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TTF® files for 7-, 14-segment and dot-matrix display

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When writing about any subject, the writer may sometimes need to represent the information in a way that the representation resembles the origin of the information itself. When writing about calculators, for example, it should be a good idea to use images that better represent keystrokes, display characters and resulting LCD information. Better yet, having true-type fonts® (TTF) instead of using bitmapped images leads to smaller files and better results. The following example illustrates it better.

Consider that you want to represent the keystroke sequence when using a calculator to compute the permutation of five units, three at a time. By using regular TTF files, you can represent the keystroke sequence, say, like this:

... press [5] [ENTER] [3] [left-shift][nPr] and the display shows **60.0000**

If you have a suitable font for the job, you can build another representation, like:

...press ⑤ (ENTER) ③ ↰ (nPr) and the display shows 60,0000 .

In other cases, instead of adding a string of characters to represent one single resulting value you may need to show the entire calculator display. Consider, now, that you want to represent the use of another calculator, say, an HP30S, to calculate the resulting value from $47-(23\times.5\times\cos(70))$. With the HP30S display template and the convinient TTF files, you can generate a bitmapped image and add it to your text so it looks like this:

After keying $47-(23\times.5\times\cos(70)$ in, the display shows:

DEG

⭠*.5*cos(70)⭢
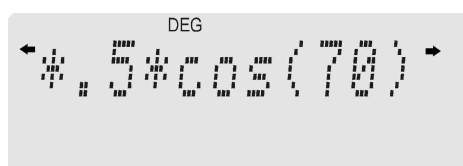
Then press (ENTER) and the display shows:

DEG

47-(23*.5*c ⭢⭡
43.06676835

TTF file contents: a brief description

Each TTF file mentioned here contains all characters available in the display of its related calculator model, and some of them actually have interesting features. In order to maintain a standard coding, all main characters kept their related ASCII code in all fonts, like 0 to 9 digits and alpha characters in calculators with ALPHA capability. Many arrangements were tested for non-standard and specific characters found in some new models prior to set their current positions in fonts where they appear. The final arrangement was the best author's choice, but it does not mean they are the definitive choices. If needed or proven better, improved versions for these fonts may be released later. And, of course, any effects allowed to TTF characters (like colouring) apply to these TTF characters as well.

One important remark related to dots and commas as radix marks and/or digit grouping (thousands separators) must be made. In some calculator models, either dot or comma occupies the space between two digits and requires no additional space when typed in. In other models this may happen conversely. Using an interesting feature related to TTF coding, it is possible to generate 'zero size' characters, meaning a character may be placed at the right or left of the current cursor position while the cursor itself is not shifted right as expected when the character is typed in. This feature takes place with extraordinary advantage in some LCD character set, like the ones for the HP41, Voyagers, the HP10BII itself and other models. In other cases, like the LED display for the Classic models or the LCD character set for the HP42S and the HP48/49, either a dot or a comma occupies the space equivalent to a whole digit. Dots and commas in all TTF files shown here are positioned the same way they are in actual calculators.

KeySet 4 TTF

KeySet 4 TTF allows virtually any key-like character to be created in an easy way: surround any valid character sequence with parenthesis and set the sequence as KeySet 4. In some particular cases, like ⌨1/x or ⌨x² and others, the whole key is available with a single character and there is no need for parenthesis. As a typing aid, space bar generates a regular blank space to separate two key sequences, and a special 'key space' is available through ` character (ASCII code: 96). If you want to add ⌨5 ⌨ENTER ⌨3 to your main text, simply type in `(5) (ENTER) (3)` and set the whole text, all parenthesis and blank spaces included, as KeySet 4. If you want to add a hypothetical ⌨0 1 to your text, type in `(0`1)` and follow the same procedure above.

Some characters available with KeySet 4:

Some of what can be done with KeySet 4:

Dot Matrix TTF

There are four different TTF files related to dot-matrix characters suitable for most RPL models, like the HP28C/S and any HP48/49 series calculators, and all of them follow the HP48/49 internal character coding. Either HP DotMatrix 2 or HP DotMatrix 3 TTF files

have characters with the same dot resolution, although HP DotMatrix 2 uses 5×7 characters (regular) and HP DotMatrix 3 uses 7×7 characters (large). Both HP DotMatrix 1 and HP DotMatrix 1 Menu TTF files mainly represent a minifont, with dot resolution different of the one used with HP DotMatrix 2 and HP DotMatrix 3 in order to enhance main-text resolution.

One interesting feature available with HP DotMatrix 1 Menu TTF is the ability to add the menu identifier, i.e., a four-dot, 'zero-size' row (ASCII code: 179) over any existing character at the left of the cursor position. One of the following samples shows this feature.

