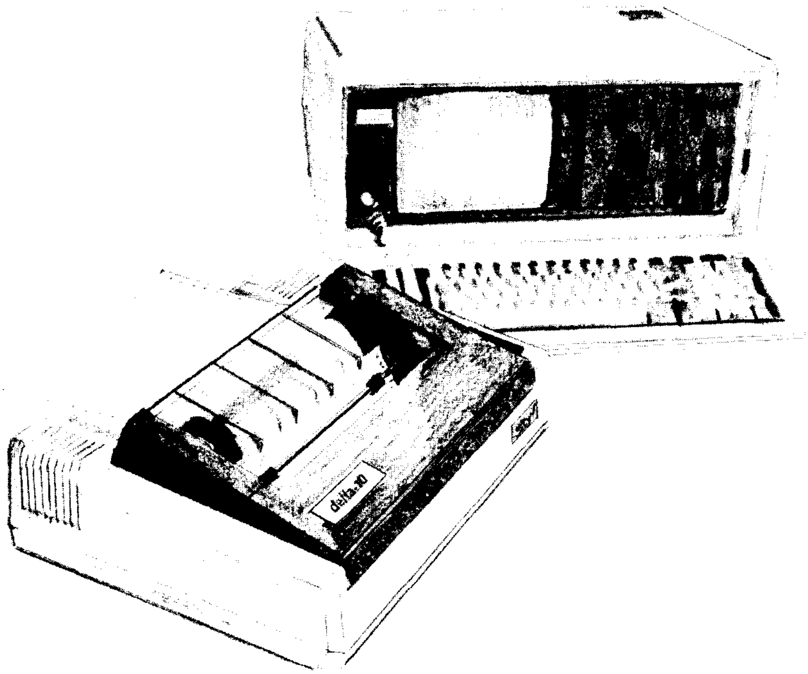


Chapter 8

Printing Dot Graphics

In Chapter 7 you were introduced to a form of computer graphics; you were able to actually define characters dot by dot. In this chapter you'll learn to use the same principles to make Delta print whole pages of dot graphics! We'll show you how to use dot graphics to create "super download characters." In addition, you'll see how your Delta printer can be used as a graphics plotter. This can have some practical business applications as well as create some terrific computer art!

Comparing Dot Graphics with Download Characters

A good understanding of dot graphics requires an understanding of how dot matrix printers work; you may want to review the first few pages of Chapter 7. The principles for dot graphics are the same as those for download characters.

There are some differences in the way they are implemented however. While download commands can be used to define a character between four and eleven columns of dots wide, dot graphics commands can be used to define a shape as narrow as one column of dots wide or as wide as 3264 dots on a Delta-15!

There is no "descender data" with dot graphics; graphics images are always printed with the top seven or eight pins of the print head, depending on whether you have a 7-bit or 8-bit interface (if you're not sure which type of interface your computer has, check the appendix for your computer).

So when do you use graphics and when do you use download characters? Practically anything you can do with graphics you can do with download characters, and vice versa. A clever programmer could actually plot a mathematical curve using download characters or use strings of graphics data as user-defined characters. But why do it the hard way? There are several instances when dot graphics is clearly the best way to approach the problem:

- If the graphic image to be printed is wider than 11 dots or higher than 7 dots
- If an image is to be printed just one time, as opposed to a frequently used "text" character
- If you want higher resolution (Delta can print as many as 240 dots per inch in dot graphics mode; text mode, which includes download characters, prints 60 dots per inch)

Using the Dot Graphics Commands

The command to print normal density (60 dots per inch horizontal; 72 dots per inch vertical) dot graphics uses this format:

```
<ESC> "K" n1 n2 m1 m2. . .
```

Just like many of the other codes you have learned, the command starts with an escape sequence (<ESC> "K" in this case). But unlike Delta's other codes there can be any number of graphics data bytes following the command. That's where *n1* and *n2* come in; they are used to tell Delta how many bytes of graphics data to expect.

Specifying the number of columns of dots

To figure the values of *n1* and *n2*, you'll need to figure out how wide your graphic image will be (remember that there are 60 columns of dots per inch in normal density). Then comes the fun part: converting one number (the number of columns of dots) into two! Why is it necessary to use two numbers to tell Delta the number of graphics codes to expect? Because the largest number we can send in one byte (that's what the BASIC CHR$( ) function sends: one byte) is 255. And with normal density graphics it's possible to have a graphics image as wide as 480 dots on Delta-10 or 816 dots on Delta-15. So to figure out how many columns of graphics data to expect, Delta multiplies *n2* by 256 and adds the value of *n1*. If you divide the number of columns by 256, then *n2* is the quotient and *n1* is the remainder (why not let your computer figure it out for you: if the number of columns is assigned to variable X, then N1 = X MOD 256 and N2 = INT(X/256)). Table 8-1 might make things even easier.

Table 8-1
Calculating n1 and n2

If the number of columns, x, ranges from:	then *n1* is:	and *n2* is:
1 to 255	x	0
256 to 511	x - 256	1
512 to 767	x - 512	2
768 to 1023	x - 768	3
1024 to 1279	x - 1024	4
1280 to 1535	x - 1280	5
1536 to 1791	x - 1536	6
1792 to 2047	x - 1792	7
2048 to 2303	x - 2048	8
2304 to 2559	x - 2304	9
2560 to 2815	x - 2560	10
2816 to 3071	x - 2816	11
3072 to 3264	x - 3072	12

Specifying the graphics data

Now that we've told Delta data how much data to expect, we better figure out how to send that information! Just as you do with download characters, with dot graphics you have control over the firing of every single pin on Delta's print head. In Figure 8-1, you can see that we've labeled each pin on the print head with a number, as we did with download characters (you should note one important difference: this time the *top* pin has the highest value; for download character definitions it is the bottom pin). And specifying pins to fire is done in the same way: to fire the second pin from the top, for instance, send a CHR$(64). Firing several pins at once is done in a similar fashion. For example, to print the first, third, and fourth dots, add their values (128 + 32 + 16) to send this total: CHR$(176).

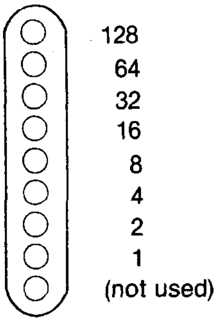
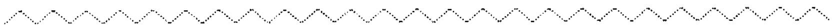


Figure 8-1. *Starting with the most significant bit at the top, each pin of the print head is assigned a value which is a power of two. Note that for 7-bit computers, the top pin has a value of 64, and the bottom two pins are unused.*

A short program should demonstrate how to implement the graphics command. The program below gave us this printout:



```
1Ø 'PRINT GRAPHIC PATTERN
2Ø WIDTH "LPT1:",255
3Ø LPRINT CHR$(27) CHR$(75) CHR$(94) CHR$(1);
4Ø FOR I = 1 TO 25
5Ø FOR J = Ø TO 6
6Ø LPRINT CHR$(2^J);
7Ø NEXT J
8Ø FOR J = 6 TO Ø STEP -1
9Ø LPRINT CHR$(2^J);
1ØØ NEXT J
11Ø NEXT I
```

```
120 WIDTH "LPT1:",80
130 LPRINT
```

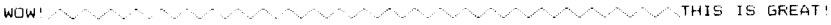
In line 30 we've selected normal density graphics and said that 350 characters of graphics data would follow (94 + (1 * 256) = 350). The loop between lines 40 and 110 is repeated 25 times; this is what gives us the "zigzag" effect. The loop from line 50 to line 70 creates the lines that slope up; the loop between lines 80 and 100 prints the downward sloping lines. This is an example of plotting a very simple mathematical function to create a design. Later in this chapter we'll show something more complex.

Combining text and graphics

It's also possible to mix text and graphics in one line. This can be useful for labeling charts or graphs, or even inserting fancy graphics in text. Try adding these lines to our program:

```
25 LPRINT "WOW!";
115 LPRINT "THIS IS GREAT!";
```

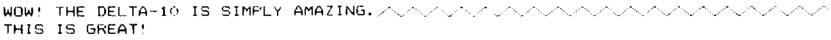
Now if you run the program you should get a printout that looks like this:



```
WOW!                                                    THIS IS GREAT!
```

But there is one thing to be careful of: all graphics data must print on the same line. The graphics command is turned off at the end of each line, even if you have specified that more graphics codes follow. To see what we mean, change line 25 as shown and run the program.

```
25 LPRINT "WOW! THE DELTA-10 IS SIMPLY AMAZING.";
```



```
WOW! THE DELTA-10 IS SIMPLY AMAZING.
THIS IS GREAT!
```

(To get the same effect, Delta-15 users should change two program lines:

```
3Ø LPRINT CHR$(27) CHR$(75) CHR$(188) CHR$(2);
4Ø FOR I = 1 TO 5Ø
```

This will make the zigzag pattern long enough to go off the page.)

As you can see, Delta printed graphics up to the end of the line, then ignored the rest of the graphics data and returned to normal text on the next line.

Printing a Design or Logo

Since you control the firing of every pin, you can print nearly anything with Delta that you can draw (and probably better, if you're like most computer users!). This can be used for creating "computer art" or drawing maps. Or, as we'll show you here, you can use dot graphics to print your logo at the top of each letter you print.

Designing an image to print with dot graphics is much like designing download characters. The best way to start is to lay out your image on graph paper. Since you can print eight rows (seven with a 7-bit interface) of dots with each pass of the print head, draw a heavy horizontal line every eight rows on your graph paper. And it may be helpful to write the dot values (128, 64, 32, etc.) down the left side of each row. Then after you've filled in the "dots" that you want to print, it's time to get out the old calculator again! Just as you did with download characters, add up the values of each column of dots; this makes up one byte.

In the program below, we've taken the logo graphics information and put it into BASIC DATA statements. The program itself is short and simple. The loop starting at line160 reads the data statements into a string array variable called LOGO$. In line 230 we change the line spacing to 8/72 inch so that the lines of graphics data will connect vertically. The actual printing is done in the loop between lines 250 and 280; line 260 sends the graphics control code to Delta and line 270 sends one line of graphics data.

The printout from the program is shown right below the program.

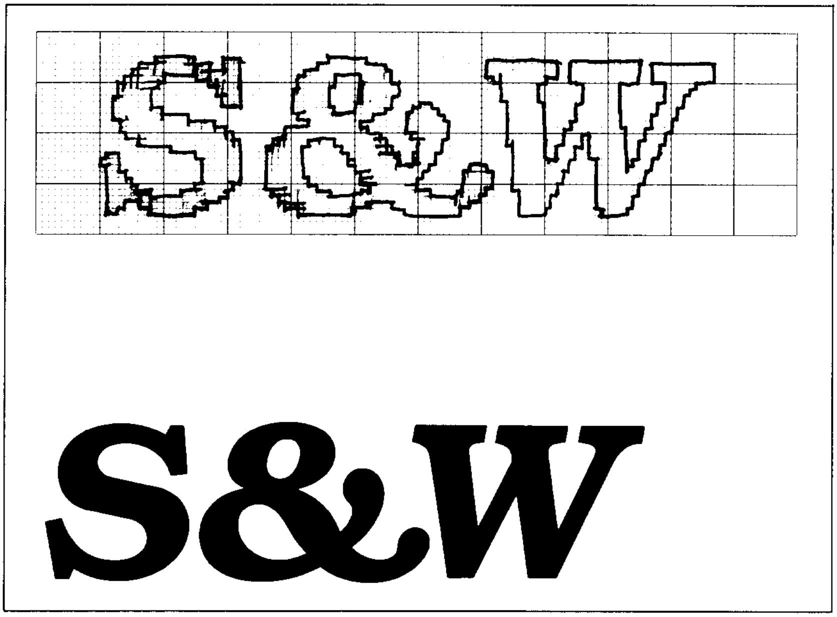


Figure 8-2. *By laying out the logo on graph paper, you can calculate all of the graphics data.*

```
1ØØ ' PRINT S&W LOGO
11Ø LINE.8$ = CHR$(27)+CHR$(65)+CHR$(8)  'Set line
   spacing to 8 dots
12Ø LINE.12$ = CHR$(27)+CHR$(5Ø)         'Set line
   spacing to 1/6"
13Ø GRAPHIC$ = CHR$(27)+CHR$(75)         'Select dot
   graphics
14Ø DIM LOGO$(4)
15Ø WIDTH "LPT1:",255
16Ø ' READ DATA
17Ø FOR ROW = 1 TO 4
18Ø FOR COLUMN = 1 TO 1ØØ
19Ø READ P
2ØØ LOGO$(ROW) = LOGO$(ROW) + CHR$(P)
21Ø NEXT COLUMN
22Ø NEXT ROW
23Ø ' PRINT LOGO
24Ø LPRINT LINE.8$;
25Ø FOR ROW = 1 TO 4
26Ø LPRINT GRAPHIC$;CHR$(1ØØ);CHR$(Ø);
27Ø LPRINT LOGO$(ROW)
28Ø NEXT ROW
```

```
290 LPRINT LINE.12$
300 'ROW 1
310 DATA Ø,Ø,Ø,Ø,1,3,7,7,7,15,14,14,14,
   14,14,7,7,3,3,15
320 DATA 15,15,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,
   Ø,1,3,3,7,7,15,14,14,14
330 DATA 14,15,7,7,7,3,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
340 DATA Ø,6,7,7,7,7,7,7,7,7,6,6,Ø,Ø,7,7,7,7,7,7
350 DATA 7,7,7,7,7,Ø,Ø,7,7,7,7,7,7,7,7,7,7,Ø,Ø,Ø
360 ' ROW 2
370 DATA Ø,Ø,6Ø,255,255,255,255,255,143,15,7,7,7,7,
   3,3,3,131,193,241
380 DATA 24Ø,24Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,1,121,253,
   253,255,255,255,143,7,7,7
390 DATA 31,253,252,248,248,24Ø,192,Ø,7,15,
   31,31,15,7,3,Ø,Ø,Ø,Ø,Ø
400 DATA Ø,Ø,Ø,224,255,255,255,255,255,31,Ø,
   Ø,Ø,1,3,31,255,255,255,255
410 DATA 255,255,1,Ø,Ø,Ø,1,7,31,255,252,24Ø,192,
   128,Ø,Ø,Ø,Ø,Ø,Ø
420 'ROW 3
430 DATA Ø,31,31,3,129,128,192,192,192,192
440 DATA 192,224,224,224,224,24Ø,255,255,255,255
450 DATA 255,127,Ø,Ø,Ø,Ø,63,127,255,255
460 DATA 255,255,193,128,128,128,128,192,224,24Ø
470 DATA 252,255,255,255,127,63,31,7,7,31
480 DATA 254,252,248,224,128,Ø,Ø,3,7,7,7,3,Ø,Ø,
   192,255,255,255,255,255
490 DATA 15,15,63,252,24Ø,192,Ø,24Ø,255,255
500 DATA 255,255,255,7,15,127,252,24Ø,192,Ø,Ø,
   Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
510 'ROW 4
520 DATA Ø,248,248,24Ø,224,224,112,112,56,56
530 DATA 56,56,56,12Ø,12Ø,24Ø,24Ø,224,224,192,128,
   Ø,Ø,Ø,Ø,Ø,192,224,24Ø,24Ø
540 DATA 24Ø,248,248,248,12Ø,12Ø,56,56,56,56
550 DATA 48,112,224,224,224,224,24Ø,24Ø,248,248
560 DATA 12Ø,12Ø,56,56,56,56,12Ø,24Ø,224,224
570 DATA 192,128,Ø,Ø,Ø,128,248,248,248,248,24Ø,
   192,Ø,Ø,Ø,Ø,Ø,Ø,24Ø,248
580 DATA 248,248,248,24Ø,192,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,
   Ø,Ø,Ø,Ø,Ø,Ø,Ø
```

S&W

Plotting with Delta

This section of the manual gets into more serious BASIC programming just because it's required in order to have the computer act as a plotter driver. Don't be intimidated; while it's beyond the scope of this manual to teach BASIC, if you try the examples and take it slowly you should be doing some fancy plotting of your own before you know it.

If designing and calculating dot graphics images by laying them out on graph paper seems too tedious to you, then let the computer do the work for you! With your computer doing the calculations and Delta plotting the output, you can come up with some terrific business graphs, charts, and mathematical function plots.

The best way to do this is to set up an array in memory. This is your "graph paper." The first thing to do is to determine how big you want your output to be; this will determine the size of your array. (If you have grandiose plans to fill an entire page with plotter output, you better have lots of memory in your computer. With 60 dots per inch horizontally and 72 dots per inch vertically, it takes at least 540 bytes of memory for each square inch of plotted area. That doesn't sound so bad—but an area 8 inches square requires over 32K!)

Your array should be two-dimensional (just like graph paper) where one dimension will be the number of columns of dots and the other dimension is the number of printing lines (remember that you can have up to eight rows of dots per printed line).

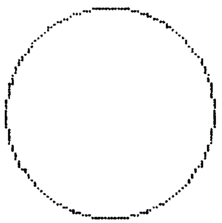
Here's a program that will use calculated-shape graphics to plot a circle. As you'll see, by changing a few lines it can be used to plot virtually any shape.

```
1ØØ ' DELTA-PLOT
1ØØØ ' Set program constants
1Ø1Ø MAXCOL% = 75         : MAXROW% = 14
1Ø2Ø DIM BIT%(MAXCOL%,MAXROW%)
1Ø3Ø MASK%(1) = 64        : MASK%(4) = 8
1Ø4Ø MASK%(2) = 32        : MASK%(5) = 4
1Ø5Ø MASK%(3) = 16        : MASK%(6) = 2
1Ø6Ø LX = 2Ø   : LY = 2Ø
```

```
1Ø7Ø LXFAC = 72/LX      : LYFAC = 87/LY
2ØØØ ' Plot curve
2Ø1Ø RAD = 9
2Ø2Ø X1 = 19   : Y1 = 1Ø
2Ø3Ø FOR ANG% = Ø TO 36Ø STEP 1Ø
2Ø4Ø RANG = ANG%*6.28/36Ø
2Ø5Ø X2 = RAD*COS(RANG)+1Ø  : Y2 = RAD*SIN(RANG)+1Ø
2Ø6Ø GOSUB 4ØØØ
2Ø7Ø NEXT ANG%
3ØØØ ' Send bit image map to printer
3Ø1Ø LPRINT CHR$(27) "A" CHR$(6)
3Ø2Ø FOR ROW% = Ø TO MAXROW%
3Ø3Ø A$ = ""
3Ø4Ø LPRINT CHR$(27) "K" CHR$(MAXCOL%) CHR$(Ø);
3Ø5Ø FOR COL% = 1 TO MAXCOL%
3Ø6Ø A$ = A$ + CHR$(BIT%(COL%,ROW%))
3Ø7Ø NEXT COL%
3Ø8Ø LPRINT A$ " "
3Ø9Ø NEXT ROW%
31ØØ LPRINT CHR$(27) "2"
311Ø END
4ØØØ ' Draw a line from X1,Y1 to X2,Y2
4Ø1Ø XL = X2 - X1       : YL = Y2 - Y1
4Ø2Ø NX = ABS(XL*LXFAC) : NY = ABS(YL*LYFAC)
4Ø3Ø IF NX < NY THEN NX = NY
4Ø4Ø NS% = INT(NX+1)
4Ø5Ø DX = XL/NS%        : DY = YL/NS%
4Ø6Ø FOR I% = 1 TO NS%
4Ø7Ø X1 = X1 + DX       : Y1 = Y1 + DY
4Ø8Ø GOSUB 5ØØØ
4Ø9Ø NEXT I%
41ØØ RETURN
5ØØØ ' Plot a point at X1,Y1
5Ø1Ø XX = X1 * LXFAC    : YY = Y1 * LYFAC
5Ø2Ø COL% = INT(XX) + 1
5Ø3Ø ROW% = INT(YY/6)
5Ø4Ø XIT% = INT(YY - ROW% * 6)+1
5Ø5Ø BIT%(COL%,ROW%) = BIT%(COL%,ROW%) OR
   MASK%(XIT%)
5Ø6Ø RETURN
```

How the program works

In the program above, we've created an array called BIT%, which is dimensioned in line 1020. You'll note that instead of



using numeric constants to dimension the array, we used the variables MAXCOL% and MAXROW%. This way, if your computer has enough memory and you want to plot a larger image, all you need to change are the values in line 1010. The array MASK% contains the values of the dots. (In order to make this program run on the most computers, we're using only six pins for graphics. With many computers, you can use all eight available pins.) In lines 1060 and 1070 we've defined some other variables you'll be interested in: LX, LXFAC, LY, and LYFAC are used as scaling factors. By changing these values, you can change the size of your printed image or even distort it (you can, for example, make our circle print as an ellipse). Experiment a little bit!

The main calculations for plotting the image are done starting at program line 2000. This is where you put the formulas that you want to plot. By changing just the lines between 2000 and 3000 (with some creative mathematics!) you can plot any function—limited only by your imagination. Some examples are shown at the end of this section.

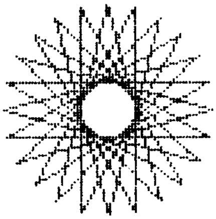
What the program section starting at 2000 actually does is to calculate starting and ending points for a line (in our circle the "lines" are very short—sometimes the starting and ending points are the same). The coordinates of the starting point of the line are assigned to variables X1 and Y1. The line ends at point X2,Y2. When these coordinates have been calculated, a subroutine call is made to line 4000. This subroutine calculates the coordinates of individual points along that line.

After these coordinates have been determined, the subroutine at line 5000 is called. This routine turns "on" an individual dot in our array called BIT%. (Keep in mind that no printing has been done yet; the computer is still drawing the image on its "graph paper" in memory.) The way an individual dot is turned on is using the logical OR function in line 5050.

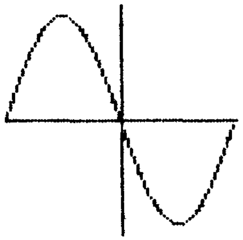
When all the points have been plotted in memory, printing begins at line 3000. We first set the line spacing to 6/72 inch using the ⟨ESC⟩ "A" command. This is so that there are no gaps between rows of dots. Then the loop from line 3020 to line 3090 prints the dot graphics image one line (which is six dots high) at a time. The variable A$ is used to build a string of all the columns of BIT% in a given row.

