CASTLES TECHNOLOGY

VEGA3000 EFT-POS

Book 2

User Manual

Confidential

Version1.0

Jan 2015

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Revision History

Version	*Date*	*Descriptions*
1.0	May 27, 2014	Initial creation.
1.1	Jan 14, 2015	Add FCC Warning

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1. Introduction

This document provides a guideline on operating and configuringCastles VEGA3000 terminal.

The scope of this document includesetting up the terminal, basic operation, application life cycle, and some advance features.

1.1. Type of Terminal

VEGA3000 terminal is portable type can be battery operated.

Portable type is designed as two pieces of hardware, handset and base unit. Handset unit features major components, and also optional contactless reader, WiFi, GRPS modem. Wired connection like power, modem, Ethernet, USB or serial ports, are be located in base unit. There are additional power connection and USB port on handset unit, allow the handset unit can be operated alone.

Handset

Front View

Rear View

Base

Front View

Rear View

Side View

To start up the terminal needs to press “Power Button” key after the adapter connected.

2. Hardware Setup

2.1. Parts of the Terminal

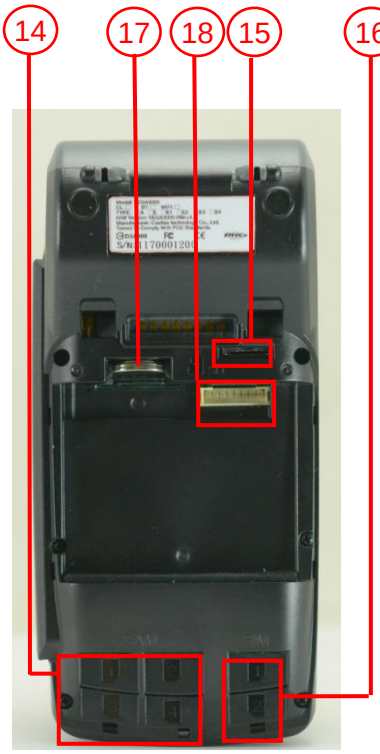
Front

VEGA3000

1. **LCD Display (Color TFT)**
2. **Privacy Shields**
3. **Keyboard**
4. **Cancel Key**
5. **Clear Key**
6. **Enter Key**
7. **Magnetic Stripe Reader**
8. **Smart Card Reader**
9. **Contactless Card Landing Zone**
10. **Paper Roll Handle**

Rear

VEGA3000



VEGA3000

VEGA3000 Rechargeable Battery

11. RechargeableBattery Cover
12. Battery Cover Lock
13. Base Connector
14. SAM Slots
15. Micro SD Card Slot
16. GSM SIM Card Slots
17. RTC Battery
18. Battery Connector

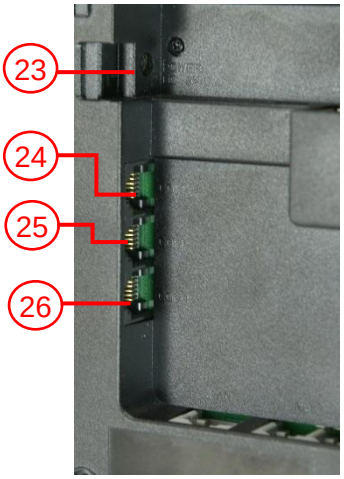
Side

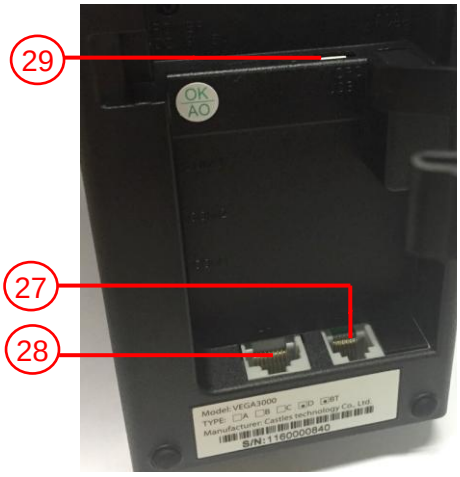
VEGA3000 Portable

19. Power Connector

20. USB Port

Base (Portable)





