# The HP-GL Story told by Tom Tremble, HP San Diego Division

As far as I remember, the original HP-GL language was developed by NORM JOHNSON and (I think) DALE SHAPPER, while working on the <u>9872A</u>, a four pen A3 vector plotter intended for use with Loveland's desktop programmable calculators (9825A, etc).

The story is said that some sort of mnemonic command language using alphabetic characters for the commands, and integer numeric (digits 0 to 9 and the minus sign) parameters as the data was desired. Only common punctuation (periods, commas, and colons, and semi-colons were allowed as separators, etc. This structure could be handled easily by any computing device and interface method whereas the binary format used by other devices of the time was difficult to impossible on some systems. Two characters were chosen for the commands because "one character didn't allow for enough commands, and three characters was too much to deal with".

Over the years, HP-GL was extended to HP-GL/2 (this when large format devices exceeded the dimensions that a 16 bit integer could specify using plotter units of 1016 "plotter units" to the inch, 40 per millimeter) and to add more functionality. When the LaserJet III was in development, the Boise division decided that vector plotting capability was needed in addition to the PCL language. The San Diego R&D Language team decided that if the HP-GL language was to be "owned" by San Diego in the future (in stead of by Boise), we had best take charge. Hence, a team was put together to create "a re-usable HP-GL/2 language definition and source code". There is a core set of commands which all devices must have, and several types of extensions groups which are used by devices based on their capabilities and purpose -- i.e., the color group, technical extensions, etc. This project was called "Starship" and resulted in the "Starship Code" which is used today in most higher end LaserJet's, DeskJet 1600, all DesignJets, and perhaps a few other products, be they raster or vector devices (all are raster print engines today). The definition has stayed essentially fixed since then.

#### HP-GL

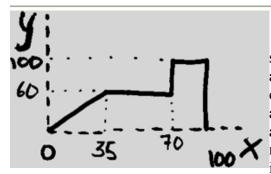
The HP-GL (Graphics Language) originated as a teamwork in the San Diego Division of Hewlett-Packard in the early 1970's. A veteran from those early days, Tom Tremble, has written a few words for us about <u>The story of HP-GL</u>. And a programming language it is, having become an industry standard. HP-GL was the original language, meant to support HP's first series of X/Y-plotters (The <u>9872 family</u>), being a flatbed machine with a moving arm and on this arm a moving pen holder. With wires wound up around two motors and pens located in slots along e front, the gthraphics presented was of really

high quality, being the first high-level language plotter on the market. The plotter was delivered with both HP-IB (IEEE488 8-bit bus standard), and RS232 (model 7221B).

As time went on, HP delivered a huge numbers of different series, with different models within each series. The original firmware was built around 16-bit addressing, limiting the physical size to AO (E) using a +- scheme for 16 bit integer data. (The resolution was 40 units/mm). Internally the electronics parces the incoming ASCII data and translates the two-letter commands into motor movements in the X and Y-directions, while also taking care of the pen selection and movement up and down. The HP-GL example gives you a sample of HP-GL programming.

Finally it was decided to change the core of HP-GL in order to allow for longer plots and also looking into the field of graphical plotting. The firmware code was completely re-written, using 32bit addressing and thus allowing for much longer plots. And in order to avoid special versions for every plotter family the commands were structured differently. This new version was called HP-GL/2.

## HP-GL Example



Here is an example of a simple drawing, some outline of something we want to have as a series of lines on our paper. In user coordinates the x varies from 0-->100, and y also 0-->100. All of HP's HP-GL plotters have a hardware resolution of 40 increments per millimeter, which constitutes the absolute increments. A reletive movement of 8000

plotter units means a position change of 8000/40mm=200 mm.

In our little example, we want these lines to walk over the whole area of the paper we load into our unit. Regardless of the size, and the number of plotter units we use, we must map our xy-values into whatever paper we have using a SC (scale) command. This command locates our range between the outer limits we are able to use, P1 (lower left) and P2 (upper right). In this simplified example the chain of commands will thus become:

| IN;                                     | INitialize the printer, resetting all HP-GL parametres to preset values. The ";" serves as a delimiter in the original HP-GL, separating the commands. A separator character is not used in HP-GL/2.  |
|---|---|
| SC0,100,0,100;                          | SCale the x-values (mapping them) such that the complete x-direction width is now having the value range X <sub>min</sub> =0 and X <sub>max</sub> =100. The same will be valid for the Y-axis.  |
| SP1;                                    | Select Pen number 1. In the "old" days when pens were pens in a carousel, the plotter could rotate the carousel and pick one of the pens. In this case the pen in position 1. (Whatever color and width it might have).   |
| PU;                                     | Pen Up, lift the "pen" up, no line is drawn on the media.   |
| PA0,0;                                  | Plot Absolute(with the pen up) from wherever you were to the position $0,0$ (x,y).  |
| PD;                                     | Pen Down, lover the pens to hit the media   |
| PA35,60,70,60,<br>70,100,100,100,100,0; | Move now the penn through the different points, like (35,60), (70,60), (70,100), (100,100), (100,0)   |
| PU;                                     | Lift the pen  |
| SP0;                                    | Select Pen 0, Meaning "no pen", to be sure nothing is plotted. In the old fashion pen plotters the pen previously used will be returned to its position in the pen carriage.  |
| NR; or PG;                              | Not Ready will for a pen plotter with a sheet of paper loaded put the paper forward, ready to be taken out. PG; (PaGe) is the most important command for all of HP's HP-GL or HP-GL/2 units. This command terminates the command sequences given to the plotter. And we also have to add the semicolon (;) as the last character, even in HP-GL/2. "The Plot Is Over", spit out the paper and be ready for the next plot. In the diagnostic section of this CD you will find a simple sequence for unit testing from DOS. |

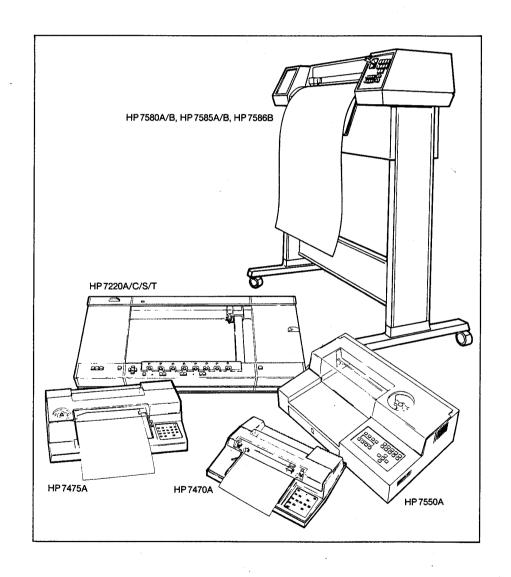
Finally, just to inform you: All of our large plotters and printers have the X-direction vertical. This is due to the fact that the longest axis (X-axis) runs along the media path. And we just defined it like this!

## 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<br>Manual | 07090-90001 |
| 7090A            | Operator's Manual                     | 07090-90002 |
| 7220 <b>A</b> ,S | Operating and Programming<br>Manual   | 07220-90002 |
| 7220C,T          | Operating and Programming<br>Manual   | 07220-90003 |
| 7225A/17601A     | Operating and Programming<br>Manual   | 17601-90000 |
| 7225B/17601A     | Operating and Programming<br>Manual   | 17601-90006 |
| 7225A,B/17603A   | Operating and Programming<br>Manual   | 17603-90002 |
| 7225A/17604A     | Operating and Programming<br>Manual   | 17604-90000 |
| 7240 <b>A</b>    | Operating and Programming Manual      | 07240-90000 |

### Introduction

Plotter Manuals

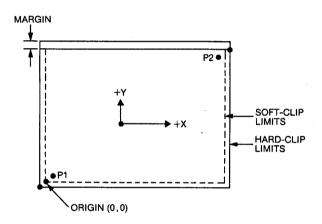
## Plotter Manuals (Continued)

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

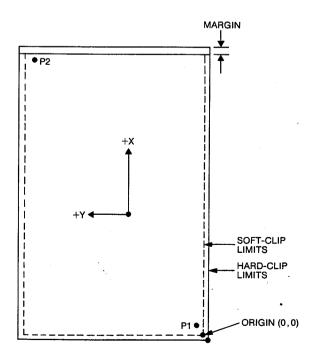
<sup>\*</sup>For HP 7580B and 7585B plotters with serial prefix numbers 2309, 2331, 2334, and 2335. \*\*For HP 7580B, 7585B, and 7586B plotters with serial prefix numbers 2402 and above.

## The Plotter Coordinate System

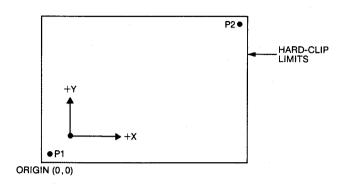
The plotting surface of all HP plotters is a Cartesian coordinate system that is scaled in plotter units. The plotter unit is the smallest possible addressable move and is 0.025 mm (approximately 0.001 in.) in length. The orientation of the X- and Y-axes, the locations of the origin point, and the default 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.