Samples

HP30S and HP33S

These two calculators allow ALPHA characters to be shown in the display as a dot-matrix arrangement and both have a particular character set not based on the ones found in the RPL models. Also, the HP30S display has italic-style dot-matrix characters and an additional 7-segment area. Hence, three specific TTF files were created to represent both of them.

One interesting feature available with both HP30S CharSet and 3 HP33S TTF is the ability of adding a 'zero size' underscore (HP30S CharSet 3: ASCII code 196; HP33S: underscore character) to the character at the left of the current cursor position. This feature applies to any existing character, but the ones suitable to accept the underscore are the 'top positioned' ones, also available. Another feature related to the HP33S TTF: a whole-digit dot is added with colon and a whole digit comma is added with semicolon (as can be seen in the HP33S User's Manual) while 'zero size' dot and comma are added with their respective characters.

Samples

HP30S

HP33S

Remaining TTF files

The table below summarises all TTF files created by the author with the purpose of help building documents related to calculators, mainly HP models.

Font name	Main purpose	Sample
HP82143A CharSet 4	HP82143A hardcopy characters	ABCDabcd0123∡ᵣ‡θ
HP82240 ECMA94 CharSet	HP82240B hardcopy characters [1]	ABCDabcd0123→←↓↑ ABCDabcd0123→←µʰ

Font name	Main purpose	Sample
HP82240 ROMAN8 CharSet		
HP Classic LED set	LED display characters[2]	*1.23 Error 1.23*
HP DotMatrix 1 HP DotMatrix 1 Menu HP DotMatrix 2 HP DotMatrix 3	Dot matrix characters	ABCDabcd0123→←↓↑∠∑∇√≦ ABCabc0123→←↓↑∠∑∇√≦ ABCabc0123→←↓↑∠∑∇√≦
HP Platinum LCD[3] HP Voyager Character Set	HP12C Platinum and any Voyager series calculator (HP10C to HP16C)	1,234.56 Error 0 1,234.56 Error 0
HP10BII CharSet 1 HP10BII Keyset 2	HP10BII display characters and keystroke icons	1,234.56 600d ON OFF NPV ▬ 0 1 STO =
HP30S HP30S_7	HP30S display characters	1,234.56 1,2,3 SYN 123456 1u2/3 Error
HP33S CharSet 3	HP33S display characters	1,234.56 00001 LBL A
HP41 Character Set[4] HP41 Character Set Xtended	HP41 display standard characters and extended character set	12345 Ø1TLBL A ⊦≯∡abcde⌐ghiↄ
HP42SCharSet 3	HP42S display characters	1.2345 ABCabc 01▶LBL A
HP71B	HP71B display characters	1,234.56 10 INPUT A
HP9S[5]	HP9S display characters	123456 dAtA
KeySet 4	general-purpose 'key builder'	{} ◀ ∂ ⤶ ⤷ ALPHA

[1] Each of these two fonts represent the HP82240B hardcopy, but they have a different mapping for characters with codes from 127_d to 255_d.

[2] This TTF is actually a general-purpose character set for LED display with 'zero-size' dot and comma, but it also has a whole-digit dot (semicolon), so the Classic was added to its name.
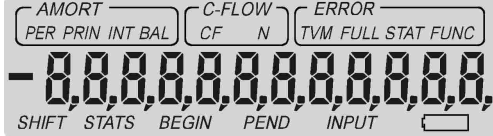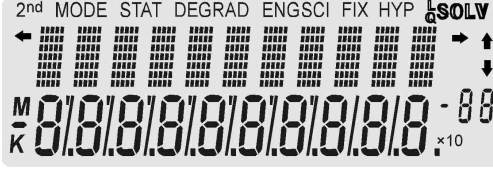
[3] Each of these fonts have a different mapping for lower-case ALPHA characters. Also, the Platinum set allows random character assembly: a, b, c, d, e, f and g draw 'zero size' segments at the right of the cursor position.

[4] The two HP41 character set were kept as separated files for compatibility with existing data related to standard HP41 character set.

[5] The HP9S TTF has a, b, c, d, e, f and g 'zero size' segments at the left of the cursor to build random characters

Display templates

The following display templates are available for building any random display related to their respective calculator models. They were drawn with CorelDRAW!® over bitmapped images obtained from the original calculator displays and are saved in CDR® format. It is necessary to install Arial® TTF file (annunciators) and the specific TTF files corresponding to the calculator characters used in the template. Except for the Arial® TTF file, all necessary fonts to compose the templates are available for download from the HPCC site.