21. Base Connector

22. Base LED

23. Power Connector

24. Com port 3

25. Com port 2

26. Com port 1

27. Modem - Line Port

28. Ethernet Port

29. Micro USB Port

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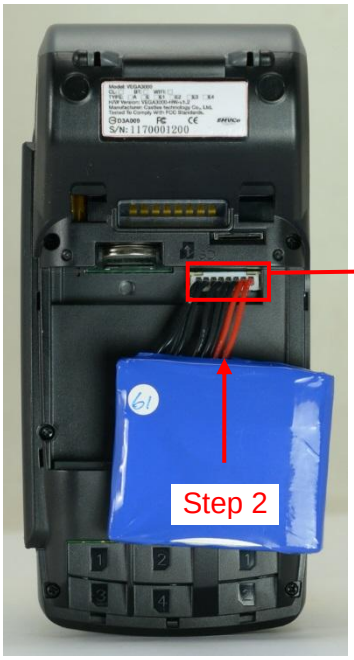
2.2. Inserting the Battery



Step 1: Remove battery cover

Step 2: Insert battery into compartment, battery contact point must align with batteryconnector.

2.3. Inserting the SAM Card

VEGA3000 Portable

Step 1: Remove battery cover / back cover

Step 2: Insert SAM card into desire slot.

SAM 1 & 2:

Gold contact at lower side of card and facing right.

SAM 3 & 4:

Gold contact at lower side of card and facing left.

2.4. Inserting the Paper Roll

Step 1: Pulluppaper roll box handle.

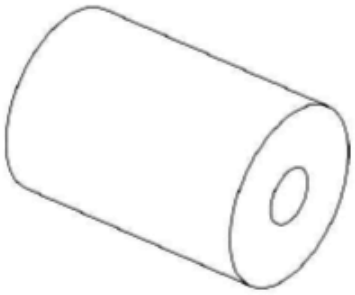
Step 2: Gentle open paper roll cover.

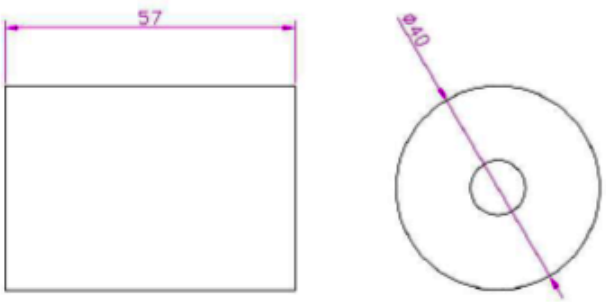
Step 3: Insert paper roll as direction showed.

Paper specification

Width: 57mm

Outside diameter: 40mm





2.5. Inserting the GSM SIM Card

VEGA3000 Portable

Step 1: Remove battery cover / back cover

Step 2: Open SIM socket and insert GSM SIM card into desire slot.

SIM 1 & 2:

Gold contact at upper side of card and facing down.

2.6. Inserting the Memory card

VEGA3000 Portable

Step 1: Remove battery cover / back cover

Step 2: Insert Micro SD memory card.

Micro SD :

Gold contact at lower side of card and facing right.

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2.7. Power Supply Specifications

I/P: 9Vdc, 4A

2.8. Operating Ambient Temperature

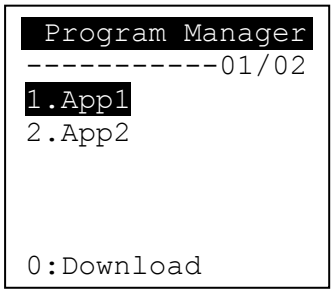
Range : 0° ~ 50°

3. Basic Operation

3.1. Program Manager

Upon power on, terminal will enter Program Manager if not default application selected. All user applications are list in Program Manager. User may select an application and run the application or view the application info, delete the application or set to default run upon power on. User may enter System Menu to configure terminal settings.

