530	9640,7530	±10240	±8130	512×406.5 mm (20.17×16.02 in.)
	NORMAL (D-size)	-15710,-10060	15710,10060	±16310	±10660	815.5×533 mm (32.13×21 in.)
	NORMAL (A4-size)*	-2700,-4830	2700,4830	±3300	±5430	165×271.5 mm (6.5×10.7 in.)
	NORMAL (A3-size)	-6780,-4830	6780,4830	±7380	±5430	369×271.5 mm (13.54×10.7 in.)

^{*}A and A4-sizes are loaded with the longer axis horizontal. All other sizes have long axis vertical.

HP Plotter	Optional Switch Settings and/or	Default Scaling Points		Plotting Range		Maximum
	Paper Type/Size	P1 _x ,P1 _y	P2 _x ,P2 _y	X-axis	Y-axis	Plotting Area (X by Y)
7580A,B	NORMAL (A2-size)	-10280,-7260	10280,7260	±10880	±7860	544×393 mm (21.43×15.48 in.)
NOTE: P1,P2 coordinate values for all	NORMAL (A1-size)	-15120,10760	15120,10760	±15720	±11 360	786×568 mm (30.97×22.38 in.)
758X plotters are approximate. ■	EXPAND (A-size)*	-3190,-4900	3190,4900	±3790	±5500	189.5×275 mm (7.47×10.84 in.)
	EXPAND (B-size)	-7500,-4900	7500,4900	±8100	±5500	405×275 mm (15.96×10.84 in.)
	EXPAND (C-size)	-10040,-7930	10040,7930	±10640	±8530	532×426.5 mm (20.96×16.8 in.)
	EXPAND (D-size)	-16110,-10460	16110,10460	±16710	±11 060	835.5×553 mm (32.92×21.79 in.)
	EXPAND (A4-size)*	-3090,-5230	3090,5230	±3690	±5830	184.5×291.5 mm (7.27×11.49 in.)
	EXPAND (A3-size)	-7180,-5240	7180,5240	±7780	±5840	389×292 mm (15.33×11.5 in.)
	EXPAND (A2-size)	-10680,-7660	10680,7660	±11 280	±8260	564×413 mm (22.22×16.27 in.)
	EXPAND (A1-size)	-15520,-11160	15520,11160	±16120	±11760	806×588 mm (31.76×23.17 in.)
7585A,B and 7586B	NORMAL (A-size)**	-2790,-4500	2790,4500	±3390	±5100	169.5×255 mm (6.68×10.05 in.)
NOTE: P1,P2 coordinate values for all 758X plotters	NORMAL (B-size)	-7100,-4500	7100,4500	±7700	±5100	385×255 mm (15.17×10.05 in.)
	NORMAL (C-size)**	-7090,-10075	7090,10075	±7690	±10675	384.5×533.75 mm (15.15×21.03 in.)
are approxi- mate. ■	NORMAL (D-size)	-15710,-10060	15710,10060	±16310	±10660	815.5×533 mm (32.13×21 in.)

	·				
NORMAL (E-size)	-20840,-16180	20840,16180	±21 440	±16780	1072×839 mm (42.24×33.06 in.)
NORMAL (A4-size)**	-2700,-4830	2700,4830	±3300	±5430	165×271.5 mm (6.5×10.7 in.)
NORMAL (A3 size)	-6780,-4830	6780,4830	±7380	±5430	369×271.5 mm (13.54×10.7 in.)
NORMAL (A2-size)**	-6875,-10785	6875,10785	±7475	±11385	373.75×569.25 mm (14.73×22.43 in.)
NORMAL (A1-size)	-15120,-10760	15120,10760	±15720	±11360	786×568 mm (30.97×22.38 in.)
NORMAL (A0-size)	-22190,-15740	22 190, 15 740	±22790	±16340	1139.5×817 mm (44.9×32.19 in.)
EXPAND (A-size)**	-3190,-4900	3190,4900	±3790	±5500	189.5×275 mm (7.47×10.84 in.)
EXPAND (B-size)	-7500,-4900	7500,4900	±8100	±5500	405×275 mm (15.96×10.84 in.)
EXPAND (C-size)**	-7485,-10480	7485,10480	±8085	±11 080	404.25×554 mm (15.93×21.83 in.)
EXPAND (D-size)	-16110,-10460	16110,10460	±16710	±11060	835.5×553 mm (32.92×21.79 in.)
EXPAND (E-size)	-21 250,-16 580	21 250, 16 580	±21 850	±17180	1092.5×859 mm (43.05×33.84 in.)
EXPAND (A4-size)**	-3090,-5230	3090,5230	±3690	±5830	184.5×291.5 mm (7.27×11.49 in.)
EXPAND (A3-size)	-7180,-5240	7180,5240	±7780	±5840	389×292 mm (15.33×11.5 in.)
EXPAND (A2-size)**	−7270,−11180	7270,11180	±7870	±11780	393.5×589 mm (15.5×23.21 in.)
EXPAND (A1-size)	-15520,-11160	15520,11160	±16120	±11760	806×588 mm (31.76×23.17 in.)
EXPAND (A0-size)	-22590,-16145	22590,16145	±23190	±16745	1159.5×837.25 mm (45.68×32.99 in.)

^{*}A and A4-sizes are loaded with the longer axis horizontal. All other sizes have long axis vertical.

**A, C, A4, and A2-sizes are loaded with the longer axis horizontal. All other sizes have long axis vertical.

	Optional Switch Settings and/or	Default Scaling Points		Plotting Range		Maximum
HP Plotter	Paper Type/Size	P1 _x ,P1 _y	P2 _x ,P2 _y	X-axis	Y-axis	Plotting Area (X by Y)
***7586B (Roll Paper)	NORMAL 914.14 mm/36 in.	-23 184 ,-17 052	23 184,17 052	±23784	±17652	1189.2×882.6 mm (46.6×34.6 in.)
	NORMAL 609.6 mm/24 in.	-17088,-11000	17088,11000	±17688	±11600	884.4×580 mm (34.7×22.7 in.)
	NORMAL 279.4 mm/11 in.	-7436,-4653	7436,4653	±8036	±5253	401.8×262.25 mm (15.75×10.3 in.)

^{***}Applies to roll paper on the 7586B. Limits listed are for a single frame on a multi-frame plot. The X-axis default scaling points are fixed; Y-axis scaling points are approximate. Since the paper is continuous in the X-direction, the plotter uses the width of the paper to determine the scaling points for one frame.

Power-up Initialization

Upon application of power, each plotter performs an initialization cycle to set certain plotting conditions to predefined default values. These default values differ from plotter to plotter, and some functions are not implemented on all plotters. The functions established by each plotter are shown in the following Power-up Default Conditions table.

Power-up Default Conditions

Function	Condition	Equivalent Instruction	Exceptions
Plotting mode	Absolute	PA;	1
Pen state	Up(off)	PU:	None
Automatic pen functions	On	AP;	2
Pen velocity	Machine dependent	vs;	3
Adaptive pen velocity	Off	VN;	4
Scaling points (P1,P2)	Machine dependent	IP;	5
Scaling	User-unit scaling off	SC;	6
Input window	Mechanical limits	IW;	7, 8
Chord angle/tolerance	5 degrees	CT;	9
Symbol mode	Off	SM;	None
Digitize clear	On	DC;	10
Tick length	tp and tn = 0.5% of $ P2_x - P1_x $ for Y-tick and 0.5% of $ P2_y - P1_y $ for X-tick	TL;	11
Line type and pattern length	Solid line; 4% of distance from P1 to P2	LT;	None
Mask value	223,0,0	IM;	12
Label origin	Current pen position	_	None
Label direction	Horizontal	DR1,0	13
Character size	Relative: width = 0.75% of $ P2_x - P1_x $ height = 1.5% of $ P2_y - P1_y $	SR;	11, 14
Character slant	0 degrees	SL0;	None
Extra space	No extra space	ES0,0;	15
Select character set	Standard	SS;	None
Standard set	Set 0	CS0;	None
Alternate set	Set 0	CA0;	None
Character chord	5 degrees	CC;	15
Label buffer	Cleared	BL etx	15
Label terminator	FTX (decimal code 3)	DT;	16

¹Applicable only to 7090, 7470, 7475, 7550, 7580, 7585, and 7586.