As you can see, by taking the program in small pieces and analyzing it, graphics programming does not have to be difficult. If you want to try some other plots, try these (replace lines between 2000 and 3000 with the lines below). The printouts from each program are shown below the listing.

```
2000 ' Plot curve
2010 RAD = 9
2020 FOR ANG% = 0 TO 360 STEP 15
2030 RANG = ANG%*6.28/360
2040 RANG2 = (ANG%+150)*6.28/360
2050 X1 = RAD*COS(RANG)+10   : Y1 = RAD*SIN(RANG)+10
2060 X2 = RAD*COS(RANG2)+10  : Y2 =
   RAD*SIN(RANG2)+10
2070 GOSUB 4000
2080 NEXT ANG%
```



```
2000 ' Plot curve
2010 X1 = 0 : Y1 = 10 : X2 = 20 : Y2 = 10 : GOSUB
   4000
2020 X1 = 10 : Y1 = 0 : X2 = 10 : Y2 = 20 : GOSUB
   4000
2030 X1 = 0 : Y1 = 10 : FOR X2 = 0 TO 20 STEP .2
2040 Y2 = 10 - 9 * SIN(3.14159  * X2/10) : GOSUB
   4000
2050 NEXT X2
```



Using Delta for business graphics

You don't have to be a mathematician, scientist, or computer hacker/artist to use Delta's graphics capabilities. It can be used for business graphics too—line graphs, bar charts, pie charts, and more! There are many commercially available graphics programs that support Delta's graphics. And, of course, you can write your own. To get you started, we've written a program that prints a pie chart. Here it is:

```
100 ' PIECHART
110 ESC$ = CHR$(27)          : LF$ =CHR$(10)
120 FF$ = CHR$(12)           : VTAB$ = CHR$(11)
130 EMPHASIZED$ = ESC$ + "E"     : NOT.EMPHASIZED$ =
   ESC$ + "F"
1000 ' Set program constants
1010 OPEN "LPT1:" AS #1 : WIDTH #1,255
1020 DIM BIT%(190,36),A$(36),PCT%(25),TEXT$(42),
   PIECETEXT$(25)
1030 MASK%(1) = 64          : MASK%(4) = 8
1040 MASK%(2) = 32          : MASK%(5) = 4
1050 MASK%(3) = 16          : MASK%(6) = 2
1060 LX = 20                : LY = 20
1070 LXFAC = 190/LX         : LYFAC = 216/LY
1080 FOR I= 1 TO 42
1090 TEXT$(I) = SPACE$(80)
1100 NEXT I
1110 GOSUB 7000
2000 ' Plot curve
2010 RAD = 9
2020 X1 = 19                : Y1 = 10
2030 PRINT " ";
2040 FOR ANG% = 0 TO 360 STEP 5
2050 RANG = ANG%*6.28/360
2060 X2 = RAD*COS(RANG)+10   : Y2 = RAD*SIN(RANG)+10
2070 GOSUB 4000
```

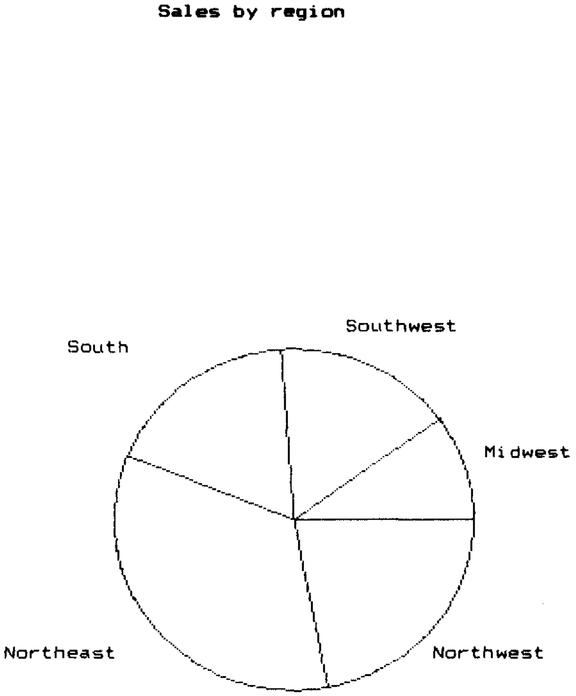
```
2080 NEXT ANG%
2090 FOR PIECE% = 1 TO NUMBER.PIECES%
2100 X1 = 10                : Y1 = 10
2110 TOTAL.PCT%=TOTAL.PCT%+PCT%(PIECE%)
2120 ANG%=360*TOTAL.PCT%*.01
2130 RANG = ANG%*6.28/360
2140 X2 = RAD*COS(RANG)+10  : Y2 = RAD*SIN(RANG)+10
2150 GOSUB 4000
2160 GOSUB 6000
2170 NEXT PIECE%
3000 ' Send bit image map to printer
3010 PRINT
3020 FOR ROW% = 0 TO 35
3030 A$(ROW%) = ""
3040 FOR COL% = 1 TO 190
3050 A$(ROW%) = A$(ROW%) + CHR$(BIT%(COL%,ROW%))
3060 NEXT COL%
3070 PRINT CHR$(176);CHR$(176);
3080 NEXT ROW%
3090 PRINT
3091 PRINT#1,SPACE$(40-LEN(TITLE$)/2);EMPHASIZED$;
   TITLE$;NOT.EMPHASIZED$;LF$
3100 PRINT#1,VTAB$;VTAB$;VTAB$
3110 PRINT#1,ESC$;"A";CHR$(6)
3120 PRINT#1,TEXT$(1);LF$;TEXT$(2);LF$;TEXT$(3);LF$
3130 FOR ROW% = 0 TO 35
3140 PRINT#1,"          ";ESC$;"K";
   CHR$(190);CHR$(0);
3150 PRINT#1,A$(ROW%)
3160 PRINT#1,TEXT$(ROW%+4);LF$
3170 PRINT CHR$(176);CHR$(176);
3180 NEXT ROW%
3190 PRINT#1,TEXT$(40);LF$
3200 PRINT#1,TEXT$(41);LF$
3210 PRINT#1,TEXT$(42);LF$
3220 PRINT#1,ESC$;"2";FF$
3230 END
4000 ' Draw a line from X1,Y1 to X2,Y2
4010 XL = X2 - X1       : YL = Y2 - Y1
4020 NX = ABS(XL*LXFAC) : NY = ABS(YL*LYFAC)
4030 IF NX < NY THEN NX = NY
4040 NS% = INT(NX+1)
4050 DX = XL/NS%        : DY = YL/NS%
4060 FOR I% = 1 TO NS%
4070 X1 = X1 + DX       : Y1 = Y1 + DY
```

```
4080 GOSUB 5000
4090 NEXT I%
4100 PRINT CHR$(29);CHR$(205);CHR$(175);
4110 RETURN
5000 ' Plot a point at X1,Y1
5010 XX = X1 * LXFAC    : YY = Y1 * LYFAC
5020 COL% = INT(XX) + 1
5030 ROW% = INT(YY/6)
5040 XIT% = INT(YY - ROW% * 6)+1
5050 BIT%(COL%,ROW%) = BIT%(COL%,ROW%) OR
   MASK%(XIT%)
5060 RETURN
6000 ' Place text fields in the proper location
6010 MIDANG%=(ANG%+PREVANG%)/2
6020 RANG = MIDANG%*6.28/360
6030 X3 = INT(20*SIN(RANG))  : Y3 =
   INT(22*COS(RANG))
6040 X4 = 22 + X3       : Y4 = 40 + Y3
6050 IF MIDANG%>270 OR MIDANG<90 THEN
   MID$(TEXT$(X4),Y4) = PIECETEXT$(PIECE%) ELSE
   MID$(TEXT$(X4),Y4-LEN(PIECETEXT$(PIECE%)))=
   PIECETEXT$(PIECE%)
6060 PREVANG%=ANG%
6070 RETURN
7000 ' Accept Data from Screen
7010 CLS: PRINT : PRINT : PRINT :
7020 INPUT "ENTER TITLE FOR CHART: ",TITLE$
7030 AMT.SOFAR%=0        : AMT.LEFT%=100
7040 FOR I=1 TO 24
7050 CLS: PRINT "      ENTER PARAMETERS FOR
   PIE-CHART"
7060 PRINT "  TOTAL SO FAR :   ";
7070 PRINT USING "###";AMT.SOFAR%
7080 PRINT "  TOTAL REMAINING: ";
7090 PRINT USING "###";AMT.LEFT%
7100 PRINT :PRINT :PRINT :PRINT
7110 INPUT "ENTER PERCENTAGE FOR FIELD:   ",PCT%(I)
7120 IF PCT%(I)>AMT.LEFT% OR PCT%(I)=0 THEN
   PCT%(I)=AMT.LEFT%
7130 AMT.LEFT%=AMT.LEFT%-PCT%(I)
7140 AMT.SOFAR%=AMT.SOFAR%+PCT%(I)
7150 PRINT :PRINT
7160 INPUT "ENTER DESCRIPTION OF FIELD:   ",
   PIECETEXT$(I)
```

```
7170 IF LEN(PIECETEXT$(I))>15 THEN PRINT "FIELD TOO
   LONG - 15 CHAR. MAX": GOTO 7160
7180 IF AMT.LEFT%=0 GOTO 7200
7190 NEXT I
7200 NUMBER.PIECES%=I
7210 IF NUMBER.PIECES%=1 THEN 7030
7220 CLS
7230 RETURN
```

You should recognize many sections of code from the plotting program. We've just expanded on that program framework to include routines for inputting data to be graphed (starts at line 7000) and placing labels next to the pie chart (starts at line 6000).

The output from our program is shown below.



High Resolution Graphics

Up until now all of the dot graphics printing we have done has been with Delta's normal density mode. This can give you some pretty sharp images at great speed. Sometimes though, you may want to create an image with even higher resolution. Delta has four density modes you can use; they're summarized in Table 8-2.

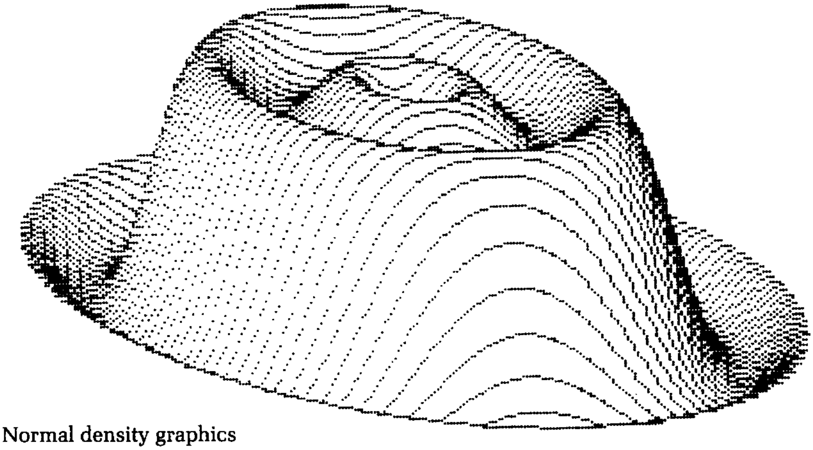
Table 8-2
Dot graphics commands

Function	Control code
Normal density (60 dots/inch)	⟨ESC⟩ "K" *n1 n2 m1 m2* . . .
Double density (120 dots/inch)	⟨ESC⟩ "L" *n1 n2 m1 m2* . . .
Double density/double speed	⟨ESC⟩ "y" *n1 n2 m1 m2* . . .
Quadruple density (240 dots/inch)	⟨ESC⟩ "z" *n1 n2 m1 m2* . . .

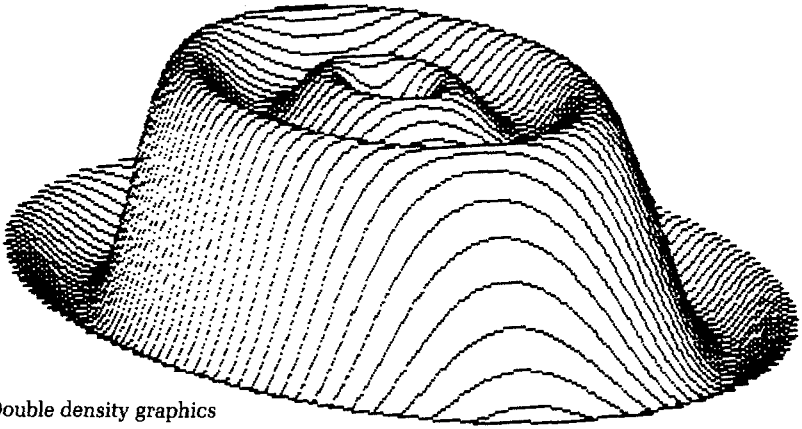
Note: If your computer does not support lowercase characters, use CHR$(121) and CHR$(122) for "y" and "z", respectively.

The command syntax for all of the commands is the same—just as you have learned it for the ⟨ESC⟩ "K" (normal density) command. The number of columns to be printed is *n1* + 256∗*n2*.

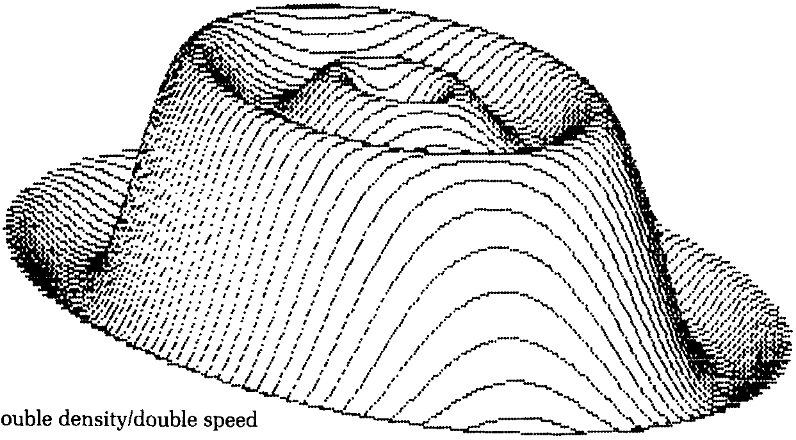
So what do these different modes do? On the following pages are actual size reproductions of printouts of the same image printed in each of the four different densities. They were all printed using the plotting program in this chapter (with a rather complex set of formulas starting at line 2000!).



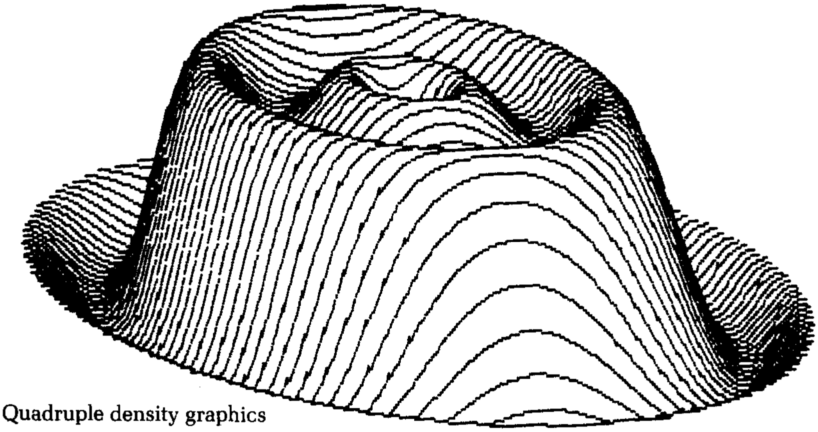
Normal density graphics



Double density graphics

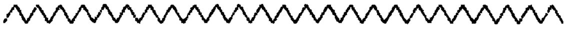


Double density/double speed

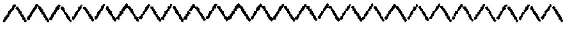


Quadruple density graphics

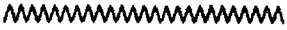
So if quadruple density looks so great, why not use it all the time? Let's try an experiment on your printer which will show just how the different density modes work. Using the first program in this chapter, change line 30 to try each of the different modes. Just change the CHR$(75) (which is the ASCII code for "K") to "L", "y", and "z" in turn. Your printouts should look something like this:



⟨ESC⟩"L"



⟨ESC⟩"y"



⟨ESC⟩"z"

As you can see, the different modes seem to condense the printed image. So, to get the same image in a higher density mode, you must plot more points. This requires twice as much memory for your array, twice as much computing time, and twice as much printing time (but the results may be worth it!).

Star's engineers have given programmers a unique shortcut for program development though—double density double speed mode. Although this mode requires just as much memory and computing time as double density, it prints at the same speed as normal density graphics. Amazing, you say? Well, it is—until you know the secret. Every other column of dots is ignored, so the output is actually the same as normal density graphics. The advantage is that you can write and debug your programs at double speed, then change to double density graphics for terrific output.

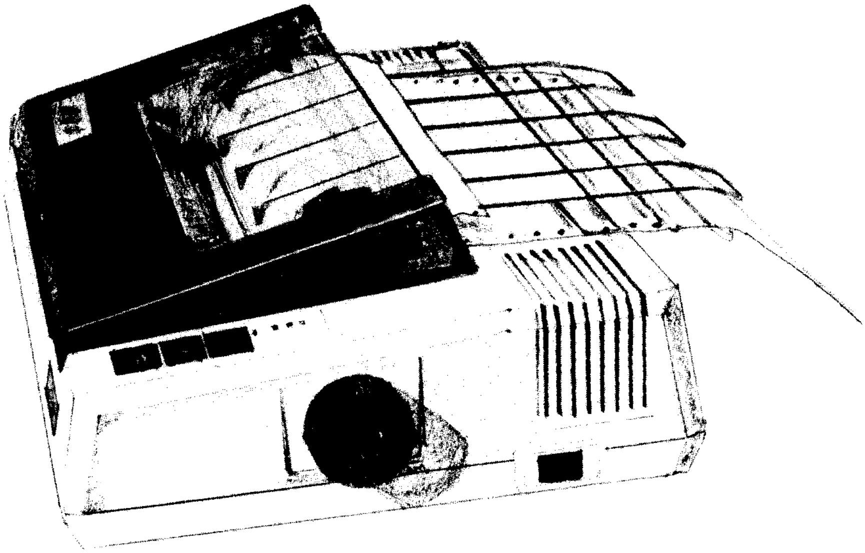
If You Have Problems with BASIC

You may write some graphics programs that look just right in the listing, but the printouts aren't quite what you expected. A common problem is that the BASIC interpreter in your computer is inserting a few of its own codes. For instance, if your program generates a CHR$(13) as valid graphics data, BASIC may follow it with a CHR$(10). Another problem arises with certain computers that replace horizontal tabs (CHR$(9)) with a series of spaces (CHR$(32)). A possible solution to these problems is to not use the bottom dot (which has a value of 1). This way, you will never produce an odd number, hence, you will never have a CHR$(13) or CHR$(9). (This is why we used only six pins in our plotting program.)

That's one solution to one problem. You'll find more of each (with specific information for *your* computer) in the appropriate appendix.

Summary

Control code	Function
⟨ESC⟩ "K" *n1 n2 m1 m2* . . .	Print *n1* + 256∗*n2* columns of normal density graphics
⟨ESC⟩ "L" *n1 n2 m1 m2* . . .	Print double density graphics
⟨ESC⟩ "y" *n1 n2 m1 m2* . . .	Print double density graphics at double speed
⟨ESC⟩ "z" *n1 n2 m1 m2* . . .	Print quadruple density graphics



Chapter 9

Getting it All Together

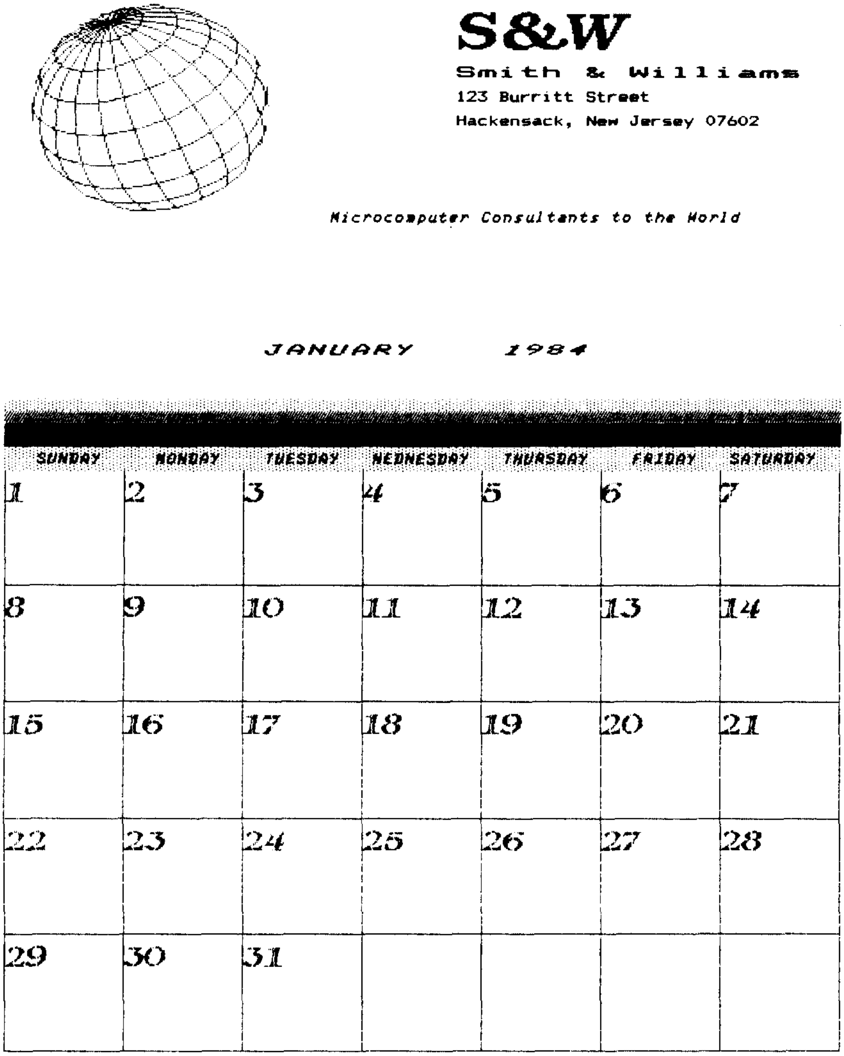
You have now seen how all of Delta's functions work. You surely have some good ideas of ways to use some of Delta's many capabilities. With all the different printing styles available you won't run out of variations for quite a while. And if there is a style of printing that Delta doesn't have built-in, you can develop your own with Delta's download characters.

Four different modes of graphics provide you with limitless ways to create pictures with Delta. You have learned how to create both stored-data and calculated shapes using Delta's graphics capabilities.

The calendar on the following page is a demonstration of just some of Delta's abilities. You will recognize many of the things that you have learned while reading this book. The globe was created the same way as the calculated-shape graphics that you learned about. The S&W logo was used to illustrate stored-data graphics. And you are sure to recognize many of the print styles used at the top of the calendar. Those shaded bars are created by using different graphics densities.

The numbers in the calendar itself are the ones that you created with download characters. And the lines creating the boxes are made with Delta's block graphics characters.

Delta's flexibility in line spacing and its ability to mix many types of printing on one line make it possible to create complex forms like this calendar. With Delta's advanced features it's easy to create a business form or letterhead, and fill it out at the same time. That's a productive printer.



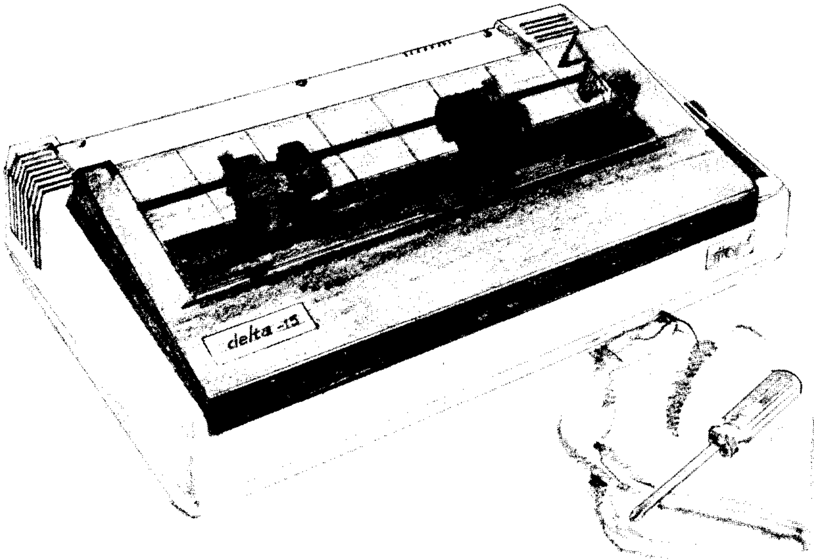
S&W

Smith & Williams
123 Burritt Street
Hackensack, New Jersey 07602

Microcomputer Consultants to the World

JANUARY 1984

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				



Chapter 10

Maintenance

As almost any good mechanic will tell you, dust and heat are the prime enemies of any mechanism, and Delta is no exception. The best maintenance is *preventive*. So, to start with, we hope you've found a clean, dust-free location with a comfortable temperature range for your computer printer system, *and* that you'll keep the printer's dust-cover where it belongs — in its place atop the printer! Appendix A gives you further tips on locating Delta.

Cleaning Delta

The second rule for long life is *periodic cleaning*. Both inside and outside of the case respond gratefully to periodic cleaning with a damp rag and alcohol. Do this whenever the case appears to be getting dirty, always being careful to avoid dripping alcohol on the printer mechanism. To clean the *inside* of dust and paper lint, use a nice soft brush, after first removing the printer's upper case in the following manner.

Removing the Upper Case

First, turn the power switch *off* and unplug Delta.

Remove the tractor unit.

Remove the platen knob.

Next, remove the two Phillips screws, per Figure 10-1. (You'll find *three* screws on the larger Delta-15.)

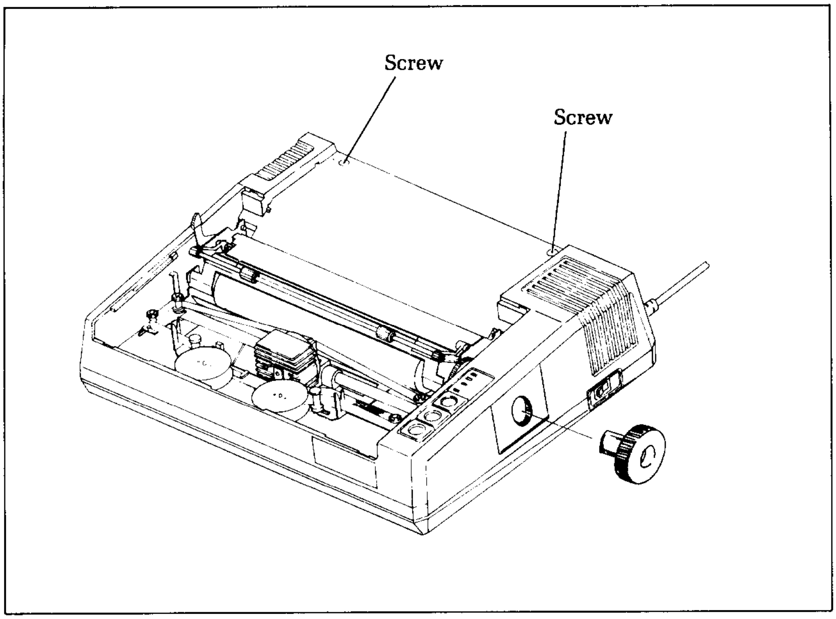


Figure 10-1. *To remove Delta's upper case, remove the screws.*

Lift up the upper case from the back; then "pop out" the front of the case by pushing outward with your thumbs where the plastic tabs fit into the bottom case.

