

## CHAPTER

## 6

## SAS/GRAPH Fonts

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### Overview

SAS/GRAPH software has a variety of type styles that you can use to display text and special characters in your procedure output. These type styles are stored in *fonts* that you can specify when you want to select type for the text on your graphs or choose plot symbols.

This chapter explains how to specify a font, how to change the default hardware font, how to produce special characters, and how to select a software font.

*Note:* In some operating environments, you can access the System or TrueType fonts that are available to the host print driver that is currently set for your printer. For more information, see the SAS documentation for your operating environment. △

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### Specifying Fonts in SAS/GRAPH Programs

When you select a type style for text or plot symbols, you use statement options to assign the font. You can assign fonts for any amount of text from a single character in a title to all the text in your output. When SAS/GRAPH software encounters an explicit font specification in a SAS statement, it uses the font that you specify rather than a font that is specified in a GOPTIONS statement or the device's hardware font.

If you do not make a font assignment, in most cases SAS/GRAPH software uses the default hardware font for your device.

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## Font Specifications

A *font specification* is an argument that takes a font name as its value. Font specifications typically take the following form:

FONT=*font*

F=*font*

where *font* is a valid SAS name. The specified font can be

- a catalog entry that is either
  - supplied by SAS Institute (for example, CENTB)
  - user-generated (for example, MYFONT generated by the GFONT procedure).

See “Font Lists” on page 131 for a list of valid font names for Institute-supplied software fonts.

- a hardware font that is either in the form of
  - HWxxxxnnn*
  - hardware-font-name*.

See “Alternative Hardware Fonts” on page 129 for details.

For example, the following statement specifies the Century Bold font in a title:

```
title font=centb 'This is a Title';
```

However, there are other arguments that also take *font* as a value. For example, the FTEXT= option in the following GOPTIONS statement specifies the Century Bold font for all text that does not have a more explicit font specification:

```
goptions ftext=centb;
```

*Note:* In this chapter, the argument FONT= is used to represent any argument that takes *font* as its value.  $\triangle$

---

## Default Fonts

When a font is needed, SAS/GRAPH software looks first for a font specification in the statement or procedure that produces the output, and then it looks in the GOPTIONS statement. If no font specification is found, SAS/GRAPH software uses one of the following:

- for TITLE1 statements, the default font is SWISS.
- for all other text, the default font is NONE. The NONE font specifies the default hardware font for the output device.

In some cases, the device’s hardware font cannot be used and the SIMULATE font is used instead. The SIMULATE font is a software font that simulates the device’s hardware characters by allowing the same amount of space for the text that the hardware characters use. The SIMULATE font is used whenever the default hardware font is unavailable, including the following situations:

- FONT=NONE or FONT=HWxxxxnnn or no font is specified, *and* one of the following conditions or sets of conditions is also met:
  - GOPTIONS NOCHARACTERS is specified.
  - The device driver does not support hardware text.
  - You request a hardware font for a different device.

- You specify an angle or rotation for the characters that the device does not support.
- The device does not have scalable hardware characters (that is, hardware characters can be generated only in the proportions specified with the font), *and* one of the following conditions is also met:
  - The values of the HPOS= and VPOS= graphics options do not match the values displayed in the LCOLS or PCOLS field or the LROWS or PROWS field in the Detail window of the device entry.
  - The HSIZE= or VSIZE= graphics option is set to nondefault values.
  - You replay a graph in a template that is not the same size as the full size of the graphics output area, or you use a device driver other than the one you used to create the graph.
  - The target device and the display device have different values for the HPOS= and VPOS= graphics options.
  - You use any height specification, including the HEIGHT=, HTEXT=, HTITLE=, and HBY= graphics options, that is not equal to 1.

You should never delete the SIMULATE font from the fonts catalog.

*Note:* You can change the font that is used as the SIMULATE font with the SIMFONT= graphics option. If you use the SIMFONT= option, it is better to specify a uniform font. Do not specify a hardware font as a substitute for SIMULATE. See “SIMFONT” on page 389 for more information on the SIMFONT= option.  $\Delta$

---

## Font Locations

SAS/GRAPH software fonts are stored in catalogs. SAS/GRAPH looks only into catalogs with certain librefs and names to find fonts. By default, SAS/GRAPH searches for the font in the catalog SASHELP.FONT, which contains Institute-supplied fonts, key maps, and device maps.