Not implemented on 7090, 7225, 7240, 7245, 7470, and 7475.

Velocity = 75 cm/s on 7090; 25 cm/s on 7225 (17601, 17603, 17604); 24 cm/s on 7240 and 7245; 36 cm/s on 7220 and 9872; and 38.1 cm/s on 7470 and 7475. On 7550, 7580, 7580, 7585, and 7586, default speeds for fiber-tip, roller-ball, and drafting pen carousels are 50, 60, and 15 cm/s, respectively. Transparency pen carousels on the 7550 default at 10 cm/s.

Applicable only to 7220 and 9872.

Refer to table of Plotting Areas and Default P1,P2 Locations.

On 7240 and 7245, scaling is implemented only when 9972/SCALED switch is set to SCALED (moves default to millimetres).

Ton 7090, limits are soft-clip limits that depend on setting of ISO/ANSI switch and front-panel toggle. On 7470, mechanical limits depend on setting of US/AA switch. On 7475, mechanical limits depend on setting of US/AA switch. On 7475, mechanical limits depend on paper size on 7580, 7585, and 7586, mechanical limits depend on paper size and position of EXPAND/NORMAL switch. Refer to table of Plotting Areas and Default P1,P2 Locations.

On 7240 and 7245, input window is: X1, Y1 = infinity, — 39 800

Not implemented on 7090, 7225 (17601,17603), 9872, or 7470 with HP-IB or HP-IL.

Ton 7090, 7470, and 7475, algebraic P1,P2 distances are used.

120n 7240 and 7245, IN; defaults to 255 and 255,0, respectively. Note also that only the first mask value is applicable for plotters with an RS-232-C interface.

130n 7580, 7585, and 7586, label direction is relative (DR1,0) in EMULATE or absolute (DI12,0) in NORMAL.

140n 7580, 7585, and 7586, label direction is relative in EMULATE or absolute in NORMAL. In either case, characters are 0.285 cm wide by 0.375 cm high.

15Applicable only to 7550, 7580, 7585, and 7586.

Power-up Default Conditions (Continued)

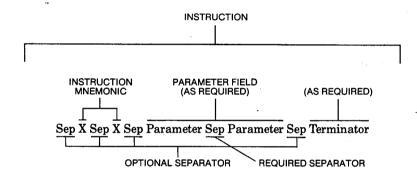
Function	Condition	Equivalent Instruction	Exceptions
Fill type, spacing, and angle	 Type 1, solid bidirectional fill 1% of distance between P1 and P2 0 degrees 	FT;	17
Pen Thickness	0.3 mm (fill spacing for solid fill)	PT;	17
Rotation '	0 degrees (default orientation)	RO;	18
User-defined fill type	Solid bidirectional fill	UF;	19
Character selection mode	HP 7-bit mode	CM;	19
Polygon mode	Polygon buffer cleared	PM 0; PM 2	19
Downloadable character buffer	Cleared	DL;	19

 $^{^{17}\}rm{Applicable}$ only to 7475, 7550, 7580B, and 7585B (serial prefix number 2402 and higher), and 7586. $^{18}\rm{Applicable}$ only to 7090, 7475, 7550, 7580, 7585, and 7586. $^{19}\rm{Applicable}$ only to 7550, 7580B, and 7585B (serial prefix number 2402 and higher), and 7586.

HP-GL Syntax

In all cases, an HP-GL instruction is a two-letter mnemonic, which may be upper- or lowercase. The mnemonic suggests the instruction's function; for instance, PA is the mnemonic for the plot absolute instruction and LB is the mnemonic for the label instruction. An HP-GL instruction is defined as a mnemonic followed by its parameter field, if any, and a terminator.

If multiple parameters follow the mnemonic, they must be delimited from each other by a required separator. Optional separators may also be used before, after, and between the mnemonic and before the terminator as shown below. Separators and terminators that are recognized by each plotter are listed in the table entitled HP-GL Separators and Terminators.



Each parameter in the parameter field must comply with one of three format types; integer, decimal, or character. The parameter format type as well as the numerical ranges of integers and decimals varies from plotter to plotter. Numerical ranges for each plotter are listed in the table entitled Parameter Formats and Ranges. Parameter format types required by each HP-GL instruction are given in the definition column of the table entitled HP-GL Instruction Set.

HP-GL Separators and Terminators

	Required	Omtional	Re	quired Termina	itor ¹
HP Plotter	Parameter Separator	Optional Separators	HP-IB	RS-232-C	HP-IL
7090A	One or more commas and/ or spaces, or a + or - sign which may be preceded by commas or spaces	Zero or more commas and/ or spaces	; or LF or the next mnemonic		_
7220A,C,S,T	One or more commas and/or spaces	Zero or more commas and/ or spaces		; only	-
7225A,B/17601A	One comma	Spaces are ignored	; or LF	<u></u>	
7225A,B/17603A 7225A,B/17604A	One or more commas and/or spaces	Zero or more commas and/ or spaces		; only	· ·
7240A	One comma	Spaces are ignored	-	; only	
7245A,B	One comma	Spaces are ignored	; or LF	_	<u></u>
7470A	One or more commas and/ or spaces, or a + or - sign which may be preceded by commas or spaces	Zero or more commas and/ or spaces	; or LF or any numeric or nonalpha- betic charac- ters such as \$ or #, or the next mnemonic	; or non- numeric or nonalpha- betic charac- ters such as \$ or #, or the next mnemonic	; or LF or any nonnumeric or nonalpha- betic charac- ters such as \$ or #, or the next mnemonic
7475A	One or more commas and/or spaces, or a + or - sign which may be preceded by commas or spaces	Zero or more commas and/ or spaces	; or LF or the next mnemonic	; or the next mnemonic	_
7550A	One or more commas and/or spaces	Zero or more commas and/ or spaces	; or LF or the next mnemonic	; or the next mnemonic	-
7580A,B/ 7585A,B/7586B	One or more commas and/ or spaces	Zero or more commas and/ or spaces	; or LF or the next mnemonic	; or the next mnemonic	
9872A,B,C,S,T	One comma	Spaces are ignored	; or LF	-	

 $^{^{1}}$ In all cases, the control character ETX (ASCII decimal equivalent 3) is the default terminator for HP-GL instructions LB and BL. (The terminator may be redefined by the DT instruction on some plotters.)

The format table below is for summary purposes only. Refer to specific HP-GL instructions for exact parameter ranges.

Parameter Formats and Ranges

	Inte	ger (i)	Decimal (d)	
HP Plotter	Not Scaled	Scaled*	Not Scaled	Scaled*
7090A	-32 768 to +32 767 (Decimal fraction truncated)	-32 768 to +32 767 (Decimal fraction truncated)	-128.0000 to +127.9999 (Decimal fraction optional)	-128.0000 to +127.9999 Decimal fraction optional)
7220A,C,S,T	±32767 (Decimal fraction truncated)	±16383 (Decimal fraction truncated)	± 127.999 (Decimal fraction optional)	±127.999 (Decimal fraction optional)
7225A,B/ 17601A	±32767 (Decimal produces an error)	±32767 (Decimal produces an error)	±127.999 (Decimal fraction optional)	±127.999 (Decimal fraction optional)
7225A,B/ 17603A	±32767 (Decimal produces an error)	±32767 (Decimal produces an error)	±127.999 (Decimal fraction optional)	±127.999 (Decimal fraction optional)
7225A,B/ 17604A	±32 767 (Decimal fraction truncated)	±32767 (Decimal fraction truncated)	±127.999 (Decimal fraction optional)	±127.999 (Decimal fraction optional)
7240A 7245A,B	$\pm 1 \times 10^{\pm 99}$ (Decimal fraction optional)	$\pm 1 \times 10^{\pm 99}$ (Decimal fraction optional)	$\pm 1 \times 10^{\pm 99}$ (Decimal fraction optional)	$\pm 1 \times 10^{\pm 99}$ (Decimal fraction optional)
7470A/ 7475A	-32768 to +32767 (Decimal fraction discarded; integer portion unchanged if number is positive, but is increased to next more negative integer if number is negative)	-32768.0000 to +32767.9999 (Decimal fraction optional)	-128.0000 to +127.999 (Decimal fraction optional)	-32 768.0000 to +32 767.9999 (Decimal fraction optional)
7550A	-2^{23} to $+2^{23}-1$ (Decimal fraction rounded)	-2^{23} to $+2^{23}-1$ (Decimal fraction rounded)	-2^{23} to $+2^{23}-1$ (Decimal fraction optional)	-2^{23} to $+2^{23}-1$ (Decimal fraction optional)
7580A,B/ 7585A,B/ 7586B	-2^{26} to $+2^{26}-1$ (Decimal fraction rounded)	-2^{26} to $+2^{26}-1$ (Decimal fraction rounded)	-2^{26} to $+2^{26}-1$ (Decimal fraction optional)	-2^{26} to $+2^{26}-1$ (Decimal fraction optional)
9872A,B,C,S,T	±32767 (Decimal produces an error)	±16383 (Decimal produces an error)	±127.999 (Decimal fraction optional)	±127.999 (Decimal fraction optional)

^{*}A scaled format is used only when user-unit scaling is active. This format applies to all HP-GL instruction parameters that are interpreted as user units.