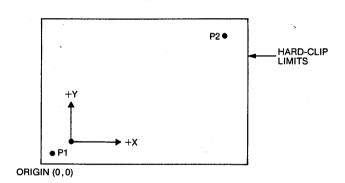
HP 7090A

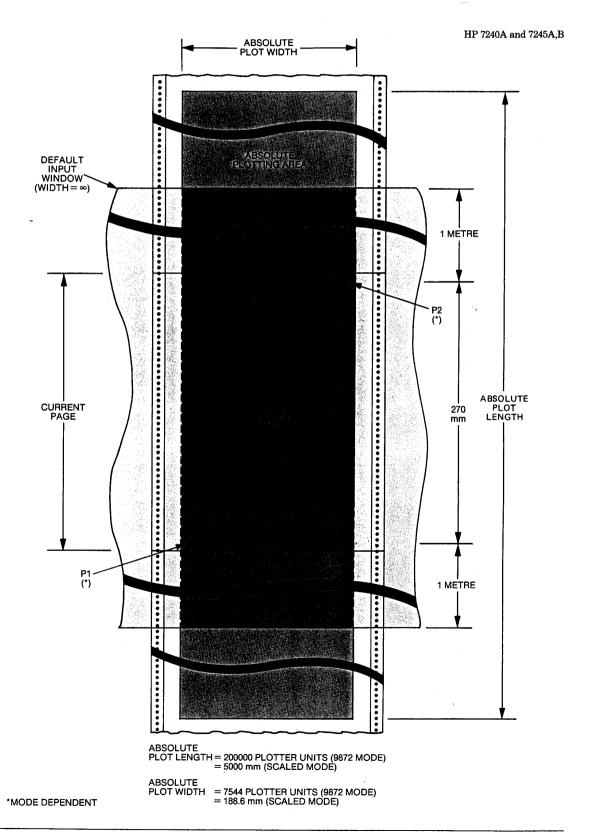


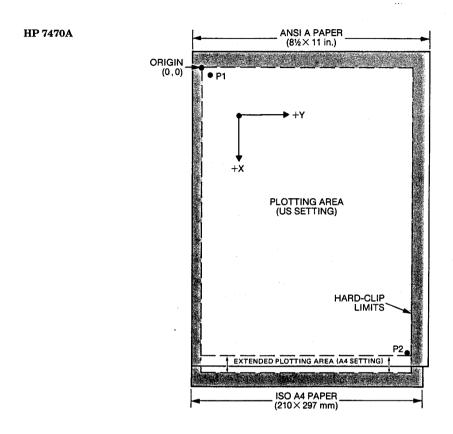


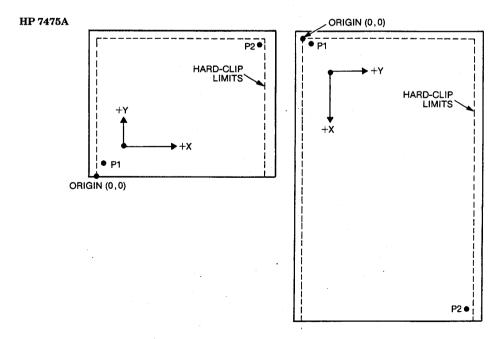


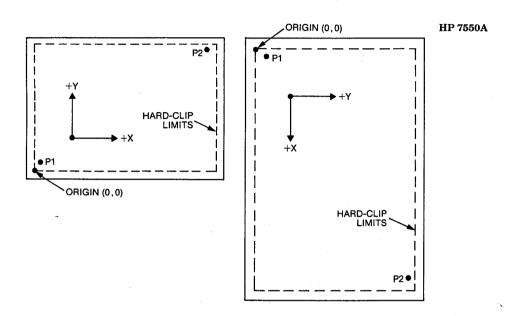
## HP 7225A,B (17601A, 17603A, and 17604A)

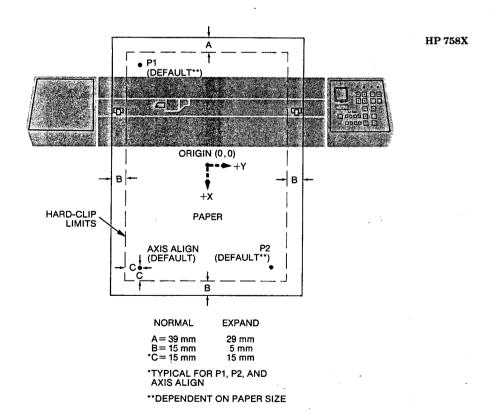












|                                      | Optional Switch<br>Settings and/or                         | Default Sc                       | aling Points                     | Plotting Range |  | Maximum<br>Plotting Area  |
|--------------------------------------|--|----------------------------------|----------------------------------|----------------|--|---|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

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

<sup>\*</sup>A and A4-sizes are loaded with the longer axis horizontal. All other sizes have long axis vertical.

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

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

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

<sup>\*\*\*</sup>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<br>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<br>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 $<br>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         |

<sup>&</sup>lt;sup>1</sup>Applicable 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)

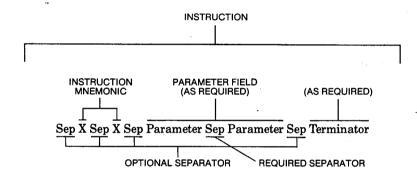
| Function                      | Condition   | Equivalent<br>Instruction | Exceptions |
|-------------------------------|---|---------------------------|------------|
| Fill type, spacing, and angle | <ul> <li>Type 1, solid bidirectional fill</li> <li>1% of distance between P1 and P2</li> <li>0 degrees</li> </ul> | 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         |

 $<sup>^{17}\</sup>rm{Applicable}$  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                                 | Required Terminator <sup>1</sup>  |  |  |  |
|----------------------------------|---|--|---|--|--|--|
| HP Plotter                       | Parameter<br>Separator  | Optional<br>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<br>commas and/<br>or spaces | ; or LF or the<br>next<br>mnemonic  |  | <del>_</del>   |  |
| 7220A,C,S,T                      | One or more commas and/ or spaces   | Zero or more<br>commas and/<br>or spaces | <del></del>   | ; only   | <del>-</del>   |  |
| 7225A,B/17601A                   | One comma   | Spaces are ignored                       | ; or LF   | <u></u>  |  |  |
| 7225A,B/17603A<br>7225A,B/17604A | One or more commas and/or spaces  | Zero or more<br>commas and/<br>or spaces | <del></del>   | ; only   | · ·  |  |
| 7240A                            | One comma   | Spaces are ignored                       | <del>-</del>  | ; only   | <del></del>  |  |
| 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<br>commas and/<br>or spaces | ; or LF or any<br>numeric or<br>nonalpha-<br>betic charac-<br>ters such as<br>\$ or #, or<br>the next<br>mnemonic | ; or non-<br>numeric or<br>nonalpha-<br>betic charac-<br>ters such as<br>\$ or #, or<br>the next<br>mnemonic | ; or LF or any<br>nonnumeric<br>or nonalpha-<br>betic charac-<br>ters such as<br>\$ or #, or<br>the next<br>mnemonic |  |
| 7475A                            | One or more commas and/or spaces, or a + or - sign which may be preceded by commas or spaces  | Zero or more<br>commas and/<br>or spaces | ; or LF or the<br>next<br>mnemonic  | ; or the next<br>mnemonic  | _  |  |
| 7550A                            | One or more commas and/or spaces  | Zero or more<br>commas and/<br>or spaces | ; or LF or<br>the next<br>mnemonic  | ; or the next<br>mnemonic  | -  |  |
| 7580A,B/<br>7585A,B/7586B        | One or more commas and/ or spaces   | Zero or more<br>commas and/<br>or spaces | ; or LF or<br>the next<br>mnemonic  | ; or the next<br>mnemonic  | <del></del>  |  |
| 9872A,B,C,S,T                    | One comma   | Spaces are ignored                       | ; or LF   | -  |  |  |

 $<sup>^{1}</sup>$ 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)   | Deci  | mal (d)   |
|-------------------------------|---|---|---|---|
| HP Plotter                    | Not Scaled  | Scaled*   | Not Scaled  | Scaled*   |
| 7090A                         | -32 768 to +32 767<br>(Decimal fraction<br>truncated)   | -32 768 to +32 767<br>(Decimal fraction<br>truncated)           | -128.0000 to<br>+127.9999<br>(Decimal fraction<br>optional) | -128.0000 to<br>+127.9999<br>Decimal fraction<br>optional)        |
| 7220A,C,S,T                   | ±32767 (Decimal fraction truncated)   | ±16383 (Decimal fraction truncated)                             | $\pm 127.999$ (Decimal fraction optional)                   | ±127.999 (Decimal fraction optional)                              |
| 7225A,B/<br>17601A            | ±32767 (Decimal produces an error)  | ±32767 (Decimal produces an error)                              | ±127.999 (Decimal fraction optional)                        | ±127.999 (Decimal fraction optional)                              |
| 7225A,B/<br>17603A            | ±32767 (Decimal produces an error)  | ±32767 (Decimal produces an error)                              | ±127.999 (Decimal<br>fraction optional)                     | ±127.999 (Decimal fraction optional)                              |
| 7225A,B/<br>17604A            | ±32 767 (Decimal fraction truncated)  | ±32767 (Decimal fraction truncated)                             | ±127.999 (Decimal fraction optional)                        | ±127.999 (Decimal fraction optional)                              |
| 7240A<br>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/<br>7475A               | -32768 to +32767<br>(Decimal fraction<br>discarded; integer<br>portion unchanged<br>if number is<br>positive, but is<br>increased to next<br>more negative<br>integer if number is<br>negative) | -32768.0000 to<br>+32767.9999<br>(Decimal fraction<br>optional) | -128.0000 to<br>+127.999 (Decimal<br>fraction optional)     | -32 768.0000 to<br>+32 767.9999<br>(Decimal fraction<br>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/<br>7585A,B/<br>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)                              |

