



# **Application Note**

## **AN\_277**

# **FT800\_Create\_User-Defined\_Font**

**Version 1.0**

**Issue Date: 2013-11-25**

This application note describes how to add user-defined fonts into FT800's internal font table.

Use of FTDI devices in life support and/or safety applications is entirely at the user's risk, and the user agrees to defend, indemnify and hold FTDI harmless from any and all damages, claims, suits or expense resulting from such use.

**Future Technology Devices International Limited (FTDI)**

Unit 1, 2 Seaward Place, Glasgow G41 1HH, United Kingdom

Tel.: +44 (0) 141 429 2777 Fax: + 44 (0) 141 429 2758

Web Site: <http://ftdichip.com>

Copyright © 2013 Future Technology Devices International Limited

## **Table of Contents**

1	Introduction .....	2
1.1	Scope .....	2
1.2	Software Required .....	2
1.3	Hardware Required .....	2
1.4	Limitation of Fnt_cvt.exe .....	2
2	Introduce of Font converter utility .....	3
2.1	Output file introduction .....	3
2.2	Command introduction .....	3
3	Operation flow of font conversion.....	5
3.1	Make a source text file .....	5
3.2	Convert font by fnt_cvt.exe.....	7
4	Example Code.....	9
5	Conclusion.....	11
6	Contact Information.....	12
Appendix A – References .....		13
Document References.....		13
Acronyms and Abbreviations .....		13
Appendix B – List of Tables & Figures .....		14
List of Tables .....		14
List of Figures .....		14
Appendix C – Revision History .....		15

## 1 Introduction

This application note describes how to create and add user-defined fonts into FT800's internal font table for displaying on a screen connected to the FT800.

### 1.1 Scope

This document shows how to generate raw data from a user-defined font with FTDI's font converter utility [fnt\\_cvt](#) on a Windows PC, and shows how to add the raw data to the font table of the FT800. Example code will be added to explain how to output the user-defined characters on a display.

### 1.2 Software Required

- Visual Studio Express 2010 C++, which it can be downloaded from Microsoft's website. <http://www.microsoft.com/visualstudio/cht/downloads#d-2010-express>
- Fnt\_cvt.exe, which is the EVE's font converter utility provided by FTDI. It can be downloaded from following link. [http://www.ftdichip.com/Support/Utilities/EVE/fnt\\_cvt\\_0.3.1.zip](http://www.ftdichip.com/Support/Utilities/EVE/fnt_cvt_0.3.1.zip).
- FTDI D2XX driver, which can be downloaded from FTDI's website. <http://www.ftdichip.com/Drivers/D2XX.htm>

### 1.3 Hardware Required

- PC with Windows OS installed
- FT800 development module with LCD panel; VM800B or VM800C
- FTDI's MPSSE cable; C232HM-DDHSL-0

### 1.4 Limitation of Fnt\_cvt.exe

- Only True-type-font is supported
- Bitmap handle 0 to 14 are reserved for user-defined fonts
- Bitmap handle 15 is reserved for co-processor commands
- A maximum of 127 characters can be saved in a font table, index 0 is reserved.
- A source text file must be saved in UTF-8 format.

## 2 Introducing the Font converter utility

Fnt\_cvt.exe is the utility which runs on Windows and extracts characters from the font file into a specified point size, FT800 metric block, and raw bitmap data. The characters to be converted must be specified in UTF-8 encoding file or ASCII printable code set from 32 to 126.

### 2.1 Output file introduction

The EVE font conversion utility will generate the metric block file as well as L1, L4, L8 format bitmap data. The output is a 148byte metric block appended with the variable size raw bitmap data.

The output data of this utility is prepared for 1 bitmap handle of the FT800.

The EVE font conversion utility will generate three files as following in each of the L1, L4 and L8 folders.

- \*.raw: The binary format of converted file, which can be downloaded into FT800 graphics memory directly with the BITMAPS command.
- \*.rawh: The header file of the converted file, which is in text representation. The programmer can include this file into their program and build it into the final binary.
- \*.rtf: The file defining the character and index mapping relationship.