HP-GL Instructions

Below is a list of HP-GL instructions common to the 7470A, 7475A, 7550A, and 758XB plotters.

CA	IN	00	SL
CP	IP	OP	SM
CS	IW	os	SP
DC	LB	OW	SR
\mathbf{DF}	LT	. PA	SS
DI	OA	PD	\mathbf{TL}
DP	\mathbf{OC}	PR	UC
\mathbf{DR}	OD	PU	VS
\mathbf{DT}	OE	SA	XT
\mathbf{EC}	OF	SC	YT
IM	OI	SI	

The table beginning on the following page contains a comprehensive review of HP-GL. The table is divided into four sections that pertain to the interfacing capability of each plotter.

Plotters listed in the first section of the table can function on either the HP-IB or RS-232-C interface. The **7470A**, **7475A**, and **758XA** have a single interface that is specified as an option (001 for RS-232-C and 002 for HP-IB). The **7550A** and **758XB** have dual interface capability.

				Н	P-IE	or R	S-23	32-0	7			н	P-II	В		,		I	RS-232	2-C		HP-IL
			7 4 7 0	7 4 7 5	7 5 5 0	7 7 5 5 8 8 0 5	7 5 8 0	5 8	7 5 8 6	7 0 9 0	7 1 1 7 2 6 5 0 A 1	7 2 4 5	7 2 4 5	9 8 7 2	9 8 7 2 B	9 8 7 2 S	7 2 2 0 A	7 2 2 0 S	7 1 2 7 2 6 5 0 A 3	7 1 2 7 2 6 5 0 A 4	7 2 4 0	7 4 7 0
Н	P-GL Instruction	Definition	Å	Ă	Å	ÅÅ		Ď	B	Å	ВА		B	Ā	č	$\left[egin{array}{c} \widetilde{\mathbf{T}} \end{array} \right]$	C	T	BA	ВА	Å	Å
AA	X,Y,arc angle(,chord angle)	Arc absolute X,Y,arc angle, chord angle (d)											*								*	
AA	X,Y,arc angle(,chord angle)	Arc absolute X,Y,arc angle, chord angle (i)															*	*				
AA	X,Y,arc angle(,chord angle)	Arc absolute X,Y (i/d), arc angle (i), chord angle (i)	†	*							٠											
AA	X,Y,arc angle(,chord tolerance)	Arc absolute X,Y (i), arc angle (d), chord tolerance (d)				*		*	*												-	
AA	X,Y,arc angle(,chord tolerance)	Arc absolute X,Y (d), arc angle (d), chord tolerance (d)			*									:								
AF	\$	Advance full page	N	N	*	N	1	N	*/8	N	N	N	N		8	*/8	8	*/8	N	N		N
AH	`	Advance half page	N	N	*	N]	N	*/8	N	N	N	N		8	*/8	8	*/8	N	N		N
¹AP	n	Automatic pen operations (i)	N	N	*	*		*	*	N	N	N	N	*	*	*	*	*	N	N	N	N
AR	X,Y,arc angle(,chord angle)	Arc relative X,Y,arc angle, chord angle (d)									·	*	ı.								*	
AR	X,Y,arc angle(,chord angle)	Arc relative X,Y,arc angle, chord angle (i)															*	*	,	*		
AR	X,Y,arc angle(,chord angle)	Arc relative X,Y (i/d), arc angle (i), chord angle (i)	†	*							,											
AR	X,Y,arc angle(,chord tolerance)	Arc relative X,Y (i), arc angle (d), chord tolerance (d)				*	:	*	*										*			

				HF	-IB	or RS	5-232-0	2			F	[P-]	В				F	RS-232	-C		HP-IL
			7 4 7 0	7 4 7 5	7 5 5 0	7 7 5 5 8 8 0 5	7 7 5 5 8 8 0 5	7 5 8 6	7 0 9	7 1 1 7 2 6 5 (A 1	7 7 5 2 9 4	2 4	8 7	9 8 7 2 B	9 8 7 2 S	7 2 2 0	7 2 2 0	7 1 2 7 2 6 5 0	7 1 2 7 2 6 5 0	7 2 4	7 4 7 0
H	P-GL Instruction	Definition	A	A	A	AA	BB	B	A	BA	A		2 A	C	T	A C	S T	A 3 B A	A 4 B A	0 A	A
AR	X,Y,arc angle(,chord tolerance)	Arc relative X,Y (d), arc angle (d), chord tolerance (d)			*																
AS	pen acceleration (,pen number)	Select pen acceleration (i)				*	*	*													
\mathbf{BF}		Buffer plot			*		NB	N													
BL	сс	Buffer label			*	*	*	*													
BP .		Веер									*	*	!							*	
¹CA	set	Designate alternate character set	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
CC	chord angle	Set character chord angle (d)			*	*	*	*													
CI	radius(,chord angle)	Circle of radius (d); drawn with chord angle (d)										*								*	
CI	radius(,chord angle)	Circle of radius (i); drawn with chord angle (i)														*	*				
CI	radius(,chord angle)	Circle of radius (i/d); drawn with chord angle (i)	†	*			-														
CI	radius(,chord tolerance)	Circle of radius (i); drawn with chord tolerance (d)				*	*	*													
CI	radius(,chord tolerance)	Circle of radius (d); drawn with chord tolerance (d)			*						, .										
CM	switch mode (,fall- back mode)	Character selection mode (i)			*		В	*													
¹ CP	spaces, lines	Character plot (d)	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

¹CS	set	Designate character set	*	*	*	*	* .	*	*	*	*	*	*	*	*	*	*	*	*	*	*
СТ	n	Set chord tolerance mode (i) for AA, AR, CI			*	*	*	*							1						
cv	n(,input delay)	Enables curved line generator for delay (i)			*																
DC		Digitize clear	*	*	*	*	*	*		*	*	*	*	*	*	*	*	*	*	*	*
¹DF		Set default values	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
¹DI	run,rise	Set absolute label direction (d)	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
DL	character number (,pen control), X,Y(,)(,pen control)(,)	Define downloadable character			*		В	*									,				
DP		Digitize point	*	*	*	*	*	*		. * .	*	*	*	*	*	*	*	*	*	*	*
¹DR	run,rise	Set relative label direction (d)	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
DS	slot,set	Designate character set (i) into slot (i)			*		В	*											٠		
DT	label terminator	Define label terminator (c)	*	*	*	*	*	*	*		*	*				*	*	*	*	*	*
DU	run,rise	Set user-unit direction (d)										*								*	
EA	X,Y	Edge rectangle absolute (i/d)		*							:										
EA	X,Y	Edge rectangle absolute (i)					В	*													
EA	X,Y	Edge rectangle absolute (d)			*																
EC	(n)	Enable cutter	N	N	N	N	N	D	N	N				8	*/8	8	*/8	N	N		N
EP		Edge polygon			*		В	*		7							-				
ER	X,Y	Edge rectangle relative (i/d)		*																	
ER	X,Y	Edge rectangle relative (i)					В	*													
ER	X,Y	Edge rectangle relative (d)			*																