<sup>\*</sup>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          | $\operatorname{SL}$ |
|---------------|---------------|-------------|---------------------|
| CP            | IP            | OP          | SM                  |
| CS            | IW            | os          | SP                  |
| DC            | LB            | OW          | SR                  |
| $\mathbf{DF}$ | LT            | . <b>PA</b> | SS                  |
| DI            | OA            | PD          | $\mathbf{TL}$       |
| DP            | $\mathbf{OC}$ | PR          | UC                  |
| $\mathbf{DR}$ | OD            | PU          | VS                  |
| $\mathbf{DT}$ | OE            | SA          | XT                  |
| 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<br>4<br>7<br>0 | 7<br>4<br>7<br>5 | 7<br>5<br>5<br>0 | 7 7<br>5 5<br>8 8<br>0 5 | 7<br>5<br>8<br>0 | 5<br>8 | 7<br>5<br>8<br>6 | 7<br>0<br>9<br>0 | 7 1<br>1 7<br>2 6<br>5 0<br>A 1 | 7<br>2<br>4<br>5 | 7<br>2<br>4<br>5 | 9<br>8<br>7<br>2 | 9<br>8<br>7<br>2<br>B | 9<br>8<br>7<br>2<br>S  | 7<br>2<br>2<br>0<br>A | 7<br>2<br>2<br>0<br>S | 7 1<br>2 7<br>2 6<br>5 0<br>A 3 | 7 1<br>2 7<br>2 6<br>5 0<br>A 4 | 7<br>2<br>4<br>0 | 7<br>4<br>7<br>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<br>angle (d), chord<br>tolerance (d) |                  |                  |                  | *                        |                  | *      | *                |                  |                                 |                  |                  |                  |                       |  |                       |                       |                                 |                                 | -                |                  |
| AA  | X,Y,arc angle(,chord tolerance) | Arc absolute X,Y (d), arc<br>angle (d), chord<br>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<br>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,<br>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),<br>arc angle (i), chord<br>angle (i)   | †                | *                |                  |                          |                  |        |                  |                  | ,                               |                  |                  |                  |                       |  |                       |                       |                                 |                                 |                  |                  |
| AR  | X,Y,arc angle(,chord tolerance) | Arc relative X,Y (i),<br>arc angle (d),<br>chord tolerance (d) |                  |                  |                  | *                        | :                | *      | *                |                  |                                 |                  |                  |                  |                       |  |                       |                       | *                               |                                 |                  |                  |

|                 |                                   |  |                  | HF               | -IB              | or RS                    | 5-232-0                  | 2                |             |                                 | F                 | [P-]   | В      |                       |                       |                  | F                | RS-232                   | -C                       |               | HP-IL            |
|-----------------|-----------------------------------|--|------------------|------------------|------------------|--------------------------|--------------------------|------------------|-------------|---------------------------------|-------------------|--------|--------|-----------------------|-----------------------|------------------|------------------|--------------------------|--------------------------|---------------|------------------|
|                 |                                   |  | 7<br>4<br>7<br>0 | 7<br>4<br>7<br>5 | 7<br>5<br>5<br>0 | 7 7<br>5 5<br>8 8<br>0 5 | 7 7<br>5 5<br>8 8<br>0 5 | 7<br>5<br>8<br>6 | 7<br>0<br>9 | 7 1<br>1 7<br>2 6<br>5 (<br>A 1 | 7 7<br>5 2<br>9 4 | 2<br>4 | 8 7    | 9<br>8<br>7<br>2<br>B | 9<br>8<br>7<br>2<br>S | 7<br>2<br>2<br>0 | 7<br>2<br>2<br>0 | 7 1<br>2 7<br>2 6<br>5 0 | 7 1<br>2 7<br>2 6<br>5 0 | 7 2 4         | 7<br>4<br>7<br>0 |
| H               | P-GL Instruction                  | Definition   | A                | A                | A                | AA                       | BB                       | B                | A           | BA                              | A                 |        | 2<br>A | C                     | T                     | A<br>C           | S<br>T           | A 3<br>B A               | A 4<br>B A               | 0<br><b>A</b> | A                |
| AR              | X,Y,arc angle(,chord tolerance)   | Arc relative X,Y (d), arc<br>angle (d), chord tolerance<br>(d) |                  |                  | *                |                          |                          |                  |             |                                 |                   |        |        |                       |                       |                  |                  |                          |                          |               |                  |
| AS              | pen acceleration<br>(,pen number) | Select pen acceleration<br>(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<br>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);<br>drawn with chord angle (i)          | †                | *                |                  |                          | -                        |                  |             |                                 |                   |        |        |                       |                       |                  |                  |                          |                          |               |                  |
| CI              | radius(,chord<br>tolerance)       | Circle of radius (i); drawn with chord tolerance (d)           |                  |                  |                  | *                        | *                        | *                |             |                                 |                   |        |        |                       |                       |                  |                  |                          |                          |               |                  |
| CI              | radius(,chord<br>tolerance)       | Circle of radius (d); drawn with chord tolerance (d)           |                  |                  | *                |                          |                          |                  |             |                                 | , .               |        |        |                       |                       |                  |                  |                          |                          |               |                  |
| CM              | switch mode (,fall-<br>back mode) | Character selection mode (i)                                   |                  |                  | *                |                          | В                        | *                |             |                                 |                   |        |        |                       |                       |                  |                  |                          |                          |               |                  |
| <sup>1</sup> CP | spaces, lines                     | Character plot (d)   | *                | *                | *                | *                        | *                        | *                | *           | *                               | *                 | *      | *      | *                     | *                     | *                | *                | *                        | *                        | *             | *                |

| ¹CS | set   | Designate character set                        | * | * | * | * | * . | * | * | *     | * | * | * | * | *   | * | *   | * | * | * | * |
|-----|---|--|---|---|---|---|-----|---|---|-------|---|---|---|---|-----|---|-----|---|---|---|---|
| СТ  | n   | Set chord tolerance mode<br>(i) for AA, AR, CI |   |   | * | * | *   | * |   |       |   |   |   |   | 1   |   |     |   |   |   |   |
| cv  | n(,input delay)   | Enables curved line<br>generator for delay (i) |   |   | * |   |     |   |   |       |   |   |   |   |     |   |     |   |   |   |   |
| DC  |   | Digitize clear                                 | * | * | * | * | *   | * |   | *     | * | * | * | * | *   | * | *   | * | * | * | * |
| ¹DF |   | Set default values                             | * | * | * | * | *   | * | * | *     | * | * | * | * | *   | * | *   | * | * | * | * |
| ¹DI | run,rise  | Set absolute label direction (d)               | * | * | * | * | *   | * | * | *     | * | * | * | * | *   | * | *   | * | * | * | * |
| DL  | character number<br>(,pen control),<br>X,Y(, )(,pen<br>control)(, ) | Define downloadable<br>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-                   | C                |                  |             |            | H                | P-II             | В                |                       |                       |                       | ]                     | RS-232                          | 2-C                             |                  | HP-IL            |
|----|---|---|------------------|------------------|------------------|--------------------------|--------------------------|------------------|------------------|-------------|------------|------------------|------------------|------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------------------|---------------------------------|------------------|------------------|
|    |   |   | 7<br>4<br>7<br>0 | 7<br>4<br>7<br>5 | 7<br>5<br>5<br>0 | 7 7<br>5 5<br>8 8<br>0 5 | 7 7<br>5 5<br>8 8<br>0 5 | 7<br>5<br>8<br>6 | 7<br>0<br>9<br>0 | 1<br>2<br>5 | 2 6        | 7<br>2<br>4<br>5 | 7<br>2<br>4<br>5 | 9<br>8<br>7<br>2 | 9<br>8<br>7<br>2<br>B | 9<br>8<br>7<br>2<br>S | 7<br>2<br>2<br>0<br>A | 7<br>2<br>2<br>0<br>S | 7 1<br>2 7<br>2 6<br>5 0<br>A 3 | 7 1<br>2 7<br>2 6<br>5 0<br>A 4 | 7<br>2<br>4<br>0 | 7<br>4<br>7<br>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,<br>sweep angle(,chord<br>angle          | Edge wedge of circle with radius (i/d), start angle (i), sweep angle (i), chord angle (i)         |                  | *                |                  |                          |                          |                  |                  |             |            |                  |                  |                  |                       |                       |                       |                       |                                 |                                 |                  |                  |
| EW | radius,start angle,<br>sweep angle(,chord<br>tolerance)     | Edge wedge of circle with radius (i), start angle (d), sweep angle (d), chord tolerance (d)       |                  |                  |                  |                          | В                        | *                |                  |             |            |                  |                  |                  |                       |                       |                       |                       |                                 |                                 |                  |                  |
| EW | radius,start angle,<br>sweep angle(,chord<br>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<br>number)                                   | Select tip force for pen  |                  |                  | *                | *                        | *                        | *                |                  |             |            |                  |                  |                  |                       |                       |                       |                       |                                 |                                 |                  |                  |
| FT | type(,spacing<br>(,angle))                                  | Fill type (i) with spacing (d) and angle (i)  |                  | *                |                  |                          |                          |                  |                  |             |            |                  |                  |                  |                       |                       |                       |                       |                                 |                                 |                  |                  |
| FT | type(,spacing<br>(,angle))                                  | Fill type (i) with spacing (d) and angle (d)  |                  |                  | *                |                          | В                        | *                |                  |             |            |                  |                  |                  |                       |                       |                       |                       |                                 |                                 |                  |                  |
| GC | count number  | Set count number (i)  |                  |                  | *                |                          | -                        |                  |                  |             |            |                  |                  |                  |                       |                       |                       |                       |                                 |                                 |                  |                  |
| GP | (group number,(pen<br>number(,number of<br>pens(,length)))) | Designate group (i)<br>starting with pen (i) of<br>specified pens (i) changing<br>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              | С   | Input character for sizing with OB instruction                    |   |   | N  | * | Y | N |    |   |   |   | : |   |   |    |     |   |    |     |    |
| <sup>1</sup> IM | e(,s(,p))   | Set e-, s-, and p-masks (i)                                       | * | * | *  | * | * | * | *  | * | * | * | * | * | * | *  | *   | * | *  | *   | *  |
| ¹IN             |   | Initialize plotter  | * | * | *  | * | * | * | *  | * | * | * | * | * | * | *  | *   | * | *  | *   | *  |
| <sup>1</sup> 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<br>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)  |   |   | *  | * | * | * |    |   |   |   |   |   |   |    |     |   |    |     |    |
| КҮ              | key(,function)  | Assign function (i) to key (i)                                    |   |   | *  |   |   |   |    |   |   |   |   |   |   |    |     |   |    |     |    |
| ¹LB             | $\mathbf{c}\dots\mathbf{c}$   | Label ASCII string (c)  | * | * | *  | * | * | * | *  | * | * | * | * | * | * | *  | *   | * | *  | *   | *  |
| LE              | n   | Set label enhancement n<br>for dot matrix characters (i)          | - |   |    |   |   |   |    |   | * | * |   |   |   |    |     | ٠ |    | *   |    |
| LO              | position number   | Set label origin (i)  |   |   | *  | * | * | * | *  |   | * | * |   |   |   |    |     |   |    | *   |    |
| ¹LT             | pattern number<br>(,pattern length)                                       | Set line type (i) and pattern length (d)                          | * | * | *  | * | * | * | *  | * | * | * | * | * | * | *  | *   | * | *  | *   | *  |
| NR              |   | Not ready (View state)  |   |   | *  | * | * | * |    |   |   |   |   |   |   |    |     |   |    |     |    |
| <sup>2</sup> OA |   | Output actual position (i<br>return) and pen status (i<br>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 |
|----------------------------------|-------|-------------|-----|-----------|----|
|----------------------------------|-------|-------------|-----|-----------|----|