Following table shows the format of font metric block

Address	Size	Value
p + 0	128	width of each font character, in pixels
p + 128	4	font bitmap format, for example L1, L4 or L8
p + 132	4	font line stride, in bytes
p + 136	4	font width, in pixels
p + 140	4	font height, in pixels
p + 144	4	pointer to font graphic data in memory

**Table 2.1 Format of font metric block**

### 2.2 Command introduction

The command format of the conversion utility is :

```
fnt_cvt.exe -i TrueTypeFontFile -s pointsize [-u utf8_file][[-a] [-d FT800_address]]
```

#### Arguments list:

'-i' : Mandatory argument. The input file shall be true type font file(\*.ttf,\*.ttc) located in the same folder as the utility, otherwise fnt\_cvt.exe will search the windows system font directory for the font file.

'-s' : Optional argument. The width in pixels of font characters to be converted. If this argument is not present, the size is assumed to be 12.

'-u' : Mandatory argument if the input file is encoding in UTF-8. The utf8\_file specifies the file name. Fnt\_cvt.exe will read this file and convert the characters in this file. Users can copy the characters to be converted into this file and ensure the file encoded with UTF-8. The numbers of characters shall be no more than 127.

'-a': Mandatory argument if users want to convert the ASCII printable character set, i.e. from 32 to 126. There is no input file required.

'-d': Optional argument. This argument defines the start address of metric block in FT800 in RAM\_G. If it is not present, fnt\_cvt.exe will assume RAM\_G is the starting address. Because the bitmap raw data is following the metric block, the raw bitmap data address is starting from FT800\_address + 148.

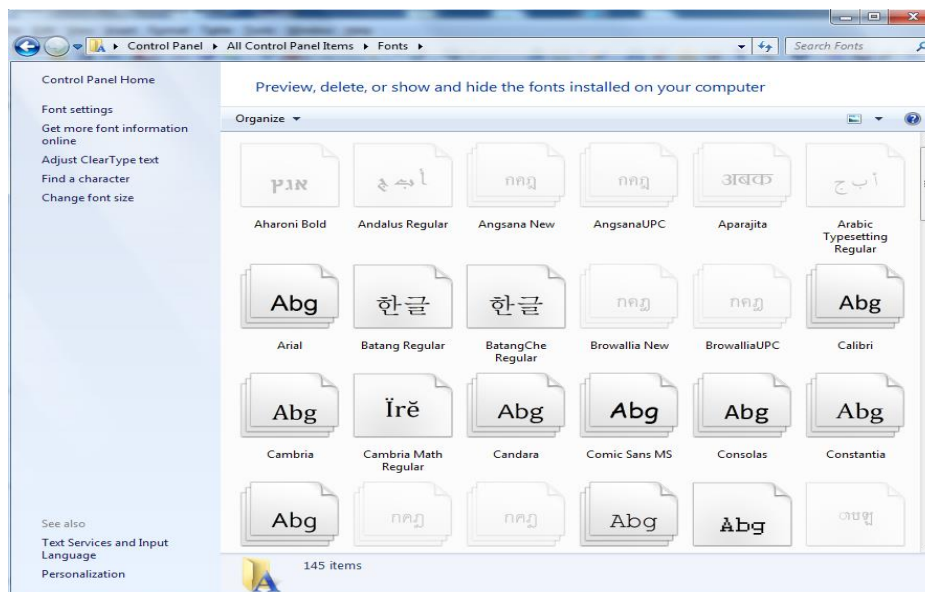
### 3 Operation flow of font conversion

The operation steps are shown in this chapter, Windows 7 is used for this example.

#### 3.1 Make a source text file

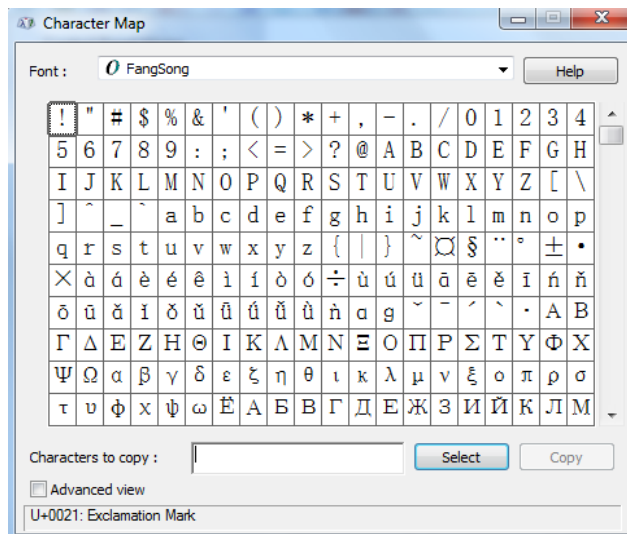
To make a source text file, it is not enough to simply key in characters in a text editor. The font type should be selected from the font table to make sure those characters show on the LCD as expected.