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	•			HI	P-II	or R	5-232-	$\overline{\mathbf{c}}$				H	P-II	В]	RS-232	2-C		HP-IL
			7 4 7 0	7 4 7 5	7 5 5 0	7 7 5 5 8 8 0 5	7 7 5 5 8 8 0 5	7 5 8 6	7 0 9 0	1 2 5	2 6	7 2 4 5	7 2 4 5	9 8 7 2	9 8 7 2 B	9 8 7 2 S	7 2 2 0 A	7 2 2 0 S	7 1 2 7 2 6 5 0 A 3	7 1 2 7 2 6 5 0 A 4	7 2 4 0	7 4 7 0
Н	P-GL Instruction	Definition	A	A	A	AA	BB		A		3 A	A	В	Ā	C	T	C	T	B A	B A	A	A
ES	spaces(,lines)	Set extra spacing between characters or lines			*	*	*	*														
EW	radius,start angle, sweep angle(,chord angle	Edge wedge of circle with radius (i/d), start angle (i), sweep angle (i), chord angle (i)		*																		
EW	radius,start angle, sweep angle(,chord tolerance)	Edge wedge of circle with radius (i), start angle (d), sweep angle (d), chord tolerance (d)					В	*														
EW	radius,start angle, sweep angle(,chord tolerance)	Edge wedge of circle with radius (d), start angle (d), sweep angle (d), chord tolerance (d)			*						•											
FP	•	Fill polygon			*		В	*														
FR	ę ·	Advance frame			N		NB	*/8														
FS	pen force(,pen number)	Select tip force for pen			*	*	*	*														
FT	type(,spacing (,angle))	Fill type (i) with spacing (d) and angle (i)		*																		
FT	type(,spacing (,angle))	Fill type (i) with spacing (d) and angle (d)			*		В	*														
GC	count number	Set count number (i)			*		-															
GP	(group number,(pen number(,number of pens(,length))))	Designate group (i) starting with pen (i) of specified pens (i) changing at interval (i)			N	-	В	*			<i>i</i> .											
GR	$X,Y1(,Y2,\ldots Yn)$	Graph relative to current pen (d)				-							*								*	

1,0		l	ŀ	i	11		1	1	11		1	l	1	ı	1	11	1 :	1	ı	1 1	II
IC	C	Input character for sizing with OB instruction			N	*	Y	N					:								
¹ IM	e(,s(,p))	Set e-, s-, and p-masks (i)	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
¹IN		Initialize plotter	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
¹ IP	$\mathrm{P1}_{X},\!\mathrm{P1}_{Y},\!\mathrm{P2}_{X},\!\mathrm{P2}_{Y}$	Input P1 and P2 (i)								*	*	*	*	*	*	*	*	*	*		
IP	$\mathrm{P1}_{X},\!\mathrm{P1}_{Y}(,\!\mathrm{P2}_{X},\!\mathrm{P2}_{Y})$	Input P1 and P2 (i)	*	*	*	*	*	*	*				·							*	*
IV	slot(,left)	Invoke slot (i) into character table (i)			*		В	*													
¹IW	$X_{lo},\!Y_{lo},\!X_{hi},\!Y_{hi}$	Input window (i)	*	*					*	*			*	*	*	*	*	*	*.		*
IW	$X_{lo},\!Y_{lo},\!X_{hi},\!Y_{hi}$	Input window (d)								-	*	*								*	
IW	X1,Y1,X2,Y2	Input window (i)			*	*	*	*													
KY	key(,function)	Assign function (i) to key (i)			*																
¹LB	$\mathbf{c}\dots\mathbf{c}$	Label ASCII string (c)	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
LE	n	Set label enhancement n for dot matrix characters (i)	-								*	*						٠		*	
LO	position number	Set label origin (i)			*	*	*	*	*		*	*								*	
¹LT	pattern number (,pattern length)	Set line type (i) and pattern length (d)	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
NR		Not ready (View state)			*	*	*	*													
² OA		Output actual position (i return) and pen status (i return)	*	*	*	*	*	*	*	*				*	*	*	*	*	*		*
OA		Output actual position (i/d return) and pen status (i return)									*	*								*	
ОВ		Output box dimensions of character from IC (i return)			N	*	Y	N													
¹OC		Output commanded position and pen status (i return)				*	*	*	*	*			*	*	*	*	*	*	*		

HP-GL Instruction Set (Continued	HP-GL	Instruction	Set	(Continue	ed
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			HP	-IB	or I	RS-	232-0	2				н	P-IF	3				I	RS-232	2-C		HP-IL
		7 4 7 0	7 4 7 5	7 5 5 0	7 7 5 8 8 8 0 8	5 8	7 7 5 5 8 8 0 5	7 5 8 6	7 0 9 0	1 2 5 A	1 7 6 0	7 2 4 5	7 2 4 5	9 8 7 2	9 8 7 2 B	9 8 7 2 S	7 2 2 0 A	7 2 2 0 S	7 1 2 7 2 6 5 0 A 3	7 1 2 7 2 6 5 0 A 4	7 2 4 0	7 4 7 0
HP-GL Instruction	Definition	A	A	A	A A	1	ВВ	В	A	В	Α	A	В	Α	С	Т	С	Т	ВА	ВА	+	A *
oc	Output commanded position (i/d return) and pen status (i return)	*	*	*								*	*								*	*
OD	Output digitized point and pen status (i return)	*	*	*	*		*	*			*			*	*	*	*	*	*	*		*
OD	Output digitized point (i/d return) and pen status (i return)											*	*								*	
¹OE	Output error (i return)	*	*	*	*		*	*	*		*	*	*	*	*	*	*	*	*	*	*	*
² OF	Output factors (i return)	*	*	*	*		*	*	*		*	*	*	*	*	*	*	*	*	*	*	*
og	Output count number and escape status (i return)			*																		
ОН	Output hard-clip limits (i return)		*	*	*		*	*	*													
² OI	Output identification (c return)	*	*	*	*		*	*	*		*	*	*	*	*	*	*	*	*	*	*	*
ОК	Output function key (i return)			*			NB	N										-				
OL	Output length of buffered label (d, i, i return)			*	*		*	*											*			
² OO	Output options (i return)	*	*	*	*		*	*	*		*	*	*		*	*	*	*	*	*	*	*
¹ OP	Output P1 and P2 (i return)	*	*	*	*		*	*	*		*	*	*	*	*	*	*	*	*	*	*	*
¹OS	Output status (i return)	*	*	*	*		*	*	*		*	*	*	*	*	*	*	*	*	*	*	*
ОТ	Output carousel status (i return)			*	*	:	*	*														

	ow		Output window (i return)	*	*	*		В	*	*		1	1					1				
	OY		Output location of syntax error (c return)								*											
1	oz		Output last command string (c return)						·		*							Ī.				
1	¹PA	X,Y(,X,Y(,))	Plot absolute to X,Y (i)			*	*	*	*	*	*			*	*	*	*	*	*	*		
	PA	X,Y(,X,Y(,))	Plot absolute to X,Y (i/d)	*	*							*	*								*	*
	PB		Plot label from buffer			*	*	*	*													
	PC	X,Y(,X,Y(,))	Position cursor to X,Y (i/d)									*	*								*	
	¹PD		Pen down								*	*	*	*	*	*	*	*	*	*	*	
	PD	(X,Y(,))	Pen down (i)				*	*	*													
	PD	(X,Y(,))	Pen down (i/d)	*	*	*				*												
	PG	n '	Advance page	N		*	N	N	*/8	N	N	*	*		8	*/8	8	*/8	N	N	8	
	PM	n	Enable polygon mode n (i)	\$	100	*	i. Pysa	B	*	. 9,										- 1		
	¹PR	X,Y(,X,Y(,))	Plot relative from current pen (i)				*	*	*	*	*			*	*	*	*	*	*	*		
	PR	X,Y(,X,Y(,))	Plot relative from current pen (i/d)	*	*	*						*	*								*	*
	PS	paper size	Select paper size (i)		*					*												
	PT	thickness	Select pen thickness (d)		*	*		В	*									,				
	¹PU	,	Pen up								*	*	*	*	*	*	*	*	*	*	*	
	PU	(X,Y(,))	Pen up (i)				*	*	*	*												
	PU	(X,Y(,))	Pen up (i/d)	*	*	*														-		*
	RA	X,Y	Fill rectangle absolute (i)					В	*													
	RA	X,Y	Fill rectangle absolute (d)			*										ĺ						
	RA	X,Y	Fill rectangle absolute (i/d)		*																	
	RC		Read cursor position (i/d return) and pen status (i return)						_			*	*								*	