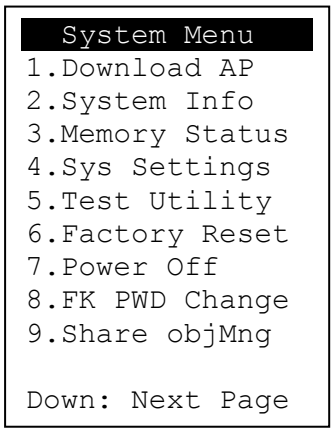
Program Manager



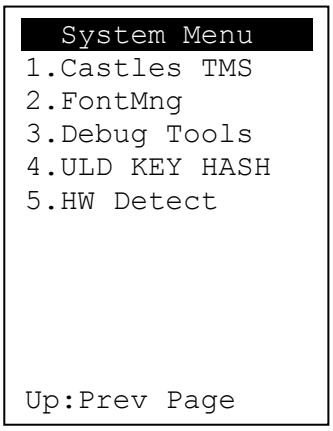
- Press[0] button to enter System Menu.
- Press [1] button to toggle default application selection.
- Press [2] button to delete application.
- Press [3] button to view application info.
- Press [OK] button to run application.
- Press [Power] or [·] buttonas up and down bottonto select application.

System Menu

Page 1



Page 2

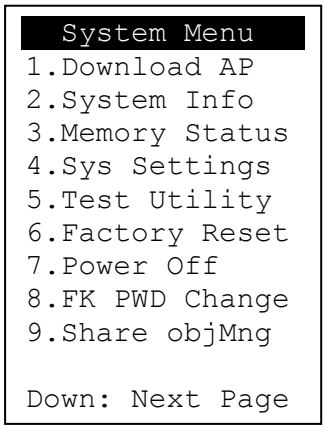


- Press [·] button to page 2.

3.2. Download AP

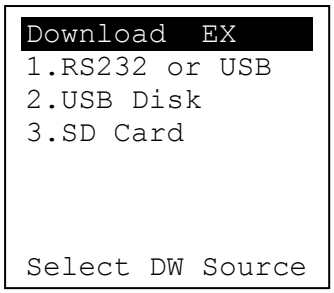
Download user application or kernel modules firmware.

System Menu



- Press [1] button to enter Download AP menu.

Download AP Menu



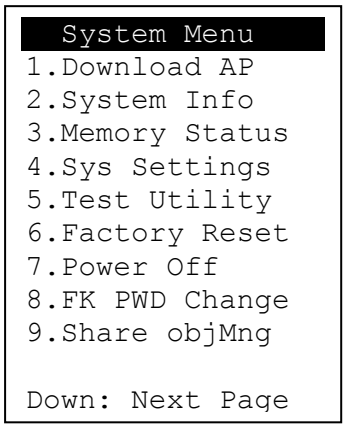
Select download source:

- Press [1] button to select source as RS232 or USB connection and enter ULD download mode.
- Press [2] button to select source as USB disk.
- Press [3] button to select source as SD card.

3.3. System Info

View kernel module firmware information.

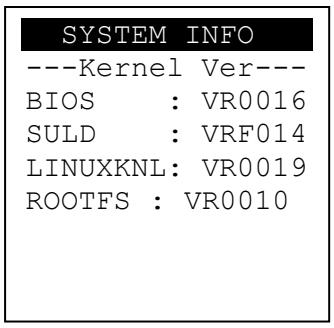
System Menu



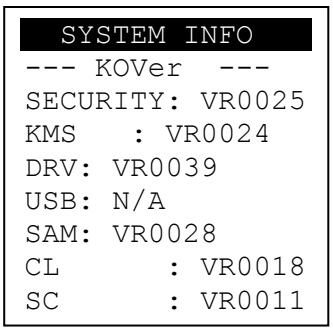
- Press [2] button to enter System Info menu.

System Info Menu

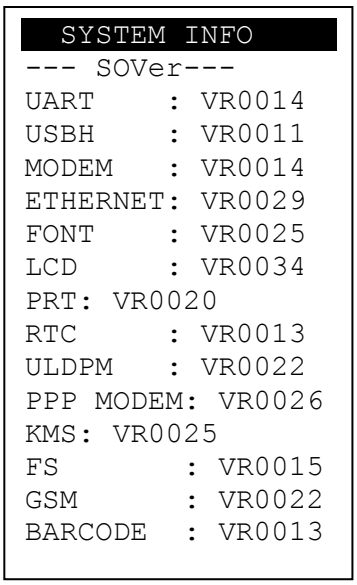
Page 1



Page 2

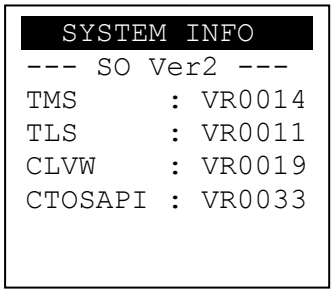


Page 3

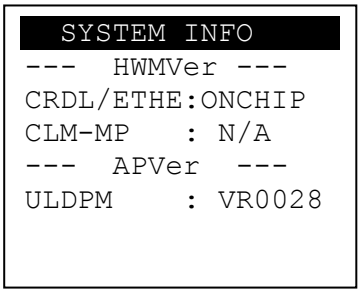


- Press [·] button to next page.