If you want to specify fonts that you have created locally, submit a LIBNAME statement that associates the libref GFONT0 with the location of your font catalog. If you have specified more than one libref in the sequence GFONT0 through GFONT9, SAS/GRAPH software performs a sequential search of these catalogs when locating the font that you have specified.

When you specify a font name, SAS/GRAPH software searches for the font in the following order:

- 1 If a SAS data library with the libref GFONT0 exists, then SAS/GRAPH software looks there for a catalog named FONT. If GFONT0.FONT exists, it is checked for the specified font. If the font is not there, SAS/GRAPH software looks next for a library with the libref GFONT1 and for a catalog named FONT in that library. The search is repeated for the sequence of librefs through GFONT9.
- 2 If SAS/GRAPH software fails to find the specified font in any FONT catalog in the libraries GFONT0 to GFONT9, or if it finds a GFONT $n$  libref without a FONT catalog, or if it encounters an undefined libref in that sequence before locating the specified font, then it searches for the font in SASHELP.FONT. (SASHELP is one of the standard librefs defined automatically whenever you start your SAS session; you do not need to issue a LIBNAME statement to define it.)
- 3 If the specified font is not found in SASHELP.FONT, then a warning is issued and the SIMPLEX font is used. The SIMPLEX font is the default software font and should never be deleted from the fonts catalog.

See Chapter 16, “The GFONT Procedure,” on page 675 for additional information on specifying the libref GFONT0.

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## Using Hardware Fonts

There are several advantages to using hardware fonts instead of software fonts. Hardware fonts often are produced faster than software fonts and produce smaller output files. Also, some devices, such as laser printers with resident hardware fonts, may produce better quality output with hardware fonts than with software fonts. You can use either your device's default hardware font (FONT=NONE) or you can specify an alternative font.

---

### Default Hardware Fonts

SAS/GRAPH software uses a device's default hardware font to draw characters when both of the following conditions are true:

- No font specification is made in the SAS/GRAPH program, or FONT=NONE is specified.
- The hardware font can be used. See "Default Fonts" on page 126 for details on when hardware fonts cannot be used.

Every available hardware font for a particular device has a number associated with it. This number and the corresponding font name are listed in the Chartype window of the device entry for your device. The default hardware font is the font whose number is entered in the Chartype field in the Parameters window of the device entry. When FONT=NONE or no font is specified, SAS/GRAPH software uses the font assigned to this field.

If your device has only one hardware font (this is often the case), the Chartype field has a value of 0. If your device has more than one hardware font, you can assign a different default hardware font either by specifying it with the CHARTYPE= option in a GOPTIONS statement (see the next section) or by using the GDEVICE procedure to modify the value of the Chartype field in the Parameters window of your device entry.

### Changing the Default Hardware Font

#### With a GOPTIONS Statement

To assign the default hardware font for your current SAS session, use the CHARTYPE= option in a GOPTIONS statement. Assign it the actual number of the hardware font as listed in the Chartype field in the Chartype window of the device entry for your device.

Using the CHARTYPE= option only changes the default font for the duration of your SAS session; using the CHARTYPE= option does not change the value of the field in the device entry. (See "CHARTYPE" on page 312 for a complete description of the CHARTYPE= option.)

When you specify a hardware font by using the graphics option CHARTYPE=*n* and the font specification NONE, the size of the character cells is determined by the current values for the HPOS= and VPOS= options. This means that the font is drawn using the current cell size. As a result, the aspect ratio of the displayed font may be different and the height of the characters, if displayed in cells, may be affected.

**CAUTION:**

Specifying a nonscalable hardware font with the CHARTYPE= option may cause the SIMULATE font to be used.  $\triangle$

In addition, if the font selected with CHARTYPE= is not scalable and if the values of HPOS= and VPOS= do not match the values of the Rows and Cols fields in the Chartype window, then the SIMULATE font is substituted.