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				HP	-IB	or RS	-232-0	;		,,,, ,	H	P-11	3		T		F	RS-232	-C		HP-IL
		•.	7 4 7 0	7 4 7 5	7 5 5 0	7 7 5 5 8 8 0 5	7 7 5 5 8 8 0 5	7 5 8 6	7 0 9 0	7 1 1 7 2 6 5 0 A 1	7 2 4 5	7 2 4 5	9 8 7 2	9 8 7 2 B	9 8 7 2 S	7 2 2 0 A	7 2 2 0 S	7 1 2 7 2 6 5 0 A 3	7 1 2 7 2 6 5 0 A 4	7 2 4 0	7 4 7 0
H	P-GL Instruction	Definition	Å	A	Å	AA	ВВ	B	A	ВА	A	В	Ā	č	Ť	C	Ť	BA	ВА	Å	A
RO	n	Rotate coordinate system (i)		*	*	*	*	*	*												
RP	n .	Replots buffered plot n times (i)			*		NB	N					, ,								
RR	X,Y	Fill rectangle relative (i)					В	*													
RR	X,Y	Fill rectangle relative (d)			*																
RR	X,Y	Fill rectangle relative (i/d)		*																	
¹SA		Select alternate character set	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
2SC	$X_{\min}, X_{\max}, Y_{\min}, Y_{\max}$	User-unit scaling (i)	*	*	*	*	*	*	*	*				*	*	*	*	*	*	*	*
SC	$X_{min}, X_{max}, Y_{min}, Y_{max}$ (,r)	User-unit scaling (d) with rotation (i)								·	*	*								*	
SC	mm(,r)	Set scaling in millimetres (d) with rotation (i)									*	*								*	
SC	in(,r)	Set scaling in inches (d) with rotation (i)									*	*								*	
SC	(,r)	Set scaling with rotation (i)									*	*								*	
SG	group number	Select pen group (i)			N		В	*													
¹SI	width,height	Set absolute character size (d)	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
¹ SL	$tan\theta$	Set character slant from vertical (d)	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
¹SM	c	Specify character for symbol mode plotting (c)	*	*	*	*	*	*	*	*			*	*	*	*	*	*	*		*

SM	c(,n)	Specify character (c) for symbol mode plotting at each multiple of coordinate n (i)									*	*			•					*	
¹SP	pen number	Select pen (i)	*	*	*	*	*	*	*	N	N	N	*	*	*	*	*	N	N	N	*
¹SR	width,height	Set relative character size (d)	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
¹SS		Select standard character set	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
ST		Set text position									*	*								*	
su	width,height	Set user-unit character size (d)										*								*	
¹TL	tp(,tn)	Set tick length (d)	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
uc	(pen control,)X,Y (,pen control)(,)	Plot user-defined character (i)			*	*	*	*		* .	*	*	*	*	*	*	*	*	*	*	
UC	(pen control,)X,Y (,pen control)(,)	Plot user-defined character (d)	*	*																	N
UF	$gap_1(,gap_2,\dots gap_{20})$	Create user-defined fill type			*		В	*				:									
¹VA		Activate adaptive velocity	N	N	N	N	N	N	N	N	N	N	*	. *	*	*	*	N	N	N	N
¹VN		Reactivate normal velocity	N	N	N	N	N	N	N	N	N	N	*	*	*	*	*	N	N	N	N
¹VS	pen velocity(,pen number)	Set velocity (i) for pen (i)			*	*	*	*		*		*	*	*	*	*	*	*	*	*	
vs	pen velocity	Set velocity (d)	*	*					*												*
WD	cc	Write to display			*		NB	N													
WG	radius,start angle, sweep angle(,chord angle)	Fill wedge of circle with radius (i/d), start angle (i), sweep angle (i), chord angle (i)		*																	
WG	radius,start angle, sweep angle(,chord tolerance)	Fill wedge of circle with radius (i), start angle (d), sweep angle (d), chord tolerance (d)					В	*													

				HF	-IE	or l	RS	-232-0	C				H	P-II	3				I	RS-232	-C		HP-IL
HP-GL In	astruction	Definition	7 4 7 0 A	7 4 7 5 A	7 5 5 0 A	5 8	5	7 7 5 5 8 8 0 5 B B	7 5 8 6 B	7 0 9 0 A	9	7 1 1 7 2 6 5 0 A 1 B A	7 2 4 5 A	7 2 4 5 B	9 8 7 2 A	9 8 7 2 B C	9 8 7 2 S T	7 2 2 0 A C	7 2 2 0 S T	7 1 2 7 2 6 5 0 A 3 B A	7 1 2 7 2 6 5 0 A 4 B A	7 2 4 0 A	7 4 7 0 A
	start angle, angle(,chord ce)	Fill wedge of circle with radius (d), start angle (d), sweep angle (d), chord tolerance (d)			*	<u> </u>																	
(,start p point(,n minor t	(,tick interval point(,end number of ick intervals jor tick))))	Plot user-unit X-axis												*.								*	
¹XT		Draw X-axis tick	*	*	*	*		*	*	*	* ,	*	*	*	*	*	*	*	*	*	*	*	*
(,start p point(,n minor t	(,tick interval point(,end number of ick intervals jor tick))))	Plot user-unit Y-axis												*							-	*	
¹YT		Draw Y-axis tick	*	*	*	*		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

Abbreviations

(i) = Integer (d) = Decimal (or Real) (i/d) = Integer if not scaled or decimal if scaled. (c) = ASCII character

Syntax Notations

() = All items in parentheses are optional.
 c...c = Any number of labeling characters.
 (,...) = Any number of X,Y coordinate pairs. In the GR instruction, any number of

Plotter Applicability

= Normal implementation

N = Instruction recognized, but ignored (NOP).

Blank = Instruction not recognized (error 1 set).

† Implemented only on RS-232-C plotters with serial prefix number 2312A or

migner.

Error 8 is set if sheet paper is being used, roll paper is not properly loaded, or, for the 7220 and 9872, the plotter is a B or C model.

Implemented only on 7580B/7585B plotters with serial prefix number 2402 and higher. On earlier B models, error 1 set.

NOP'd on 7580B/7585B plotters with serial prefix number 2402 and higher. On earlier B models, error 1 set.

= Implemented only on 758XB plotters with serial prefix numbers 2309, 2331, 2334, 2335. On B models with serial prefix number 2402 and higher, instruc-

tion is NOP'd.

= Draws a cutline across the border between plots.

 $^{^1\}mathrm{Instructions}$ applicable to all plotter models. $^2\mathrm{Instructions}$ applicable to all plotter models except 9872A.

Plotter ASCII Code Definitions in Character Sets

Reaction in All Sets

The reaction of all plotters to nonprinting ASCII control characters (decimal equivalents 0 through 32 and 127) are listed in the table entitled Plotter Reaction to ASCII Control Characters.

ASCII

Character

Decimal Value

31

32

127

142

143

US

SP

DEL

SS2

SS3

0 **NULL** ¹No Operation (NOP) SOH ¹NOP 1 2 ¹NOP STX **End Label Instruction (Default)** 3 ETX 1NOP ETO ¹NOP **ENQ** 5 ¹NOP ACK 6 NOP 7 BEL 8 BS Backspace 2NOP 9 HT 10 LF Line Feed VT Inverse Line Feed 11 NOP. 12 FF 13 CR Carriage Return Select Alternate Character Set SO 14 Select Standard Character Set 15 SINOP DLE 16 NOP DC1 17 DC2 NOP 18 19 DC3 NOP 20 NOP DC4 21 NAK ¹NOP 22 ¹NOP SYN 23 ETB ¹NOP 24 CAN ¹NOP 25 ¹NOP $\mathbf{E}\mathbf{M}$ 26 ¹NOP **SUB** 27 **ESC** ¹NOP 28 FS ¹NOP 29 GS ¹NOP 30 RS ¹NOP

Plotter Reaction to ASCII Control Characters

¹NOP

Space 1,3NOP

Single Shift to Slot G2

(ISO 8-Bit Mode Only)

Single Shift to Slot G3 (ISO 8-Bit Mode Only)

 $^{^1\}mathrm{On}$ all 9872 models, error 4 is generated. $^2\mathrm{On}$ 7475A and 7550A plotters, and on 758X plotters with serial prefix number 2402 and higher, decimal 9 generates 1/2 backspace (HT, horizontal tab). $^3\mathrm{On}$ 7470A plotters, decimal 127 causes the \perp symbol to be drawn. $^4\mathrm{Implemented}$ only on 7550A plotters and on 758X plotters with serial prefix number 2402 and higher.