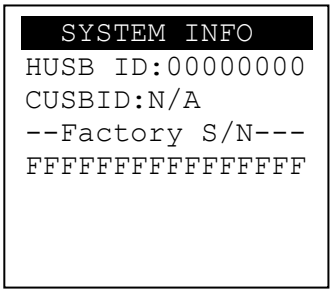
Page 4



Page 5



Page 6



Page 7

```
  SYSTEM INFO
-EXT SO Ver P.1 -
CRDLMDL  : VR0100
CACLENTRY: VR0100
CAMPP: VR0300
CAVPM    : VR0012
CAEMVL2  : VR0013
CAEMVL2AP: VR0004
```

3.4. Memory Status

View terminal flash memory and RAM information.

System Menu

```
  System Menu
1.Download AP
2.System Info
3.Memory Status
4.Sys Settings
5.Test Utility
6.Factory Reset
7.Power Off
8.FK PWD Change
9.Share objMng

Down: Next Page
```

- Press [3] button to enter Memory Status menu.

Memory Status Menu

```
 MEMORY STATUS
--FLASH Memory--
Total:   31616KB
Used :   22640KB

--SDRAM Memory--
Total:   31872KB
Used :   10908KB
```

3.5. System Settings

View or change terminal system settings.

Setting	***Descriptions***
Key Sound	Enable (Y) or disable (N) the beep sound when pressing any key.
Exec DFLT AP	Enable (Y) or disable (N) execution of default selected application.
USB CDC Mode	Enable (Y) or disable (N) USB CDC mode.
FunKey PWD	Enable (Y) or disable (N) password protection to access function key (0 ~ 3) in Program Manager.
PMEnter PWD	Enable (Y) or disable (N) password protection to enter Program Manager.
SET USB Host	Enable (Y) or disable (N) USB host mode.
Base USB CDC	Enable (Y) or disable (N) USB CDC mode in base unit. [Portable model only]
List SHR Lib	Enable (Y) or disable (N) to list all shared libraries in Program Manager.
Key MNG Mode	**<TBC>**
Bat Threshld	Battery charging threshold value. [Portable model only]
Null Cradle	Enable (Y) if base is null cradle. [Portable model only]
Debug Mode	Enable (Y) or disable (N) console debug mode.
Debug Port	Serial port for console debug.
Mobil AutoON	Enable (Y) or disable (N) to auto turn on GSM module after start up the terminal.
Bklit Auto Off	Enable (Y) or disable (N) Auto OffLCDBacklight
Bklit Off Time	Thresholdof Auto Off LCD Backlight
PWR KEY OFF	Enable (Y) or disable (N) Power key rebooting
GDB Mode	Enable (Y) or disable (N) GDB mode.
GDB Timeout	GDB connection timeout.
GDB Channel	GDB connection channel.
ETHER IP/PORT	GDB Ethernet connection setting.
RTC Time Zone	Set Time Zone of Real Time Clock.
NTP Enable	Enable (Y) or disable (N) Network Time Protocol.

NTP Update Freq	Frequency of Network Time Protocol updating.

System Menu

```
  System Menu
1.Download AP
2.System Info
3.Memory Status
4.Sys Settings
5.Test Utility
6.Factory Reset
7.Power Off
8.FK PWD Change
9.Share objMng

Down: Next Page
```

- Press [4] button to enter System Settings menu.