## With the GDEVICE Procedure

To change the default hardware font with the GDEVICE procedure, change the Chartype field in the Parameters window for the device:

- 1 Invoke the GDEVICE procedure and select the entry for your device.
- 2 Go to the Chartype window and review the available fonts.
- 3 Note the number of the font that you want to use as the default font and go to the Parameters window.
- 4 Enter the number of the font in the Chartype field.
- 5 Close the window and exit the procedure.

*Note:* If you change the number in the Chartype field in the Parameters window of the device entry, the change is permanent and remains in effect from one SAS session to another until you change the entry again. △

(See Chapter 15, “The GDEVICE Procedure,” on page 651 for information on viewing device entries and changing device parameters.)

---

## Alternative Hardware Fonts

An alternative hardware font can be specified in any SAS statement where a font specification is valid. You can use more than one hardware font in a single graph (or even in a single statement), as long as all of the fonts that you specify exist on your device. If you specify a hardware font, make sure that the font is available on the device and that there is a corresponding Chartype value for the font. If you request a hardware font that does not have a Chartype defined, SAS/GRAPH software substitutes the SIMULATE font.

These are the three ways to specify alternative hardware fonts:

- In the font specification, explicitly assign a hardware font using the following form:

*HWxxxnnn*

*HW*

identifies the font as a hardware font. The font name must begin with the characters HW.

*xxx*

are the last two or three characters of the module name in the Module field in the Detail window of your device entry. If the module name has eight characters (SASGDPSL, for example), use the last three characters (PSL). If the module name has only seven characters (SASGDVT, for example), use the last two characters (VT).

*nnn*

is the Chartype number of the hardware font that you want to use as listed in the Chartype window in the device entry. This value should be a three-digit decimal number, with leading zeros if necessary.

- In the font specification, explicitly assign a hardware font using the following form:

*hardware-font-name*

identifies the name of the hardware font that is listed in the Chartype window of the device entry. *Hardware-font-name* must be enclosed in

quotation marks and the maximum length is 256 characters. The specified font name will be converted internally to the HWxxxxnnn name. Note that in Annotate, the specified font name must be enclosed in both double quotes and single quotes (see Chapter 11, “Annotate Dictionary,” on page 427 for details).

- Assign one of the fonts listed in the Chartype window of your device entry as the default hardware font with the CHARTYPE= graphics option. You can also change the default hardware font by modifying the value of the Chartype field in the Parameters window of your device entry. Then you can use FONT=NONE in your SAS/GRAPH procedure or statement to specify the new default hardware font.

When you specify FONT=HWxxxxnnn or *hardware-font-name*, the size of the character cells is determined by the values in the Rows and Cols fields in the Chartype window of the device entry, and the values of the HPOS= and VPOS= options are ignored for the font. Consequently, the font retains its original proportions. In addition, with this method the font catalog is checked for proportional spacing information. This information is used by the software to determine how much space to reserve for proportional text. See Chapter 9, “Graphics Options and Device Parameters Dictionary,” on page 301 for additional information.

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## Specifying Special Characters

Some fonts contain characters that are not mapped to the keyboard and cannot be typed directly into a text string. To display these special characters, substitute a character code or a hexadecimal value in the text string.

Character codes include the letters, numbers, punctuation marks, and symbols that are commonly found on a keyboard. They are usually associated with symbols or national alphabets. These codes enable you to display the character by specifying the font and using the keyboard character in the text string.

For example, to produce the character  $\zeta$ , assign the Greek font and specify the character code z in the text string.

```
title font=greek 'z';
```

*Hexadecimal values* are any two-digit hexadecimal numbers enclosed in quotation marks and followed by the letter x, for example, '3D'x. (In double-byte character sets, the hexadecimal values contain four digits, for example, '4E60'x.)

You display characters with hexadecimal values the same way that you display them with character codes, that is, by specifying the font that contains the special character and placing the hexadecimal value in the text string. For example, this TITLE statement uses hexadecimal 18 to produce £ in the Zapf type style. (This example assumes a U.S. key map).

```
title font=zapf '18'x;
```

*Note:* The character code or hexadecimal value associated with any character in any font is dependent on the key map that is currently being used.  $\Delta$

In addition, you can use a key map to map selected characters to your keyboard. For example, if you want to be able to type e directly, you could create a key map that maps e to the key that usually generates the asterisk (\*) and a device map that maps e to your output device. Then, when you press the \* key, although you see \* on your display, e is produced on your graphics device. See Chapter 18, “The GKEYMAP Procedure,” on page 719 for details.