|                   |  |                  | HP               | -IB              | or I                     | RS-       | 232-0                    | 2                |                  |                  |                  | н                | P-IF             | 3                |                       |                       |                       | I                     | RS-232                          | 2-C                             |         | HP-IL            |
|-------------------|--|------------------|------------------|------------------|--------------------------|-----------|--------------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------------------|---------------------------------|---------|------------------|
|                   |  | 7<br>4<br>7<br>0 | 7<br>4<br>7<br>5 | 7<br>5<br>5<br>0 | 7 7<br>5 8<br>8 8<br>0 8 | 5   8   5 | 7 7<br>5 5<br>8 8<br>0 5 | 7<br>5<br>8<br>6 | 7<br>0<br>9<br>0 | 1<br>2<br>5<br>A | 1<br>7<br>6<br>0 | 7<br>2<br>4<br>5 | 7<br>2<br>4<br>5 | 9<br>8<br>7<br>2 | 9<br>8<br>7<br>2<br>B | 9<br>8<br>7<br>2<br>S | 7<br>2<br>2<br>0<br>A | 7<br>2<br>2<br>0<br>S | 7 1<br>2 7<br>2 6<br>5 0<br>A 3 | 7 1<br>2 7<br>2 6<br>5 0<br>A 4 | 7 2 4 0 | 7<br>4<br>7<br>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<br>*           |
| 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)  | *                | *                | *                | *                        |           | *                        | *                | *                |                  | *                | *                | *                | *                | *                     | *                     | *                     | *                     | *                               | *                               | *       | *                |
| <sup>2</sup> OF   | Output factors (i return)  | *                | *                | *                | *                        |           | *                        | *                | *                |                  | *                | *                | *                | *                | *                     | *                     | *                     | *                     | *                               | *                               | *       | *                |
| og                | Output count number and escape status (i return)                 |                  |                  | *                |                          |           |                          |                  |                  |                  |                  |                  |                  |                  |                       |                       |                       |                       |                                 |                                 |         |                  |
| ОН                | Output hard-clip limits (i return)                               |                  | *                | *                | *                        |           | *                        | *                | *                |                  |                  |                  |                  |                  |                       |                       |                       |                       |                                 |                                 | :       |                  |
| <sup>2</sup> OI   | Output identification (c return)                                 | *                | *                | *                | *                        |           | *                        | *                | *                |                  | *                | *                | *                | *                | *                     | *                     | *                     | *                     | *                               | *                               | *       | *                |
| ОК                | Output function key (i return)                                   |                  |                  | *                |                          |           | NB                       | N                |                  |                  |                  |                  |                  |                  |                       |                       |                       | -                     |                                 |                                 |         |                  |
| OL                | Output length of buffered label (d, i, i return)                 |                  |                  | *                | *                        |           | *                        | *                |                  |                  |                  |                  |                  |                  |                       |                       |                       |                       | *                               |                                 |         |                  |
| <sup>2</sup> OO   | Output options (i return)  | *                | *                | *                | *                        |           | *                        | *                | *                |                  | *                | *                | *                |                  | *                     | *                     | *                     | *                     | *                               | *                               | *       | *                |
| <sup>1</sup> 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.<br>Pysa | <b>B</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                   | ;                |                  | <del>,,,,</del> ,               | H                | P-11             | 3                |                       | T                     |                       | F                     | RS-232                          | -C                              |                  | HP-IL            |
|-----------------|---|--|------------------|------------------|------------------|--------------------------|--------------------------|------------------|------------------|---------------------------------|------------------|------------------|------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------------------|---------------------------------|------------------|------------------|
|                 |   | •  | 7<br>4<br>7<br>0 | 7<br>4<br>7<br>5 | 7<br>5<br>5<br>0 | 7 7<br>5 5<br>8 8<br>0 5 | 7 7<br>5 5<br>8 8<br>0 5 | 7<br>5<br>8<br>6 | 7<br>0<br>9<br>0 | 7 1<br>1 7<br>2 6<br>5 0<br>A 1 | 7<br>2<br>4<br>5 | 7<br>2<br>4<br>5 | 9<br>8<br>7<br>2 | 9<br>8<br>7<br>2<br>B | 9<br>8<br>7<br>2<br>S | 7<br>2<br>2<br>0<br>A | 7<br>2<br>2<br>0<br>S | 7 1<br>2 7<br>2 6<br>5 0<br>A 3 | 7 1<br>2 7<br>2 6<br>5 0<br>A 4 | 7<br>2<br>4<br>0 | 7<br>4<br>7<br>0 |
| H               | P-GL Instruction                          | Definition                                       | Å                | A                | Å                | AA                       | ВВ                       | B                | A                | ВА                              | A                | В                | Ā                | č                     | Ť                     | C                     | Ť                     | BA                              | ВА                              | Å                | Ā                |
| 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)                  | *                | *                | *                | *                        | *                        | *                | *                | *                               | *                | *                | *                | *                     | *                     | *                     | *                     | *                               | *                               | *                | *                |
| <sup>1</sup> 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<br>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<br>(,pen control)(,)                  | Plot user-defined character (i)  |   |   | * | * | *  | * |   | * . | * | * | * | *   | * | * | * | * | * | * |   |
| UC  | (pen control,)X,Y<br>(,pen control)(,)                  | Plot user-defined character (d)  | * | * |   |   |    |   |   |     |   |   | 5 |     |   |   |   |   |   |   | N |
| UF  | $gap_1(,gap_2,\dots gap_{20})$                          | Create user-defined fill type  |   |   | * |   | В  | * |   |     |   |   | ī |     |   |   |   |   |   |   |   |
| 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<br>number)                            | Set velocity (i) for pen (i)   |   |   | * | * | *  | * |   | *   |   | * | * | *   | * | * | * | * | * | * |   |
| vs  | pen velocity  | Set velocity (d)   | * | * |   |   |    |   | * |     |   |   |   |     |   |   |   |   |   |   | * |
| WD  | cc  | Write to display   |   |   | * |   | NB | N |   |     |   |   |   |     |   |   |   |   |   |   |   |
| WG  | radius,start angle,<br>sweep angle(,chord<br>angle)     | Fill wedge of circle with radius (i/d), start angle (i), sweep angle (i), chord angle (i)            |   | * |   |   |    |   |   |     |   |   |   |     |   |   |   |   |   |   |   |
| WG  | radius,start angle,<br>sweep angle(,chord<br>tolerance) | Fill wedge of circle with<br>radius (i), start angle (d),<br>sweep angle (d), chord<br>tolerance (d) |   |   |   |   | В  | * |   |     |   |   |   |     |   |   |   |   |   |   |   |

|                                  |  |   | HP-IB or RS-232-C     |                       |                       |          | HP-IB |                                 |                       |                       |       |  |                       | HP-IL                 |                       |                            |                            |                            |                            |  |  |                       |                       |
|----------------------------------|--|---|-----------------------|-----------------------|-----------------------|----------|-------|---------------------------------|-----------------------|-----------------------|-------|--|-----------------------|-----------------------|-----------------------|----------------------------|----------------------------|----------------------------|----------------------------|--|--|-----------------------|-----------------------|
| HP-GL Ir                         | nstruction   | Definition  | 7<br>4<br>7<br>0<br>A | 7<br>4<br>7<br>5<br>A | 7<br>5<br>5<br>0<br>A | 5<br>8   | 5     | 7 7<br>5 5<br>8 8<br>0 5<br>B B | 7<br>5<br>8<br>6<br>B | 7<br>0<br>9<br>0<br>A | 9     | 7 1<br>1 7<br>2 6<br>5 0<br>A 1<br>B A | 7<br>2<br>4<br>5<br>A | 7<br>2<br>4<br>5<br>B | 9<br>8<br>7<br>2<br>A | 9<br>8<br>7<br>2<br>B<br>C | 9<br>8<br>7<br>2<br>S<br>T | 7<br>2<br>2<br>0<br>A<br>C | 7<br>2<br>2<br>0<br>S<br>T | 7 1<br>2 7<br>2 6<br>5 0<br>A 3<br>B A | 7 1<br>2 7<br>2 6<br>5 0<br>A 4<br>B A | 7<br>2<br>4<br>0<br>A | 7<br>4<br>7<br>0<br>A |
|                                  | start angle,<br>angle(,chord<br>ce)  | Fill wedge of circle with radius (d), start angle (d), sweep angle (d), chord tolerance (d) |                       |                       | *                     | <u> </u> |       |                                 |                       |                       |       |  |                       |                       |                       |                            |                            |                            |                            |  |  |                       |                       |
| (,start p<br>point(,r<br>minor t | (,tick interval<br>point(,end<br>number of<br>tick intervals<br>jor tick)))) | Plot user-unit X-axis   |                       |                       |                       |          |       |                                 |                       |                       |       |  |                       | *.                    |                       |                            |                            |                            |                            |  |  | *                     |                       |
| ¹XT                              |  | Draw X-axis tick  | *                     | *                     | *                     | *        |       | *                               | *                     | *                     | *   , | *                                      | *                     | *                     | *                     | *                          | *                          | *                          | *                          | *                                      | *                                      | *                     | *                     |
| (,start p<br>point(,r<br>minor t | (,tick interval<br>point(,end<br>number of<br>cick intervals<br>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.