- a. Select Control Panel -> All Control Panel items -> Fonts window in PC, and all the fonts installed are showed in the window.



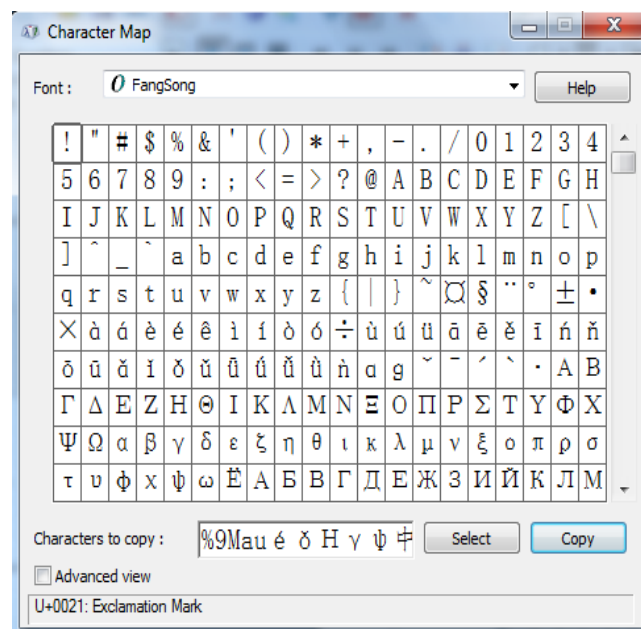
**Figure 3-1 Font window**

- b. Click "Find a character" in left menu to pop up the Character Map window.
- c. Select a Chinese font from its drop down box. Here the FangSong font is selected as an example for Chinese font display.



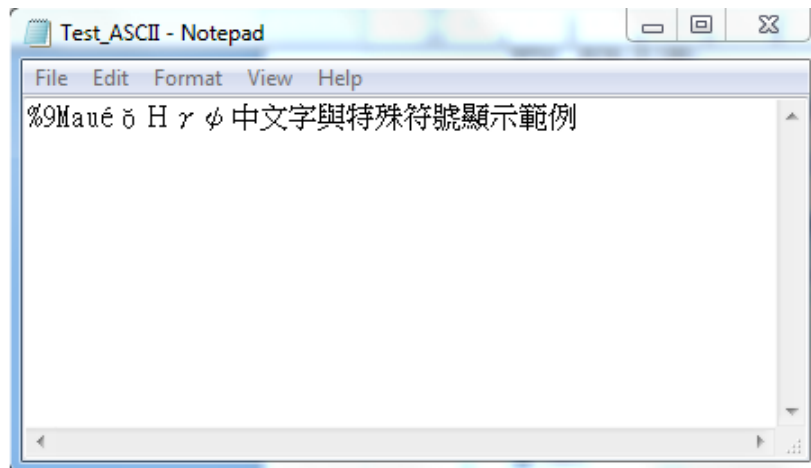
**Figure 3-2 Character Map**

- d. Select characters in this window. Here the standard and extended ASCII characters, and some Chinese characters are selected as an example.
- e. Select character "%" and click button "Select", and repeat this action for the next couple characters, or type the characters in the input column directly. The whole string in this example is "%9Mauéø Hyψ 中文字與特殊符號顯示範例".