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## Using SAS/GRAPH Software Fonts

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### Rendering Fonts

SAS/GRAPH software includes methods of storing rendered versions of Bitstream fonts, along with three graphics options to control how the fonts are rendered.

When your graphics output uses one of the Bitstream fonts provided in SAS/GRAPH software, SAS/GRAPH must process information contained in corresponding FONT catalog entries to determine how to draw characters of the specified size and typeface. The process of calculating the character shapes and sizes is known as *rendering* the font. Bitstream fonts available in SAS/GRAPH software include the Century, Swiss, and Zapf families.

SAS/GRAPH software can store rendered versions of the Bitstream fonts in memory or in special SAS files. Using these rendered versions of the fonts can provide a speed improvement when characters of the same size and style are used again during the SAS session. SAS/GRAPH software can read the rendered version of the characters from memory or from the rendered font file rather than having to perform the rendering calculations again each time the characters are used. If you store the rendered fonts in files in a permanent SAS data set, SAS/GRAPH software can use the rendered font files again in subsequent SAS sessions.

*Note:* Because the rendered font files use a special utility member type, they do not appear in the list of library members that is displayed when you issue a DIRECTORY command for the SAS data library in which the font files are stored. △

You control whether and how rendered versions of fonts are stored using the FONTRES=, RENDER=, and RENDERLIB= graphics options. See Chapter 9, “Graphics Options and Device Parameters Dictionary,” on page 301 for details.

---

### Font Lists

The fonts available with SAS/GRAPH software are listed in the following tables. All of these fonts are stored in the catalog SASHELP.FONTSD. For many fonts, the last letter or letters of the font name indicates weight or spacing of the font:

B	bold (thicker)
E	empty (outline) versions of their counterparts
I	italic (slanted)
L	light (thin)
U	uniformly spaced versions of their counterparts; most SAS/GRAPH fonts that do not end in U are proportionately spaced; however, the Kanji fonts are always uniform.
X	expanded (wider characters and extra space between characters).

#### **CAUTION:**

**Empty and uniform versions of fonts cannot be used if you have deleted their filled or proportionally spaced counterparts.** △

If the label of a font in SASHELP.FONTSD is "Depends on," it is possible to delete it. However, empty and uniform versions of fonts are generated from their regular, bold, or

italic counterparts. Therefore, if you delete any of these fonts, you cannot use the uniform or empty version of that font. For example, you must have the CENTB (Century Bold) font in order to use the CENTBE (Century Bold Empty) font.

Figure 6.1 Roman Alphabet Text Fonts

Type Style	Font Name	Type Sample	Uniform Font
Brush	BRUSH	<i><b>A B C a b c 1 2 3</b></i>	
Century			
Bold	CENTB	<b>A B C a b c 1 2 3</b>	CENTBU
Bold Empty	CENTBE	A B C a b c 1 2 3	
Bold Italic	CENTBI	<i><b>A B C a b c 1 2 3</b></i>	CENTBIU
Bold Italic Empty	CENTBIE	<i>A B C a b c 1 2 3</i>	
Expanded	CENTX	<b>A B C a b c 1 2 3</b>	CENTXU
Expanded Empty	CENTXE	A B C a b c 1 2 3	
Expanded Italic	CENTXI	<i><b>A B C a b c 1 2 3</b></i>	CENTXIU
Expanded Italic Empty	CENTXIE	<i>A B C a b c 1 2 3</i>	
German	GERMAN	Œ B C a b c 1 2 3	GERMANU
German Italic	GITALIC	Ɔ B C a b c 1 2 3	GITALICU
Hershey			
Sans Serif	SIMPLEX	A B C a b c 1 2 3	SIMPLEXU
Sans Serif Bold	DUPLEX	A B C a b c 1 2 3	DUPLEXU
Serif	COMPLEX	A B C a b c 1 2 3	COMPLEXU
Serif Bold	TRIPLEX	A B C a b c 1 2 3	TRIPLEXU
Serif Bold Italic	TITALIC	<i>A B C a b c 1 2 3</i>	TITALICU
Serif Italic	ITALIC	<i>A B C a b c 1 2 3</i>	ITALICU
Old English	OLDENG	A B C a b c 1 2 3	OLDENGU
Script	SCRIPT	<i>A B C a b c 1 2 3</i>	
Cscript	CSCRIPT	<i>A B C a b c 1 2 3</i>	
Swiss	SWISS	<b>A B C a b c 1 2 3</b>	SWISSU
Empty	SWISSE	A B C a b c 1 2 3	
Bold	SWISSB	<b>A B C a b c 1 2 3</b>	SWISSBU
Bold Empty	SWISSBE	A B C a b c 1 2 3	
Bold Italic	SWISSBI	<i><b>A B C a b c 1 2 3</b></i>	SWISSBIU