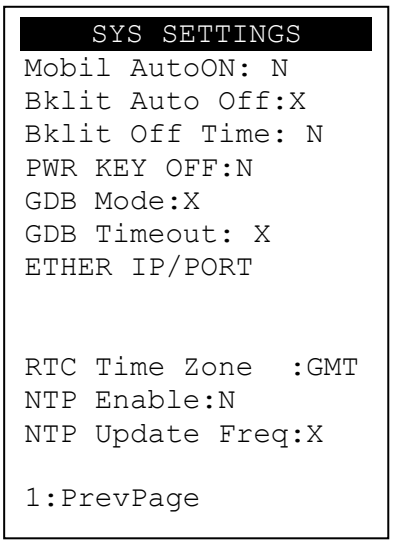
System Settings Menu

Page 1

```
  SYS SETTINGS
Key Sound   : Y
Exec DFLT AP: Y
 -AP Name
USB CDC Mode: Y
FunKeyPWD :N
PMEnterPWD:N
SET USB Host: N
Base USB CDC: X
List SHR Lib: N
Key MNG Mode: 0
Bat Threshld: X
Null Cradle : X
Debug Mode  :N
Debug Port  :X
2: Next Page
```

- Press [Power] or [·]button to select setting.
- Press [OK] button to change the setting value.
- Press [⇦] button to toggle Y ⇨ N ⇨ Y.
- Press [2] button to next page.

Page 2

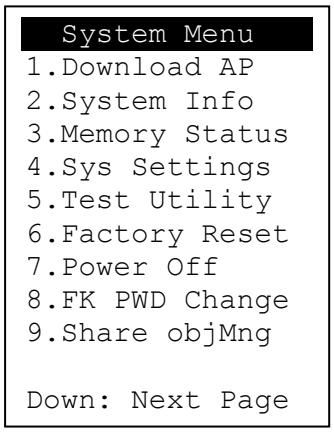


- Press [Power] or [·]button to select setting.
- Press [OK] button to change the setting value.
- Press [⇦] button to toggle Y ⇨ N ⇨ Y.
- Press [1] button to previous page.
- Press [2] button to next page.

3.6. Test Utility

Perform terminal hardware components diagnostic.

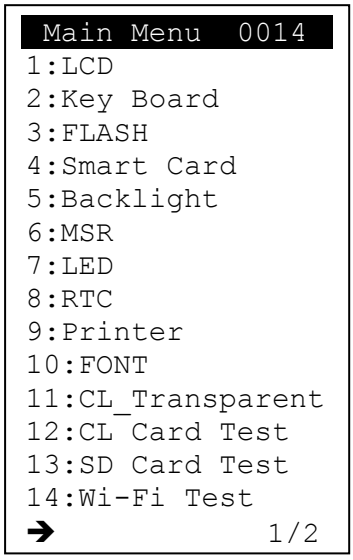
System Menu



- Press [5] button to enter Test Utility menu.

Test Utility Menu

Page 1

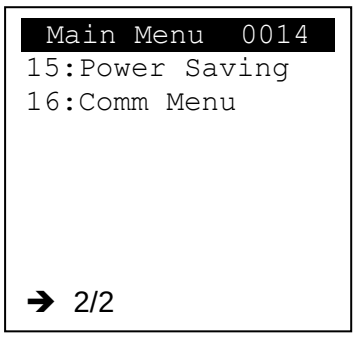


- Press [1] and [OK] button to diagnose LCD.
- Press [2] and [OK] button to diagnose keyboard.
- Press [3] and [OK] button to diagnose flash memory.
- Press [4] and [OK] button to diagnose smart card module.
- Press [5] and [OK] button to diagnose backlight.
- Press [6] and [OK] button to diagnose magnetic stripe reader.

- Press [7] and [OK] button to diagnose LED.
- Press [8] and [OK] button to diagnose real time clock.
- Press [9] and [OK] button to diagnose printer.
- Press [1], [0]and [OK] button to view font.
- Press [1], [1] and [OK] button to diagnose contactless reader in transparent mode.
- Press [1], [2]and [OK] button to diagnose contactless card.
- Press [1], [3] and [OK] button to diagnose SD memory card.
- Press [1], [4] and [OK] button to test Wi-Fi.
- Press [·] button to next page.

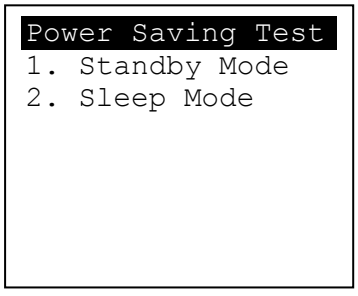
Note: Default password for changing RTC is 8418.