<sup>&</sup>lt;sup>1</sup>Instructions applicable to all plotter models. <sup>2</sup>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** <sup>1</sup>No Operation (NOP) SOH <sup>1</sup>NOP 1 2 <sup>1</sup>NOP STX **End Label Instruction (Default)** 3 ETX 1NOP ETO <sup>1</sup>NOP **ENQ** 5 <sup>1</sup>NOP 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 <sup>1</sup>NOP 22 <sup>1</sup>NOP SYN 23 ETB <sup>1</sup>NOP 24 CAN <sup>1</sup>NOP 25 <sup>1</sup>NOP  $\mathbf{E}\mathbf{M}$ 26 <sup>1</sup>NOP **SUB** 27 **ESC** <sup>1</sup>NOP 28 FS <sup>1</sup>NOP 29 GS <sup>1</sup>NOP 30 RS <sup>1</sup>NOP

Plotter Reaction to ASCII Control Characters

<sup>1</sup>NOP

Space 1,3NOP

Single Shift to Slot G2

(ISO 8-Bit Mode Only)

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

 $<sup>^1\</sup>mathrm{On}$  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. □

7090A

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

| Decimal<br>Value  | Set O   | Set 1                          | Set 2 | Set 3 | Set 4            |
|---|---|--------------------------------|-------|-------|------------------|
| 35<br>39<br>91<br>92<br>93<br>94<br>95<br>96<br>123<br>124<br>125 | # ' [ \ ] ^ <del>  \                                 </del> | #<br>' [<br>√<br>↑<br>♥<br>' π | £     | £     | خ<br>ا<br>ا<br>ا |

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

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

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

## CHARACTER SET Ø

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

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

| Decimal<br>Value | Set 0 | Set 1<br>9825<br>ASC11 | Set 2<br>French/German<br>ASCII | Set 3<br>Scandinavian<br>ASCII | Set 4<br>Spanish/Latin<br>American ASCII |
|------------------|-------|------------------------|---------------------------------|--------------------------------|--|
| 35<br>39         | # ,   | #                      | <b>.</b>                        | ţ                              | ٤  |
| 91               | ] [   | [                      | [                               | 0                              | ]  |
| 92               | ١     | ł                      | ç                               | Æ                              | i  |
| 93               | ]     | ]                      | ĺ                               | ø                              | ]  |
| 94               | ^     | 1                      | •                               | æ                              | •  |
| 95               | _     | _                      |                                 | -                              | 4_1                                      |
| 96               | ,     |                        |                                 | <b>`</b>                       |  |
| 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<br>Value                        | Set Ø       | Set 1<br>9825<br>ASC11 | Set 2<br>French/German<br>ASCII | Set 3 Scandinavian ASCII | Set 4<br>Spanieh/Latin<br>American ASCII |
|---|-------------|------------------------|---------------------------------|--------------------------|--|
| 35<br>39                                | #           | #                      | 1                               | į                        | Į.                                       |
| 91<br>92<br>93<br>94<br>95<br>96<br>123 | ;<br>;<br>; | [                      | [                               | 0<br>E<br>*              | [<br>]<br>]                              |
| 124<br>125<br>126                       | ` }<br>~    | <b>+</b><br>→          |                                 | 1.<br>1.<br>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<br>Value | Std<br>ASCII | 9825<br>ASCII | French<br>ASCII | German<br>ASCII | Swedish/<br>Finnish<br>ASCII | Denish/<br>Norwegian<br>ASCII | Spanish<br>ASCII | British<br>ASCII |
| 35               |              |               |                 | £               |                              |                               | *                | £                |
| 36               | \$           | \$            | \$              | \$              | <b>8</b>                     | \$                            | \$               | \$               |
| 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               | <b>ä</b>                     | 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 A 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<br>ASCII | 9825<br>Set | French/German | Scandinavian | Spanish/Latin<br>American |
| 35<br>39   | #,                | #           | £             | ť            | ٤                         |
| 91         | Γ                 | Ē           | [             | 0            | [ [                       |
| 92         | 1                 | - f<br>∃    | Ç             | Æ            | 1 1                       |
| 93<br>94   | Ţ                 | <b>↑</b>    | , J           | Ø<br>æ       | ٠ ا                       |
| 95         | _                 | _           | -             | E=X          | L=,                       |
| 96<br>123  | {                 | π           | ••            | ••           | 7                         |
| 124        |                   |             | •             |              | ~                         |
| 125<br>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      |
| · <del>··</del> <del>·</del> - | 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 | u  | 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      | +  | +  | +  | +  | +  | +  | +  | •• | <b>オ</b> | +          | +  | +  | +  | +  | +  | +  | +   | +  | +  | +  | +  |
| ١ | 44      |    |    | ٠, |    | ,  | ,  |    | ~  | Þ        |            | •  |    |    |    |    |    | ,   | ,  |    |    | ,  |
|   | 45      | -  | -  | _  | -  | -  | _  | _  | Ù  | ユ        | -          | _  | _  | _  | _  |    |    | -   | -  | -  | -  | -  |
| ١ | 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  | <b>†</b> | 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.       | <b>,</b> < | <  | <  | <  | <  | <  | <  | <   | <  | <  | <  | <  |
|   | 61      | =  | =  | =  | =  | =  | =  | =  | §  | 7        | =          | =  | =  | =  | =  | =  | =  | =   | =  | =  | =  | =  |
| ĺ | 62      | >  | >  | >  | >  | >  | >  | >  | f  | t        | >          | >  | >  | >  | >  | >  | >  | >   | >  | >  | >  | >  |
| l | 63      | ?  | ?  | ?  | ?  | ?  | ?  | ?, | ¢  | ソ        | ?          | ?  | ?  | ?  | ?` | ?  | ?  | ?   | ?  | ?  | ?  | ?  |
| L | 64      | @  | @  | 0  | @  | 0  | @  | @  | â  | 9        | @          | @  | É  | @  | §  | à  | @  | §   | §  | §  | §  | @  |

|                  |   |   |          |   |          |          |   |   | SI      | ΕT |    |    |    |                |          |    |    |    |    |    |    |
|------------------|---|---|----------|---|----------|----------|---|---|---------|----|----|----|----|----------------|----------|----|----|----|----|----|----|
| DECIMAL<br>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        | <b>Φ</b> | F | ó | _       | F  | F  | F  | F  | F              | F        | F  | F  | F  | F  | F  | F  |
| 71               | G | G | G        | G | G        | <b></b>  | G | ú | ヌ       | G  | G  | G  | G  | G              | G        | G  | G  | G  | G  | G  | G  |
| 72               | Н | Н | Н        | Н | Н        | ×        | Н | à | <b></b> | 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  | K  | K  | ıΚ | Κ              | K        | K  | К  | K  | Κ  | 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 | Þ       | T  | Т  | Т  | Т  | T <sub>.</sub> | 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 | [,       | [        | [ | 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 | <b>~</b> | ^        | ^ | ß | **      | ^  | ^  | Ü  | ^  | ^              | <b>^</b> | ^  | ^  | ^  | ^  | ^  | 1  |
| 95               |   |   |          |   |          |          |   | Ô | ۰       |    |    |    | _  |                | _        |    | _  | _  | _  |    |    |
| 96               | ` |   | <b>`</b> | ` | `        | `        | ` | Á |         | `  | `  | é  | `  | `              | `        | `  | ù  | `  | `  | `  | `  |

| DECIMAL<br>VALUE | 0      | 1 | 2 | 3      | 4 | 5        | 6 | 7        | SI<br>8 | ET<br>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<br>-   | b | ã        |         | b       | b  | b     | b      | b  | b     | þ   | b  | b      | b      | þ  | Ь  |
| 99               | C      | С | C | C      | C | C        | С | Đ        |         | C       | С  | C     | C      | С  | C     | C   | С  | С      | C      | С  | C  |
| 100              | ď      | d | ď | d<br>_ | d | U<br>—   | d | đ<br>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<br>_ | f | f | f<br>- | f | <b>=</b> | 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<br>~   |         | 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 | <b>≠</b> | 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<br>—  | 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 | ±<br>-   | 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<br> | Z      | Z  | Z     | Z   | Z  | Z      | Z<br>~ | 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  | °  |
| 125              | }      | - |   |        |   | }        | } | >        |         | }       | â  | â     | â<br>- | ü  | è<br> | }   | è  | Ç<br>~ | õ      | õ  | ∞  |
| 126              | ~      |   | ' |        |   | ~        | ~ | ±        |         |         | -  | ü     | -      | ß  |       |     | ì  |        |        | •  | ~  |
|                  |        |   |   |        |   |          |   |          |         |         |    |       |        | ÷  |       |     |    |        |        |    |    |
|                  |        |   |   |        |   |          |   |          |         |         |    |       |        |    |       |     |    |        |        |    |    |