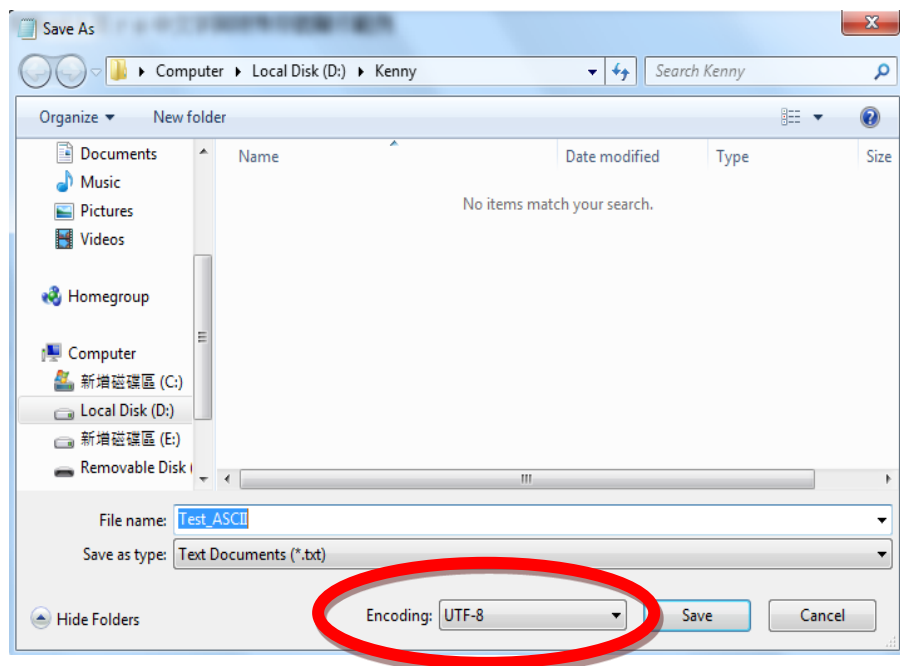
**Figure 3-3 Character Map**

- f. Click "Copy" button to finish it.
- g. Execute text editor NotePad, and paste those characters into it.



**Figure 3-4 Text editor Notepad**

- h. Click File -> Save to save it as a txt file, and select encoding as UTF-8. Test\_ASCII.txt is the name of this example text file.



**Figure 3-5 Window of Save text file**

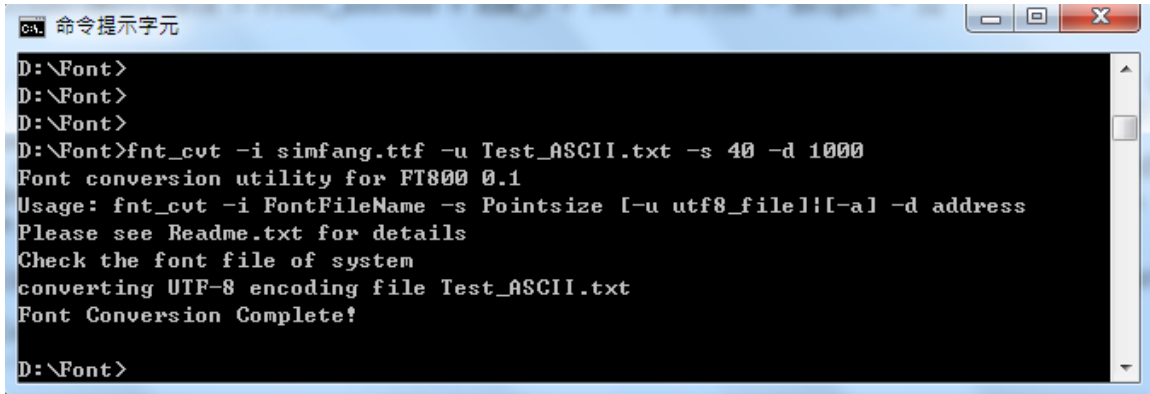
## 3.2 Convert font by fnt\_cvt.exe

The text file should be converted into a raw or rawh file for loading into the RAM font table of the FT800 for display. The operation flow is shown in this chapter.