All plotters have the capability of labeling with any of at least five internal character sets. These character sets are designated sets 0 through 4, and each set includes characters that correspond with, or are accessed by, ASCII printing characters (decimal codes 33 through 126). Except for minor cosmetic differences, such as a slash through the numeral zero, these five character sets are identical from plotter to plotter. In addition, each character set has identical upper- and lowercase alphabetic characters and identical numerals. They differ only in certain symbols and punctuation marks that are unique to a particular language.

At any time, the plotter can label using either the standard character set or the alternate character set. When default conditions are established, all plotters automatically set both the standard and alternate sets to the ANSI ASCII character set (set 0). The standard character set and the symbols which vary from set to set are shown next for each plotter.

NOTE: The plotters will perform an automatic backspace before drawing any of the shaded symbols. Therefore, when an accented letter is required, the letter should be entered first, followed by the accent. \Box

7090A

CHARACTER SET 0
! "#\$%&'()*+, -. /0123456789:; <=>?@
ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`
abcdefghijklmnopqrstuvwxyz{|}~

Decimal Value	Set O	Set 1	Set 2	Set 3	Set 4
35 39 91 92 93 94 95 96 123 124 125	# ' [\] ^ - \ { ! }	#	£	£	

7220A,C,S,T and 9872A,B,C,S,T

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

Decimal Value	Set O Standard ASCII	Set 1 9825 ASCII	Set 2 French/German ASCII	Set 3 Scandinavian ASCII	Set 4 Spanish/Latin American ASCII
35 39 91 92 93 94 95 96 123 124 125	# [\] ~ { }	# - - -	£ [Ç]	£ Ø Æ Ø æ	

CHARACTER SET Ø

7225A,B (17601A, 17603A, 17604A)

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

Decimal Value	Set 0	Set 1 9825 ASC11	Set 2 French/German ASCII	Set 3 Scandinavian ASCII	Set 4 Spanish/Latin American ASCII
35 39	# ,	#	.	ţ	٤
91] [[[0]
92	١	ł	ç	Æ	i
93]]	ĺ	ø]
94	^	1	•	æ	•
95	_	_		-	4_1
96	,			`	
123	{	• π		•	L 7 *
124		⊦	•	•	- 7
125	}	-	••	••	.~
126	~	- Touris	'	. •	.~

7240A and 7245A,B

CHARACTER SET 0

! "#\$%%'() * + , - . / Ø 1 2 3 4 5 6 7 8 9 : ; < = > ?
@ A B C D E F G H I J K L M N O P Q R S T U V W X Y Z [\] ^ _
`abcdefghijklmnapqrstuvwxyz{{}} ~

Decimal Value	Set Ø	Set 1 9825 ASC11	Set 2 French/German ASCII	Set 3 Scandinavian ASCII	Set 4 Spanieh/Latin American ASCII
35 39	#	#	1	į	Į.
91 92 93 94 95 96 123	; ; ;	[[0 E *	[]]
124 125 126	` } ~	+ →		1. 1. 2.	

The 7240 and 7245 plotters have nine additional internal dot matrix character sets. Below is the standard ASCII dot matrix set (set 20), followed by the symbols in the dot matrix character sets that change from set to set. Automatic backspacing is not performed on these symbols.

CHARACTER SET 20
! * # \$ % & * () * + , - . / 0 1 2 3 4 5 6 7 8 9 ; ; < = > ?
@ A B C D E F G H I J K L M N O P Q R S T U V W X Y Z [\] * _
* a b c d e f g h i j k l m n o p q r 5 t u v w x y z { l } ~ #

	Set 20	Set 21	<u>Set 22</u>	Set 23	Set 24	Set_25	<u>Set 26</u>	Set 27
Decimal Value	Std ASCII	9825 ASCII	French ASCII	German ASCII	Swedish/ Finnish ASCII	Denish/ Norwegian ASCII	Spanish ASCII	British ASCII
35				£			*	£
36	\$	\$	\$	\$	8	\$	\$	\$
64	•		à	S	É		@	•
91	C	E ·		Ä	Ä	Æ	i	C
92	\	1.	ç	Ö	Ö	0	FI	\ \
93	3	נ	s	Ü	A	. A	ć)
94	~ .		~	_	_	י ט	~	1
96	•		•		€	•	•	
123	-{	π	é	ä	ä	ae	-{	₹ .
124	:		م ا	ä	ä	ø	ñ	
125	}	→	<u> </u>	ū	a	a	>	3-
126	~	Σ		B	~	[12]	~	~
127			-	-	**	-	**	-

The Roman Extension ASCII dot matrix set (set 28) is shown next. The shaded characters highlight the differences between this set and set 20 shown above.

CHARACTER SET 28

! " * \$ % 4 ' () * + , - . / 0 1 2 | ' G N T 1 & 0 6 () > ?

• A B C D 6 F G & A J 0 8 M 8 U A Q Ø 6 4 U 9 M A Y 0 U 6 1 8 _

CHARACTER SET O

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

Decimal	Set 0	Set 1	Set 2	Set 3	Set 4
Value	Standard ASCII	9825 Set	French/German	Scandinavian	Spanish/Latin American
35 39	#,	#	£	ť	٤
91	[Ē	[0	[[
92	1	- f ∃	Ç	Æ	1 1
93 94	Ţ	↑	, J	Ø æ	٠ ا
95	_	_	-	E=X	L=,
96 123	{	π	••	••	7
124		Ë	•		~
125 126	} ~		1		()

CHARACTER SET 0 ! "#\$%&'() *+, -./0123456789:; <=>?@ ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_ abcdefghijklmnopqrstuvwxyz{|}~

Refer to the 7470A chart for the shaded symbols associated with automatic backspacing. These symbols are the same on the 7470A and 7475A plotters.

The 7475A plotter has 19 internal character sets. In addition to the standard five sets, the 7475A plotter also contains the following:

Set 6	JIS ASCII	Set 33	ISO German
Set 7	Roman Extensions	Set 34	ISO French
Set 8	Katakana	Set 35	ISO British
Set 9	ISO IRV (International	Set 36	ISO Italian
2000	Reference Version)	Set 37	ISO Spanish
Set 30	ISO Swedish	Set 38	ISO Portuguese
Set 31	ISO Swedish for Names	Set 39	ISO Norwegian,
Set 32	ISO Norwegian,		Version 2
· ·· · -	Version 1	•	

Except for minor cosmetic differences, these sets are the same as the corresponding sets pictured in the ASCII Code Definitions in Character Sets table beginning on page 37.

Character sets 0, 10, and 20 from the three respective fonts are shown below. The difference in the total space required to plot the sets emphasizes the difference between fixed-space fonts and variable-space fonts.

Fixed-Space Vector Font

CHARACTER SET 0
! "#\$%&'() *+, -./0123456789:; <=>?@
ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`
abcdefghijklmnopqrstuvwxyz{|}~

Variable-Space Arc Font

CHARACTER SET 10
!"#\$%&'()*+,-./0123456789:;<=>?@
ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_\
abcdefghijklmnopqrstuvwxyz{|}~

Fixed-Space Arc Font (Implemented only on 758XB plotters with serial prefix number 2402 and above.)

CHARACTER SET 20
! "#\$%&'()*+,-./0123456789:;<=>?@
ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_'
abcdefghijklmnopqrstuvwxyz{|}~

The table beginning on the following page shows all the character sets. Each of the shaded symbols is automatically backspaced one character before it is drawn.

The special centered symbols in character sets 5, 15, and 25 (ASCII decimal codes 65 through 79) are designed for use in symbol mode with the SM instruction. When used in a label instruction, spacing will be irregular and may produce undesirable results.