| DECIMAL |    |     |    |         |     |    |    |     | SE       | Т  |    |     |     |     |     |    |    |    | *  |     |
|---------|----|-----|----|---------|-----|----|----|-----|----------|----|----|-----|-----|-----|-----|----|----|----|----|-----|
| VALUE   | 10 | 11  | 12 | 13      | 14  | 15 | 16 | 17  | 18       | 19 | 40 | 41  | 42  | 43  | 44  | 45 | 46 | 47 | 48 | 49  |
| 33      | !  | !   | !  | !       | !   | !  | !  | À   | •        | !  | !  | !   | ! . | !   | !   | !  | !  | !  | !  | !   |
| 34      | 11 | 11  | 11 | 11      | 11  | H  | 11 | Â   | Γ        | 11 | 11 | II  | п   | 11  | H   | 11 | 11 | Ħ  | 11 | п   |
| 35      | #  | #   | £  | £       | Ś   | #  | #  | È   | J        | #  | #  | #   | #   | #   | £   | £  | £  | £  | #  | §   |
| 36      | \$ | \$  | \$ | \$      | \$  | \$ | \$ | Ê   |          | ¤  | ¤  | ¤   | \$  | \$  | \$  | \$ | \$ | \$ | \$ | \$  |
| . 37    | %  | %   | %  | %       | %   | %  | %  | Ë   | •        | %  | %  | %   | %   | %   | %   | %  | %  | %  | %  | %   |
| 38      | &  | &   | &  | &       | &   | &  | &  | î   | Э        | &  | &  | &   | &   | &   | &   | &  | &  | &  | &  | &   |
| 39      | '  | , 1 |    | 1.00000 |     | ,  |    | Ϊ   | ア        | ,  | 1  | ,   | ,   | ,   | ,   | ,  | ,  | ,  | ,  | ,   |
| 40      | (  | (   | (  | (       | (   | (  | (  | 1   | 1        | (  | (  | (   | ( . | (   | (   | (  | (  | (  | (  | (   |
| 41      | )  | )   | )  | )       | )   | )  | )  | `   | Ċ        | )  | )  | )   | )   | )   | )   | )  | )  | )  | )  | ( ) |
| 42      | *  | *   | *  | *       | *   | *  | *  | ^ . | I        | *  | *  | *   | *   | *   | *   | *  | *  | *  | *  | *   |
| 43      | +  | +   | +  | +       | +   | +  | +  | ••  | <b>オ</b> | +  | +  | +   | +   | +   | +   | +  | +  | +  | +  | +   |
| 44      | ,  | ,   | ,  | ,       | ,   | ,  | ,  | ~   | Þ        | ,  | ,  | , . | ,   | ,   | ,   | ,  | ,  | ,  | ,  | ,   |
| 45      | -  | -   | _  | _       | _   | _  | -  | Ù   | ı        | -  | -  | -   | -   | _   | _   | -  |    | _  | -  | -   |
| 46      |    | ٠   | •  |         | •   |    |    | Û   | 3        |    |    |     |     |     |     |    |    | •  |    | •   |
| 47      | 1  | /   | /  | /       | /   | /  | /  | £   | ניי      | /  | /  | /   | /   | /   | /   | /  | /  | /  | /  | /   |
| 48      | 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  |     | ア        | 1  | 1  | 1   | 1   | 1   | 1   | 1  | 1  | 1  | 1  | 1   |
| 50      | 2  | 2   | 2  | 2       | 2   | 2  | 2  |     | 1        | 2  | 2  | 2   | 2   | 2   | 2   | 2  | 2  | 2  | 2  | 2   |
| 51      | 3  | 3   | 3  | 3       | 3   | 3  | 3  | •   | ġ        | 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   |
| 53      | 5  | 5   | 5  | 5       | 5   | 5  | 5  | Ç   | オ        | 5  | 5  | 5   | 5   | 5   | 5   | 5  | 5  | 5  | 5  | 5   |
| 54      | 6  | 6   | 6  | 6       | 6   | 6  | 6  | Ñ   | カ        | 6  | 6  | 6   | 6   | 6   | 6   | 6  | 6  | 6  | 6  | 6   |
| 55      | 7  | 7   | 7  | 7       | 7   | 7  | 7  | ñ   | †        | 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   |
| 57      | 9  | 9   | 9  | 9       | 9   | 9  | 9  | Ġ   | ケ        | 9  | 9  | 9   | 9   | 9   | 9   | 9  | 9  | 9  | 9  | 9   |
| 58      | :  | :   | :  | :       | :   | :  | :  | ¤   | ב        | :  | :  | :   | :   | :   | :   | :  | :  | :  | :  | :   |
| 59      | ;  | ;   | ;  | ;       | ·.; | ;  | ;  | £   | ţ        | ;  | ;  | ;   | ; . | ;   | ;   | ;  | ;  | ;  | ;  | ;   |
| 60      | <  | <   | <  | <       | <   | <  | <  | ¥   | Đ        | <  | <  | <   | <   | <   | <   | <  | <  | <  | <  | <   |
| 61      | =  | =   | =  | =       | =   | =  | =  | §   | Z        | =  | =  | =   | =   | =   | =   | =  | =  | =  | =  | =   |
| 62      | >  | >   | >  | >       | >   | >  | >  | f   | ţ        | >  | >  | >   | >   | >   | , > | >  | >  | >  | >  | >   |
| 63      | ?  | ?   | ?  | ?       | ?   | ?  | ?  | ¢   | ソ        | ?  | ?  | ?   | ?   | ? ; |     | ?  | ?  | ?  | ?  | ?   |
| 64      | @  | @   | @  | @       | @   | @  | @  | â   | 9        | @  | @  | É   | @   | §   | à   | @  | §  | §  | §  | @   |

|   | ECIMAL |    |    |     |     |                | •  |    | •  | SE       | Т     |    |    |             |    |        |    |    |    |    |    |
|---|--------|----|----|-----|-----|----------------|----|----|----|----------|-------|----|----|-------------|----|--------|----|----|----|----|----|
|   | VALUE  | 10 | 11 | 12  | 13  | 14             | 15 | 16 | 17 | 18       | 19    | 40 | 41 | 42          | 43 | 44     | 45 | 46 | 47 | 48 | 49 |
| Γ | 65     | Α  | Α  | Α   | Α   | Α <sub>C</sub> | )  | Α  | ê  | Ŧ        | Α     | Α  | Α  | Α           | Α  | Α      | Α  | Α  | Α  | Α  | Α  |
| ı | 66     | В  | В  | В   | В   | Во             | )  | В  | ô  | ッ        | В     | В  | В  | В           | В  | В      | В  | В  | В  | В  | В  |
|   | 67     | С  | С  | С   | С   | C,             | ,  | С  | û  | ₹        | С     | С  | С  | С           | С  | С      | С  | С  | С  | С  | С  |
|   | 68     | D  | D  | D   | D   | D <sub>+</sub> |    | D  | á  | ٢        | D     | D  | Đ  | D           | D  | D      | D  | D  | D  | D  | D  |
|   | 69     | Ε  | Ε  | Ε   | Ε   | E×             |    | Ε  | é  | ţ        | Ε     | Ε  | Ε  | Ė           | Ε  | Ε      | Ε  | Ε  | Ε  | Ε  | Ε  |
| Ì | 70     | F  | F  | F   | F   | F¢             | ,  | 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  |
|   | 72     | Н  | Н  | Н   | Н   | Η <sub>X</sub> | :  | Н  | à  | <b>ネ</b> | Н     | Н  | Н  | Н           | Н  | Н      | Н  | Н  | Н  | Н  | Н  |
| ı | 73     | 1  | ١  | 1   | ١   | 1 2            |    | 1. | è  | ノ        | ij    | İ  | 1  | 1           | 1  | 1      | 1  | 1  | 1  | 1  | 1  |
|   | 74     | J  | J  | J   | J   | Jy             |    | J. | ò  | Ŋ        | J     | J  | J  | J           | J  | J      | J  | J  | J  | J  | J  |
| ı | 75     | K  | K  | K   | K   | Κ×             |    | K  | ù  | t        | K     | Κ  | Κ  | Κ           | K  | K      | Κ  | K  | K  | K  | Κ  |
|   | 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 <sub>X</sub> |    | М  | ë  | 1        | М     | М  | М  | М           | М  | М      | М  | М  | М  | М  | М  |
|   | 78     | Ν  | Ν  | Ν   | Ν   | $N_1$          |    | Ν  | ö  | 木        | Ν     | Ν  | Ν  | Ν           | Ν  | Ν      | Ν  | Ν  | Ν  | N. | Ν  |
| ı | 79     | 0  | 0  | 0   | 0   | 0,             |    | 0  | ü  | 7        | 0     | 0  | 0  | 0           | 0  | 0      | 0  | 0  | 0  | 0  | 0  |
|   | 80     | Р  | Р  | Ρ   | Ρ   | Р              | _  | Ρ  | Å  | Ξ        | Ρ     | Ρ  | Ρ  | Ρ           | Ρ  | Ρ      | Р  | Ρ  | Ρ  | Ρ  | Р  |
| ı | 81     | Q  | Q  | Q   | Q   | Q              | ı  | Q  | î  | ሪ        | Q     | Q  | Q  | Q           | Q  | Q      | Q  | Q  | Q  | Q  | Q  |
| 1 | 82     | R  | R  | R   | R   | R              | R  | R  | Ø  | K        | R     | R  | R  | R           | R  | R      | R  | R  | R  | R  | R  |
| 1 | 83     | S  | S  | S   | S   | S              | S  | S  | Æ  | ŧ        | S     | S  | S  | S           | S  | S      | S  | S  | S  | S  | S  |
| ı | 84     | Τ  | T  | T   | Т   | Т              | Τ  | T  | å  | ተ        | Т     | T  | Т  | Τ.          | Τ  | T      | T  | T  | T  | Τ  | Τ  |
|   | 85     | U  | U  | U   | U   | U              | U  | U  | í  | . 1      | U     | U  | U  | U           | U  | U      | U  | U  | Ų  | U  | U  |
|   | 86     | ٧  | ٧  | ٧   | ٧   | ٧              | ٧  | ٧  | Ø  | 3        | ٧     | ٧  | ٧  | ٧           | ٧  | ٧      | ٧  | ٧  | ٧  | ٧  | ٧  |
|   | 87     | W  | W  | W   | W   | W              | W  | W  | æ  | ラ        | W     | W  | W  | W           | W  | W      | W  | W  | W  | W  | W  |
|   | 88     | X  | Χ  | Χ   | Χ   | Χ              | Χ  | X  | Ä  | IJ       | Χ     | Χ  | Χ  | Χ           | Χ  | Χ      | X  | Χ  | Χ  | Χ  | X  |
| İ | 89     | Υ  | Υ  | Υ   | Υ   | Υ              | Υ  | Υ  | ì  | Jlν      | Υ     | Υ  | Υ  | Υ           | Υ  | Υ      | Υ  | Υ  | Υ  | Υ  | Y  |
|   | 90     | Z  | Z  | Z   | Z   | Z              | Z  | Z  | Ö  | b        | Z     | Z  | Z  | Z           | Z  | Z      | Z  | Z  | Z  | Z  | Ζ  |
|   | 91     | [  | [  | [   | Ø   | [              | [  | [  | Ü  |          | [     | Ä  | Ä  | Æ           | Ä  | •      | [  | •  | i  | Ã  | Æ  |
|   | 92     | `  | √  | Ç   | Æ   | i              | \  | ¥  | É  | ŋ        | \     | Ö  | Ö  | ø           | Ö  | Ç      | \  | Ç  | Ñ  | Ç  | Ø  |
|   | 93     | Ĵ  | ]  | ]   | 0 8 |                | ]  | ]  | ï  | ン<br>"   | }     | Å  | Å  | Å           | Ü  | §<br>^ | ]  | é  | j  | Õ  | Å  |
|   | 94     |    | 1  |     | æ   |                |    |    | ß  |          |       |    | Ü  | -           |    |        |    |    |    | -  |    |
|   | 95     |    |    |     |     |                |    |    | Ô  |          | _     |    |    | <del></del> | _  |        | _  | _  |    | _  |    |
| L | 96     |    |    | e d |     |                |    | •  | Á  |          | ·<br> |    | é  |             | -  | -      |    | ù  |    |    |    |