- Execute cmd.exe to enter DOS command window
- Enter the folder which contain EVE's font utility, it is D:\Font> in this example.
- Type command `fnt_cvt -i simfang.ttf -u Test_ASCII.txt -s 40 -d 1000`



The usage of parameters for this command can be found in chapter 2.2. simfang.ttf is the file name of font Fangsong, pixel size 40 and the start address of font is 1000 in this example.



```

D:\Font>
D:\Font>
D:\Font>
D:\Font>fnt_cvt -i simfang.ttf -u Test_ASCII.txt -s 40 -d 1000
Font conversion utility for FT800 0.1
Usage: fnt_cvt -i FontFileName -s Pointsize [-u utf8_file][[-a] -d address
Please see Readme.txt for details
Check the font file of system
converting UTF-8 encoding file Test_ASCII.txt
Font Conversion Complete!
D:\Font>
  
```

**Figure 3-6 Execute fnt\_cvt command**

- d. If successful, a folder named "simfang\_Test\_ASCII.txt40" is created, and there are 3 sub folders L1, L4 and L8 inside it which contain 3 kinds of raw bitmap data. Those raw format files are now ready for use with the FT800.

## 4 Example Code

- a. Copy data from rawh file and paste into buffer

[illegible]

- b. Copy raw data of custom font from rawh file and paste to following buffer

[illegible]

**c. Create sample code to show custom font**

```
ft_void_t SAMAPP_ShowCustomFont()
{
    ft_prog_uchar8_t *special;
    unsigned char i=0;
    //load font data into memory
    Ft_Gpu_Hal_WrMemFromFlash(phost, RAM_G + 1000, SAMApp_ShowCustomFont_MetricBlock, 148);
    Ft_Gpu_Hal_WrMemFromFlash(phost, RAM_G + 1000 + 148, SAMApp_ShowCustomFont_FontBmpData,
36432);
    //start command
    Ft_Gpu_CoCmd_Dlstart(phost);
    //set the background to white color
    Ft_App_WrCoCmd_Buffer(phost,CLEAR_COLOR_RGB(255,255,255));
    Ft_App_WrCoCmd_Buffer(phost,CLEAR(1,1,1));

    Ft_App_WrCoCmd_Buffer(phost,BEGIN(BITMAPS));
    Ft_App_WrCoCmd_Buffer(phost,COLOR_RGB(255,0,0));//configure text as red color
    Ft_App_WrCoCmd_Buffer(phost,BITMAP_HANDLE(6));//assign bitmap handle 6 as custom font
table
    //parameter value of below commands can be found in SAMApp_ShowCustomFont_MetricBlock[]
    Ft_App_WrCoCmd_Buffer(phost,BITMAP_SOURCE(-508));
    Ft_App_WrCoCmd_Buffer(phost,BITMAP_LAYOUT(L8,36,46));
    Ft_App_WrCoCmd_Buffer(phost,BITMAP_SIZE(NEAREST,BORDER,BORDER,36,46));
    Ft_Gpu_CoCmd_SetFont(phost, 6, RAM_G +1000);
    //put custome fonts to the expect X,Y coordinate
    //we show those fonts in two rows
    for(i=1;i<=10;i++)
    {
        //show font 1~10 in low 1
        Ft_App_WrCoCmd_Buffer(phost,VERTEX2II(i*36,20,6,i));
        //show font 11~20 in low 2
        Ft_App_WrCoCmd_Buffer(phost,VERTEX2II(i*36,56,6,i+10));
    }

    Ft_App_WrCoCmd_Buffer(phost,END());

    Ft_App_WrCoCmd_Buffer(phost,DISPLAY());
    Ft_Gpu_CoCmd_Swap(phost);

    /* Download the commands into fifo */
    Ft_App_Flush_Co_Buffer(phost);

    /* Wait till coprocessor completes the operation */
    Ft_Gpu_Hal_WaitCmdfifo_empty(phost);
}
```

## 5 Conclusion

The test result of the above sample code is shown in the following figure. It is now possible to add and utilize these characters in a display, which could be needed for applications in specific regions or markets.