Page 2



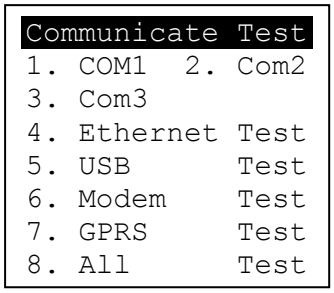
- Press [1], [5]and [OK]button to enter Power Saving Test Menu.
- Press [1], [6] and [OK] button to enter Communication Test Menu.
- Press [Power] button to previous page.
- Press [X] button to exit.

Power Saving Test Menu



- Press [1] button to Standby Mode.
- Press [2] button to Sleep Mode.

Communication Test Menu

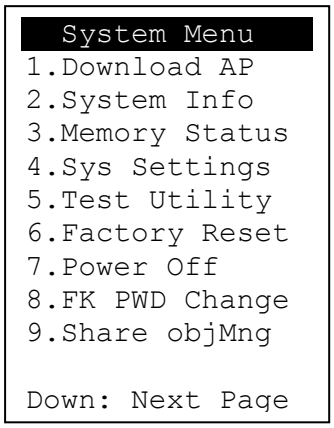


- Press [1] button to diagnose Com 1.
- Press [2] button to diagnose Com 2.
- Press [3] button to diagnose Com 3.
- Press [4] button to diagnose Ethernet module.
- Press [5] button to diagnose USB.
- Press [6] button to diagnose modem.
- Press [7] button to diagnose GPRS.
- Press [8] button to diagnose all, from item 1 to 7.

3.7. Factory Reset

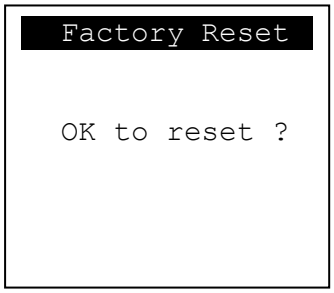
Perform factory reset, all user application, fonts and data will be deleted.

System Menu

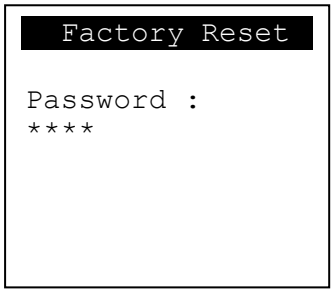


- Press [6] button to enter Factory Reset menu.

Factory Reset Menu



- Press [OK] button to perform factory reset.

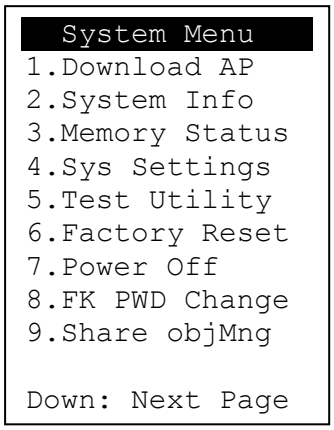


- Enter factory reset password.***Default password: 8418***

3.8. Power Off

Power off terminal.

System Menu

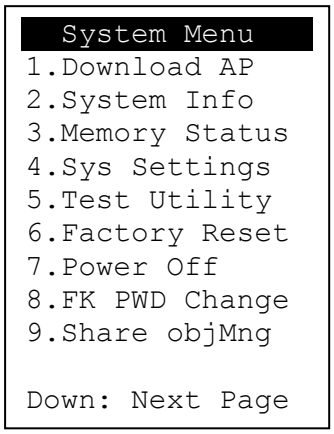


- Press [7] button to power off terminal.

3.9. Function Key Password Change

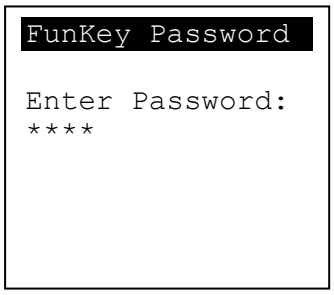
Change function key access password.

System Menu

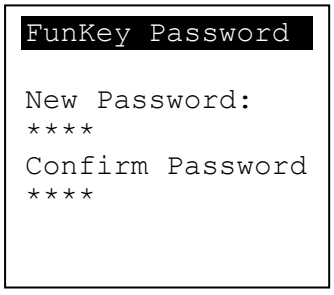


- Press [8] button to enter FunKey Password menu.