| DECIMAL |    |          |    |    |          |          |    |          | SE | T  |    |    |            |    | · · · · · · · · · · · · · · · · · · · |    |    |    |    |    |
|---------|----|----------|----|----|----------|----------|----|----------|----|----|----|----|------------|----|---------------------------------------|----|----|----|----|----|
| VALUE   | 10 | 11       | 12 | 13 | 14       | 15       | 16 | 17       | 18 | 19 | 40 | 41 | 42         | 43 | 44                                    | 45 | 46 | 47 | 48 | 49 |
| 97      | а  | а        | а  | а  | а        | Ω        | а  | Ã        |    | а  | а  | а  | а          | а  | а                                     | а  | а  | а  | а  | а  |
| 98      | b  | b        | b  | þ  | b        | C        | b  | ã        |    | þ  | b  | b  | b          | b  | b                                     | b  | b  | b  | b  | b  |
| 99      | С  | С        | С  | С  | С        | C        | С  | Ð        |    | С  | С  | С  | С          | С  | 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  | e ¯      |          | е  | ĺ        |    | 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  | Ò        |    | 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  | į  |
| 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        | <b>≠</b> | 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        | Π        | 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  |
| 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  | , <b>q</b> | q  | q                                     | q  | q  | q  | q  | q  |
| 114     | r  | r        | r  | r  | r        | -        | r  |          |    | r  | r  | ٢  | r          | r  | r                                     | r  | r  | r  | r  | r  |
| 115     | s  | S        | s  | s  | S        | <b>↑</b> | 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  | 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  |
| 119     | w  | W        | W  | W  | W        | ÷        | W  | 1/4      |    | W  | w  | W  | W          | W  | W                                     | W  | W  | W  | W  | w  |
| 120     | x  | х        | Х  | X  | X        | *        | X  | 1/2      |    | х  | X  | х  | X          | X  | X                                     | X  | X  | X  | Х  | х  |
| 121     | У  | у        | у  | у  | у        | <b>V</b> | У  | <u>a</u> |    | У  | у  | у  | у          | у  | y                                     | 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  |
| 123     | {  | π        |    |    |          | {        | {  | «        |    | {  | ä  | ä  | æ          | ä  | é                                     | {  | à  | •  | ã  | æ  |
| 124     | 1  | ۲        |    |    |          |          | 1  |          |    |    | ö  | ö  | Ø          | ö  | ù                                     | 1  | ò  | ñ  | Ç  | Ø  |
| 125     | }  | <b>→</b> |    |    | <b>)</b> | }        | }  | <b>»</b> |    | }  | å  | å  | å          | ü  | è                                     | }  | è  | Ç  | õ  | å  |
| 126     | ~  |          |    |    |          | ~        | ~  | ±        |    |    | _  | ü  |            | Β. |                                       |    | ì  | ~  | •  | ~  |
|         |    |          |    |    |          |          |    |          |    |    |    |    |            | 2  |                                       |    |    |    |    |    |
|         |    |          |    |    |          |          |    |          |    |    |    |    |            |    |                                       |    |    |    |    |    |

| DECIMAL |    |    |          |            |    |    |     |    | SE | Т  |    |    | -  |    |    |    |              |    |            |    |
|---------|----|----|----------|------------|----|----|-----|----|----|----|----|----|----|----|----|----|--------------|----|------------|----|
| VALUE   | 20 | 21 | 22       | 23         | 24 | 25 | 26  | 27 | 28 | 29 | 50 | 51 | 52 | 53 | 54 | 55 | 56           | 57 | 58         | 59 |
| 33      | ļ  | !  | !        | !          | !  | !  | !   | À  | •  | ļ  | !  | !  | !  | !  | !  | !  | !            | !  | !          |    |
| 34      | 11 | 11 | #        | 11         | 11 | U  | 11  | Â  | Γ  | П  | 11 | H  | 11 | 11 | II | 11 | 11           | 11 | 15         | #1 |
| 35      | #  | #  | £        | £          | ż  | #  | #   | È  | ١  | #  | #  | #  | #  | #  | £  | £  | £            | £  | #          | Ş  |
| 36      | \$ | \$ | \$       | \$         | \$ | \$ | \$  | Ê  | •  | ¤  | ¤  | ¤  | \$ | \$ | \$ | \$ | \$           | \$ | \$         | \$ |
| 37      | %  | %  | %        | %          | %  | %  | %   | Ë  | •  | %  | %  | %  | %  | %  | %  | %  | %            | %  | %          | %  |
| 38      | &  | &  | &        | &          | &  | &  | &   | Î  | Э  | &  | &  | &  | &  | &  | &  | &  | &            | &  | &          | &  |
| 39      | ,  | •  | <b>1</b> | ,          | T' | ,  | •   | Ï  | 7  | ,  | •  | ,  | •  | '  | ,  | ,  | ,            | ,  | ,          | ,  |
| 40      | (  | (  | (        | (          | (  | (  | (   | •  | 1  | (  | (  | (  | (  | (  | (  | (  | (            | (  | (          | (  |
| 41      | )  | )  | )        | )          | )  | )  | )   | `  | ゥ  | )  | )  | )  | )  | )  | )  | )  | )            | )  | )          | )  |
| 42      | *  | *  | *        | *          | *  | *  | *   | ^  | I  | *  | ×  | *  | *  | ×  | *  | ×  | <del>*</del> | *  | ` <b>*</b> | *  |
| 43      | +  | +  | +        | +          | +  | +  | +   | •• | オ  | +  | +  | +  | +  | +  | +  | +  | +            | +  | +          | +  |
| 44      | ,  | ,  | ,        | ,          | ,  | ,  | ,   | ~  | Þ  | ,  | ,  | ,  | ,  | ,  | ,  | ,  | ,            | ,  | ,          | ,  |
| 45      | _  | _  |          | -          |    | -  |     | Ù  | 2  | -  | -  | -  |    | -  | -  | -  | -            | -  | -          | -  |
| 46      |    |    |          | •          |    |    |     | Û  | 3  |    |    |    |    |    |    |    |              |    |            |    |
| 47      | 1  | /  | /        | /          | /  | /  | /   | £  | ツ  | /  | /  | /  | /  | /  | /  | /  | /            | /  | /          | /  |
| 48      | 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   |    | ℱ  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1            | 1  | 1          | 1  |
| 50      | 2  | 2  | 2        | 2          | 2  | 2  | 2   |    | 1  | 2  | 2  | 2  | 2  | 2  | 2  | 2  | 2            | 2  | 2          | 2  |
| 51      | 3  | 3  | 3        | 3          | 3  | 3  | 3   | •  | ウ  | 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  |
| 53      | 5  | 5  | 5        | 5          | 5  | 5  | 5   | Ç  | オ  | 5  | 5  | 5  | 5  | 5  | 5  | 5  | 5            | 5  | 5          | 5  |
| 54      | 6  | 6  | 6        | 6          | 6  | 6  | 6   | Ñ  | カ  | 6  | 6  | 6  | 6  | 6  | 6  | 6  | 6            | 6  | 6          | 6  |
| 55      | 7  | 7  | 7        | 7          | 7  | 7  | 7   | ñ  | †  | 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  |
| 57      | 9  | 9  | 9        | 9          | 9  | 9  | 9   | Ś  | ታ  | 9  | 9  | 9  | 9  | 9  | 9  | 9  | 9            | 9  | 9          | 9  |
| 58      | :  | :  | :        | :          | :  | :  | :   | ¤  | ב  | :  | :  | :  | :  | :  | :  | :  | :            | :  | :          | :  |
| 59      | ;  | ;  | ; .      | , <b>;</b> | ;  | ;  | ;   | £  | Ħ  | ;  | ;  | ;  | ;  | ;  | ;  | ;  | ;,           | ;  | ;          | ;  |
| 60      | <  | <  | <        | <          | <  | <  | <   | ¥  | Ð  | <  | <  | <  | <  | <  | <  | <  | <            | <  | <          | <  |
| 61      | =  | =  | =        | =          | =  | =  | =   | §  | λ  | =  | =  | =  | =  | =  | =  | =  | =            | =  | =          | =  |
| 62      | >  | >  | >        | >          | >  | >  | >   | f  | t  | >  | >  | >  | >  | >  | >  | >  | >            | >  | >          | >  |
| 63      | ?  | ?  | ?        | ?          | ?  | ?  | . ? | ¢  | ソ  | ?  | ?  | ?  | ?  | '? | ?  | ?  | ?            | ?  | ?          | ?  |
| 64      | @  | @  | @        | @          | @  | @  | @   | â  | タ  | @  | @  | É  | @  | §  | à  | @  | Ş            | Ş  | Ş          | @  |