Then stand the upper case on its end, right next to the printer so the short colored wires attached to the control panel remain connected. It's a good idea to keep the case from falling over by setting the corner of the printer on the edge of the case as shown in Figure 10-2.

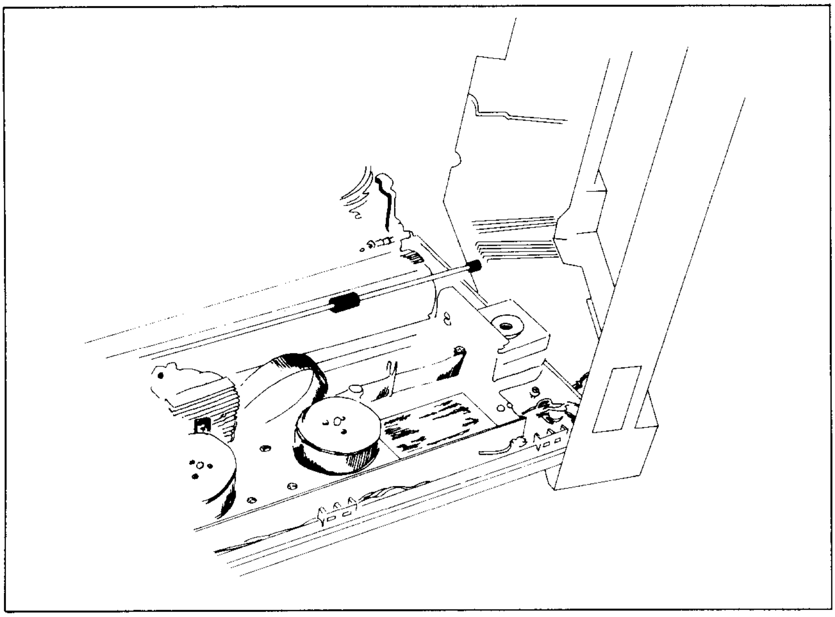


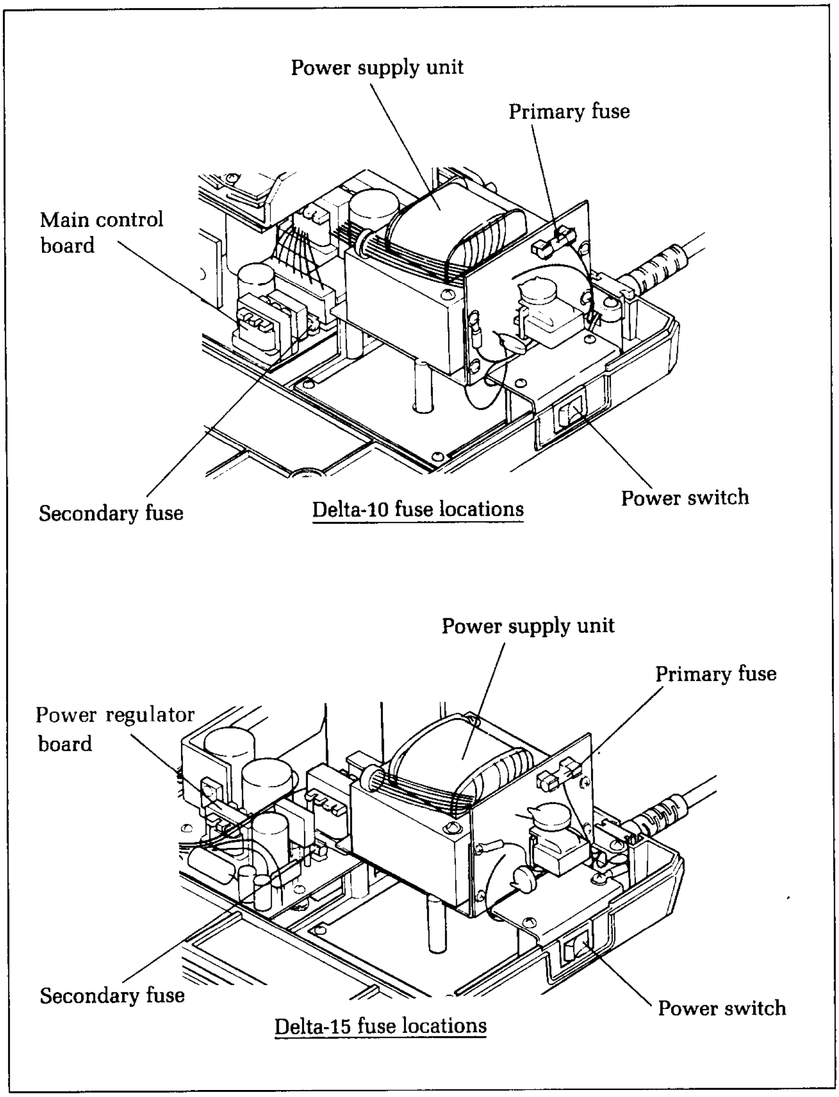
Figure 10-2. *Tilt the cover up so that you don't have to disconnect the control panel wires.*

NOTE TO THE UNWARY: When cleaning the inside of Delta, be *very* careful not to bend or injure any of those tiny wires or other little gizmos that lie exposed and defenseless against a heavy-handed touch.

Besides the periodic cleanings, the only other maintenance you'll encounter will be changing the ink ribbon (see Appendix A for these directions), and replacing an occasional blown fuse or replacement of the print head after a long period of use.

Replacing a Fuse

How can you tell when you've blown a fuse? Well, when the printer won't operate and the power lamp on the control panel isn't lit, even though you're sure the power switch is on and the printer is plugged in — it's likely a blown fuse.



Delta-10 fuse locations

Delta-15 fuse locations

Figure 10-3. *The secondary fuses are a little tricky to reach.*

To check out the fuses (there are two), turn the power switch *off*, and disconnect the power plug. Then remove the platen knob and the upper case, as described in the preceding section.

When the case is off, check for the correct fuse locations on Figure 10-3. Remove the primary fuse first, held in its clamps near the power switch. The fuse is a commonly used type, with a metal strip suspended in a glass and metal case. If the strip is broken, the fuse is blown.

Replace this fuse with a 2A/125V slow-blow type fuse; then test-run the printer. Still immobile? Check the secondary fuse, which is still further inside the "works," as shown in Figure 10-3. If *that's* blown, replace it with a 3A/125V slow-blow type fuse.

Then if the printer still isn't working, better call on your Delta dealer for help.

Incidentally, it makes it easier to remove and replace the fuses if you have a long, flat screwdriver and some needlenose pliers handy. The fuses are small, and the secondary fuse is sort of hard to get at without these particular tools. (But be careful not to crush the glass fuses with the pliers.)

We've found the following technique works pretty well for replacing the secondary fuse. Using the long flat screwdriver, pop one end of the fuse loose from its holding clamp and stand it on end. Then grab the loose end with the needle nose pliers and pull it out. To insert the new fuse, lower it into place with the pliers, so that it lies flat against the two holding clamps. Then use the long screwdriver to push each metal end of the fuse into its adjacent holding clamp.

Replacing the Print Head

As mentioned earlier, the print head has a long life, printing perhaps 100,000,000 characters before it wears out. You'll know when that happens when the printout is too faint for your taste even after replacing the ink ribbon.

WARNING: The print head gets hot during operation, so let it cool off for awhile, if necessary, to avoid burning your fingers.

To replace the print head, start by removing the printer cover and the ink ribbon. Then unplug the print head cable (see Figure 10-4) while holding down the head cable board. Next, remove the two screws and washers which fasten the print head. Then place the new print head in position, and attach it with the same two screws. Apply "screw lock," (an adhesive available at hardware stores) to the heads of the screws. Finally, insert the head cable, with the printed side up, tightly into the head connector on the cable board. Be sure that it's a good solid connection, or it could cause problems.

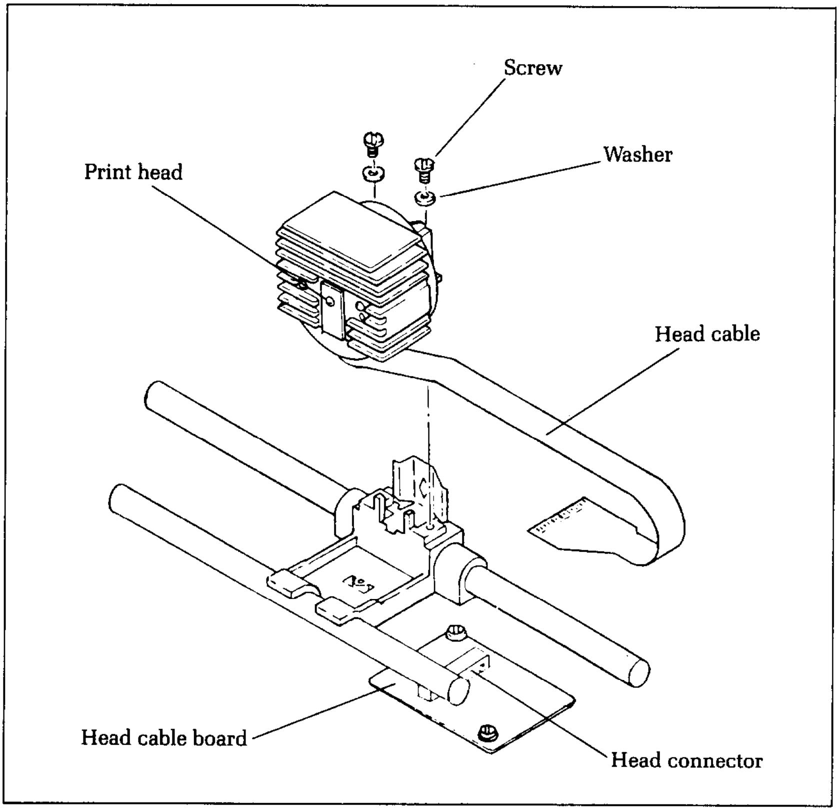
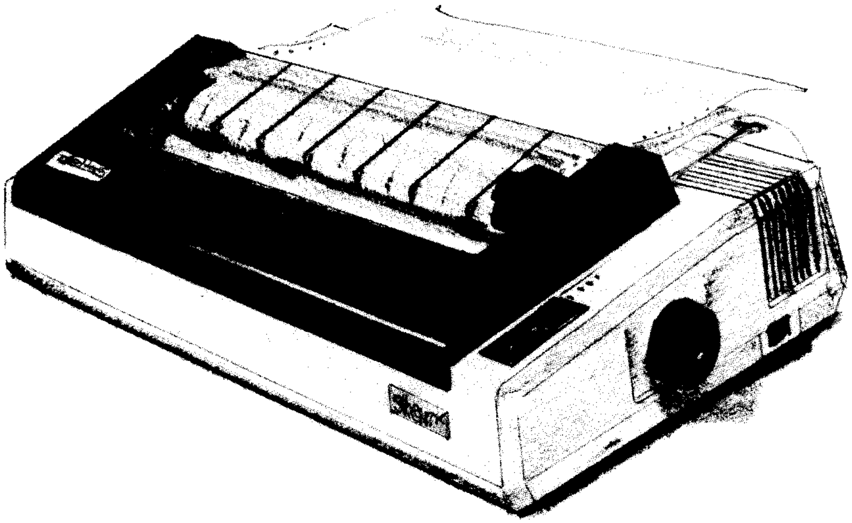


Figure 10-4. *Replacement of Delta's print head is simple.*

Back to perfect printing!



Appendix

Appendix A

Setting Up Delta

In this appendix, we'll show you how to unpack your new Delta printer, set it up in the right location, and get it ready for you to load it with paper and start printing! But first . . .

Where shall we put it?

Before you do anything else, give some thought to where you'll be using your printer. Obviously, it will be somewhere near your computer. And both computer and printer will lead longer, healthier lives if they like their environment. For instance, we recommend . . .

- Placing the printer on a flat surface
- Keeping it out of direct sunlight and away from heat-producing appliances
- Using it only in temperatures where you are comfortable
- Avoiding areas with a lot of dust, grease, or humidity
- Giving it "clean" electricity. Don't connect it to the same circuit as large, noise-producing motors
- Providing the right voltage, which is not over 10% more or less than 120 volts AC.

WARNING: Extremely high or low voltage can damage your printer.

What have we here?

Let's take a look at what's in the box. Take it slow and easy, and check each item in the box against Figure A-1. There should be exactly 11 items. One important item is the printer registration and warranty card. Now is the time to fill it in and mail it. It's a good warranty, and you'll like the protection it gives you.

Let's move on to the next step . . .

Removing the shipping screws

There are two shipping screws on the bottom of the printer,

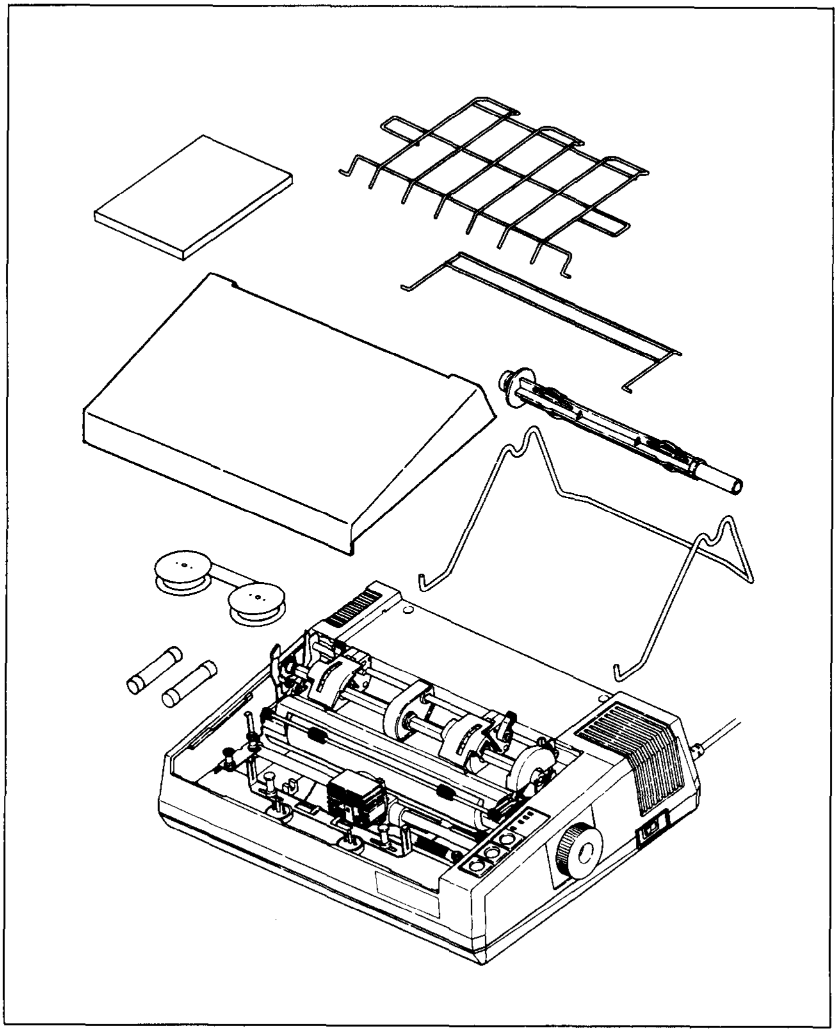


Figure A-1. *Inside the carton you should find: 1) printer, 2) printer cover, 3) paper guide, 4) paper separator, 5) roll paper holder, 6) roll paper shaft, 7) ink ribbon, 8) platen knob, 9) spare fuses, 10) User's Manual, 11) warranty card.*

used to hold the internal chassis to the external frame during shipping. To get at these, carefully place the printer upside down on a soft surface like a foam cushion. Remove the two screws with a Phillips screwdriver as shown in Figure A-2.

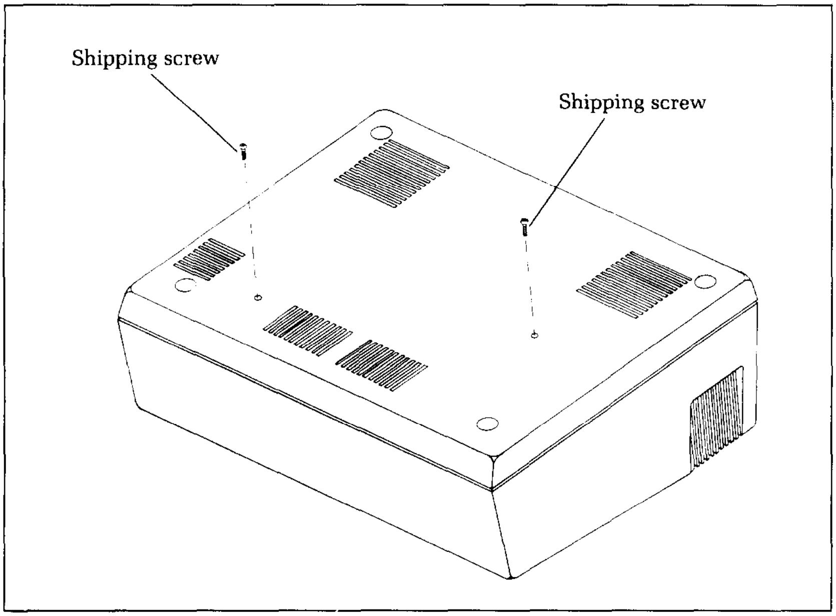


Figure A-2. *Remove the shipping screws before using Delta.*

Removing the packing from inside the printer

Remove three cardboard pieces: a large flat piece protecting the print head, and two smaller pieces stuck in at either end of the platen (the rubber cylinder that feeds the paper through the printer).

You'll want to save the screws, along with the rest of the packing material and the shipping box, in case you ever have to ship the printer. Tape the screws somewhere on the box or packing. (You *did* fill in that registration card, didn't you?)

Installing the platen knob

This is the knob that turns the rubber platen cylinder. It fits into the hole on the right side of the printer case. Just match the odd-shaped hole in the knob with the same shape on the shaft you'll see inside the hole in the case, and press on firmly. Give the knob a few twirls to see that it's turning the platen easily and smoothly.

Removing the tractor unit

The tractor unit, shown in Figure A-4, comes mounted on the printer during shipment. It is used only with sprocket-feed paper. When other papers are used, such as single sheets or roll paper,

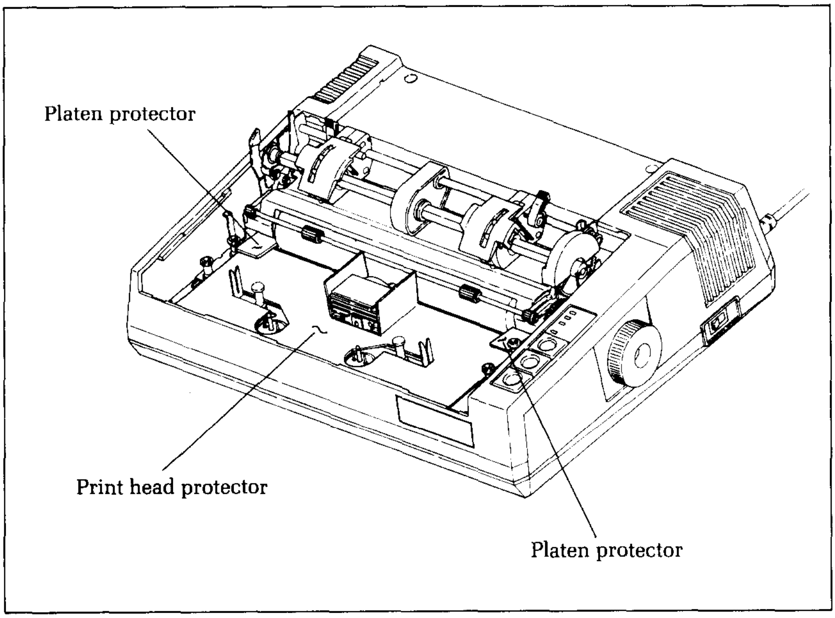


Figure A-3. *There are three pieces of cardboard to remove.*

the unit should be removed, in the following manner:

Remove the printer cover (if attached).

Identify the "snap levers" as shown in Figure A-4.

Pull both snap levers forward, and at the same time . . .

Rock the tractor unit up and towards you about half an inch.

Now lift the tractor up and away from the printer.

Up to this point, we've been clearing the decks for action, so to speak. Only two more things are left to do before we can start printing. They are, 1) attach the paper separator and paper guide racks, and 2) install the ink ribbon. Actually, if you're planning to print on single sheets only, you won't need to use the paper separator and paper guide, which are designed expressly to guide continuous paper (roll or sprocket-feed) through the printer.

Attaching the paper separator and paper guide

First, identify the paper separator (the large metal rack), shown in Figure A-5. Insert one protruding end into the hole shown in the diagram, then gently bend the other protruding end until it snaps into the opposite hole. Follow the same procedure with the smaller metal rack, which is the paper guide.

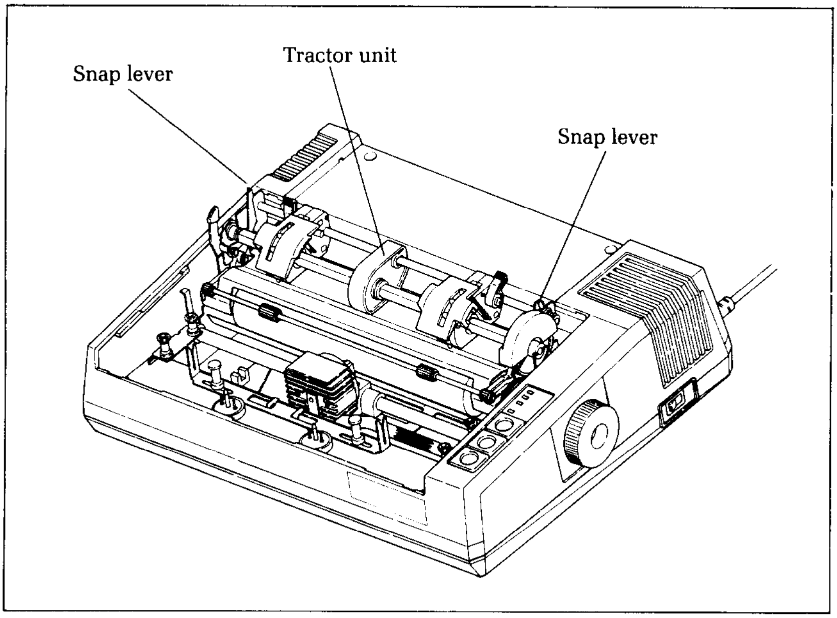


Figure A-4. *Remove the tractor by pulling the snap levers towards you and tilting the tractor unit back.*

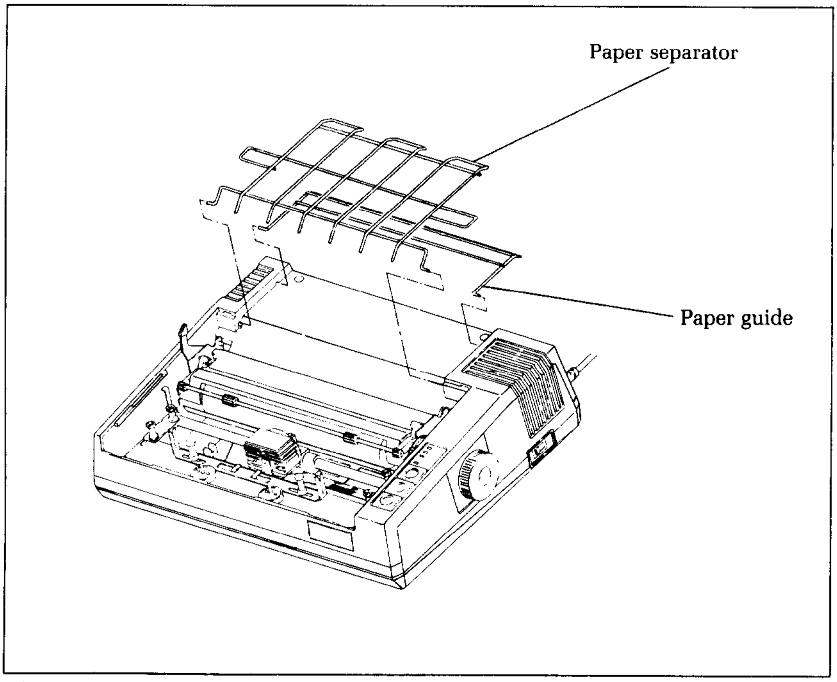


Figure A-5. *Attach the paper guide and paper separator.*

Important news: If you get these in upside down, they won't work. So take another sharp look at Figure A-5 before we pass on to the final act—installing the ink ribbon.

(NOTE: If you're wondering about the wire roll paper holder and holder shaft, we'll explain these in Chapter 1, where we discuss the whole subject of paper selection, paper feed, and related topics.)