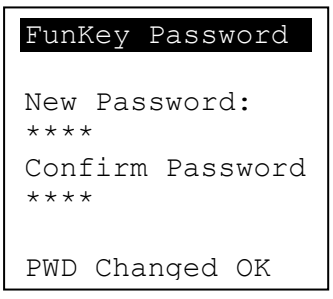
FunKey Password Menu



- Enter current password. ***(Default password is "0000")***



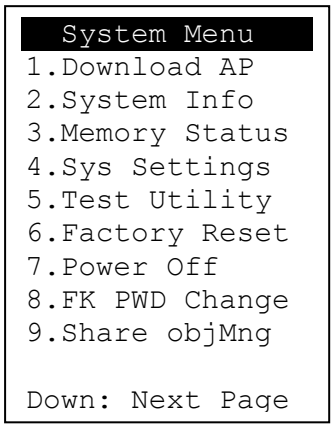
- Enter new password.
- Enter new password again to confirm.



3.10. Share Object Management

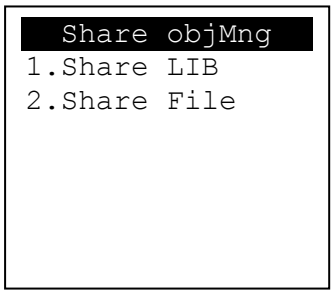
View share object in terminal.

System Menu



- Press [9] button to enter Share Object Management menu.

Share Object Management Menu

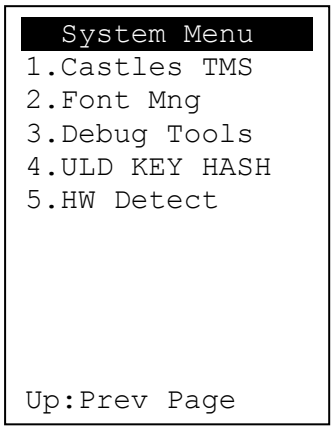


- Press [1] button to view shared library.
- Press [2] button to view shared file.

3.11. CastlesTMS

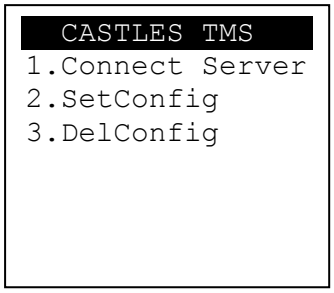
Connect to TMS (Terminal Management Software) server, set or delete TMS configuration.

System Menu (Page 2)



- Press [1] button to enter Castles TMS menu.

Castles TMS Menu

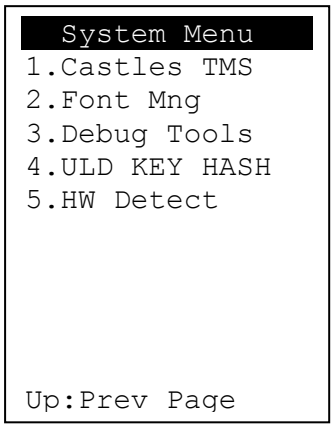


- Press [1] button to connect to TMS server.
- Press [2] button to set TMS configuration.
- Press [3] button to delete TMS configuration.

3.12.Font Mng

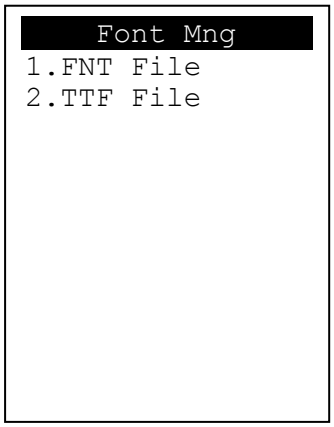
View Font Management.

System Menu (Page 2)



- Press [2] button to view Font Management.

FontManagment

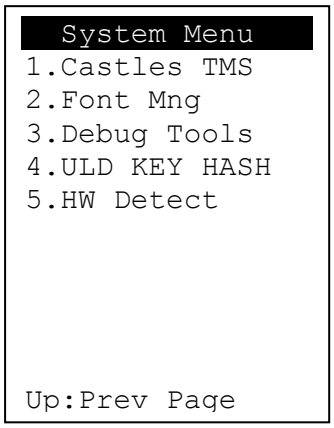


- Press [1] button to view FNT Font list.
- Press [2] button to view TTF Font list.