| Г |                  | <u> </u> |    |    |    |  |          |            |    | SE       | т  | · · · · · |    |    |                |    |    |    |    |    |    |
|---|------------------|----------|----|----|----|--|----------|------------|----|----------|----|-----------|----|----|----------------|----|----|----|----|----|----|
| 1 | DECIMAL<br>VALUE | 20       | 21 | 22 | 23 | 24   | 25       | 26         | 27 |          |    | 50        | 51 | 52 | 53             | 54 | 55 | 56 | 57 | 58 | 59 |
| ł | 65               | A        | A  | Α  | Α  | Α  | <u> </u> | Α          | ê  | チ·       | Α  | Α         | A  | Α  | Α              | Α  | Α  | Α  | A  | A  | A  |
| ı | 66               | В        | В  | В  | В  | В  | 0        | В          | ô  | ッ        | В  | В         | В  | В  | В              | В  | В  | В  | В  | В  | В  |
| ł | 67               | С        | С  | С  | С  | С  | ۵        | C          | û  | ,<br>T   | С  | С         | С  | С  | С              | С  | С  | С  | С  | С  | С  |
| 1 | 68               | D        | D  | D  | D  | D  | <b>△</b> | D          | á  | ر<br>ا   | D  | D         | D  | D  | D              | D  | D  | D  | D  | D  | D  |
| l | 69               | E        | E  | E  | E  | Ε  | ×        | E          | é  | J        | Ε  | E         | Ε  | E  | Ε              | E  | Ε  | E  | E  | E  | E  |
| 1 | 70               | F        | F  | F  | F  | F  | ^<br>•   | F          | ó  | _        | F  | F         | F  | F  | F              | F  | F  | F  | F  | F  | F  |
| ı | 71               | G        | G  | G  | G  | G  | <b>~</b> | G          | ú  | ጸ        | G  | G         | G  | G  | G              | G  | G  | G  | G  | G  | G  |
| I | 72               | Н        | Н  | Н  | Н  | Н  | '<br>又   | Н          | à  | <b>ネ</b> | Н  | Н         | Н  | Н  | Н              | Н  | H  | Н  | Н  | Н  | Н  |
|   | 73               | I        | I  | I  | I  | Ι  | z        | I          | è  | ,        | I  | Ι         | Ι  | I  | Ι              | I  | I  | I  | I  | I  | I  |
| I | 74               | J        | J  | J  | J  | J  | -<br>Ү   | J          | δ  | · /\     | J  | J         | J  | J  | J              | J  | J  | J  | J  | J  | J  |
| ı | 75               | К        | K  | Κ  | K  | K  | ×        | K          | ù  | t        | K  | K         | K  | K  | K              | K  | K  | K  | Κ  | K  | к  |
| l | 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  | М  | М  | ×        | М          | ë  | ۸        | М  | М         | М  | М  | М              | М  | М  | М  | М  | М  | М  |
| İ | 78               | N        | Ν  | Ν  | Ν  | Ν  | ı        | Ν          | ö  | 巿        | Ν  | Ν         | Ν  | Ν  | N              | N  | Ν  | N  | N  | Ν  | Ν  |
| l | 79               | 0        | 0  | 0  | 0  | 0  | *        | 0          | ü  | 7        | 0  | 0         | 0  | 0  | 0              | 0  | 0  | 0  | 0  | 0  | 0  |
| ı | 80               | Ρ        | Р  | Ρ  | Ρ  | Ρ  | _        | Р          | Å  | Ξ        | Ρ  | Ρ         | Р  | Р  | Ρ              | Ρ  | Ρ  | Ρ  | Р  | Р  | Р  |
| l | 81               | Q        | Q  | Q  | Q  | Q  | ı        | Q          | î  | ۵        | Q  | Q         | Q  | Q  | Q              | Q  | Q  | Q  | Q  | Q  | Q  |
| ı | 82               | R        | R  | R  | R  | R  | R        | R          | Ø  | ٧        | R  | R         | R  | R  | R              | R  | R  | R  | R  | R  | R  |
| ı | 83               | S        | S  | S  | s  | S  | S        | S          | Æ  | ŧ        | S  | S         | S  | S  | S              | S  | S  | S  | S  | S  | s  |
|   | 84               | Т        | T  | T  | Т  | T  | T        | Т          | å  | 7        | T  | Т         | T  | Ţ  | T <sub>.</sub> | T  | T  | T  | Т  | Т  | Т  |
| l | 85               | U        | U  | U  | U  | U  | U        | U          | í  | 1        | U  | U         | U  | U  | U              | U  | U  | U  | Ų  | U  | U  |
| l | 86               | V        | ٧  | ٧  | ٧  | ٧  | ٧        | ٧          | Ø  | 3        | ٧  | ٧         | ٧  | ٧  | ٧              | ٧  | ٧  | ٧  | ٧  | ٧  | ٧  |
| İ | 87               | W        | W  | W  | W  | W  | W        | W          | æ  | 5        | W  | W         | W  | W  | W              | W  | W  | W  | W  | W  | W  |
| l | 88               | Х        | Χ  | Χ  | Χ  | Χ  | Χ        | Χ          | Ä  | IJ       | Χ  | Χ         | X  | Χ  | Χ              | Χ  | Χ  | Χ  | Χ  | Χ  | Х  |
|   | 89               | Υ        | Υ  | Υ  | Υ  | Υ  | Υ        | Υ          | ì  | ル        | Υ  | Υ         | Υ  | Υ  | Υ              | Υ  | Υ  | Υ  | Υ  | Υ  | Υ  |
| l | 90               | Z        | Z  | Z  | Z  | Z  | Z        | Z          | Ö  | V        | Z  | Z         | Z  | Z  | Z              | Z  | Z  | Z  | Z  | Z  | Z  |
|   | 91               | [        | [  | [  | Ø  | [  | [        | [          | Ü  |          | [  | Ä         | Ä  | Æ  | Ä              | •  | [  | •  | i  | Ã  | Æ  |
| l | 92               | \        | √  | Ç  | Æ  | i  | \        | ¥          | É  | り.       | Λ. | Ö         | Ö  | Ø  | Ö              | Ç  | \  | Ç  | Ñ  | Ç  | Ø  |
|   | 93               | ]        | ]  | ]  | Ø  | ]  | ]        | ]          | ï  | ン<br>"   | ]  | Å         | Å  | Å  | Ü              | Ş  | ]  | é  | j  | Õ  | Å  |
| l | 94               | ^ =      | 1  |    | æ  | 14<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15 | ^        | ^          | ß  |          | ^  | ^         | Ü  | ^  | ^ .            | ^  | ^  | ^  | ^  | ^  | ^  |
|   | 95               | _ E      |    |    |    |  | -        | <u>-</u> · | Ô  | -        | -  | -         | -  | -  | -              | -  | -  | -  | -  | -  | -  |
|   | 96               |          |    |    |    | •  | •        | •          | Á  |          | •  | •         | é  | '  | ٠.             | •  | •  | ù  | '  | •  | •  |

| DECIMAL |          |          |        |          |    |              |    |          | SE |    |    |    |    |    |    |    |    |     |    |          |
|---------|----------|----------|--------|----------|----|--------------|----|----------|----|----|----|----|----|----|----|----|----|-----|----|----------|
| VALUE   | 20       | 21       | 22     | 23       | 24 | 25           | 26 |          | 28 | 29 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57  | 58 | 59       |
| 97      | а        | а        | a      | а        | а  | 0            | а  | Ã        |    | а  | а  | a  | а  | a  | a  | а  | a  | а   | a  | а        |
| 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  | <b>≠</b>     | 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     | <b>v</b> | ٧        | ٧      | ٧        | ٧  | ſ            | ٧  | -        |    | ٧  | ٧  | ٧  | ٧  | ٧  | ٧  | ٧  | ٧  | ٧   | ٧  | <b>V</b> |
| 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  | <b>V</b>     | У  | <u>a</u> |    | У  | У  | У  | У  | У  | У  | У  | У  | У   | У  | У        |
| 122     | z        | Z        | Z      | <b>Z</b> | Z  | •            | Z  | <u>o</u> |    | Z  | Z  | Z  | Z  | Z  | Z  | Z  | Z  | Z   | Z  | z        |
| 123     | {        | Υ        |        |          |    | {            | {  | «        |    | {  | ä  | ä  | æ  | ä  | é  | {  | à  | •   | ã  | æ        |
| 124     |          | -        |        |          |    | 1            |    |          |    |    | ö  | ö  | Ø  | ö  | ù  | İ  | ò. | ñ   | Ç  | Ø        |
| 125     | }        | <b>→</b> | Marsan | ĺ        |    | }            | }  | <b>»</b> |    | }  | å  | å  | å  | ü  | è  | }  | è  | Ç   | õ  | â        |
| 126     | ~        | • 3      | •      |          |    | ~            | ~  | ±        |    | -  |    | ü  | _  | ß  | •• | _  | ì  | ~   | •  | ~        |
|         |          |          |        |          |    |              |    |          |    |    |    |    |    |    |    |    |    |     |    |          |
|         |          |          |        |          |    |              |    |          |    |    |    |    |    |    |    |    |    |     |    |          |