Installing the ribbon

Telling you how to set the ribbon is like writing a set of instructions on how to tie your shoelaces. It takes a lot longer to describe it than it does to do it! So, you'll be smart to study the several figures shown here; they'll tell you all you really need to know.

Nevertheless, if you feel better following written instructions, read on . . .

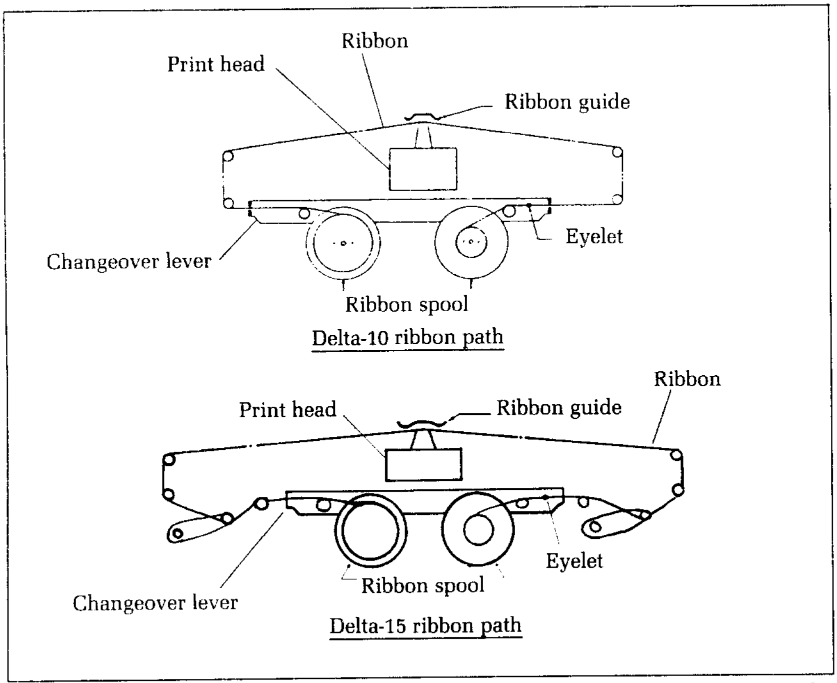


Figure A-6. *You'll find this diagram of the ink ribbon path inside your Delta for easy reference when you change ribbons.*

After looking carefully at the Figure A-6, begin by turning the power *off*, and removing the printer cover. Then slide the print

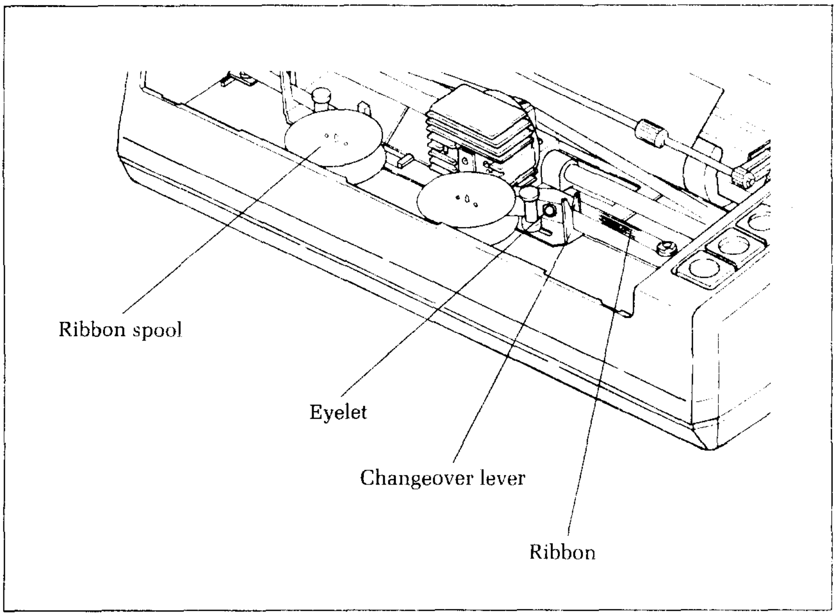


Figure A-7. *The eyelet should be between the ribbon spool and the changeover lever.*

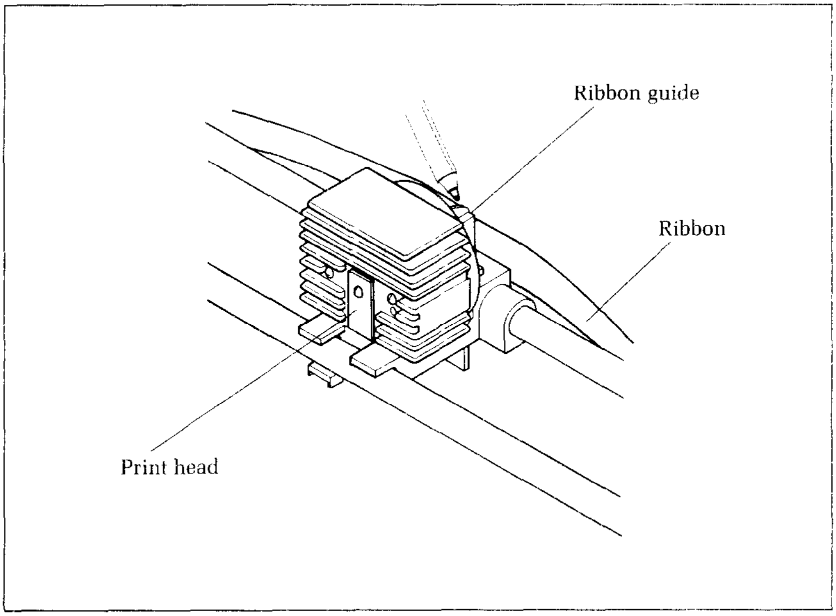


Figure A-8. *You may want to use a ballpoint pen to press the ribbon guide towards the platen and work the ribbon down beside it.*

head gently to the center of the printer. Next, set one of the ribbon spools on a ribbon spool post, being careful to have it wind/unwind exactly as shown in the figures. The spool should fit so that the drive pins engage the spool.

Next, you start threading the ribbon. The only tricky part is around the print head, so pay particular attention to Figure A-8. The ribbon should fit in the slot between the print head and the ribbon guide. Use a ballpoint pen to work the ribbon down between the print head and the ribbon guide.

The other thing to watch is the position of the eyelet near the end of the ribbon. This works exactly like a typewriter ribbon eyelet; it can't get by the slotted guide, which causes the ribbon to automatically reverse its direction.

Finally, set the other spool snugly on the opposite spool holder; then turn the spools by hand four or five turns in each direction to verify that everything is properly set and ready to roll.

Installing the printer cover

Now that you've completed the steps described in this Appendix A, you may want to mount the printer cover in place to keep dust and dirt away. It's a simple procedure. Merely fit the two tabs at the back edge of the cover into the two slots right next to the two holes where you fastened the wire rack paper separator. Then drop the other end down gently until it sits firmly on the printer. That's all!

To remove the cover just reverse the process: lift up the front and pull it out of the slots at the back.

Connecting Delta to your computer

To complete the installation, you'll need to connect Delta to your computer. In Appendixes B through G, we've described the procedure, including specific guidelines for making connections with several of the most popular computers used by Delta owners.

Appendix B

IBM Personal Computer and Compaq Computer

Both the IBM Personal Computer and the Compaq computer function the same when connected to Delta. We will discuss the IBM-PC, knowing that all we say works just as well for the Compaq.

Delta can connect to either a serial or a parallel interface in the IBM-PC or IBM-XT computers. IBM calls a parallel interface a "Parallel Printer Adapter", and they call a serial interface an "Asynchronous Communications Adapter."

You only need a cable to connect Delta to your IBM-PC. Your Delta dealer can furnish this cable, or you can use a standard IBM-PC parallel printer cable for the parallel interface.

We recommend that you set the DIP switches in Delta as shown below when connecting it to an IBM-PC parallel interface.

Recommended DIP Switch Settings for IBM-PC

Switch	Setting	Function
1-1	ON	11 inch page size
1-2	ON	Normal print density
1-3	ON	10 CPI pitch
1-4	ON	Normal characters
1-5	ON	1/6 inch line feed
1-6	ON	U.S.A. Character set
1-7	ON	
1-8	ON	
2-1	ON	Paper-out detector active
2-2	OFF	Parallel interface
2-3	OFF	8-bit interface
2-4	OFF	No auto line feed

IBM-PC Parallel Cable

Delta			IBM-PC Parallel	
Pin No.	**Function**		**Pin No.**	**Function**
1	STROBE	————	1	STROBE
2	D1	————	2	D0
3	D2	————	3	D1
4	D3	————	4	D2
5	D4	————	5	D3
6	D5	————	6	D4
7	D6	————	7	D5
8	D7	————	8	D6
9	D8	————	9	D7
10	ACK	————	10	ACK
11	BUSY	————	11	BUSY
12	PAPER END	————	12	PAPER END
13	SELECTED	————	13	SELECT
16	GROUND	————	18-25	GROUND
31	RESET	————	16	RESET
32	ERROR	————	15	ERROR

The IBM-PC expects its printer to be connected to the parallel interface. If you are using the serial interface, then you will need to instruct your computer to send information to the serial interface instead of to the parallel interface. This is done with the MODE command. You must use the following two commands each time you turn on your computer.

```
MODE COM1:48,N,8,1,P
MODE LPT1:=COM1:
```

The first "sets up" the asynchronous adapter to match the settings of DIP switch 3 in Delta. The second re-directs printer output to the serial port. The switches on DIP switch 3 must be set as shown below to use this MODE command. (The IBM-DOS manual tells you how to create a different MODE command for different DIP switch settings.) You can put these two MODE commands into a file named AUTOEXEC.BAT and it will execute automatically each time you start your computer.

Table B-1
Serial switch settings

Switch	Setting	Function
3-1	OFF	8 data bits
3-2	OFF	No parity
3-3	ON	Serial busy, block mode
3-4	OFF	
3-5	either	Parity
3-6	ON	4800 baud
3-7	ON	
3-8	OFF	

The serial cable shown below will work with DIP switch 3 set as shown above to connect Delta to a serial interface on the IBM.

IBM-PC Serial Cable

Delta			IBM-PC	
Pin No.	**Function**		**Pin No.**	**Function**
2	TRANSMIT DATA	——	3	RECEIVE DATA
3	RECEIVE DATA	——	2	TRANSMIT DATA
4	REQUEST TO SEND	——	5	CLEAR TO SEND
5	CLEAR TO SEND	——	4	REQUEST TO SEND
7	SIGNAL GROUND	——	7	SIGNAL GROUND
8	CARRIER DETECT	——	4	REQUEST TO SEND
20	DATA TERMINAL READY	——	6	DATA SET READY

BASIC programing

All the programs in this book are written in the BASIC used by the IBM-PC. That makes it easy to do the things that we show you. But when you start writing your own programs there are several things that you should know.

IBM BASIC defaults to a printer width of 80. This means that it will automatically insert a carriage return and line feed after every 80 characters. If you want to print lines longer than 80 characters you will need to change the width of the printer. If you set the printer width to 255, then the IBM will *never* insert a line feed and carriage return, unless you start a new line. (This is what you want usually.) To set the width of the printer to 255, use this statement:

```
    1ØØ WIDTH "LPT1:", 255
```

IBM BASIC has one other little trick that will mess up your graphics if you let it. IBM BASIC is very insistent about adding a line feed to a carriage return. This is fine if you are printing text, but if an ASCII 13 pops up in the middle of your graphics printout, IBM BASIC will *still* add a line feed to it. This will put strange things in the middle of your graphics, and leave you with extra characters at the end of your line.

There is an easy way to avoid this problem. You just open the printer as a random file. The following program shows how this is done.

```
1Ø OPEN "LPT1:" AS #1            ' RANDOM ACCESS
2Ø WIDTH #1, 255                 ' SET WIDTH TO 255
3Ø PRINT #1, "TESTING"           ' PRINT A LINE
4Ø PRINT #1, CHR$(1Ø)            ' ADD YOUR OWN LF
```

Listing programs

To list programs on the IBM-PC, use the LLIST command. This directs the listing to the printer instead of the screen.

Program listings

There are no program listings given here for the IBM-PC because all the programs in the book are written for the IBM-PC.

Appendix C

Apple II Computers

Apple II computers require an interface board (mounted inside the Apple II) and a cable to run Delta. Star recommends that you use the **grafstar**™ interface for the Apple II, II+, and IIe, by Star Micronics. It comes complete with a cable and is easily installed. A unique feature of the **grafstar**™ makes it possible to do some fancy dot graphics programming.

You can, of course, use many of the available parallel interface boards for the Apple II, and an appropriate cable.

Setting the switches

We recommend that you set the DIP switches in Delta as shown below when connecting it to an Apple II.

Recommended DIP Switch Settings for Apple

Switch	Setting	Function
1-1	ON	11 inch page size
1-2	ON	Normal print density
1-3	ON	10 CPI pitch
1-4	ON	Normal characters
1-5	ON	1/6 inch line feed
1-6	ON	U.S.A. Character set
1-7	ON	
1-8	ON	
2-1	ON	Paper-out detector active
2-2	OFF	Parallel interface
2-3	ON	7-bit interface
2-4	OFF	No auto line feed

Applesoft BASIC

The Apple II computer, using Applesoft BASIC, does not

Apple Parallel Cable

Delta		Apple Board	
Pin No.	**Function**	**Pin No.**	**Function**
25	SIG GND	1	SIG GND
26	SIG GND	2	SIG GND
27	SIG GND	3	SIG GND
1	STROBE	4	STROBE
28	SIG GND	5	N/C
2	DATA1	6	DATA1
3	DATA2	7	DATA2
4	DATA3	8	DATA3
5	DATA4	9	DATA4
6	DATA5	10	DATA5
7	DATA6	11	DATA6
8	DATA7	12	DATA7
9	DATA8	13	DATA8
10	ACK	14	ACK
29	SIG GND	15	SIG GND

have different types of PRINT statements for the screen and printer. You must add commands to your programs that direct the output of the PRINT statements to the printer. To direct output to the printer (with the interface board in slot #1) you must use the PR# 1 command. Depending on the version of Applesoft BASIC that you are using this command can take various forms. It is usually one of the following:

```
1Ø PR# 1
or
1Ø PRINT "<Ctrl-D>PR#1"
or
1Ø PRINT CHR$(4) "PR#1"
```

To return output to the screen, the command is PR#0, in the same form that works for PR# 1.

To allow line lengths longer than the Apple II usually uses you must add the following statement to your programs:

```
2Ø PRINT CHR$(9) "255N"
```

This allows lines of any length to be sent to the printer and is especially important for dot graphics. (The number 255 in the BASIC statement above could be replaced by any number from 0 to 255 and would set the line length to that value.)

Two codes are a particular problem on the Apple II: CHR$(7) and CHR$(9). Try to avoid using these in dot graphics programs.

The Apple II computer uses CHR$(9) as a printer initialization code. It won't send it on to the printer. There is a way to bypass this problem, however. You can change the printer initialization code to a value other than CHR$(9) like this:

```
PR#1
PRINT CHR$(9); CHR$(1)
```

This makes CHR$(1) the printer initialization code (and transfers the problems to *that* code) and allows you to use Delta's tabs.

There is one more way to sneak problem codes past the Apple II's operating system and that's to poke the codes directly to the output port. To send ASCII code 9, for example, you could do this:

```
100 N = 9
110 IF PEEK(49601)>127 THEN 110
120 POKE 49296,N
```

Line 110 checks the printer's status, and when it's ok, line 120 pokes the code to the printer.

Listing programs

To make a listing of your BASIC programs on Delta from your Apple II computer you must take the following steps:

1. Be sure that the program that you wish to list is in the memory of the Apple II.
2. Direct the output to the printer by typing PR#1.
3. Type LIST to start the listing.
4. When the listing is finished, type PR#0 to redirect the output to the screen.

Program listings

Following are program listings in Applesoft BASIC for the main programs used in the tutorial section of this book. The only modifications that you might have to make are to the PR#1 and PR#0 commands as discussed above.

Chart program

```
100 PR# 1
110 PRINT CHR$ (9);"255N"
120 GOSUB 1000: GOSUB 2000
130 PRINT "*REGULAR*"
140 GOSUB 3000
150 PRINT "*DOUBLE STRIKE*"
160 PRINT DS$;
170 GOSUB 3000
180 PRINT "*EMPHASIZED*"
190 EM = TRUE
200 GOSUB 3000
210 PRINT "*DOUBLE STRIKE & EMPHASIZED*"
220 PRINT DS$;EM$;
230 GOSUB 3000
240 END
1000 REM
1010 IT$ = CHR$ (27) + CHR$ (52)
1020 RO$ = CHR$ (27) + CHR$ (53)
1030 EN$ = CHR$ (27) + "W" + CHR$ (1)
1040 CE$ = CHR$ (27) + "W" + CHR$ (0)
1050 PI$ = CHR$ (27) + "B" + CHR$ (1)
1060 EL$ = CHR$ (27) + "B" + CHR$ (2)
1070 CO$ = CHR$ (27) + "B" + CHR$ (3)
1080 EM$ = CHR$ (27) + "E"
1090 CM$ = CHR$ (27) + "F"
1100 DS$ = CHR$ (27) + "G"
1110 CD$ = CHR$ (27) + "H"
1120 UN$ = CHR$ (27) + "-" + CHR$ (1)
1130 CU$ = CHR$ (27) + "-" + CHR$ (0)
1140 SP$ = CHR$ (27) + "S" + CHR$ (0)
1150 SB$ = CHR$ (27) + "S" + CHR$ (1)
1160 CS$ = CHR$ (27) + "T"
1170 RA$ = CHR$ (27) + "@"
1180 TRUE = 1:FALSE = 0
1190  RETURN
2000  REM
2050  PRINT RA$
2060  PRINT EN$;"  NORMAL    ENLARGED  "
2070  PRINT RA$;
2080  PRINT UN$;
2090  PRINT CO$;"CONDENSED ";
```

```
2100  PRINT EL$;"  ELITE   ";
2110  PRINT PI$;"  PICA    ";
2120  PRINT CO$;"CONDENSED ";
2130  PRINT EL$;"  ELITE   ";
2140  PRINT PI$;"  PICA    ";
2150  PRINT RA$
2160  RETURN
3000  REM
3050 IT = FALSE: PRINT RO$;
3060 UN = FALSE: PRINT CU$;
3070 EN = FALSE: PRINT CE$;
3080 PI = FALSE:
3100  PRINT CO$;
3110  GOSUB 3500:
3120  PRINT EL$;
3130  GOSUB 3500
3140  PRINT PI$;:PI = TRUE
3150  GOSUB 3500
3170  IF EN = TRUE THEN PRINT : GOTO 3190
3180  PRINT EN$;:EN = TRUE: GOTO 3080
3190  IF UN = TRUE THEN PRINT : GOTO 3210
3200  PRINT UN$;:UN = TRUE: GOTO 3070
3210  IF IT = TRUE THEN  PRINT RA$: RETURN
3220  PRINT IT$;:IT = TRUE: GOTO 3060
3500  REM
3550 BL$="      ":FD$="...."
3560  IF EM = FALSE THEN  PRINT "AB" + CHR$ (99) +
   CHR$ (100);: GOTO 3610
3570  IF PI = FALSE THEN  PRINT FD$;: GOTO 3590
3580  PRINT EM$;"AB"; CHR$ (99) + CHR$ (100);
3590  IF EN = TRUE THEN  PRINT " ";: RETURN
3600  IF EN = FALSE THEN  PRINT BL$;: RETURN
3610  REM
3620  IF EN = TRUE THEN  PRINT " ";: RETURN
3630  PRINT SP$;"X" + CHR$ (120);
3640  PRINT SB$;"Y" + CHR$ (121) + " ";
3650  PRINT CS$;
3660  RETURN
```

Special character chart program

```
10 L$ =  CHR$ (27) + ">"
20 Z$ =  CHR$ (27) + "="
25  PR# 1
27  PRINT  CHR$ (9);"255N"
30  FOR J = 160 TO 255 STEP 8
```

```
40  FOR I = J TO J + 7
50  PRINT I;"= ";L$; CHR$ (I);Z$;"  ";
60  NEXT I: PRINT : NEXT J
70  PR# Ø
80  END
```

Macro program

```
1Ø  PR# 1
15  PRINT  CHR$ (9);"255N"
2Ø  PRINT  CHR$ (27);"+";
3Ø  PRINT  CHR$ (18);
4Ø  PRINT  CHR$ (27);"W"; CHR$ (Ø);
5Ø  PRINT  CHR$ (27);"F";
6Ø  PRINT  CHR$ (27);"H";
7Ø  PRINT  CHR$ (27);"-"; CHR$ (Ø);
8Ø  PRINT  CHR$ (27);"T";
9Ø  PRINT  CHR$ (27);"5";
1ØØ  PRINT  CHR$ (3Ø)
11Ø  PR# Ø
12Ø  END
```

Bridge hand program

```
1Ø  HOME
2Ø  GOSUB 1ØØØ
3Ø  GOSUB 2ØØØ
4Ø  GOSUB 3ØØØ
5Ø  GOSUB 4ØØØ
6Ø  END
1ØØØ  REM
1Ø1Ø  DIM HA(4),DE(52),CA$(13),SU$(3)
1Ø2Ø CA$(1) = " 2":CA$(2) = " 3":CA$(3) = " 4":
   CA$(4) = " 5" : CA$(5) = " 6"
1Ø3Ø CA$(6) = " 7":CA$(7) = " 8":CA$(8) = " 9":
   CA$(9) = " 1Ø"
1Ø4Ø CA$(1Ø) = " J":CA$(11) = " Q":CA$(12) = " K":
   CA$(13) = " A"
1Ø5Ø SU$(Ø) = "S":SU$(1) = "H":SU$(2) = "D":
   SU$(3) = "C"
1Ø8Ø  RETURN
2ØØØ  REM
2Ø1Ø  PR# 1
2Ø15  PRINT  CHR$ (9); CHR$ (25)
2Ø16  PRINT  CHR$ (25);"255N"
```

```
2Ø2Ø  PRINT  CHR$ (27); CHR$ (68); CHR$ (2Ø);
   CHR$ (4Ø); CHR$ (Ø)
2Ø3Ø  PRINT  CHR$ (27); CHR$ (43); CHR$ (27);
   CHR$ (36); CHR$ (Ø); CHR$ (27); CHR$ (69);
   CHR$ (3Ø)
2Ø4Ø  PRINT  CHR$ (27); CHR$ (42); CHR$ (Ø)
2Ø45  FOR I = 1 TO 4
2Ø5Ø  PRINT  CHR$ (27); CHR$ (42); CHR$ (1);
2Ø6Ø  FOR J = 1 TO 13
2Ø7Ø  READ X: PRINT  CHR$ (X);
2Ø8Ø  NEXT J
2Ø9Ø  NEXT I
21ØØ  PRINT
211Ø  RETURN
212Ø  DATA  72,11,4,1Ø,2Ø,1Ø,52,72,52,1Ø,2Ø,1Ø,4
213Ø  DATA  83,11,16,8,2Ø,8,86,41,86,8,2Ø,8,16
214Ø  DATA  67,11,8,16,8,18,65,62,65,18,8,16,8
215Ø  DATA  68,11,8,Ø,28,Ø,62,65,62,Ø,28,Ø,8
3ØØØ  REM
3Ø1Ø  FOR CA = 1 TO 52
3Ø2Ø X = INT ( RND (1) * 4 + 1)
3Ø3Ø  IF HA(X) = 13 THEN 3Ø2Ø:
3Ø35 HA(X) = HA(X) + 1
3Ø4Ø DE(CA) = X
3Ø5Ø  NEXT CA
3Ø6Ø  RETURN
4ØØØ  REM
4Ø1Ø  PR# 1
4Ø12  PRINT CHR$ (9); CHR$ (25)
4Ø14  PRINT CHR$ (25);"255N":
4Ø15  PRINT CHR$ (27);"!"; CHR$ (9);"NORTH"
4Ø2Ø  PRINT CHR$ (27);"$"; CHR$ (1); CHR$ (27);
   CHR$ (7Ø);
4Ø3Ø HA = 1
4Ø4Ø  FOR SU = Ø TO 3
4Ø5Ø  PRINT CHR$ (9);
4Ø6Ø  GOSUB 43ØØ
4Ø7Ø  PRINT
4Ø8Ø  NEXT SU
4Ø9Ø  PRINT CHR$ (27);"!";"WEST"; CHR$(9);
   CHR$ (9);"EAST"
41ØØ  PRINT CHR$ (27);"$"; CHR$ (1); CHR$ (27);
   CHR$ (7Ø);
411Ø  FOR SU = Ø TO 3
```

```
4120 HA = 2
4130  GOSUB 4300
4140  PRINT  CHR$ (9); CHR$ (9);
4150 HA = 3
4160  GOSUB 4300
4170  PRINT
4180  NEXT SU
4190  PRINT CHR$ (27);"!"; CHR$ (9);"SOUTH"
4200  PRINT CHR$ (27);"$"; CHR$ (1); CHR$ (27);
   CHR$ (70);
4210 HA = 4
4220  FOR SU = 0 TO 3
4230  PRINT CHR$  (9);
4240  GOSUB 4300
4250  PRINT
4260  NEXT SU
4270  PRINT CHR$ (27);"$"; CHR$ (0); CHR$ (27);
   CHR$ (70)
4280  RETURN
4300  PRINT SU$(SU);
4310  FOR CA = 13 TO 1 STEP  - 1
4320 H1 = HA: IF DE(SU * 13 + CA) = H1 THEN  PRINT
   CA$(CA);
4330  NEXT CA
4340  RETURN
```