Model	Complete template	Sample
Any Voyager (HP10C to HP16C)	− 8,8,8,8,8,8,8,8,8,8, * USER f g BEGIN GRAD D.MY C PRGM	− 1 2 3,4 5 6.7 - 1 2 g BEGIN D.MY C
HP12Cp	− 8,8,8,8,8,8,8,8,8,8, RPN ALG USER f g BEGIN D.MY C PRGM	− 1 2 3,4 5 6.7 - 1 2 ALG g BEGIN D.MY C
HP10BII	AMORT / C-FLOW / ERROR PER PRIN INT BAL / CF N / TVM FULL STAT FUNC −8,8,8,8,8,8,8,8,8,8,8,8, SHIFT STATS BEGIN PEND INPUT	AMORT INT − 13,894.66
HP30S	2nd MODE STAT DEGRAD ENGSCI FIX HYP LSOLV ←⊞⊞⊞⊞⊞⊞⊞⊞⊞→↑ M 8.8.8.8.8.8.8.8.8.8.8 - 88 K ×10	DEG 30*(2+5 ↑ 2 10.
HP9S	2ndF DEGRAD ( ) BIN OCT HEX ED HYP CPLX STAT σ M 0000000000 - 88 E 0000000000, CPK USL LSL	2ndF RAD CPLX M 3.141592654

Brief comments about zero-length characters

While trying to create a character that would not cause the cursor to move forward, i.e., a character that would be placed where the cursor was without moving it, I came up with a zero-length character. The main application was to add a dot or a comma in a display with LCD or LED-based characters so the dot or comma would be inserted into two characters without creating an extra gap between them.

Fact is that such feature has also proved handy in other circumstances, like creating characters with more than one color, I mean, creating a set of characters with different colors occupying the same place. Consider the following example:

- **Key in the sequence   abcdefghijklmno** (leave some extra space characters in the left)
- **Now give each character a different color, like   abcdefghijklmno**
- **Now select the hole set in order to choose a different font: abcdefghijklmno**
- **Now change the current font to "14seg display builder" and you'll get this:**


(The "black mask" was added only for better viewing purposes)

This is because in the 14seg display builder font, the first 15 lower-case letters add the corresponding 14 segments plus the dot as zero-length characters, so they will occupy the same place but will retain their relative positions. This way, all sorts of characters can be previously simulated with the TTF and then reproduced in the physical display with the correct set of commands sent to the controller:

 | adgi | bcefjm | bcefhkln

14-segment builder segment map

According to some manufacturer data sheets, the following segment map, with the corresponding segment names, was used as a reference:
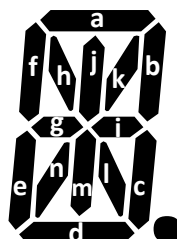
How to compose menu references

The **HP DotMatrix 1 Menu** true-type font (from now on, simply Menu font) was developed having documents written for HP calculators in mind. This font allows the user to add references to menu labels found in many HP calculators, such as HP17B/BII, HP18C, HP19B/BII, HP28C/S, HP27S, HP42S, HP48 and HP49 Series and others. As with any TTF file, the Menu font must be installed, and installation procedures are not covered here. Please, refer to the documentation of the operating system you are using in your computer for further details.

Special Characters

There are four special-purpose characters that are coded according to the following table:

Code	Character	Arial character	Comments
179	▬	³	backwards four-dot row used to identify directories
192	▌	Ù	single column (size adjustment)
193	▌▌	Ú	two columns (size adjustment)
194	▓	Û	four columns (size adjustment)

Inserting Regular Characters

You may add any character found in Menu font by using one of the two ways described above.

1. Converting text already typed in – select the existing text (example: ÙPOFFÚ) and change the font type to **HP DotMatrix 1 Menu** (example: ▐POFF▌)

2. Adding new characters – use Insert, Symbol, choose **HP DotMatrix 1 Menu** font name and pick the symbols you want to add.

You can use both methods to create one single sequence.

Adding directory identifier (bar)

Let's take the previous label (▐POFF▌) as an example. Position the text cursor at the right of the character that will be added the directory bar (example: ▐). If you are using any text processor that accepts ASCII input, insert ASCII 179 (if using Windows Word, press [ALT] 0179 while using the number keypad; this sequence adds character code 179). The menu label now should look: ▐POFF▌. If you type in **ÙPO³FFÚ**, select it and choose **HP DotMatrix** 1 Menu as the new font instead. It works the same.

Samples: ▐REG▌ ▐IF▌ ▐TIME▌ ▐END▌ ▐MINE▌ ▐CD▌

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These fonts are dedicated to all HP users, specially the MoHPC contributors, who inspired me to create many of them.

[These fonts and further "How To" files that explain how to use the characters are available to download from <www.hpcc.org>. Ed.]