(continued)



Figure 6.2 Roman Alphabet Text Fonts—continued

Type Style	Font Name	Type Sample	Uniform Font
Bold Italic Empty	SWISSBIE	<i>A B C a b c 1 2 3</i>	
Expanded	SWISSX	<b>A B C a b c 1 2 3</b>	SWISSXU
Expanded Empty	SWISSXE	A B C a b c 1 2 3	
Expanded Bold	SWISSXB	<b>A B C a b c 1 2 3</b>	SWISSXBU
Expanded Bold Empty	SWISSXBE	A B C a b c 1 2 3	
Italic	SWISSI	<i>A B C a b c 1 2 3</i>	SWISSIU
Italic Empty	SWISSIE	<i>A B C a b c 1 2 3</i>	
Light	SWISSL	A B C a b c 1 2 3	SWISSLU
Light Empty	SWISSLE	A B C a b c 1 2 3	
Zapf	ZAPF	<b>A B C a b c 1 2 3</b>	ZAPFU
Empty	ZAPFE	A B C a b c 1 2 3	
Bold	ZAPFB	<b>A B C a b c 1 2 3</b>	ZAPFBU
Bold Empty	ZAPFBE	A B C a b c 1 2 3	
Bold Italic	ZAPFBI	<b><i>A B C a b c 1 2 3</i></b>	ZAPFBIU
Bold Italic Empty	ZAPFBIE	<i>A B C a b c 1 2 3</i>	
Italic	ZAPFI	<i>A B C a b c 1 2 3</i>	ZAPFIU
Italic Empty	ZAPFIE	<i>A B C a b c 1 2 3</i>	

Table 6.1 Non-Roman Alphabet Fonts

Type Style	Font Name	Uniform Font Name
Arabic	ARABIC	
Arabic Empty	ARABICE	
Cyrillic	CYRILLIC	CYRILLIU
Greek	GREEK	GREEKU
Greek (serif)	CGREEK	CGREEKU
Hebrew	HEBREW	
Hebrew	NHEBREW*	
Hebrew Empty	HEBREWE	
Hiragana	HIRA	
Hiragana	NHIRA*	
Kanji	KANJI	
Kanji	KANSJIS	
Kanji Subset		

Type Style	Font Name	Uniform Font Name
Kanji 1	KAN1	
Kanji 2	KAN2	
Kanji 3	KAN3	
Kanji 4	KAN4	
Kanji 5	KAN5	
Kanji 6	KAN6	
Kanji 7	KAN7	
Kanji 8	KAN8	
Katakana	KATA	
Katakana	NKATA*	

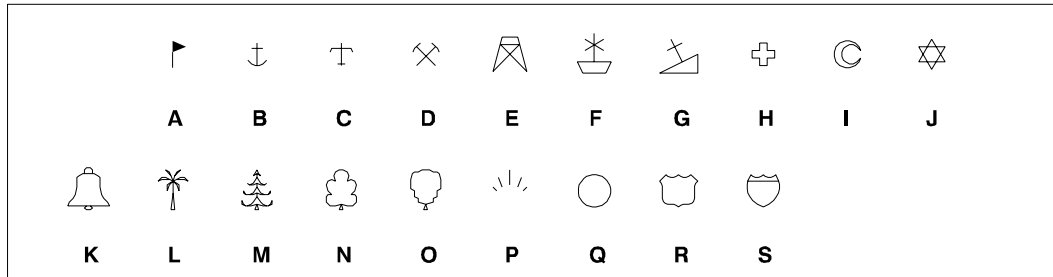
\*This font requires a special keyboard and is host-dependent. If you are not equipped to use this font, use the host-independent version listed directly above.