Numeral program

```
10  REM
20  PR# 1
25  PRINT  CHR$ (9);"255N"
27  PRINT  CHR$ (9); CHR$ (25)
30 DC$ =  CHR$ (27) +  CHR$ (42) +  CHR$ (1)
40 DP$ =  CHR$ (27) +  CHR$ (88) +  CHR$ (1)
50 CP$ =  CHR$ (27) +  CHR$ (88) +  CHR$ (0)
60 L7$ =  CHR$ (27) + "1":L12$ =  CHR$ (27) +
   CHR$ (50)
70  FOR N1 = 33 TO 73
80  PRINT DC$;
90  PRINT  CHR$ (N1);
100 READ N2
110  PRINT  CHR$ (N2);
120  FOR S = 1 TO 11
130  READ MS
140  PRINT  CHR$ (MS);
150   NEXT S
```

```
16Ø  NEXT N1
18Ø AS = 33
19Ø  FOR NU = Ø TO 9
21Ø NT$(NU) =  CHR$ (AS + Ø) +  CHR$ (AS + 1)
22Ø NB$(NU) =  CHR$ (AS + 2) +  CHR$ (AS + 3)
225 AS = AS + 4
23Ø  NEXT NU
24Ø BL$ =  CHR$ (73)
25Ø  PRINT DP$;L7$
26Ø  FOR NU = Ø TO 9
27Ø  PRINT NT$(NU);BL$;
28Ø  NEXT NU
29Ø  PRINT
3ØØ  FOR NU = Ø TO 9
31Ø  PRINT NB$(NU);BL$;
32Ø  NEXT NU
33Ø  PRINT CP$;L12$
34Ø  REM  ZERO
35Ø  DATA  11,Ø,96,16,1Ø4,16,44,3Ø,14,Ø,2,1
36Ø  DATA  11,2,1,2,1,6,8,38,88,32,88,32
37Ø  DATA  11,3,12,19,12,51,Ø,96,Ø,96,Ø,96
38Ø  DATA  11,Ø,32,Ø,48,Ø,28,3,12,3,4,3
39Ø  REM  ONE
4ØØ  DATA  11,Ø,Ø,Ø,Ø,Ø,4,Ø,4,Ø,4,126
41Ø  DATA  9,12,114,12,114,12,2,Ø,Ø,Ø,Ø,Ø
42Ø  DATA  11,64,Ø,64,Ø,64,Ø,64,32,8Ø,47,8Ø
43Ø  DATA  9,47,8Ø,47,64,Ø,64,Ø,64,Ø,Ø,Ø
44Ø  REM  TWO
45Ø  DATA  11,Ø,Ø,Ø,Ø,Ø,12,16,14,Ø,6,Ø
46Ø  DATA  11,3,Ø,3,Ø,7Ø,56,7Ø,56,4,24,Ø
47Ø  DATA  11,64,Ø,64,32,64,32,8Ø,32,8Ø,4Ø,64
48Ø  DATA  11,44,64,38,65,34,65,32,8Ø,32,88,Ø
49Ø  REM  THREE
5ØØ  DATA  11,Ø,Ø,Ø,Ø,Ø,Ø,4,2,4,2,4
51Ø  DATA  11,34,84,34,92,34,76,34,68,2,64,Ø
52Ø  DATA  11,16,Ø,48,Ø,56,64,48,64,32,64,32
53Ø  DATA  11,64,32,64,48,9,54,9,22,9,6,1
54Ø  REM  FOUR
55Ø  DATA  11,Ø,Ø,Ø,Ø,Ø,Ø,64,36,88,32,16
56Ø  DATA  11,Ø,Ø,64,32,64,56,64,6Ø,2,12,Ø
57Ø  DATA  11,Ø,8,4,1Ø,5,1Ø,5,8,4,72,4
58Ø  DATA  11,88,38,89,38,89,6,73,4,8,6,Ø
59Ø  REM  FIVE
6ØØ  DATA  11,Ø,Ø,Ø,Ø,64,32,84,5Ø,76,34,68
61Ø  DATA  1Ø,34,68,34,68,34,68,2,68,2,Ø,Ø
```

```
62Ø  DATA  1Ø,Ø,32,24,1Ø1,24,97,Ø,64,Ø,64,Ø
63Ø  DATA  11,64,Ø,96,1,48,15,48,15,16,15,Ø
64Ø  REM  SIX
65Ø  DATA  11,Ø,96,Ø,112,Ø,12Ø,Ø,92,Ø,1Ø2,Ø
66Ø  DATA  11,98,Ø,98,Ø,98,Ø,7Ø,Ø,14,Ø,6
67Ø  DATA   11,6,8,23,8,55,8,99,Ø,65,Ø,64
68Ø  DATA  11,Ø,96,Ø,112,1,62,1,3Ø,1,14,Ø
69Ø  REM  SEVEN
7ØØ  DATA  11,Ø,16,8,6,8,6,8,6,8,6,8
71Ø  DATA  9,7Ø,8,1Ø2,8,54,8,6,Ø,2,Ø,Ø
72Ø  DATA  11,Ø,64,Ø,96,Ø,12Ø,Ø,124,Ø,3Ø,1
73Ø  DATA  9,6,1,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
74Ø  REM  EIGHT
75Ø  DATA  11,Ø,Ø,Ø,Ø,24,36,24,1Ø2,24,1Ø2,Ø
76Ø  DATA  11,67,Ø,67,Ø,99,28,34,28,34,28,Ø
77Ø  DATA  11,12,18,44,19,1Ø8,19,96,1,64,Ø,64
78Ø  DATA  11,Ø,96,1,112,15,48,15,16,14,Ø,Ø
79Ø  REM  NINE
8ØØ  DATA  11,Ø,Ø,12Ø,4,12Ø,6,12Ø,6,Ø,3,Ø
81Ø  DATA  11,3,Ø,3,Ø,67,4,123,4,122,4,12Ø
82Ø  DATA  11,48,Ø,56,Ø,113,Ø,99,Ø,99,Ø,99
83Ø  DATA   11,Ø,115,Ø,57,Ø,31,Ø,15,Ø,6,Ø
84Ø  REM  SPACE
85Ø  DATA  11,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
```

Download utility program

```
1Ø  DIM Z(8,12),MM(11)
15 CS$ = "*":SC$ = "@":ST$ =
   "                                        "
2Ø  HOME : GOSUB 66Ø
3Ø  VTAB 24: HTAB 34
4Ø  GET A$
5Ø  IF A$ = "P" THEN  GOSUB 68Ø: GOTO 3Ø
6Ø  IF A$ = "E" THEN  HOME : GOSUB 9ØØ: GOSUB 26Ø:
   GOTO 3Ø
7Ø  IF A$ =  CHR$ (27) THEN  HOME : END
8Ø  PRINT  CHR$ (7);: GOTO 3Ø
26Ø  REM
265  FOR I = 1 TO 11:MM(I) = Ø: NEXT I
27Ø  VTAB 3: HTAB 6: PRINT CS$;
28Ø  GET A$
29Ø  IF A$ = "J" THEN  GOSUB 39Ø: GOTO 37Ø
3ØØ  IF A$ = "K" THEN  GOSUB 41Ø: GOTO 37Ø
31Ø  IF A$ = "M" THEN  GOSUB 43Ø: GOTO 37Ø
```

```
32Ø  IF A$ = "I" THEN  GOSUB 45Ø: GOTO 37Ø
33Ø  IF A$ =  CHR$ (13) THEN  GOSUB 47Ø: GOTO 37Ø
34Ø  IF A$ =  CHR$ (32) THEN  GOSUB 49Ø: GOTO 37Ø
35Ø  IF A$ =  CHR$ (27) THEN  GOSUB 5ØØ: GOTO 38Ø
37Ø  GOTO 28Ø
38Ø  RETURN
39Ø  GOSUB 1ØØØ:Y = Y - 2:H = H - 1: IF Y < 1 THEN
   PRINT  CHR$ (7);:Y = 1:H = 1
4ØØ  GOSUB 1Ø5Ø: RETURN
41Ø  GOSUB 1ØØØ:Y = Y + 2:H = H + 1: IF Y >21 THEN
   PRINT  CHR$ (7);:Y = 21:H = 11
42Ø  GOSUB 1Ø5Ø: RETURN
43Ø  GOSUB 1ØØØ:X = X + 2:G = G + 1: IF X > 13 THEN
   PRINT  CHR$ (7);:X = 13:G = 7
44Ø  GOSUB 1Ø5Ø: RETURN
45Ø  GOSUB 1ØØØ:X = X - 2:G = G - 1: IF X < 1 THEN
   PRINT  CHR$ (7);:X = 1:G = 1
46Ø  GOSUB 1Ø5Ø: RETURN
47Ø  IF Z(G,H - 1) = 1 OR Z(G,H + 1) = 1 THEN  PRINT
   CHR$ (7);: RETURN
48Ø Z(G,H) = 1: INVERSE : VTAB X + 2: HTAB Y + 5:
   PRINT SC$;: NORMAL : RETURN
49Ø Z(G,H) = Ø: NORMAL : VTAB X + 2: HTAB Y + 5:
   PRINT CS$;: RETURN
5ØØ  REM
51Ø  FOR I = 2 TO 12: VTAB I: HTAB 29: PRINT
   "            ";: NEXT I
52Ø  IF Z(G,H) = 1 THEN  VTAB X + 2: HTAB Y + 5:
   NORMAL : PRINT SC$;: GOTO 54Ø
53Ø  IF Z(G,H) = Ø THEN  VTAB X + 2: HTAB Y + 5:
   NORMAL : PRINT " ";
54Ø  REM
55Ø  FOR I = 1 TO 11: FOR J = 1 TO 7
56Ø MM(I) = MM(I) + Z(J,I) * 2 ^ (J - 1): NEXT J:
   NEXT I
567  FOR I = 1 TO 11:S$ = STR$ (MM(I)): FOR J = 1 TO
   LEN (S$)
568  VTAB J + 16: HTAB I * 2 + 4: PRINT
   MID$ (S$,J,1);: NEXT J: NEXT I
58Ø  GOSUB 66Ø: RETURN
66Ø  FOR I = 1 TO 7: FOR J = 1 TO 11:Z(I,J) = Ø:
   NEXT J: NEXT I
67Ø  VTAB 24: HTAB 2: PRINT "E)DIT  P)RINTER  <ESC>)
   END ";: RETURN
68Ø  REM
```

```
69Ø  VTAB 21: HTAB 2: INPUT "NORMAL OR PROPORTIONAL
   (N/P) --> ";AN$
7ØØ  IF AN$ = "N" THEN PR = Ø: GOTO 75Ø
71Ø  IF AN$ = "P" THEN 73Ø
72Ø  PRINT  CHR$ (7);: GOTO 69Ø
73Ø  VTAB 21: HTAB 2: PRINT ST$;: VTAB 21: HTAB 2:
735  INPUT "PROPORTIONAL DATA (4-11) -->";PR
74Ø  IF PR < 4 OR PR > 11 THEN 73Ø
75Ø  VTAB 21: HTAB 2: PRINT ST$;: VTAB 21: HTAB 2:
755  INPUT "SHIFTED DOWN 1 ELSE ENTER Ø --> ";SH
76Ø  IF SH < Ø OR SH > 1 THEN PRINT  CHR$ (7);: GOTO
   75Ø
77Ø  VTAB 21: HTAB 2: PRINT ST$;: VTAB 21: HTAB 2:
775  INPUT "ENTER YOUR ASCII (33-126) --> ";AS
78Ø  IF AS < 33 OR AS > 126 THEN 77Ø
785  VTAB 21: HTAB 2: PRINT ST$;: VTAB 23: HTAB 38
79Ø  IF SH = 1 THEN SH = 16
8ØØ N1 = AS:N2 = PR + SH
81Ø  FOR I = 1 TO 11:MM$ = MM$ +  CHR$ (MM(I)):
   NEXT I
815  PR# 1
816  PRINT  CHR$ (9);"255N"
82Ø  PRINT  CHR$ (27);"*"; CHR$ (1); CHR$ (N1);
   CHR$ (N2);MM$
825  IF AN$ = "N" THEN  PRINT  CHR$ (27);"$";
   CHR$ (1): GOTO 83Ø
827  PRINT  CHR$ (27);"X"; CHR$ (1)
83Ø  FOR I = 1 TO 2Ø: PRINT  CHR$ (N1);" ";: NEXT I:
   PRINT
84Ø  PRINT  CHR$ (14);: FOR I = 1 TO 1Ø: PRINT
   CHR$ (N1);" ";: NEXT I: PRINT
85Ø  PRINT  CHR$ (15);: FOR I = 1 TO 2Ø: PRINT
   CHR$ (N1);" ";: NEXT I: PRINT  CHR$ (18)
86Ø  IF AN$ = "N" THEN  PRINT  CHR$ (27);"$"
   CHR$ (Ø): GOTO 87Ø
865  PRINT  CHR$ (27);"X"; CHR$ (Ø)
87Ø  PRINT  CHR$ (27);"@";:MM$ = "": RETURN
9ØØ X = 1:Y = 1:G = 1:H = 1
9Ø1  HOME
9Ø2  FOR I = 2 TO 16 STEP 2: VTAB I: HTAB 5: FOR J =
   1 TO 23: PRINT "-";: NEXT J: PRINT : NEXT I
9Ø4  FOR J = 3 TO 16 STEP 2: VTAB J: FOR I = 5 TO 27
   STEP 2: HTAB I: PRINT "!";: NEXT I: PRINT :
   NEXT J
9Ø5 K = 1: VTAB 1: HTAB 5
```

```
9Ø6  FOR K = 1 TO 11: PRINT K;" ";: NEXT K
9Ø7 K = Ø
9Ø8  FOR V = 3 TO 15 STEP 2: VTAB V: HTAB 2:
   PRINT 2 ^ K:K = K + 1: NEXT V
91Ø  VTAB 3: HTAB 3Ø: PRINT "CURSER "
912  VTAB 4: HTAB 29: PRINT "MOVEMENT"
913  VTAB 5: HTAB 29: PRINT "--------"
914  VTAB 6: HTAB 29: PRINT "<I> UP "
916  VTAB 7: HTAB 29: PRINT "<M> DOWN"
918  VTAB 8: HTAB 29: PRINT "<J> LEFT"
92Ø  VTAB 9: HTAB 29: PRINT "<K> RIGHT"
922  VTAB 1Ø: HTAB 29: PRINT "<RET> INSERT"
924  VTAB 11: HTAB 29: PRINT "<SPACE> DEL"
925  VTAB 12: HTAB 29: PRINT "<ESC> EXIT"
926  RETURN
1ØØØ  IF Z(G,H) = Ø THEN  VTAB X + 2: HTAB Y + 5:
   PRINT " ";
1Ø1Ø  IF Z(G,H) = 1 THEN  VTAB X + 2: HTAB Y + 5:
   PRINT SC$;
1Ø2Ø  RETURN
1Ø5Ø  IF Z(G,H) = 1 THEN  INVERSE : VTAB X + 2:
   HTAB Y + 5: PRINT CS$;: NORMAL
1Ø6Ø  IF Z(G,H) = Ø THEN  NORMAL : VTAB X + 2:
   HTAB Y + 5: PRINT CS$;: NORMAL
1Ø7Ø  RETURN
```

Delta Plot program

```
4  HOME : PRINT " ": PRINT " "
5  PRINT " ": PRINT " "
6  PRINT "THIS PROGRAM TAKES ABOUT"
7  PRINT "1 MINUTE  TO RUN. PLEASE"
8  PRINT " TURN ON YOUR PRINTER AND"
9  PRINT "STAND BY................"
1Ø A = 24576
2Ø  FOR I = A TO A + 12
3Ø  READ B
35  POKE I,B
4Ø  NEXT I
5Ø  DATA  32,74,255,165,25Ø,5,251
6Ø  DATA  133,252,32,63,255,96
1ØØ  REM  DELTA-PLOT
11Ø  DIM BIT%(75,14)
1ØØØ  REM  SET PROGRAM CONSTANTS
1Ø1Ø MASK%(1) = 64:MASK%(4) = 8
1Ø2Ø MASK%(2) = 32:MASK%(5) = 4
```

```
1Ø3Ø MASK%(3) = 16:MASK%(6) = 2
1Ø4Ø LX = 2Ø:LY = 2Ø
1Ø5Ø XFAC = 72 / LX:YFAC = 87 / LY
2ØØØ  REM  PLOT CURVE
2Ø1Ø RAD = 9
2Ø2Ø X1 = 19:Y1 = 1Ø
2Ø3Ø  FOR ANG = Ø TO 36Ø STEP 1Ø
2Ø4Ø R1 = ANG * 6.28 / 36Ø
2Ø5Ø X2 = RAD *  COS (R1) + 1Ø:Y2 = RAD *  SIN (R1)
   + 1Ø
2Ø6Ø  GOSUB 4ØØØ
2Ø7Ø  NEXT ANG
3ØØØ  REM  SEND BIT IMAGE MAP TO PRINTER
3ØØ5  PR# 1
3ØØ6  PRINT  CHR$ (9);"ØN"
3Ø1Ø  PRINT  CHR$ (27);"A"; CHR$ (6)
3Ø2Ø  FOR ROW = Ø TO 14
3Ø22 A$ = ""
3Ø5Ø  FOR COL = 1 TO 75
3Ø6Ø A$ = A$ +  CHR$ (BIT%(COL,ROW))
3Ø7Ø  NEXT COL
3Ø8Ø  PRINT  CHR$ (27);"K"; CHR$ (75); CHR$ (Ø);A$
3Ø9Ø  NEXT ROW
31ØØ  PRINT
31Ø2  PR# Ø
323Ø  END
4ØØØ  REM   DRAW A LINE FROM X1,Y1 TO X2,Y2
4Ø1Ø XL = X2 - X1:YL = Y2 - Y1
4Ø2Ø NX = ABS (XL * XFAC):NY = ABS (YL * YFAC)
4Ø3Ø  IF NX < NY THEN NX = NY
4Ø4Ø NS% = INT (NX + 1)
4Ø5Ø DX = XL / NS%:DY = YL / NS%
4Ø6Ø  FOR I = 1 TO NS%
4Ø7Ø X1 = X1 + DX:Y1 = Y1 + DY
4Ø8Ø  GOSUB 5ØØØ
4Ø9Ø  NEXT I
41ØØ  RETURN
5ØØØ  REM  PLOT A POINT AT X1,Y1
5Ø1Ø XX = X1 * XFAC:YY = Y1 * YFAC
5Ø2Ø COL = INT (XX) + 1
5Ø3Ø ROW = INT (YY / 6)
5Ø4Ø XIT% =  INT (YY - (6 * ROW)) + 1
5Ø42  POKE 25Ø,BIT%(COL,ROW)
5Ø44  POKE 251,MASK%(XIT%)
5Ø46  CALL 24576
```

```
5Ø5Ø BIT%(COL,ROW) = PEEK (252)
5Ø6Ø  RETURN
```

Pie chart program

```
4  HOME
5  PRINT "                 PLEASE STAND BY"
1Ø A = 768
2Ø  FOR I = A TO A + 12
3Ø  READ B
35  POKE I,B
4Ø  NEXT I
5Ø  DATA  32,74,255,165,25Ø,5,251
6Ø  DATA  133,252,32,63,255,96
1ØØ  REM  PIECHART
11Ø  DIM BIT%(19Ø,36),A$(36),PCT%(25),TXT$(42),
   PTXT$(25)
12Ø ES$ =  CHR$ (27):LF$ =  CHR$ (1Ø)
13Ø FF$ =  CHR$ (12):VT$ =  CHR$ (11)
14Ø EM$ = ES$ + "E":CE$ = ES$ + "F"
15Ø  FOR I = 1 TO 168:SP$ = SP$ + CHR$ (Ø): NEXT I
1ØØØ  REM SET PROGRAM CONSTANTS
1Ø2Ø MASK%(1) = 64:MASK%(4) = 8
1Ø2Ø MASK%(2) = 32:MASK%(5) = 4
1Ø3Ø MASK%(3) = 16:MASK%(6) = 2
1Ø4Ø LX = 2Ø:LY = 2Ø
1Ø5Ø XFAC = 19Ø / LX:YFAC = 216 / LY
1Ø6Ø  FOR I = 1 TO 42
1Ø7Ø  FOR J = 1 TO 8Ø:TXT$(I) = TXT$(I) + " "
1Ø8Ø  NEXT J: NEXT I
1Ø9Ø  GOSUB 7ØØØ
1Ø92  HOME : PRINT " ": PRINT " "
1Ø94  PRINT " ": PRINT " "
1Ø96  PRINT "THIS PROGRAM TAKES ABOUT"
1Ø97  PRINT "4 MINUTES TO RUN. PLEASE"
1Ø98  PRINT "TURN ON YOUR PRINTER AND"
1Ø99  PRINT "STAND BY................"
2ØØØ  REM  PLOT CURVE
2Ø1Ø RAD = 9
2Ø2Ø X1 = 19:Y1 = 1Ø
2Ø25  PRINT " ";
2Ø3Ø  FOR ANG = Ø TO 36Ø STEP 5
2Ø4Ø R1 = ANG * 6.28 / 36Ø
2Ø5Ø X2 = RAD * COS (R1) + 1Ø:Y2 = RAD * SIN (R1) +
   1Ø
```

```
2Ø6Ø  GOSUB 4ØØØ
2Ø7Ø  NEXT ANG
2Ø8Ø  FOR PI = 1 TO NP%
2Ø9Ø X1 = 1Ø:Y1 = 1Ø
21ØØ TP% = TP% + PCT%(PI)
211Ø ANG = 36Ø * TP% * .Ø1
212Ø R1 = ANG * 6.28 / 36Ø
213Ø X2 = RAD *  COS (R1) + 1Ø:Y2 = RAD *  SIN (R1)
   + 1Ø
214Ø  GOSUB 4ØØØ
215Ø  GOSUB 6ØØØ
216Ø  NEXT PI
3ØØØ  REM  SEND BIT IMAGE MAP TO PRINTER
3Ø2Ø  FOR ROW = Ø TO 35
3Ø22 A$(ROW) = ""
3Ø5Ø  FOR COL = 1 TO 19Ø
3Ø6Ø A$(ROW) = A$(ROW) +  CHR$ (BIT%(COL,ROW))
3Ø7Ø  NEXT COL
3Ø8Ø  NEXT ROW
3Ø9Ø  PR# 1
31ØØ  PRINT  CHR$ (9);"ØN"
311Ø X = (4Ø -  LEN (T1$) / 2)
312Ø  FOR I = 1 TO X: PRINT " ";: NEXT I
313Ø  PRINT EM$:TI$:CE$:LF$
314Ø  PRINT VT$;VT$;VT$
315Ø  PRINT ES$;"A"; CHR$ (3)
316Ø  PRINT TXT$(1);LF$;TXT$(2);LF$;TXT$(3);LF$
317Ø  FOR ROW = Ø TO 35
318Ø  PRINT ES$;"K"; CHR$ (1Ø2); CHR$ (1);
   SP$;A$(ROW)
32ØØ  PRINT TXT$(ROW + 4)
321Ø  NEXT ROW
322Ø  PRINT TXT$(4Ø);LF$
323Ø  PRINT TXT$(41);LF$
324Ø  PRINT TXT$(42);LF$
325Ø  PRINT ES$;"2";FF$
3255  PR# Ø
3257  HOME
326Ø  END
4ØØØ  REM   DRAW A LINE FROM X1,Y1, TO X2,Y2
4Ø1Ø XL = X2 - X1:YL = Y2 - Y1
4Ø2Ø NX =  ABS (XL * XFAC):NY = ABS (YL * YFAC)
4Ø3Ø  IF NX < NY THEN NX = NY
4Ø4Ø NS% =  INT (NX + 1)
4Ø5Ø DX = XL / NS%:DY = YL / NS%
```

```
4Ø6Ø  FOR I = 1 TO NS%
4Ø7Ø X1 = X1 + DX:Y1 = Y1 + DY
4Ø8Ø  GOSUB 5ØØØ
4Ø9Ø  NEXT I
41ØØ  RETURN
5ØØØ  REM  PLOT A POINT AT X1,Y1
5Ø1Ø XX = X1 * XFAC:YY = Y1 * YFAC
5Ø2Ø COL =  INT (XX) + 1
5Ø3Ø ROW =  INT (YY / 6)
5Ø4Ø XIT% =  INT (YY - (6 * ROW)) + 1
5Ø42  POKE 25Ø,BIT%(COL,ROW)
5Ø44  POKE 251,MASK%(XIT%)
5Ø46  CALL 768
5Ø5Ø BIT%(COL,ROW) = PEEK (252)
5Ø6Ø  RETURN
6ØØØ  REM
6Ø1Ø MA% = (ANG + PA%) / 2
6Ø2Ø R1 = MA% * 6.28 / 36Ø
6Ø3Ø X3 =  INT (2Ø *  SIN (R1)):Y3 =
   INT (22 *  COS (R1))
6Ø4Ø X4 = 22 + X3:Y4 = 4Ø + Y3
6Ø5Ø  IF MA% > 27Ø OR MA% < 9Ø THEN  GOSUB 61ØØ:
   GOTO 6Ø7Ø
6Ø6Ø  GOSUB 62ØØ
6Ø7Ø PA% = ANG
6Ø8Ø  RETURN
61ØØ MM$ = TXT$(X4)
61Ø2 LL$ =  LEFT$ (MM$,Y4)
61Ø4 PP =  LEN (PTXT$(PI))
61Ø6 RR$ =  RIGHT$ (MM$,8Ø - (Y4 + PP))
61Ø8 TXT$(X4) = LL$ + PTXT$(PI) + RR$
611Ø  RETURN
62ØØ MM$ = TXT$(X4)
62Ø2 PP =  LEN (PTXT$(PI))
62Ø4 LL$ =  LEFT$ (MM$,(Y4 - PP))
62Ø6 RR$ =  RIGHT$ (MM$,(8Ø - Y4))
62Ø8 TXT$(X4) = LL$ + PTXT$(PI) + RR$
621Ø  RETURN
7ØØØ  REM
7ØØ5 I = 1
7Ø1Ø  HOME : PRINT : PRINT : PRINT
7Ø2Ø  INPUT "ENTER TITLE FOR CHART ";TI$
7Ø3Ø AS% = Ø:AL% = 1ØØ
7Ø4Ø  HOME
7Ø5Ø  PRINT "TOTAL SO FAR    : ";AS%
```

```
7060  PRINT "TOTAL REMAINING : ";AL%
7070  INPUT "ENTER % FOR FIELD ";PCT%(I)
7080  IF PCT%(I) > AL% OR PCT%(I) = 0 THEN
   PCT%(I) = AL%
7090 AL% = AL% - PCT%(I)
7100 AS% = AS% + PCT%(I)
7110  INPUT "ENTER DESCRIPTION OF FIELD : ";PTXT$(I)
7120  IF  LEN (PTXT$(I)) > 15 THEN  PRINT "FIELD TOO
   LONG - 15 CHAR. MAX": GOTO 7110
7130  IF AL% = 0 THEN  GOTO 7200
7140 I = I + 1
7150  GOTO 7040
7200 NP% = I
7210  IF NP% = 1 THEN 7040
7220  HOME
7230  RETURN
```

Appendix D

TRS-80 Computers

All that's required to connect Delta to your TRS-80 is a cable. It is available at your Delta dealer.