Ì	DECIMAL				•					S	ΕT											
	VALUE	0	1	2	3	4	5	6	7	8	9	30	31	32	33	34	35	36	37	38	39	99
	33	!	!	!	!	!	!	!	À		!	!	!	!	!	!	!	! .	!	!	!	!
	34	"	11	"	11	· ·	н	**	Â	٢	II	11	11	11	11	"	11	н	"	"	o	"
	35	#	#	£	£	خ	#	#	È	١	#	#	#	#	#	£	£	£	£	#	#	¢
	36	\$	\$	\$	\$	\$	\$	\$	Ê		¤	¤	¤	\$	\$	\$	\$	\$	\$	\$	\$	\$
	37	%	%	%	%	%	%	%	Ë	•	%	%	%	%	%	%	%	%	%	%	%	%
	38	8	8	2	8	8	3	2	Î	Ŧ	2	2	2	2	2	2	8	8	8	2	8	&
	39	,	•		•		•	1	Ϊ	7	,	,	,	,	,	,	•	,	,	•	,	,
	40	(((((((1	1	((((((((((((
l	41)))))))	`	ゥ))))))))))))
l	42	×	×	×	*	×	×	×	^	I	×	×	×	×	×	*	×	×	×	*	×	*
١	43	+	+	+	+	+	+	+	••	オ	+	+	+	+	+	+	+	+	+	+	+	+
١	44			٠,		,	,		~	Þ		•						,	,			,
	45	-	-	_	-	-	_	_	Ù	ユ	-	_	_	_	_			-	-	-	-	-
۱	46							•	Û	3												.
١	47	/	/	/	/	/	/	/	£	עי	/	/	/	/	/	/	/	/	/	/	/	/
	48	0	0	0	0	0	0	0	-	_	0	0	0	0	0	0	0	0	0	0	0	0
	49	1	1	1	1	1	1	1		7	1	1	1	1	1	1	1	1	1	1	1	1
١	50	2	2	2	2	2	2	2		1	2	2	2	2	2	2	2	2	2	2	2	2
l	51	3	3	3	3	3	3	3	•	ゥ	3	3	3	3	3	3	3	3	3	3	3	3
	52	4	4	4	4	4	4	4	Ç	I	4	4	4	4	4	4	4	4	4	4	4	4
	53	5	5	5	5	5	5	5	Ç	†	5	5	5	5	5	5	5	5	5	5	5	5
l	54	6	6	6	6	6	6	6	Ñ	カ	6	6	6	6	6	6	6	6	6	6	6	6
	55	7	7	7	7	7	7	7	ñ	ŧ	7	7	7	7	7	7	7	7	7	7	7	7
	56	8	8	8	8	8	8	8	i	2	8	8	8	8	8	8	8	8	8	8	8	8
	57	9	9	9	9	9	9	9	خ	ታ	9	9	9	9	9	9	9	9	9	9	9	9
l	58	:	:	:	:	:	:	:	¤	ב	:	:	:	:	:	:	:	:	:	:	:	:
	59	;	;	;	:	;	;	;	£	サ	:	;	;	;	:	;	;	:	;	;	:	;
	60	<	<	<	<	<	<	<	¥	Ð.	, <	<	<	<	<	<	<	<	<	<	<	<
	61	=	=	=	=	=	=	=	§	7	=	=	=	=	=	=	=	=	=	=	=	=
ĺ	62	>	>	>	>	>	>	>	f	t	>	>	>	>	>	>	>	>	>	>	>	>
l	63	?	?	?	?	?	?	?,	¢	ソ	?	?	?	?	?`	?	?	?	?	?	?	?
L	64	@	@	0	@	0	@	@	â	9	@	@	É	@	§	à	@	§	§	§	§	@

									SI	ΕT		·									-
DECIMAL VALUE	0	1	2	3	4	5	6	7	8	9	30	31	32	33	34	35	36	37	38	39	99
65	Α	Α	Α	Α	Α	0	Α	ê	£	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
66	В	В	В	В	В	Φ	В	ô	ッ	В	В	В	В	В	В	В	В	В	В	В	В
67	С	С	С	С	С	Δ	С	û	テ	С	С	С	С	С	С	С	С	С	С	С	C
68	D	D	D	D	D	+	D	á	٢	D	D	D	D	D	D	D	D	D	D	D	D
69	Ε	Ε	Ε	Ε	Ε	×	Ε	é	ナ	Ε	Ε	Ε	Ε	Ε	Ε	Ε	Ε	Ε	Ε	Ε	E
70	F	F	F	F	F	Φ	F	ó	_	F	F	F	F	F	F	F	F	F	F	F	F
71	G	G	G	G	G		G	ú	ヌ	G	G	G	G	G	G	G	G	G	G	G	G
72	Н	Н	Н	Н	Н	×	Н	à		Н	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н
73	I	I	I	Ι	·I	Z	I	è	י	I	I	I	I	I	Ι	I	Ι	I	I	I	I
74	J	J	J	J	J	Y	J	ò	Ŋ	J	J	J	J	J	J	J	J	J	J	Ù	ار
75	К	Κ	K	K	К	×	K	ù	t	Κ	К	K	ıΚ	Κ	Κ	K	К	K	K	Κ	Κ
76	L	L	L	L	L	*	L	ä	フ	L	L	L	L	L	L	L	L	L	L	L	L
77	М	М	М	M	М	×	М	ë	1	М	М	М	М	М	М	М	М	М	М	М	Μ
78	Ν	Ν	Ν	Ν	Ν	ı	Ν	Ö	朮	Ν	Ν	Ν	Ν	Ν	Ν	Ν	Ν	Ν	Ν	Ν	Ν
79	0	0	0	0	0	*	0	ü	7	0	0	0	0	0	0	0	0	0	0	0	0
80	Р	Ρ	Р	Ρ	Ρ	_	Р	Å	Ξ	Р	Ρ	Ρ	Р	Р	Ρ	Ρ	Ρ	Ρ	Ρ	Р	Ρ
81	Q	Q	Q	Q	Q	1	Q	î	ሪ	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q
82	R	R	R	R	R	R	R	Ø	ĸ	R	R	R	R	R	R	R	R	R	R	R	R
83	S	S	S	S	S	S	S	Æ	ŧ	S	S	S	S	S	S	S	S	Ş	S	S	S
84	Т	Т	T	T	T	T	Τ	â	†	T	Т	Т	Т	T _.	Ţ	T	Τ	Т	Т	Т	Т
85	U	U	U.	U	U	U	U	í	1	U	U	U	U	U	U	U	U	U	U	U	U
86	٧	٧	V	٧	٧	٧	٧	Ø	3	٧	٧	٧	٧	٧	٧	٧	٧	٧	٧	٧	٧
87	W	W	W	W	W	W	W	æ	う	W	W	W	W	W	W	W	W	W	W	W	W
88	Х	Χ	Χ	Χ	. X	Х	Χ	Ä	IJ	Χ	X	Χ	Χ	Χ	Χ	Χ	Χ	Χ	Χ	Χ	×
89	Υ	Υ	Υ	Υ	Υ	Υ	Υ	ì	Jν	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Y	Υ	Υ	Υ	Υ
90	Z	Z	Z	Z	Z	Z	Z	Ö	V	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z
91	[[[Ø	E ,	[[Ü	Ω	[Ä	Ä	Æ	Ä	•	[•	i	Ã	Ã	[
92	\	√	Ç	Æ	i	\	¥	É	9	\	Ö	Ö	Ø	Ö	Ç	\	Ç	Ñ	Ç	Ç	Ø
93]]]	Ø]]]	ï	ン]	Å	Å	Å	Ü	§]	é	خ	õ	õ]
94	^	1		æ	~	^	^	ß	**	^	^	Ü	^	^	^	^	^	^	^	^	1
95								Ô	۰				_		_		_	_	_		
96	`		`	`	`	`	`	Á		`	`	é	`	`	`	`	ù	`	`	`	`