**Table 6.2** Symbol Fonts

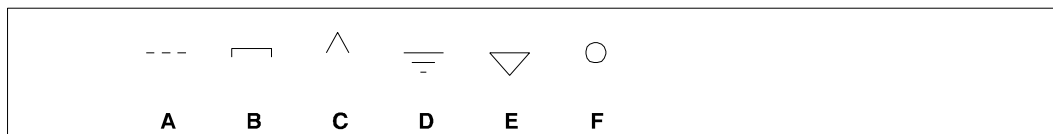
Type Style	Font Name	Uniform Font Name
Cartographic	CARTOG	CARTOGU
Electronic	ELECTRON	ELECTROU
Marker	MARKER	
Marker	MARKERE	
Empty	*	
Math	MATH	MATHU
Music	MUSIC	MUSICU
Special	SPECIAL	SPECIALU
Weather	WEATHER	WEATHERU

\*MARKERE is not displayed in the figures.

**Figure 6.3** Cartographic Font



**Figure 6.4** Electronic Font



**Figure 6.5** Marker Font

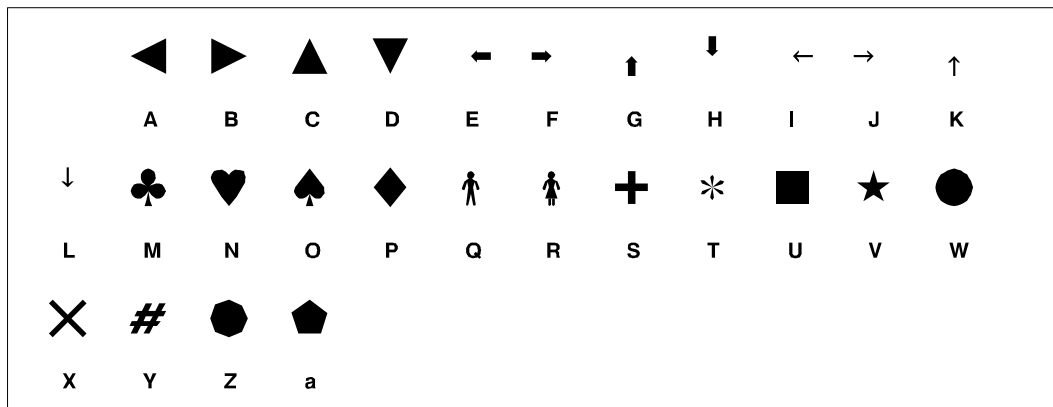


Figure 6.6 Math Font

	$\parallel$	$\perp$	$\angle$	$\therefore$	$<$	$>$	$\pm$	$\mp$	$\div$	$\neq$	$\equiv$
	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>	<b>G</b>	<b>H</b>	<b>I</b>	<b>J</b>	<b>K</b>
$\leq$	$\geq$	$\infty$	$\sim$	$\sqrt{\quad}$	$\subset$	$\cup$	$\supset$	$\cap$	$\in$	$\rightarrow$	$\uparrow$
<b>L</b>	<b>M</b>	<b>N</b>	<b>O</b>	<b>a</b>	<b>b</b>	<b>c</b>	<b>d</b>	<b>e</b>	<b>f</b>	<b>g</b>	<b>h</b>
$\leftarrow$	$\downarrow$	$\partial$	$\nabla$	$\int$	$\oint$	$\infty$	$\exists$	$\prod$	$\Sigma$		
<b>i</b>	<b>j</b>	<b>k</b>	<b>l</b>	<b>m</b>	<b>n</b>	<b>o</b>	<b>p</b>	<b>q</b>	<b>r</b>		