When connecting Delta to a TRS-80 we recommend that you set the DIP switches in Delta as shown below.

Recommended DIP Switch Settings for TRS-80

Switch	Setting	Function
1-1	ON	11 inch page size
1-2	ON	Normal print density
1-3	ON	10 CPI pitch
1-4	ON	Normal characters
1-5	ON	1/6 inch line feed
1-6	ON	U.S.A. Character set
1-7	ON	
1-8	ON	
2-1	ON	Paper-out detector active
2-2	OFF	Parallel interface
2-3	OFF	8-bit interface
2-4	ON	Auto line feed

TRS-80 Model I Parallel Cable

Delta		TRS-80 Model I	
Pin No.	**Function**	**Pin No.**	**Function**
1	STROBE	1	STROBE
2	D1	3	D1
3	D2	5	D2
4	D3	7	D3
5	D4	9	D4
6	D5	11	D5
7	D6	13	D6
8	D7	15	D7
9	D8	17	D8
11	BUSY	21	READY

TRS-80 Model II Parallel Cable

Delta		TRS-80 Model II	
Pin No.	**Function**	**Pin No.**	**Function**
1	STROBE	1	STROBE
2	D1	3	D1
3	D2	5	D2
4	D3	7	D3
5	D4	9	D4
6	D5	11	D5
7	D6	13	D6
8	D7	15	D7
9	D8	17	D8
10	ACK	19	ACK
11	BUSY	21	BUSY

TRS-80 BASIC

You may have to initialize your Model II to direct LPRINT statements to the printer. Use the SYSTEM "FORMS" command to do it.

TRS-80 uses another version of Microsoft Basic. Most of the programs in this book will work just as they are, but the TRS-80 does have a few unique "problem codes". They are 0, 10, 11, and 12. None of these are passed properly to the printer.

You can bypass the TRS-80's BASIC and send these codes directly to the printer with the following short routine. The variable N must be set equal to the code that you wish to pass (in our example it's 0).

```
9Ø N = Ø
1ØØ IF PEEK(14312)<>63 THEN 1ØØ
11Ø POKE 14312,N
```

Or you can use this special printer driver that will solve all your problems. Just run this program first, and then any codes sent by a BASIC program will be sent directly to the printer. This program is for the TRS-80 Model III.

```
5 REM  DRIVER FOR TRS-8Ø III
1Ø AD=16571
2Ø FOR I=Ø TO 14
3Ø READ A:POKE AD+I,A
```

```
4Ø NEXT I
5Ø POKE 16422,187
6Ø POKE 16423,64
7Ø DATA 33,232,55,2Ø3,126,32,252,33,17,
   Ø,57,126,211,251,2Ø1
8Ø END
```

And here is a version for the TRS-80 Model I.

```
5 REM  DRIVER FOR TRS-8Ø I
1Ø AD=16571
2Ø FOR I=Ø TO 15
3Ø READ A:POKE AD+I,A
4Ø NEXT I
5Ø POKE 16422,187
6Ø POKE 16423,64
7Ø DATA 33,232,55,2Ø3,126,32,252,33,17,
   Ø,57,126,5Ø,232,55,2Ø1
8Ø END
```

Chart program

```
1ØØ CLEAR 1ØØØ
11Ø GOSUB 1ØØØ
12Ø GOSUB 2ØØØ
13Ø LPRINT "*REGULAR*"
14Ø GOSUB 3ØØØ
15Ø LPRINT  "*DOUBLE STRIKE*"
16Ø LPRINT DS$;
17Ø GOSUB 3ØØØ
18Ø LPRINT "*EMPHASIZED*"
19Ø EM = TRUE
2ØØ GOSUB 3ØØØ
21Ø LPRINT "*DOUBLE STRIKE & EMPHASIZED*"
22Ø LPRINT DS$ EM$;
23Ø GOSUB 3ØØØ
24Ø END
1ØØØ REM
1Ø6Ø IT$ = CHR$(27) + CHR$(52)
1Ø7Ø RO$  = CHR$(27) + CHR$(53)
1Ø8Ø REM
1Ø9Ø EN$  = CHR$(27) + CHR$(87) + CHR$(1)
11ØØ NW$  = CHR$(27) + CHR$(87) + CHR$(Ø)
111Ø PI$      = CHR$(27) + CHR$(66) + CHR$(1)
```

```
112Ø EL$    = CHR$(27) + CHR$(66) + CHR$(2)
113Ø CO$ = CHR$(27) + CHR$(66) + CHR$(3)
114Ø REM
115Ø EM$    = CHR$(27) + CHR$(69)
116Ø NE$    = CHR$(27) + CHR$(7Ø)
117Ø DS$ = CHR$(27) + CHR$(71)
118Ø ND$ = CHR$(27) + CHR$(72)
119Ø UN$    = CHR$(27) + CHR$(45) + CHR$(1)
12ØØ NU$    = CHR$(27) + CHR$(45) + CHR$(Ø)
121Ø SP$   = CHR$(27) + CHR$(83) + CHR$(Ø)
122Ø SB$     = CHR$(27) + CHR$(83) + CHR$(1)
123Ø NS$      = CHR$(27) + CHR$(84)
124Ø RA$ = NE$+NU$+ND$
125Ø RA$ = RA$ + RO$ + PI$ +NW$
126Ø REM
127Ø TRUE = 1 : FALSE = Ø
129Ø RETURN
2ØØØ REM
2Ø5Ø LPRINT RA$
2Ø6Ø LPRINT EN$ "   NORMAL     ENLARGED  "
2Ø7Ø LPRINT RA$;
2Ø8Ø LPRINT UN$;
2Ø9Ø LPRINT CO$ "CONDENSED ";
21ØØ LPRINT EL$      "  ELITE   ";
211Ø LPRINT PI$       "  PICA    ";
212Ø LPRINT CO$ "CONDENSED ";
213Ø LPRINT EL$      "  ELITE   ";
214Ø LPRINT PI$       "  PICA    "
215Ø LPRINT RA$
216Ø RETURN
3ØØØ REM
3Ø5Ø IT    = FALSE       :LPRINT RO$;
3Ø6Ø UN = FALSE       :LPRINT NU$;
3Ø7Ø EN   = FALSE       :LPRINT NW$;
3Ø8Ø PI       = FALSE
3Ø9Ø REM
31ØØ LPRINT CO$;
311Ø GOSUB 35ØØ 'PRINT AS REQUIRED
312Ø LPRINT EL$;
313Ø GOSUB 35ØØ 'PRINT AS REQUIRED
314Ø LPRINT PI$; :PI = TRUE
315Ø GOSUB 35ØØ 'PRINT AS REQUIRED
316Ø REM
317Ø IF EN = TRUE THEN LPRINT :GOTO 319Ø
318Ø LPRINT EN$; :EN = TRUE :GOTO 3Ø8Ø
```

```
3190 IF UN = TRUE THEN LPRINT :GOTO 3210
3200 LPRINT UN$;  :UN = TRUE :GOTO 3070
3210 IF IT = TRUE THEN LPRINT RA$ :RETURN
3220 LPRINT IT$;  :IT = TRUE  :GOTO 3060
3500 REM
3550 BL$ = STRING$(6,32)   :FD$ = "...."
3560 IF EM = FALSE THEN LPRINT "ABcd";  :GOTO 3610
3570 IF PI = FALSE THEN LPRINT FD$;     :GOTO 3590
3580 LPRINT EM$ "ABcd" ;
3590 IF EN = TRUE THEN LPRINT " ";        :ELSE
   LPRINT BL$;
3600 RETURN
3610 REM
3620 IF EN = TRUE THEN LPRINT " ";         :RETURN
3630 LPRINT SP$; "Xx";
3640 LPRINT SB$;   "Yy  ";
3650 LPRINT NS$;
3660 RETURN
```

Special character chart program

```
10 FOR J = 160 TO 255 STEP 8
20 FOR I = J TO J+ 7
30 LPRINT I "=" CHR$(I) CHR$(9);
40 NEXT I : LPRINT : NEXT J
```

Macro program

```
10 LPRINT CHR$(27) "+";            ' START DEFINITION
   OF MACRO
20 LPRINT CHR$(18);                ' PICA
30 LPRINT CHR$(27) "W" CHR$(0);    ' EXPANDED OFF
40 LPRINT CHR$(27) "F";            ' EMPHASIZED OFF
50 LPRINT CHR$(27) "H";            ' DOUBLE-STRIKE OFF
60 LPRINT CHR$(27) "-" CHR$(0);    ' UNDERLINE OFF
70 LPRINT CHR$(27); "T";           ' SUPER & SUBSCRIPT
   OFF
80 LPRINT CHR$(27); "5";
90 LPRINT CHR$(30);          ' END MACRO DEFINITION
```

Bridge hand program

```
20 GOSUB 1000
30 GOSUB 2000
40 GOSUB 3000
50 GOSUB 4000
```

```
7Ø END
1ØØØ REM INITIALIZE VARIABLES
1Ø1Ø DIM HA(4), DE(52), CA$(13), SU$(3)
1Ø2Ø CA$(1)=" 2" : CA$(2)=" 3" : CA$(3)=" 4"
1Ø3Ø CA$(4)=" 5" : CA$(5)=" 6" : CA$(6)= " 7"
1Ø4Ø CA$(7)=" 8" : CA$(8)=" 9" : CA$(9)=" 1Ø"
1Ø5Ø CA$(1Ø)=" J" : CA$(11)=" Q" : CA$(12)=" K" :
   CA$(13)=" A"
1Ø6Ø SU$(Ø)="S" : SU$(1)="H" : SU$(2)="D" :
   SU$(3)="C"
1Ø7Ø RETURN
2ØØØ REM INITIALIZE PRINTER
2Ø1Ø LPRINT CHR$(27); CHR$(68); CHR$(2Ø); CHR$(4Ø);
   CHR$(Ø)
2Ø2Ø LPRINT CHR$(27) CHR$(43); CHR$(27) CHR$(36)
   CHR$(Ø); CHR$(27) CHR$(69) CHR$(3Ø)
2Ø3Ø LPRINT CHR$(27) CHR$(42) CHR$(Ø)
2Ø4Ø FOR I=1 TO 4
2Ø5Ø LPRINT CHR$(27); CHR$(42); CHR$(1);
2Ø6Ø FOR J=1 TO 13
2Ø7Ø READ X : LPRINT CHR$(X);
2Ø8Ø NEXT J
2Ø9Ø NEXT I
21ØØ LPRINT
211Ø RETURN
212Ø DATA 72,11,4,1Ø,2Ø,1Ø,52,72,52,1Ø,2Ø,1Ø,4
213Ø DATA 83,11,16,8,2Ø,8,86,41,86,8,2Ø,8,16
214Ø DATA 67,11,8,16,8,18,65,62,65,18,8,16,8
215Ø DATA 68,11,8,Ø,28,Ø,62,65,62,Ø,28,Ø,8
3ØØØ  REM DEAL CARD
3Ø1Ø FOR CA = 1 TO 52
3Ø2Ø X = INT(RND(Ø) * 4 + 1)
3Ø3Ø IF HA(X)=13 THEN 3Ø2Ø
3Ø35 HA(X)=HA(X) + 1
3Ø4Ø DE(CA)=X
3Ø5Ø NEXT CA
3Ø6Ø RETURN
4ØØØ REM PRINT FOUR HANDS
4Ø1Ø LPRINT CHR$(27); "!"; CHR$(9); "NORTH"
4Ø2Ø LPRINT CHR$(27); "$"; CHR$(1); CHR$(27);
   CHR$(7Ø);
4Ø3Ø HA = 1
4Ø4Ø FOR SU = Ø TO 3
4Ø5Ø LPRINT CHR$(9);
4Ø6Ø GOSUB 43ØØ
```

```
4Ø7Ø LPRINT
4Ø8Ø NEXT SU
4Ø9Ø LPRINT CHR$(27); "!"; "WEST"; CHR$(9); CHR$(9);
   "EAST"
41ØØ LPRINT CHR$(27); "$"; CHR$(1); CHR$(27);
   CHR$(7Ø);
411Ø FOR SU = Ø TO 3
412Ø HA = 2
413Ø GOSUB 43ØØ
414Ø LPRINT CHR$(9) CHR$(9);
415Ø HA = 3
416Ø GOSUB 43ØØ
417Ø LPRINT
418Ø NEXT SU
419Ø LPRINT CHR$(27); "!"; CHR$(9); "SOUTH"
42ØØ LPRINT CHR$(27); "$"; CHR$(1); CHR$(27);
   CHR$(7Ø);
421Ø HA = 4
422Ø FOR SU = Ø TO 3
423Ø LPRINT CHR$(9);
424Ø GOSUB 43ØØ
425Ø LPRINT
426Ø NEXT SU
427Ø LPRINT CHR$(27); "$"; CHR$(Ø); CHR$(27);
   CHR$(7Ø)
428Ø RETURN
429Ø REM PRINT ONE LINE
43ØØ LPRINT SU$(SU);
431Ø FOR CA = 13 TO 1 STEP -1
432Ø IF DE(SU*13+CA)=HA THEN LPRINT CA$(CA);
433Ø NEXT CA
434Ø RETURN
```

Numeral program

```
1Ø REM PROGRAM TO DEFINE AND PRINT NUMERAL
2Ø REM EACH NUMERAL IS MADE UP OF 4 CHARACTERS (2
   WIDE X 2 HIGH)
3Ø DD$ = CHR$(27)+CHR$(42)+CHR$(1)
4Ø DP$ = CHR$(27)+CHR$(88)+CHR$(1)
5Ø ND$ = CHR$(27)+CHR$(88)+CHR$(Ø)
6Ø L7$ = CHR$(27)+CHR$(49) : L12$ =
   CHR$(27)+CHR$(5Ø)
7Ø FOR N1 = 16Ø TO 2ØØ
8Ø LPRINT DD$;
```

```
9Ø LPRINT CHR$(N1);
1ØØ READ N2
11Ø LPRINT CHR$(N2);
12Ø FOR S = 1 TO 11
13Ø READ MS
14Ø LPRINT CHR$(MS);
15Ø NEXT S
16Ø NEXT N1
18Ø AS = 16Ø
19Ø FOR NUM = Ø TO 9
2ØØ NT$(NUM) = CHR$(AS + Ø) + CHR$(AS + 1)
21Ø NB$(NUM) = CHR$(AS + 2) + CHR$(AS + 3)
22Ø AS = AS + 4
23Ø NEXT NUM
24Ø BK$ = CHR$(2ØØ)
25Ø LPRINT DP$; L7$
26Ø FOR NUM = Ø TO 9
27Ø LPRINT NT$(NUM);BK$;
28Ø NEXT NUM
29Ø LPRINT
3ØØ FOR NUM = Ø TO 9
31Ø LPRINT NB$(NUM);BK$;
32Ø NEXT NUM
33Ø LPRINT ND$; L12$
34Ø REM ZERO
35Ø DATA 11,Ø,96,16,1Ø4,16,44,3Ø,14,Ø,2,1
36Ø DATA 11,2,1,2,1,6,8,38,88,32,88,32
37Ø DATA 11,3,14,19,14,51,Ø,96,Ø,96,Ø,96
38Ø DATA 11,Ø,32,Ø,48,Ø,28,3,14,3,4,3
39Ø REM ONE
4ØØ DATA 11,Ø,Ø,Ø,Ø,Ø,4,Ø,4,Ø,4,126
41Ø DATA 9,14,114,14,114,14,2,Ø,Ø,Ø,Ø,Ø
42Ø DATA 11,64,Ø,64,Ø,64,Ø,64,32,8Ø,47,8Ø
43Ø DATA 9,47,8Ø,47,64,Ø,64,Ø,64,Ø,Ø,Ø
44Ø REM TWO
45Ø DATA 11,Ø,Ø,Ø,Ø,Ø,14,16,14,Ø,6,Ø
46Ø DATA 11,3,Ø,3,Ø,7Ø,56,7Ø,56,4,24,Ø
47Ø DATA 11,64,Ø,64,32,64,32,8Ø,32,8Ø,4Ø,64
48Ø DATA 11,44,64,38,65,34,65,32,8Ø,32,88,Ø
49Ø REM THREE
5ØØ DATA 11,Ø,Ø,Ø,Ø,Ø,Ø,4,2,4,2,4
51Ø DATA 11,34,84,34,92,34,76,34,68,2,64,Ø
52Ø DATA 11,16,Ø,48,Ø,56,64,48,64,32,64,32
53Ø DATA 11,64,32,64,48,9,54,9,22,9,6,1
54Ø REM FOUR
```

```
550 DATA 11,Ø,Ø,Ø,Ø,Ø,Ø,64,36,88,32,16
56Ø DATA 11,Ø,Ø,64,32,64,56,64,6Ø,2,14,Ø
57Ø DATA 11,Ø,8,4,1Ø,5,1Ø,5,8,4,72,4
58Ø DATA 11,88,38,89,38,89,6,73,4,8,6,Ø
59Ø REM FIVE
6ØØ DATA 11,Ø,Ø,Ø,Ø,64,32,84,5Ø,76,34,68
61Ø DATA 1Ø,34,68,34,68,34,68,2,68,2,Ø,Ø
62Ø DATA 1Ø,Ø,32,24,1Ø1,24,97,Ø,64,Ø,64,Ø
63Ø DATA 11,64,Ø,96,1,48,15,48,15,16,15,Ø
64Ø REM SIX
65Ø DATA 11,Ø,96,Ø,112,Ø,12Ø,Ø,92,Ø,1Ø2,Ø
66Ø DATA 11,98,Ø,98,Ø,98,Ø,7Ø,Ø,14,Ø,6
67Ø DATA 11,7,8,23,8,55,8,99,Ø,65,Ø,64
68Ø DATA 11,Ø,96,Ø,112,1,62,1,3Ø,1,14,Ø
69Ø REM SEVEN
7ØØ DATA 11,Ø,16,8,6,8,6,8,6,8,6,8
71Ø DATA 9,7Ø,8,1Ø2,8,54,8,6,Ø,2,Ø,Ø
72Ø DATA 11,Ø,64,Ø,96,Ø,12Ø,Ø,124,Ø,3Ø,1
73Ø DATA 9,6,1,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
74Ø REM EIGHT
75Ø DATA 11,Ø,Ø,Ø,Ø,24,36,24,1Ø2,24,1Ø2,Ø
76Ø DATA 11,67,Ø,67,Ø,99,28,34,28,34,28,Ø
77Ø DATA 11,14,18,44,19,1Ø8,19,96,1,64,Ø,64
78Ø DATA 11,Ø,96,1,112,15,48,15,16,14,Ø,Ø
79Ø REM NINE
8ØØ DATA 11,Ø,Ø,12Ø,4,12Ø,6,12Ø,6,Ø,3,Ø
81Ø DATA 11,3,Ø,3,Ø,67,4,123,4,122,4,12Ø
82Ø DATA 11,48,Ø,56,Ø,113,Ø,99,Ø,99,Ø,99
83Ø DATA 11,Ø,115,Ø,57,Ø,31,Ø,15,Ø,7,Ø
84Ø REM SPACE
85Ø DATA 11,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
```