DECIMAL VALUE	0	1	2	3	4	5	6	7	SI 8	ET 9	30	31	32	33	34	35	36	37	38	39	99
								Ã													
97	a	a	a	a	а	0	a			a	a	a	a	a	a	a	a	a	a	a	a
98	þ	b	b	b	b	Э -	b	ã		b	b	b	b	b	b	þ	b	b	b	þ	Ь
99	C	С	C	C	C	C	С	Đ		С.	С	C	C	С	C	C	С	С	C	С	C
100	ď	d	ď	d _	d	U —	d	đ 4		d	ď	đ	đ	ď	đ	đ	d	ď	ď	d	d
101	e	e	e	e	e		e	Í		e	e	e	e	e	e	e	e	e	e	e	е
102	f _	f	f	f -	f	=	f	Ì		f	f	f	f	f	f	. f	f	f	f	f	f
103	9	g	g	g	9	≅	g	Ó		g	g	g	g	g	g	g	g	g	g	g	9
104	h	h	h	h	h	~	h	Ò ~		h	h	h	h	h	h	h ·	h	h	h	h	h
105	i	i	i	i	i	~	i	õ		i	i	i	i	i	i	i	i	i	i	i	i
106	j	j	j	j	j	≤ .	j	õ		j	j	j	j	j	j	j	j	j	j	j	
107	k	k	K	k	k	≥	K	Š		k	k	K	k	k	k	k	k	K	k	k	k
108	1	1	1	1	1	≠	1	š		1	1	1	1	1	1	1	1	1	1	1	l
109	m	m	m	m	m	Δ	m	Ú		m	m	m	m	m	m	m	m	m	m	m	Ш
110	n	n	n	n	n	TT —	n	Ÿ		n	n	n	n	n	n	n	n	n	n	n	n
111	0	0	0	0	0	Σ	0	ÿ		0	0	0	0	0	0	0	0	0	0	0	0
112	р	р	р	р	р	± -	р	Þ		р	р	р	р	р	þ	þ	р	р	р	р	Р
113	q	q	q	q	q	Ŧ	q	þ		q	q	q	q	q	q	q	q	q	q	q	q
114	r	r	r	r	r		r			r	L	r	r	r	r	r	r	r	r	r	r
115	S	S	S	S	S	1	S			S	S	S	S	S	S	S	S	S	S	S	s
116	t	t	t	t	t	-	t			t	t	t	t.	t	t	t	t	t	t	t	†
117	u	u	u	u	u	1	u			u	u	u	u	u	Ц	u	u	u	u	u	u
118	٧	٧	٧	٧	٧	ſ	٧	-		٧	٧	٧	٧	٧	٧	٧	٧	٧	٧	٧	٧
119	W	W	W	W	W	÷	W	1/4		W	W	W	W	W	W	W	W	W	W	W	W
120	X	X	X	X	X	*	X	1/2		X	×	×	X	X	X	X	X	X	X	X	×
121	У	У	У	У	У	∇	У	<u>a</u>		У	У	У	У	У	У	У	У	У	У	У	У
122	Z	Z	Z	Z	Z		Z	<u>o</u>		z	Z	Z 	Z	Z	Z	Z	Z	Z	Z ~	Z	z
123	{	π						<		{	ä	ä	æ	ä	é		à	•	ã	ã	μ
124		-				1	1				Ö	Ö	Ø	Ö	ù		ò	ñ	Ç	Ç	°
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67	С	С	С	С	CA		С	û	テ	С	С	С	С	С	С	С	С	С	С	С
68	D	D	D	D	D+		D	á	٢	D	D	D	D	D	D	D	D	D	D	D
69	Ε	Ε	Ε	Ε	E×		Ε	é	ţ	Ε	Ε	Е	Ė	Ε	E	E	Ε	Ε	Ε	Ε
70	F	F	F	F	F₀	,	F	ó	_	F	F	F	F	F	F	F	F	F	F	F
71	G	G	G	G	G♠	•	G	ú	7	G	G	G	G	G	G	G	G	G	G	G
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76	L	L	L	L	L*		L	ä	フ	L	L	L	L	L	L	L	L	L	L	L
77	М	М	М	М	$M_{\mathbf{X}}$		М	ë	1	М	М	М	М	М	М	М	М	М	М	М
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79	0	0	0	0	0		0	ü	7	0	0	0	0	0	0	0	0	0	0	0
80	Ρ	Р	Ρ	Ρ	Р	-	Ρ	Å	Ξ	Ρ	Ρ	Ρ	Ρ	Ρ	Ρ	Р	Р	Ρ	Ρ	Р
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82	R	R	R	R	R	R	R	Ø	У	R	R	R	R	R	R	R	R	R	R	R
83	S	S	S	S	S	S	S	Æ	ŧ	S	S	S	S	S	S	S	S	S	S	S
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89	Y	Y	Y	Y	Y	Y	Y	ì	ال را	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
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98	b	b	b	þ	b	C	b	ã		þ	b	b	b	b	b	b	b	b	b	b
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102	f	f	f	f	f	=	f	Ì		f	f	f	f	f	f	f	f	f	f	f
103	g	g	g	g	g	≅	g	Ó		g	g	g	g	g	g	g	g	g	g	g
104	h	h	h	h	h	*	h	Ò		h	h	h	h	h	h	h	h	h	h	h
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107	k	k	k	k	k	≥	k	Š		k	k	k	k	k	k	k	k	k	k	k
108	1	1	1	١	1	≠	1	š		1	١	1	1	1	1		1	1	1	1
109	m	m	m	m	m	Δ	m	Ú		m	m	m	m	m	m	m	m	m	m	m
110	n	n	n	n	n	П	n	Ÿ		n	n	n	n	n	n	n	n	n	n	n
111	0	0	0	0	0	Σ	0	ÿ		0	0	0	0	0	0	0	0	0	0	0
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115	s	S	s	s	S	↑	S			s	S	S	S	S	S	S	S	s	s	s
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98	þ	b	b	b	b)	b	ã		b	b	þ	b	b	b	b	þ	þ	b	b
99	С	С	С	С	С	C	С	Đ		С	С	С	C	С	С	¢	С	С	С	С
100	d	d	d	d	d	Ų	d	đ		d	d	d	d	d	d	d	d	d	d	d
101	е	е	е	е	е		е	Í		е	е	е	е	е	е	е	е	е	е	е
102	f	f	f	f	f	=	f	Ì		f	f	f	f	f	f	f	f	f	f	f
103	g	g	g	g	g	¥	g	Ó		g	g	g	g	g	g	g	g	g	g	g
104	h	h	h	h	h	*	h	δ		h	h	h	h	h	h	h	h	h	h	h
105	i	i	i	i	i	~	i	Õ		i	i	i	i	i	i	i	i	i	i	i
106	j	j	j	j	j	≤	j	õ		j	j	j	j	j	j	j	j	j `	j	j
107	k	k	k	k	k	≥	k	Š		k	k	k	k	k	k	k	k	k	k	k
108	1	1	1	1	1	≠	1	Š		1	1	1	1	1	1	1	1	1	1	1
109	m	m	m	m	m	Δ	m	Ú		m	m	m	m	m	m	m	m	m	m	m
110	n	n	n	n	n	Π	n	Ϋ		n	n	n	n	n	n	n	n	n	n	n
111	0	0	0	0	0	Σ	0	ÿ		0	0	0	0	0	0	0	0	0	0	0
112	р	р	р	р	р	±	р	Þ		р	р	р	р	р	р	р	р	р	р	р
113	q	q	q	q	q	Ŧ	q	þ		q	q	q	q	q	q	q	q	q	q	q
114	r	r	r	r	r	→ '	r			r	r	r	r	r	r	r	r	r	r	r
115	s	S	s	s	S	1	s			S	S	S	S	S	s	S	s	s	S	s .
116	t	t	t	t	t	+	t			t	t	t	t	t	t	t	t	t	t	t
117	u	u	u	u	u	\downarrow	u			u	u	u	u	u	u	u	u	u	u	u
118	v	٧	٧	٧	٧	ſ	٧	-		٧	٧	٧	٧	٧	٧	٧	٧	٧	٧	V
119	W	W	W	W	W	÷	W	4		W	W	W	W	W	W	W	W	W	W	W
120	×	×	×	X	×	*	×	1/2		×	×	×	×	×	×	×	×	×	×	×
121	У	У	У	У	У	V	У	<u>a</u>		У	У	У	У	У	У	У	У	У	У	У
122	z	Z	Z	Z	Z	•	Z	<u>o</u>		Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	z
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126	~ 1	• 3	•			~	~	±		-		ü	_	ß	••	_	ì	~	•	~