Figure 6.7 Music Font

	$\cdot$	$\smile$	$\frown$	$\circ$	$\circ$	$\bullet$	$\sharp$	$\flat$	$b$	$\text{—}$
	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>	<b>G</b>	<b>H</b>	<b>I</b>	<b>J</b>
$\text{—}$	$\surd$	$\surd$	$\text{tr}$	$@$	$\text{H}$	$\text{z}$	$\text{b}$	$\text{B}$		
<b>K</b>	<b>L</b>	<b>M</b>	<b>N</b>	<b>O</b>	<b>P</b>	<b>Q</b>	<b>R</b>	<b>S</b>		

Figure 6.8 Special Font

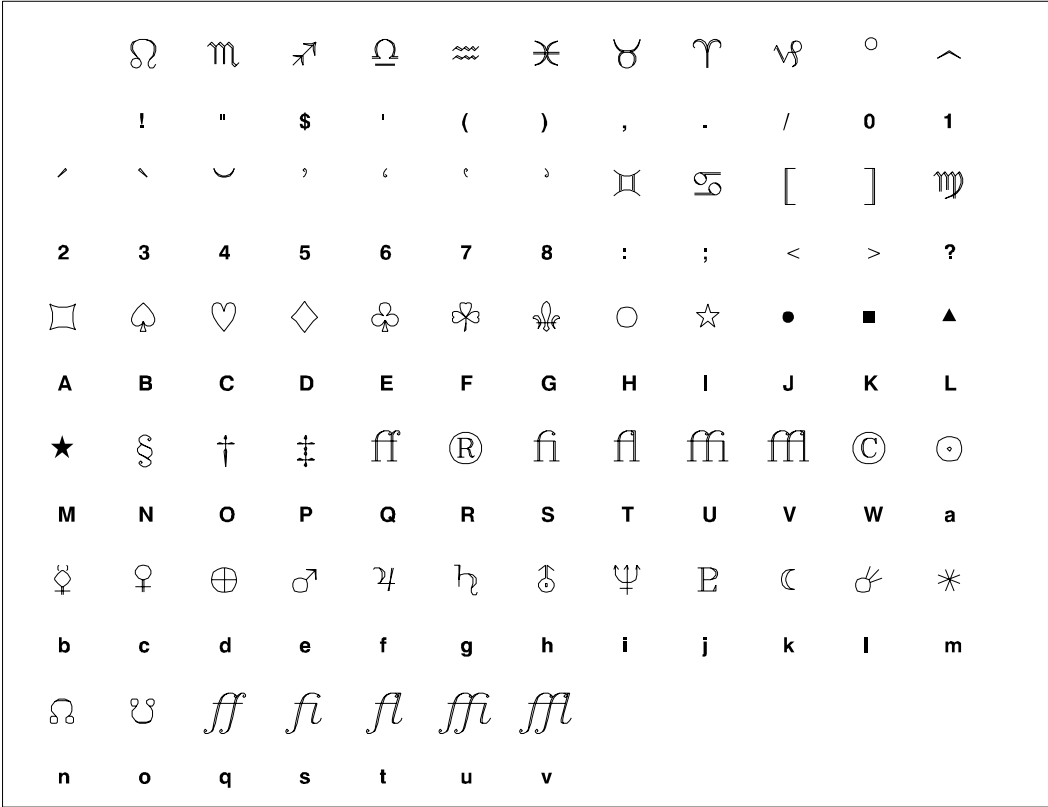
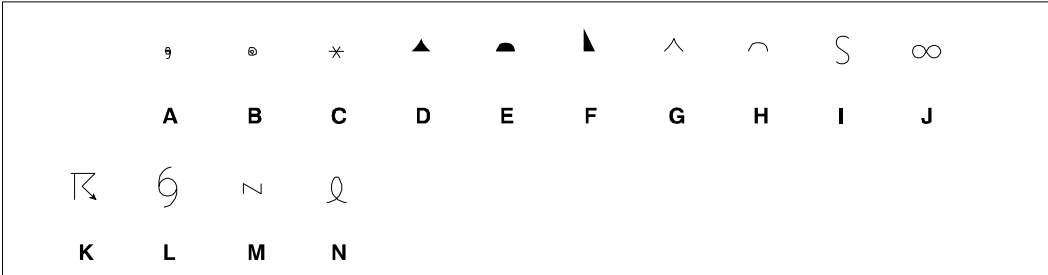


Figure 6.9 Weather Font





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