Download utility program

```
4 CLEAR 1ØØØ
5 ME$="E)DIT  P)RINT  Q)UIT
                                  "

6 BL$=STRING$(63," ")
1Ø DIM Z(8,12),MM(11)
2Ø CLS:GOSUB 66Ø
3Ø CS$="@":SC$=CHR$(143):SS$="*"
4Ø A$=INKEY$:IF A$="" THEN 4Ø
5Ø IF A$="Q" THEN CLS:END
6Ø IF A$="P" THEN GOSUB 68Ø:GOTO 4Ø
7Ø IF A$="E" THEN CLS:GOSUB 9Ø:GOSUB 26Ø:GOTO 4Ø
8Ø GOTO 4Ø
```

```
9Ø X=1:Y=1:G=1:H=1:
1ØØ FOR I=1 TO 11:MM(I)=Ø:NEXT I
1Ø5 CLS
12Ø FOR I=Ø TO 7 : PRINT "    ";
125 FOR J=1 TO 11:PRINT "!---";:NEXT J:PRINT "!":IF
   I<7 THEN PRINT:
126 NEXT I
13Ø FOR I=Ø TO 6:PRINT @64*I+64*I+64,2^I;:NEXT I
14Ø PRINT @7Ø,CS$;
15Ø PRINT @18Ø,"<R> RIGHT";
16Ø PRINT @244,"<L> LEFT";
17Ø PRINT @3Ø8,"<U> UP";
18Ø PRINT @372,"<D> DOWN";
19Ø PRINT @436,"<I> INSERT";
2ØØ PRINT @5ØØ,"<C> CLEAR";
21Ø PRINT @564,"<Q> QUIT";
22Ø RETURN
26Ø REM  EDIT LEVEL
27Ø A$=INKEY$:IF A$="" THEN 27Ø
28Ø IF A$="L" THEN GOSUB 39Ø:GOTO 37Ø
29Ø IF A$="R" THEN GOSUB 41Ø:GOTO 37Ø
3ØØ IF A$="D" THEN GOSUB 43Ø:GOTO 37Ø
31Ø IF A$="U" THEN GOSUB 45Ø:GOTO 37Ø
32Ø IF A$="I" THEN GOSUB 47Ø:GOTO 37Ø
33Ø IF A$="C" THEN GOSUB 49Ø:GOTO 37Ø
34Ø IF A$="Q" THEN GOSUB 5ØØ:GOTO 38Ø
37Ø GOTO 27Ø
38Ø RETURN
39Ø GOSUB 92Ø:Y=Y-4:H=H-1:IF Y<1 THEN Y=1:H=1
4ØØ GOSUB 95Ø:RETURN
41Ø GOSUB 92Ø:Y=Y+4:H=H+1:IF Y>41 THEN Y=41:H=11
42Ø GOSUB 95Ø:RETURN
43Ø GOSUB 92Ø:X=X+2:G=G+1:IF X>13 THEN X=13:G=7
44Ø GOSUB 95Ø:RETURN
45Ø GOSUB 92Ø:X=X-2:G=G-1:IF X<1 THEN X=1:G=1
46Ø GOSUB 95Ø:RETURN
47Ø IF Z(G,H-1)=1 OR Z(G,H+1)=1 THEN RETURN
48Ø Z(G,H)=1:PRINT @X*64+Y+5,SS$;:RETURN
49Ø Z(G,H)=Ø:PRINT @X*64+Y+5,CS$;:RETURN
5ØØ REM GET OF EDIT MODE
51Ø IF Z(G,H)=1 THEN PRINT @X*64+Y+5,SC$;
52Ø IF Z(G,H)=Ø THEN PRINT @X*64+Y+Y," ";
524 PRINT @X*64+Y+5, " ";
53Ø FOR I=1 TO 11:FOR J=1 TO 7:
   MM(I)=MM(I)+Z(J,I)*2[(J-1):NEXT J:NEXT I
```

```
54Ø CLS
542 FOR I=1 TO 11:PRINT "M";I;TAB(5);"= ";MM(I):
   NEXT I
55Ø GOSUB 66Ø:RETURN
66Ø FOR I=1 TO 7:FOR J=1 TO 11:Z(I,J)=Ø:NEXT J:
   NEXT I
67Ø PRINT @96Ø,ME$;:RETURN
68Ø REM  PRINT MODE
69Ø PRINT @832,"";:INPUT "NORMAL OR PROPORTIONAL -->
   ";AN$
7ØØ IF AN$="N" THEN PR=Ø:GOTO 75Ø
71Ø IF AN$="P" THEN GOTO 73Ø
72Ø GOSUB 1ØØØ:GOTO 69Ø
73Ø GOSUB 1ØØØ:PRINT @832,"";:INPUT "PROPORTIONAL
   DATA (4-11) --> ";PR
74Ø IF PR<4 OR PR>11 THEN 73Ø
75Ø GOSUB 1ØØØ:PRINT @832,"";:INPUT "IF SHIFTED
   ENTER 1 ELSE ENTER Ø --> ";SH
76Ø IF SH<Ø OR SH>1 THEN 75Ø
77Ø GOSUB 1ØØØ:PRINT @832,"";:INPUT "ASCII  (33-126)
   (16Ø-254) ";AS
78Ø IF (AS<33 OR AS>126) AND (AS<16Ø OR AS>254) THEN
   77Ø
79Ø GOSUB 1ØØØ
8ØØ IF SH=1 THEN SH=16 ELSE SH=Ø
81Ø N1=AS:N2=PR+SH
82Ø FOR I=1 TO 11:MM$=MM$+CHR$(MM(I)):NEXT I
83Ø LPRINT CHR$(27);"*";CHR$(1);CHR$(N1);CHR$(N2);
   MM$
84Ø IF AN$="N" THEN LPRINT CHR$(27);"$";CHR$(1):GOTO
   86Ø
85Ø LPRINT CHR$(27);"X";CHR$(1)
86Ø FOR I=1 TO 2Ø:LPRINT CHR$(N1);" ";:NEXT I:LPRINT
87Ø LPRINT CHR$(14);:FOR I=1 TO 1Ø:LPRINT
   CHR$(N1);:NEXT I:LPRINT
88Ø LPRINT CHR$(15);:FOR I=1 TO 2Ø:LPRINT
   CHR$(N1);:NEXT I:LPRINT
89Ø IF AN$="N" THEN LPRINT CHR$(27);"$";CHR$(Ø):GOTO
   896
894 LPRINT CHR$(27);"X";CHR$(Ø)
896 LPRINT CHR$(27);"@":MM$="":GOSUB 66Ø:RETURN
92Ø IF Z(G,H)=Ø THEN PRINT @X*64+Y+5," ";
93Ø IF Z(G,H)=1 THEN PRINT @X*64+Y+5,SC$;
94Ø RETURN
95Ø IF Z(G,H)=1 THEN PRINT @X*64+Y+5,SS$;
```

```
960 IF Z(G,H)=0 THEN PRINT @X*64+Y+5,CS$;
970 RETURN
1000 PRINT @832,BL$;:RETURN
```

Delta Plot program

```
5 CLEAR 1000
10 CLS:PRINT "":PRINT "":PRINT ""
20 PRINT "THIS PROGRAM TAKES ABOUT 1 MINUTE  TO RUN"
30 PRINT "PLEASE TURN ON YOUR PRINTER AND STAND  BY"
100 DIM BIT%(76,14)
110 MASK%(1)=128     : MASK%(4)=16
120 MASK%(2)=64      : MASK%(5)=8
130 MASK%(3)=32      : MASK%(6)=4
140 LX=20   : LY=20
150 XFAC=72/LX       : YFAC=87/LY
1000 REM PLOT CURVE
1010 RAD=9
1020 X1=19   : Y1=10
1030 FOR ANG=0 TO 360 STEP 10
1040 R1=ANG*6.28/360
1050 X2=RAD*COS(R1)+10  : Y2=RAD*SIN(R1)+10
1060 GOSUB 3000
1070 NEXT ANG
2000 REM
2010 LPRINT CHR$(27) "A" CHR$(6)
2020 FOR ROW=0 TO 14
2030 A$=""
2040 LPRINT CHR$(27);"K";CHR$(75);CHR$(0);
2050 FOR COL=1 TO 75
2060 MM=(BIT%(COL,ROW)
2065 IF MM=12 THEN MM=140
2070 A$=A$ + CHR$(MM)
2090 NEXT COL
2100 LPRINT A$
2110 NEXT ROW
2120 LPRINT CHR$(27) "2"
2130 END
3000 REM DRAW A LINE FROM X1,Y1 TO X2,Y2
3010 XL=X2 - X1       : YL=Y2 - Y1
3020 NX=ABS(XL*XFAC) : NY=ABS(YL*YFAC)
3030 IF NX < NY THEN NX=NY
3040 NS%=INT(NX+1)
3050 DX=XL/NS%        : DY=YL/NS%
3060 FOR I=1 TO NS%
3070 X1=X1 + DX       : Y1=Y1 + DY
```

```
3Ø8Ø GOSUB 4ØØØ
3Ø9Ø NEXT I
31ØØ RETURN
4ØØØ REM PLOT A POINT AT X1,Y1
4Ø1Ø XX=X1 * XFAC    : YY=Y1 * YFAC
4Ø2Ø COL=INT(XX) + 1
4Ø3Ø ROW=INT(YY/6)
4Ø4Ø XIT%=INT(YY-(6*ROW))+1
4Ø5Ø BIT%(COL,ROW)=BIT%(COL,ROW) OR MASK%(XIT%)
4Ø6Ø RETURN
```

Pie chart program

```
4Ø CLS
45 PRINT "            PLEASE STAND BY"
5Ø CLEAR 1ØØØØ
1ØØ ' PIECHART
11Ø ESC$ = CHR$(27)      : LF$ =CHR$(1Ø)
12Ø FF$ = CHR$(12)       : VT$ = CHR$(11)
13Ø EM$ = ESC$ + "E"     : NE$ = ESC$ + "F"
1ØØØ ' Set program constants
1Ø2Ø DIM BIT%(19Ø,36),A$(36),PCT%(25),
   TXT$(42),PXT$(25)
1Ø3Ø MASK%(1) = 128      : MASK%(4) = 16
1Ø4Ø MASK%(2) = 64       : MASK%(5) = 8
1Ø5Ø MASK%(3) = 32       : MASK%(6) = 4
1Ø6Ø LX = 2Ø   : LY = 2Ø
1Ø7Ø XFAC = 19Ø/LX      : YFAC = 216/LY
1Ø8Ø FOR I= 1 TO 42
1Ø85 REM THERE ARE 8Ø SPACES IN TXT$(I)
1Ø9Ø TXT$(I) = "  (80 spaces)  " :
11ØØ NEXT I
111Ø GOSUB 7ØØØ
112Ø CLS:PRINT " THIS PROGRAM TAKES ABOUT 5 MINUTES
   TO RUN"
113Ø PRINT "SO TURN ON YOUR PRINTER AND STAND
   BY....."
2ØØØ ' Plot curve
2Ø1Ø RD = 9
2Ø2Ø X1 = 19   : Y1 = 1Ø
2Ø4Ø FOR ANG% = Ø TO 36Ø STEP 5
2Ø5Ø RANG = ANG%*6.28/36Ø
2Ø6Ø X2 = RD*COS(RANG)+1Ø  : Y2 = RD*SIN(RANG)+1Ø
2Ø7Ø GOSUB 4ØØØ
2Ø8Ø NEXT ANG%
2Ø9Ø FOR PIE = 1 TO NP%
```

```
2100 X1 = 10   : Y1 = 10
2110 TP%=TP%+PCT%(PIE)
2120 ANG%=360*TP%*.01
2130 RANG = ANG%*6.28/360
2140 X2 = RD*COS(RANG)+10  : Y2 = RD*SIN(RANG)+10
2150 GOSUB 4000
2160 GOSUB 6000
2170 NEXT PIE
3000 ' SEND BIT IMAGE MAP TO PRINTER
3020 FOR ROW% = 0 TO 35
3030 A$(ROW%) = ""
3040 FOR COL% = 1 TO 190
3045 MM=BIT%(COL%,ROW%)
3047 IF MM=12 THEN MM=140
3050 A$(ROW%) = A$(ROW%) + CHR$(MM)
3060 NEXT COL%
3080 NEXT ROW%
3090 LL=LEN (TT$):NN=40-LL/2:FOR I=1 TO NN:LPRINT
   " ";:NEXT I
3091 LPRINT EM$;TI$;NE$;LF$
3100 LPRINT  VT$;VT$;VT$
3110 LPRINT  ESC$;"A";CHR$(3)
3120 LPRINT TXT$(1);LF$;TXT$(2);LF$;TXT$(3);LF$
3130 FOR ROW% = 0 TO 35
3140 LPRINT  "          ";
   ESC$;"K";CHR$(190);CHR$(0);
3150 LPRINT A$(ROW%)
3160 LPRINT  TXT$(ROW%+4)
3180 NEXT ROW%
3190 LPRINT  TXT$(40);LF$
3200 LPRINT  TXT$(41);LF$
3210 LPRINT  TEXT$(42);LF$
3220 LPRINT  ESC$;"2";FF$
3230 END
4000 ' DRAW A LINE FROM X1,Y1 TO X2,Y2
4010 XL = X2 - X1       : YL = Y2 - Y1
4020 NX = ABS(XL*XFAC) : NY = ABS(YL*YFAC)
4030 IF NX < NY THEN NX = NY
4040 NS% = INT(NX+1)
4050 DX = XL/NS%        : DY = YL/NS%
4060 FOR I% = 1 TO NS%
4070 X1 = X1 + DX       : Y1 = Y1 + DY
4080 GOSUB 5000
4090 NEXT I%
4110 RETURN
```

```
5ØØØ ' PLOT A POINT AT X1,Y1
5Ø1Ø XX = X1 * XFAC    : YY = Y1 * YFAC
5Ø2Ø COL% = INT(XX) + 1
5Ø3Ø ROW% = INT(YY/6)
5Ø4Ø XIT% = INT(YY - ROW% * 6)+1
5Ø5Ø BIT%(COL%,ROW%) = BIT%(COL%,ROW%) OR
   MASK%(XIT%)
5Ø6Ø RETURN
6ØØØ ' Place text fields in the proper location
6Ø1Ø MA%=(ANG%+PA%)/2
6Ø2Ø RANG = MA%*6.28/36Ø
6Ø3Ø X3 = INT(2Ø*SIN(RANG))  :
   Y3 = INT(22*COS(RANG))
6Ø4Ø X4 = 22 + X3       : Y4 = 4Ø + Y3
6Ø5Ø IF MA%>27Ø OR MA%<9Ø THEN MID$(TXT$(X4),Y4) =
   PXT$(PIE) ELSE MID$(TXT$(X4),Y4-
   LEN(PXT$(PIE)))=PXT$(PIE)
6Ø6Ø PA%=ANG%
6Ø7Ø RETURN
7ØØØ ' ACCEPT DATA FROM SCREEN
7Ø1Ø CLS: PRINT : PRINT : PRINT
7Ø2Ø INPUT "ENTER TITLE FOR CHART: ";TT$
7Ø3Ø AS%=Ø       : AL%=1ØØ
7Ø4Ø I=1
7Ø5Ø CLS: PRINT "      ENTER PARAMETERS FOR
   PIE-CHART"
7Ø6Ø PRINT "  TOTAL SO FAR :   ";
7Ø7Ø PRINT USING "###";AS%
7Ø8Ø PRINT "  TOTAL REMAINING: ";
7Ø9Ø PRINT USING "###";AL%
71ØØ PRINT :PRINT :PRINT :PRINT
711Ø INPUT "ENTER PERCENTAGE FOR FIELD:   ";PCT%(I)
712Ø IF PCT%(I)>AL% OR PCT%(I)=Ø THEN PCT%(I)=AL%
713Ø AL%=AL%-PCT%(I)
714Ø AS%=AS%+PCT%(I)
715Ø PRINT :PRINT
716Ø INPUT "ENTER DESCRIPTION OF FIELD:   ";PXT$(I)
717Ø IF LEN(PXT$(I))>15 THEN PRINT "FIELD TOO LONG -
   15 CHAR. MAX": GOTO 716Ø
718Ø IF AL%=Ø GOTO 72ØØ
7185 I=I+1
719Ø GOTO 7Ø5Ø
72ØØ NP%=I
721Ø IF NP%=1 THEN 7Ø3Ø
```

```
7220 CLS
7230 RETURN
```

Appendix E

Osborne, Kaypro and Other CP/M Computers

All that you need to connect Delta to an Osborne 1 or Kaypro computer is a cable. Your Delta dealer can provide the cable that you need.

Setting the switches

When connecting Delta to an Osborne 1, Kaypro, or other CP/M computer, we recommend that you set the DIP switches in Delta as shown below. (Although our chart indicates switch 2-2 set for a parallel interface, a serial interface will work also.)

Recommended DIP Switch Settings for Osborne 1

Switch	Setting	Function
1-1	ON	11 inch page size
1-2	ON	Normal print density
1-3	ON	10 CPI pitch
1-4	ON	Normal characters
1-5	ON	1/6 inch line feed
1-6	ON	U.S.A. Character set
1-7	ON	
1-8	ON	
2-1	ON	Paper-out detector active
2-2	OFF	Parallel interface
2-3	OFF	8-bit interface
2-4	OFF	No auto line feed

When you connect your printer to your Osborne 1 you must use the SETUP program to tell the computer whether Delta is connected to the Osborne 1's serial or parallel interface (either will work).

Osborne 1 Parallel Cable

Delta		Osborne 1	
Pin No.	**Function**	**Pin No.**	**Function**
2	DATA1	1	DATA0
6	DATA5	2	DATA4
3	DATA2	3	DATA1
7	DATA6	4	DATA5
4	DATA3	5	DATA2
8	DATA7	6	DATA6
5	DATA4	7	DATA3
9	DATA8	8	DATA7
1	STROBE	11	STROBE
11	BUSY	15	BUSY
16	SIG GND	16	SIG GND

Kaypro Parallel Cable

Delta		Kaypro	
Pin No.	**Function**	**Pin No.**	**Function**
1	STROBE	1	STROBE
2	DATA1	2	DATA1
3	DATA2	3	DATA2
4	DATA3	4	DATA2
5	DATA4	5	DATA2
6	DATA5	6	DATA2
7	DATA6	7	DATA2
8	DATA7	8	DATA2
9	DATA8	9	DATA8
11	BUSY	11	BUSY
16	SIG GND	16	SIG GND

Using MBASIC

Many CP/M computers use Microsoft BASIC (called MBASIC). If you have a CP/M-80 computer that uses Microsoft BASIC the program listings given here should work with your computer also.

MBASIC is a very close relative of the IBM-Microsoft BASIC used in this book. The only difference is that MBASIC "interprets" CHR$(9) and substitutes a group of spaces to simulate a tab. You can send a horizontal tab to Delta by using CHR$(137) instead of CHR$(9).

Microsoft BASIC uses the "L" prefix on several commands to direct them to the printer. To list programs on the printer, just type LLIST. To direct program output to the printer, use LPRINT in place of PRINT.

Some versions of Microsoft BASIC will add a carriage return and line feed at the end of every 80 (or sometimes 132) characters. To print lines longer than 80 (or 132) characters (as when doing dot graphics) you must define a wider printer width. The following statement will prevent the computer from inserting unwanted codes.

```
10 WIDTH LPRINT 255
```

Program listings

The following programs are in Microsoft BASIC for the Osborne 1.

Chart program

```
100 WIDTH LPRINT 255
110 GOSUB 1000
120 GOSUB 2000
130 LPRINT "*REGULAR*"
140 GOSUB 3000
150 LPRINT "*DOUBLE STRIKE*"
160 LPRINT DOUBLE.STRIKE$;
170 GOSUB 3000
180 LPRINT "*EMPHASIZED*"
190 EMPHASIZED=TRUE
200 GOSUB 3000
210 LPRINT "*DOUBLE STRIKE AND EMPHASIZED*"
220 LPRINT DOUBLE.STRIKE$ EMPHASIZED$;
230 GOSUB 3000
240 END
1000 REM
1060 ITALIC$=CHR$(27) + CHR$(52)
1070 ROMAN$=CHR$(27) + CHR$(53)
1090 ENLARGED$=CHR$(27) +CHR$(87)+CHR$(1)
1100 NOT.ENLARGED$=CHR$(27)+CHR$(87)+CHR$(0)
1110 PICA$=CHR$(27)+CHR$(66)+CHR$(1)
1120 ELITE$=CHR$(27)+CHR$(66)+CHR$(2)
1130 CONDENSED$=CHR$(27)+CHR$(66)+CHR$(3)
1150 EMPHASIZED$=CHR$(27)+CHR$(69)
1160 NOT.EMPHASIZED$=CHR$(27)+CHR$(70)
1170 DOUBLE.STRIKE$=CHR$(27)+CHR$(71)
```

```
1180 NOT.DOUBLE.STRIKE$=CHR$(27)+CHR$(72)
1190 UNDERLINED$=CHR$(27)+CHR$(45)+CHR$(1)
1200 NOT.UNDERLINED$=CHR$(27)+CHR$(45)+CHR$(0)
1210 SUPERSCRIPT$=CHR$(27)+CHR$(83)+CHR$(0)
1220 SUBSCRIPT$=CHR$(27)+CHR$(83)+CHR$(1)
1230 NOT.SCRIPTED$=CHR$(27)+CHR$(84)
1240 RESET.ALL$=NOT.EMPHASIZED$+NOT.UNDERLINED$+
   NOT.DOUBLE.STRIKE$
1250 RESET.ALL$=RESET.ALL$+ROMAN$+PICA$+
   NOT.ENLARGED$
1270 TRUE=1: FALSE=0
1280 REGULAR.HEADING$=STRING$(27,"*")+"REGULAR"+
   STRING$(27,"*")
1290 RETURN
2000 REM
2050 LPRINT RESET.ALL$
2060 LPRINT ENLARGED$"   NORMAL     ENLARGED"
2070 LPRINT RESET.ALL$;
2080 LPRINT UNDERLINED$;
2090 LPRINT CONDENSED$ "CONDENSED ";
2100 LPRINT ELITE$     "  ELITE   ";
2110 LPRINT PICA$      "  PICA    ";
2120 LPRINT CONDENSED$ "CONDENSED ";
2130 LPRINT ELITE$     "  ELITE   ";
2140 LPRINT PICA$"  PICA    ";
2150 LPRINT RESET.ALL$
2160 RETURN
3000 REM
3050 ITALICS=FALSE:LPRINT ROMAN$;
3060 UNDERLINED=FALSE:LPRINT NOT.UNDERLINED$;
3070 ENLARGED=FALSE:LPRINT NOT.ENLARGED$;
3080 PICA=FALSE
3100 LPRINT CONDENSED$;
3110 GOSUB 3500
3120 LPRINT ELITE$;
3130 GOSUB 3500
3140 LPRINT PICA$;:PICA=TRUE
3150 GOSUB 3500
3170 IF ENLARGED=TRUE THEN LPRINT:GOTO 3190
3180 LPRINT ENLARGED$;:ENLARGED=TRUE:GOTO 3080
3190 IF UNDERLINED=TRUE THEN LPRINT:GOTO 3210
3200 LPRINT UNDERLINED$;:UNDERLINED=TRUE:GOTO 3070
3210 IF ITALICS=TRUE THEN LPRINT RESET.ALL$:RETURN
3220 LPRINT ITALIC$;:ITALICS=TRUE:GOTO 3060
3500 REM
```

```
3550 BLANK$=STRING$(6,32):FOUR.DOT$="...."
3560 IF EMPHASIZED=FALSE THEN LPRINT"ABcd";:GOTO
   3610
3570 IF PICA=FALSE THEN LPRINT FOUR.DOT$;:GOTO 3590
3580 LPRINT EMPHASIZED$ "ABcd ";
3590 IF ENLARGED=TRUE THEN LPRINT " ";:ELSE LPRINT
   BLANK$;
3600 RETURN
3610 REM
3620 IF ENLARGED=TRUE THEN LPRINT " ";:RETURN
3630 LPRINT SUPERSCRIPT$; "Xx";
3640 LPRINT SUBSCRIPT$;   "Yy  ";
3650 LPRINT NOT.SCRIPTED$;
3660 RETURN
```

Special character chart program

```
10 FOR J=160 TO 255 STEP 8
20 FOR I=J TO J+7
30 LPRINT I "= "CHR$(I);"  ";
40 NEXT:LPRINT:NEXT
```

Macro program

```
10 LPRINT CHR$(27)"+";
20 LPRINT CHR$(18);
30 LPRINT CHR$(27)"W"CHR$(0);
40 LPRINT CHR$(27)"F";
50 LPRINT CHR$(27)"H";
60 LPRINT CHR$(27) "-" CHR$(0);
70 LPRINT CHR$(27) "T";
80 LPRINT CHR$(27) "5";
90 LPRINT CHR$(30);
```

Bridge hand program

```
10 WIDTH LPRINT 255
20 GOSUB 1000
30 GOSUB 2000
40 GOSUB 3000
50 GOSUB 4000
60 END
1000 REM
1020 DIM HAND(4),DECK(52),CARD$(13),SUIT$(3)
1030 CARD$(1)=" 2":CARD$(2)=" 3":CARD$(3)="
   4":CARD$(4)=" 5":CARD$(5)=" 6"
```

```
1Ø4Ø CARD$(6)=" 7":CARD$(7)=" 8":CARD$(8)="
   9":CARD$(9)=" 1Ø"
1Ø5Ø CARD$(1Ø)=" J":CARD$(11)=" Q":CARD$(12)="
   K":CARD$(13)=" A"
1Ø6Ø SUIT$(Ø)="S":SUIT$(1)="H":SUIT$(2)="D":
   SUIT$(3)="C"
1Ø7Ø INPUT "Random number seed ";I
1Ø8ØRANDOMIZE I
1Ø9Ø RETURN
2ØØØ REM
2Ø1Ø LPRINT CHR$(27)CHR$(68)CHR$(2Ø)CHR$(4Ø)CHR$(Ø)
2Ø2Ø LPRINT CHR$(27)CHR$(43)CHR$(27)CHR$(36)CHR$(Ø)
   CHR$(27)CHR$(69)CHR$(3Ø)
2Ø3Ø LPRINT CHR$(27)CHR$(42)CHR$(Ø)
2Ø4Ø FOR I=1 TO 4
2Ø5Ø LPRINT CHR$(27)CHR$(42)CHR$(1);
2Ø6Ø FOR J=1 TO 13
2Ø7Ø READ X:LPRINT CHR$(X);
2Ø8Ø NEXT J
2Ø9Ø NEXT I
21ØØ LPRINT
211Ø RETURN
212Ø DATA 72,11,4,1Ø,2Ø,1Ø,52,72,52,1Ø,2Ø,1Ø,4
213Ø DATA 83,11,16,8,2Ø,8,86,41,86,8,2Ø,8,16
214Ø DATA 67,11,8,16,8,18,65,62,65,18,8,16,8
215Ø DATA 68,11,8,Ø,28,Ø,62,65,62,Ø,28,Ø,8
3ØØØ REM
3Ø1Ø FOR CARD=1 TO 52
3Ø2Ø X=INT(RND*4+1)
3Ø3Ø IF HAND(X)=13 THEN 3Ø2Ø ELSE HAND(X)=HAND(X)+1
3Ø4Ø DECK(CARD)=X
3Ø5Ø NEXT CARD
3Ø6Ø RETURN
4ØØØ REM
4Ø1Ø LPRINT CHR$(27) "!" SPC(2Ø) "NORTH"
4Ø2Ø LPRINT CHR$(27) "$" CHR$(1) CHR$(27)CHR$(7Ø);
4Ø3Ø HAND=1
4Ø4Ø FOR SUIT=Ø to 3
4Ø5Ø LPRINT SPC(2Ø);
4Ø6Ø GOSUB 43ØØ
4Ø7Ø LPRINT
4Ø8Ø NEXT SUIT
4Ø9Ø LPRINT CHR$(27) "!" "WEST" SPC(4Ø) "EAST"
41ØØ LPRINT CHR$(27) "$" CHR$(1) CHR$(27)CHR$(7Ø);
411Ø FOR SUIT=Ø TO 3
```

```
412Ø HAND=2
413Ø GOSUB 43ØØ
414Ø LPRINT TAB(45);
415Ø HAND =3
416Ø GOSUB 43ØØ
417Ø LPRINT
418Ø NEXT SUIT
419Ø LPRINT CHR$(27) "!" SPC(2Ø) "SOUTH"
42ØØ LPRINT CHR$(27) "$" CHR$(1)CHR$(27)CHR$(7Ø);
421Ø HAND=4
4220 FOR SUIT=Ø TO 3
4230 LPRINT SPC(2Ø);
424Ø GOSUB 43ØØ
425Ø LPRINT
426Ø NEXT SUIT
4270 LPRINT CHR$(27) "$" CHR$(Ø)CHR$(27)CHR$(7Ø)
428Ø RETURN
43ØØ LPRINT SUIT$(SUIT);
431Ø FOR CARD=13 TO 1 STEP -1
432Ø IF DECK(SUIT*13+CARD)=HAND THEN LPRINT
   CARD$(CARD);
433Ø NEXT CARD
434Ø RETURN
```