**Figure 5-1 Test result of sample code**

## 6 Contact Information

### Head Office – Glasgow, UK

Future Technology Devices International Limited  
Unit 1, 2 Seaward Place, Centurion Business Park  
Glasgow G41 1HH  
United Kingdom  
Tel: +44 (0) 141 429 2777  
Fax: +44 (0) 141 429 2758

E-mail (Sales) [sales1@ftdichip.com](mailto:sales1@ftdichip.com)  
E-mail (Support) [support1@ftdichip.com](mailto:support1@ftdichip.com)  
E-mail (General Enquiries) [admin1@ftdichip.com](mailto:admin1@ftdichip.com)

### Branch Office – Tigard, Oregon, USA

Future Technology Devices International Limited  
(USA)  
7130 SW Fir Loop  
Tigard, OR 97223-8160  
USA  
Tel: +1 (503) 547 0988  
Fax: +1 (503) 547 0987

E-Mail (Sales) [us.sales@ftdichip.com](mailto:us.sales@ftdichip.com)  
E-Mail (Support) [us.support@ftdichip.com](mailto:us.support@ftdichip.com)  
E-Mail (General Enquiries) [us.admin@ftdichip.com](mailto:us.admin@ftdichip.com)

### Branch Office – Taipei, Taiwan

Future Technology Devices International Limited  
(Taiwan)  
2F, No. 516, Sec. 1, NeiHu Road  
Taipei 114  
Taiwan, R.O.C.  
Tel: +886 (0) 2 8791 3570  
Fax: +886 (0) 2 8791 3576

E-mail (Sales) [tw.sales1@ftdichip.com](mailto:tw.sales1@ftdichip.com)  
E-mail (Support) [tw.support1@ftdichip.com](mailto:tw.support1@ftdichip.com)  
E-mail (General Enquiries) [tw.admin1@ftdichip.com](mailto:tw.admin1@ftdichip.com)

### Branch Office – Shanghai, China

Future Technology Devices International Limited  
(China)  
Room 1103, No. 666 West Huaihai Road,  
Shanghai, 200052  
China  
Tel: +86 21 62351596  
Fax: +86 21 62351595

E-mail (Sales) [cn.sales@ftdichip.com](mailto:cn.sales@ftdichip.com)  
E-mail (Support) [cn.support@ftdichip.com](mailto:cn.support@ftdichip.com)  
E-mail (General Enquiries) [cn.admin@ftdichip.com](mailto:cn.admin@ftdichip.com)

### Web Site

<http://ftdichip.com>

System and equipment manufacturers and designers are responsible to ensure that their systems, and any Future Technology Devices International Ltd (FTDI) devices incorporated in their systems, meet all applicable safety, regulatory and system-level performance requirements. All application-related information in this document (including application descriptions, suggested FTDI devices and other materials) is provided for reference only. While FTDI has taken care to assure it is accurate, this information is subject to customer confirmation, and FTDI disclaims all liability for system designs and for any applications assistance provided by FTDI. Use of FTDI devices in life support and/or safety applications is entirely at the user's risk, and the user agrees to defend, indemnify and hold harmless FTDI from any and all damages, claims, suits or expense resulting from such use. This document is subject to change without notice. No freedom to use patents or other intellectual property rights is implied by the publication of this document. Neither the whole nor any part of the information contained in, or the product described in this document, may be adapted or reproduced in any material or electronic form without the prior written consent of the copyright holder. Future Technology Devices International Ltd, Unit 1, 2 Seaward Place, Centurion Business Park, Glasgow G41 1HH, United Kingdom. Scotland Registered Company Number: SC136640

## Appendix A – References

### Document References

N/A

### Acronyms and Abbreviations

Terms	Description
EVE	Embedded Video Engine, FT800 is the first chip of EVE family
LCD	Liquid-Crystal Display, is one kind of display devices
USB	Universal Serial Bus, is the most popular IO interface of electric device

## **Appendix B – List of Tables & Figures**

### **List of Tables**

Table 2.1 Format of font metric block .....	3
---	---

### **List of Figures**

Figure 3-1 Font window .....	5
Figure 3-2 Character Map.....	6
Figure 3-3 Character Map.....	6
Figure 3-4 Text editor Notepad .....	7
Figure 3-5 Window of Save text file.....	7
Figure 3-6 Execute fnt_cvt command .....	8
Figure 5-1 Test result of sample code .....	11

## Appendix C – Revision History

Document Title: AN\_277 FT800\_Create\_User-defined\_Font  
Document Reference No.: FT\_000937  
Clearance No.: FTDI# 368  
Product Page: <http://www.ftdichip.com/FTProducts.htm>  
Document Feedback: [Send Feedback](#)

Revision	Changes	Date
1.0	Initial Release	2013-11-25