Numeral program

```
3Ø DEF.DOWN.CHAR$=CHR$(27)+CHR$(42)+CHR$(1)
4Ø DOWN.CHAR.PROP$=CHR$(27)+CHR$(88)+CHR$(1)
5Ø NOT.DOWN.CHAR.PROP$=CHR$(27)+CHR$(88)+CHR$(Ø)
6Ø LINE.7$=CHR$(27)+CHR$(49):LINE.12$=CHR$(27)+
   CHR$(5Ø)
7Ø FOR N1=16Ø TO 2ØØ
8Ø LPRINT DEF.DOWN.CHAR$;
9Ø LPRINT CHR$(N1);
1ØØ READ N2
11Ø LPRINT CHR$(N2);
12Ø FOR S=1 TO 11
13Ø READ MS
14Ø LPRINT CHR$(MS);
15Ø NEXT S
16Ø NEXT N1
18Ø ASCII=16Ø
19Ø FOR NUM=Ø to 9
2ØØ NUMERAL.TOP$(NUM)=CHR$(ASCII+Ø)+CHR$(ASCII+1)
21Ø NUMERAL.BOT$(NUM)=CHR$(ASCII+2)+CHR$(ASCII+3)
22Ø ASCII=ASCII+4
```

```
23Ø NEXT NUM
24Ø BLANK$=CHR$(2ØØ)
25Ø LPRINT DOWN.CHAR.PROP$;LINE.7$
26Ø FOR NUM=Ø TO 9
27Ø LPRINT NUMERAL.TOP$(NUM);BLANK$;
28Ø NEXT NUM
29Ø LPRINT
3ØØ FOR NUM=Ø TO 9
31Ø LPRINT NUMERAL.BOT$(NUM);BLANK$;
32Ø NEXT NUM
33Ø LPRINT NOT.DOWN.CHAR.PROP$;LINE.12$
34Ø REM ZERO
35Ø DATA 11,Ø,96,16,1Ø4,16,44,3Ø,14,Ø,2,1
36Ø DATA 11,2,1,2,1,6,8,38,88,32,88,32
37Ø DATA 11,3,12,19,12,51,Ø,96,Ø,96,Ø,96
38Ø DATA 11,Ø,32,Ø,48,Ø,28,3,12,3,4,3
39Ø REM ONE
4ØØ DATA 11,Ø,Ø,Ø,Ø,Ø,4,Ø,4,Ø,4,126
41Ø DATA 1Ø,12,114,12,114,12,2,Ø,Ø,Ø,Ø,Ø
42Ø DATA 11,64,Ø,64,Ø,64,Ø,64,32,8Ø,47,8Ø
43Ø DATA 1Ø,47,8Ø,47,64,Ø,64,Ø,64,Ø,Ø,Ø
44Ø REM TWO
45Ø DATA 11,Ø,Ø,Ø,Ø,Ø,12,16,14,Ø,6,Ø
46Ø DATA 11,3,Ø,3,Ø,7Ø,56,7Ø,56,4,24,Ø
47Ø DATA 11,64,Ø,64,32,64,32,8Ø,32,8Ø,4Ø,64
48Ø DATA 11,44,64,38,65,34,65,32,8Ø,32,88,Ø
49Ø REM THREE
5ØØ DATA 11,Ø,Ø,Ø,Ø,Ø,Ø,4,2,4,2,4
51Ø DATA 11,34,84,34,92,34,76,34,68,2,64,Ø
52Ø DATA 11,16,Ø,48,Ø,56,64,48,64,32,64,32
53Ø DATA 11,64,32,64,48,1Ø,54,1Ø,22,1Ø,6,1
54Ø REM FOUR
55Ø DATA 11,Ø,Ø,Ø,Ø,Ø,Ø,64,36,88,32,16
56Ø DATA 11,Ø,Ø,64,32,64,56,64,6Ø,2,12,Ø
57Ø DATA 11,Ø,8,4,1Ø,5,1Ø,5,8,4,72,4
58Ø DATA 11,88,38,89,38,89,6,73,4,8,6,Ø
59Ø REM FIVE
6ØØ DATA 11,Ø,Ø,Ø,Ø,64,32,84,5Ø,76,34,68
61Ø DATA 1Ø,34,68,34,68,34,68,2,68,2,Ø,Ø
62Ø DATA 1Ø,Ø,32,24,1Ø1,24,97,Ø,64,Ø,64,Ø
63Ø DATA 11,64,Ø,96,1,48,15,48,15,16,15,Ø
64Ø REM SIX
65Ø DATA 11,Ø,96,Ø,112,Ø,12Ø,Ø,92,Ø,1Ø2,Ø
66Ø DATA 11,98,Ø,98,Ø,98,Ø,7Ø,Ø,14,Ø,6
67Ø DATA 11,7,8,23,8,55,8,99,Ø,65,Ø,64
```

```
68Ø DATA 11,Ø,96,Ø,112,1,62,1,3Ø,1,14,Ø
69Ø REM SEVEN
7ØØ DATA 11,Ø,16,8,6,8,6,8,6,8,6,8
71Ø DATA 1Ø,7Ø,8,1Ø2,8,54,8,6,Ø,2,Ø,Ø
72Ø DATA 11,Ø,64,Ø,96,Ø,12Ø,Ø,124,Ø,3Ø,1
73Ø DATA 1Ø,6,1,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
74Ø REM EIGHT
75Ø DATA 11,Ø,Ø,Ø,Ø,24,36,24,1Ø2,24,1Ø2,Ø
76Ø DATA 11,67,Ø,67,Ø,99,28,34,28,34,28,Ø
77Ø DATA 11,12,18,44,19,1Ø8,19,96,1,64,Ø,64
78Ø DATA 11,Ø,96,1,112,15,48,15,16,14,Ø,Ø
79Ø REM NINE
8ØØ DATA 11,Ø,Ø,12Ø,4,12Ø,6,12Ø,6,Ø,3,Ø
81Ø DATA 11,3,Ø,3,Ø,67,4,123,4,122,4,12Ø
82Ø DATA 11,48,Ø,56,Ø,113,Ø,99,Ø,99,Ø,99
83Ø DATA 11,Ø,115,Ø,57,Ø,31,Ø,15,Ø,7,Ø
84Ø REM SPACE
85Ø DATA 11,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,
```

Download utility program

```
1Ø DIM Z(8,12),MM(11)
15 DEF FNLOCATE$(X,Y)=CHR$(27)+CHR$(61)+CHR$(X)+
   CHR$(Y+32)
2Ø PRINT CHR$(26);:GOSUB 66Ø
3Ø CS$="<>":SC$="[]":BIT=Ø:SS$="OO"
4Ø A$=INKEY$:IF A$="" THEN 4Ø
5Ø IF A$="Q" THEN PRINT CHR$(26):END
6Ø IF A$="P" THEN GOSUB 68Ø: GOTO 4Ø
7Ø IF A$="E" THEN PRINT CHR$(26):GOSUB 9Ø:GOSUB 26Ø:
   GOTO 4Ø
8Ø GOTO 4Ø
9Ø REM  EDIT MODE
95 H=1:G=1:X=1:Y=1
96 FOR I=1 TO 11:MM(I)=Ø:NEXT I
1ØØ PRINT CHR$(26)
11Ø PRINT
12Ø PRINT "     M1 M2 M3 M4 M5 M6 M7 M8 M9 M1Ø M11"
13Ø for I=Ø to 7:PRINT "      ";:FOR J=1 TO 11:
14Ø PRINT "!==";:NEXT J:PRINT "!":IF I<7 THEN PRINT
   2^I
15Ø NEXT I
16Ø PRINT FNLOCATE$(2Ø,1);"R)IGHT L)EFT U)P D)OWN
   C)LEAR Q)UIT"
18Ø RETURN
26Ø REM **** SINGLE CHARACTER INPUT @ EDIT LEVEL****
```

```
27Ø PRINT FNLOCATE$(4,7);:PRINT CS$;:PRINT
   FNLOCATE$(2Ø,4Ø);
28Ø A$=INKEY$: IF A$="" THEN 28Ø
3ØØ IF A$="L" THEN GOSUB 39Ø:GOTO 37Ø
31Ø IF A$="R" THEN GOSUB 41Ø:GOTO 37Ø
32Ø IF A$="D" THEN GOSUB 43Ø:GOTO 37Ø
33Ø IF A$="U" THEN GOSUB 45Ø:GOTO 37Ø
34Ø IF A$="I" THEN GOSUB 47Ø:GOTO 37Ø
35Ø IF A$="C" THEN GOSUB 49Ø:GOTO 37Ø
36Ø IF A$="Q" THEN GOSUB 5ØØ:GOTO 38Ø
37Ø GOTO 28Ø
38Ø RETURN: REM ****END OF INPUT****
39Ø GOSUB 92Ø:Y=Y-3:H=H-1:IF Y<1 THEN Y=1:H=1
4ØØ GOSUB 95Ø : RETURN
41Ø GOSUB 92Ø:Y=Y+3:H=H+1:IF Y>31 THEN Y=31:H=11
42Ø GOSUB 95Ø:RETURN
43Ø GOSUB 92Ø:X=X+2:G=G+1:IF X>13 THEN X=13:G=7
44Ø GOSUB 95Ø:RETURN
45Ø GOSUB 92Ø:X=X-2:G=G-1:IF X<1 THEN X=1:G=1
46Ø GOSUB 95Ø:RETURN
47Ø IF Z(G,H-1)=1 OR Z(G,H+1)=1 THEN RETURN
48Ø Z(G,H)=1:PRINT FNLOCATE$(X+3,Y+6); SS$;:RETURN
49Ø Z(G,H)=Ø:PRINT FNLOCATE$(X+3,Y+6); CS$;:RETURN
5ØØ REM ****GET OUT OF EDIT MODE****
52Ø IF Z(G,H)=1 THEN PRINT FNLOCATE$(X+3,Y+6);
   SC$;:GOTO 54Ø
53Ø IF Z(G,H)=Ø THEN PRINT FNLOCATE$(X+3,Y+6); "  ";
54Ø REM **** PRINT THE COLUMN - VALUES****
55Ø FOR I=1 TO 11: FOR J=1 TO 7
56Ø MM(I)=MM(I)+Z(J,I)*2^(J-1):NEXT J:NEXT I
57Ø J=Ø:FOR I=1 TO 11:PRINT FNLOCATE$(19,6+J);
   RIGHT$(STR$(MM(I)),3);:J=J+3:NEXT I
572 PRINT
575 PRINT  FNLOCATE$(2Ø,1);STRING$(45," ");
58Ø GOSUB 66Ø:RETURN
66Ø FOR I=1 TO 7:FOR J=1 TO 11:Z(I,J)=Ø:NEXT J:NEXT
   I
67Ø PRINT FNLOCATE$(22,2);:PRINT "E) EDIT    P)
   PRINTER    Q) QUIT  ";:RETURN
68Ø REM ****PRINT MODE****
69Ø PRINT FNLOCATE$(2Ø,1);:INPUT "NORMAL OR
   PROPORTIONAL    (N/P)   ";AN$
7ØØ IF AN$="N" THEN PR=Ø:GOTO 75Ø
71Ø IF AN$="P" THEN GOTO 73Ø
72Ø GOTO 69Ø
```

```
730 GOSUB 2ØØØ:PRINT FNLOCATE$(2Ø,1);:INPUT "THE
   PROPORTIONAL DATA  (4-11)    "; PR
74Ø IF PR<4 OR PR>11 THEN 73Ø
75Ø GOSUB 2ØØØ:PRINT FNLOCATE$(2Ø,1);:INPUT "IF
   SHIFTED  ENTER  1 ELSE ENTER Ø  ";SH
76Ø IF SH<Ø OR SH>1 THEN GOTO 75Ø
77Ø GOSUB 2ØØØ:PRINT FNLOCATE$(2Ø,1);:INPUT "ASCII
   CODE (33-126 OR 16Ø-254)   ";AS
78Ø IF (AS<33 OR AS>126) AND (AS<16Ø OR AS>254) THEN
   77Ø
785 PRINT
79Ø PRINT FNLOCATE$(2Ø,1);STRING$(5Ø," ")
8ØØ IF SH=1 THEN SH=16 ELSE SH=Ø
81Ø N1=AS:N2=PR+SH
82Ø FOR I=1 TO 11:MM$=MM$+CHR$(MM(I)):NEXT I
83Ø LPRINT
   CHR$(27);"*";CHR$(1);CHR$(N1);CHR$(N2);MM$
84Ø IF AN$="N" THEN LPRINT CHR$(27);"$";CHR$(1):GOTO
   86Ø
85Ø LPRINT CHR$(27);"X";CHR$(1)
86Ø FOR I=1 TO 2Ø:LPRINT CHR$(N1);" ";:NEXT I:LPRINT
87Ø LPRINT CHR$(14);:FOR I=1 TO 1Ø:LPRINT CHR$(N1);"
   ";:NEXT I:LPRINT CHR$(2Ø)
88Ø LPRINT CHR$(15);:FOR I=1 to 2Ø:LPRINT CHR$(N1);"
   ";: NEXT I:LPRINT CHR$(18)
89Ø IF AN$="N" THEN LPRINT CHR$(27);"$";CHR$(Ø):GOTO
   91Ø
9ØØ LPRINT CHR$(27);"X";CHR$(Ø)
91Ø LPRINT CHR$(27);"@":MM$="":RETURN:REM ****END OF
   PRINT MODE****
92Ø IF Z(G,H)=Ø THEN PRINT FNLOCATE$(X+3,Y+6); "  ";
93Ø IF Z(G,H)=1 THEN PRINT FNLOCATE$(X+3,Y+6); SC$;
94Ø RETURN
95Ø IF Z(G,H)=1 THEN PRINT FNLOCATE$(X+3,Y+6); SS$;
96Ø IF Z(G,H)=Ø THEN PRINT FNLOCATE$(X+3,Y+6); CS$;
97Ø RETURN
2ØØØ PRINT FNLOCATE$(2Ø,1);STRING$(5Ø," ")
2Ø1Ø RETURN
```

Delta Plot program

```
1Ø PRINT CHR$(26)
2Ø PRINT "":PRINT "":PRINT ""
3Ø PRINT "THIS PROGRAM TAKES ABOUT TWO"
4Ø PRINT "MINUTES TO RUN, PLEASE TURN"
5Ø PRINT "ON YOUR PRINTER AND STAND BY"
```

```
100 REM DELTA-PLOT
110 DIM BIT%(76,14)
1000 REM SET PROGRAM CONSTANTS
1010 MASK%(1)=128:MASK%(4)=16
1020 MASK%(2)=64 :MASK%(5)=8
1030 MASK%(3)=32 :MASK%(6)=4
1040 LX=20        :LY=20
1050 XFAC=72/LX   :YFAC=87/LY
2000 REM PLOT CURVE
2010 RAD=9
2020 X1=19   :Y1=10
2030 FOR ANG%=0 TO 360 STEP 10
2040 R1=ANG%*6.28/360
2050 X2=RAD*COS(R1)+10 :Y2=RAD*SIN(R1)+10
2060 GOSUB 4000
2070 NEXT ANG%
3000 REM SEND BIT IMAGE MAP TO PRINTER
3010 LPRINT CHR$(27):"A";CHR$(6)
3020 FOR ROW%=0 TO 14
3030 A$=""
3040 LPRINT CHR$(27);"K";CHR$(75);CHR$(0);
3050 FOR COL% = 1 to 75
3060 LPRINT CHR$(BIT%(COL%,ROW%));
3070 NEXT COL%
3080 LPRINT
3090 NEXT ROW%
3100 LPRINT CHR$(27);"A";CHR$(12)
3110 END
4000 REM DRAW A LINE FROM X1,Y1 TO X2,Y2
4010 XL=X2-X1 :YL=Y2-Y1
4020 NX=ABS(XL*XFAC) : NY=ABS(YL*YFAC)
4030 IF NX<NY THEN NX=NY
4040 NS%=INT(NX+1)
4050 DX=XL/NS%   : DY=YL/NS%
4060 FOR I%=1 TO NS%
4070 X1=X1+DX    :   Y1=Y1+DY
4080 GOSUB 5000
4090 NEXT I%
4100 RETURN
5000 REM PLOT A POINT AT X1,Y1
5010 XX=X1*XFAC    :YY=Y1*YFAC
5020 COL%=INT(XX)+1
5030 ROW%=INT(YY/6)
5040 XIT%=INT(YY-ROW%*6)+1
```

```
5050 BIT%(COL%,ROW%)=BIT%(COL%,ROW%) OR MASK%(XIT%)
5060 RETURN
```

Pie chart program

```
110 ESC$=CHR$(27):LF$=CHR$(10)
120 FF$=CHR$(12):VTAB$=CHR$(11)
130 EMPHASIZED$=ESC$="E":NOT.EMPHASIZED$=ESC$+"F"
1020 DIM BIT%(190,36),A$(36),PCT%(25),TEXT$(42),
   PIECETEXT$(25)
1030 MASK%(1)=128:MASK%(4)=16
1040 MASK%(2)=64 :MASK%(5)=8
1050 MASK%(3)=32 :MASK%(6)=4
1060 LX=20:LY=20
1070 LXFAC=190/LX:LYFAC=216/LY
1080 FOR I=1 TO 42
1090 TEXT$(I)=SPACE$(80)
1100 NEXT I
1110 GOSUB 7000
1120 PRINT CHR$(26)
1130 PRINT "THIS PROGRAM TAKES ABOUT FIVE MINUTES"
1140 PRINT "PLEASE HAVE YOUR PRINTER READY AND "
1150 PRINT "STAND BY "
2010 RAD=9
2020 X1=19:Y1=10
2030 PRINT " ";
2040 FOR ANG%=0 TO 360 STEP 5
2050 RANG=ANG%*6.28/360
2060 X2=RAD*COS(RANG)+10:Y2=RAD*SIN(RANG)+10
2070 GOSUB 4000
2080 NEXT ANG%
2090 FOR PIECE%=1 TO NUMBER.PIECES%
2100 X1=10:Y1=10
2110 TOTAL.PCT%=TOTAL.PCT%+PCT%(PIECE%)
2120 ANG%=360*TOTAL.PCT%*.01
2130 RANG=ANG%*6.28/360
2140 X2=RAD*COS(RANG)+10:Y2=RAD*SIN(RANG)+10
2150 GOSUB 4000
2160 GOSUB 6000
2170 NEXT PIECE%
3010 PRINT
3020 FOR ROW%=0 TO 35
3030 A$(ROW%)=""
3040 FOR COL%=1 TO 190
3050 A$(ROW%)=A$(ROW%)+CHR$(BIT%(COL%,ROW%))
3060 NEXT COL%
```

```
3Ø7Ø PRINT CHR$(176);CHR$(176);
3Ø8Ø NEXT ROW%
3Ø9Ø PRINT
3Ø91 LPRINT SPACE$(4Ø-LEN(TITLE$)/
   2);EMPHASIZED$;TITLE$;NOT. EMPHASIZED$;LF$
31ØØ LPRINT VTAB$;VTAB$;VTAB$
311Ø LPRINT ESC$;"A";CHR$(3)
312Ø LPRINT TEXT$(1);LF$;TEXT$(2);LF$;TEXT$(3):LF$
313Ø FOR ROW%=Ø TO 35
314Ø LPRINT "
   "ESC$;"K";CHR$(19Ø)CHR$(Ø);
315Ø LPRINT A$(ROW%)
316Ø LPRINT TEXT$(ROW%+4)
317Ø LPRINT CHR$(176);CHR$(176);
318Ø NEXT ROW%
319Ø LPRINT TEXT$(4Ø);LF$
32ØØ LPRINT TEXT$(41);LF$
321Ø LPRINT TEXT$(42);LF$
322Ø LPRINT ESC$;"2";FF$
323Ø END
4ØØØ '
4Ø1Ø XL=X2-X1:YL=Y2-Y1
4Ø2Ø NX=ABS(XL*LXFAC):NY=ABS(YL*LYFAC)
4Ø3Ø IF NX<NY THEN NX=NY
4Ø4Ø NS%=INT(NX+1)
4Ø5Ø DX=XL/NS%:DY=YL/NS%
4Ø6Ø FOR I%=1 TO NS%
4Ø7Ø X1=X1+DX:Y1=Y1+DY
4Ø8Ø GOSUB 5ØØØ
4Ø9Ø NEXT I%
41ØØ PRINT CHR$(29);CHR$(205);CHR$(175);
411Ø RETURN
5ØØØ '
5Ø1Ø XX=X1*LXFAC:YY=Y1*LYFAC
5Ø2Ø COL%=INT(XX)+1
5Ø3Ø ROW%=INT(YY/6)
5Ø4Ø XIT%=INT(YY-ROW%*6)+1
5Ø5Ø BIT%(COL%,ROW%)=BIT%(COL%,ROW%) OR MASK%(XIT%)
5Ø6Ø RETURN
6ØØØ REM
6Ø1Ø MIDANG%=(ANG%+PREVANG%)/2
6Ø2Ø RANG=MIDANG%*6.28/36Ø
6Ø3Ø X3=INT(2Ø*SIN(RANG)):Y3=INT(22*COS(RANG))
6Ø4Ø X4=22+X3:Y4=4Ø+Y3
```

```
6Ø5Ø IF MIDANG%>27Ø OR MIDANG%<9Ø THEN
   MID$(TEXT$(X4),Y4)=PIECETEXT$(PIECE%) ELSE
   MID$(TEXT$(X4),Y4-LEN(PIECETEXT$(PIECE%)))
   =PIECETEXT$(PIECE%)
6Ø6Ø PREVANG%=ANG%
6Ø7Ø RETURN
7ØØØ '
7Ø1Ø PRINT CHR$(26):PRINT:PRINT:PRINT
7Ø2Ø INPUT"ENTER TITLE FOR CHART: ";TITLE$
7Ø3Ø AMT.SOFAR%=Ø;AMT.LEFT%=1ØØ
7Ø4Ø FOR I=1 TO 24
7Ø5Ø PRINT CHR$(26);"         ENTER PARAMETERS FOR
   PIE CHART"
7Ø6Ø PRINT         "          TOTAL SO FAR";
7Ø7Ø PRINT AMT.SOFAR%
7Ø8Ø PRINT         "          TOTAL REMAINING";
7Ø9Ø PRINT AMT.LEFT%
71ØØ PRINT:PRINT:PRINT:PRINT
711Ø INPUT "ENTER PERCENTAGE FOR FIELD:  ";PCT%(I)
712Ø IF PCT%(I)>AMT.LEFT% OR PCT%(I)=Ø THEN
   PCT%(I)=AMT.LEFT%
713Ø AMT.LEFT%=AMT.LEFT%-PCT%(I)
714Ø AMT.SOFAR%=AMT.SOFAR%+PCT%(I)
715Ø PRINT:PRINT
716Ø INPUT "ENTER DESCRIPTION OF FIELD:
   ";PIECETEXT$(I)
717Ø IF LEN(PIECETEXT$(I))>15 THEN PRINT "FIELD TOO
   LONG - 15 CHAR. MAX":GOTO 716Ø
718Ø IF AMT.LEFT%=Ø THEN 72ØØ
719Ø NEXT I
72ØØ NUMBER.PIECES%=I
721Ø IF NUMBER.PIECES%=Ø THEN 7Ø3Ø
722Ø PRINT CHR$(26)
723Ø RETURN
```