3.13. Debug Tools

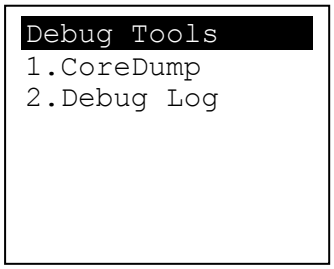
Perform the Debug Tools.

System Menu (Page 2)



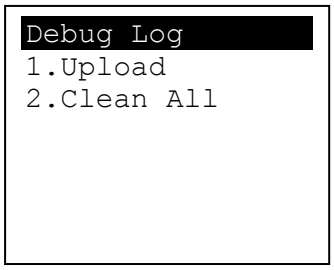
- Press [3] go to the Debug Tools Menu.

Debug Tools



- Press [1] go get the Core Dump error from terminal.
- Press [2] go to the Debug Log Menu.

Debug Log

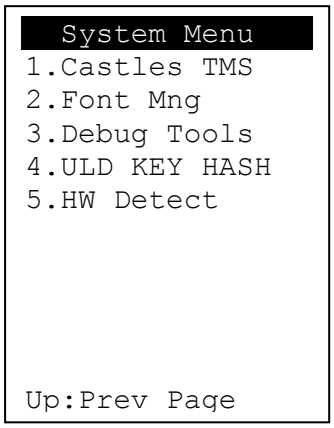


- Press [1] get the Debug Log from the memory of terminal to SD card.
- Press [2] clean all the Debug Log from the SD card.

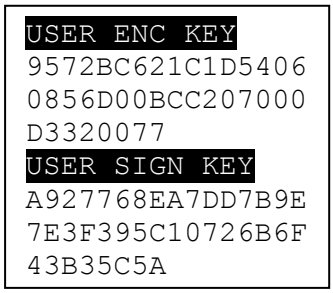
3.14. ULD Key Hash

View ULD user keyset hash value.

System Menu (Page 2)



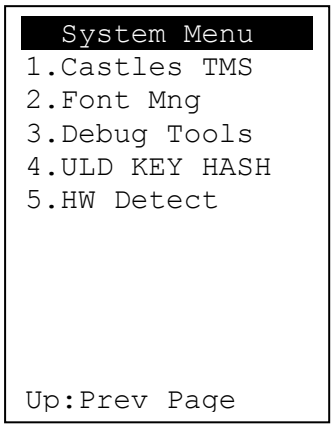
- Press [4] button to view hash value.



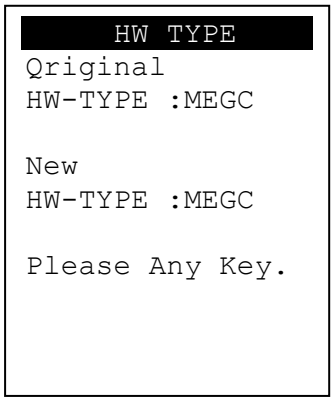
3.15. Hardware Detect

View the hardware type of the termianl.

System Menu (Page 2)



- Press [5] button to view the hardware type of the termianl.



4. Secure File Loading

Castles implemented an interface in terminal named User Loader(ULD) to provide secure file loading to system memory. Loading of user application, kernel firmware, font and others must use User Loader.

The loading process is secure by signing the files using ULD Key System.

4.1. ULD Key System

The ULD Key System uses two key sets for securely managing the kernel updating and application downloading. Each key set contains two RSA key pairs. One is used for key encryption and the other is used for signature. These two key sets are specified as below:

ULD Manufacturer Key Set

- ULD Manufacturer Key Encryption Key (RSA)
- ULD Manufacturer Signature Key (RSA)

ULD User Key Set

- ULD User Key Encryption Key (RSA)
- ULD User Signature Key (RSA)

For VEGA3000, the RSA key length is 2048bits.

4.1.1. ULD Manufacturer Key

The system consists of several kernel modules. These kernel modules are provided by the Manufacturer, and released in CAP format file with encryption and signing via ULD Manufacturer Keys.

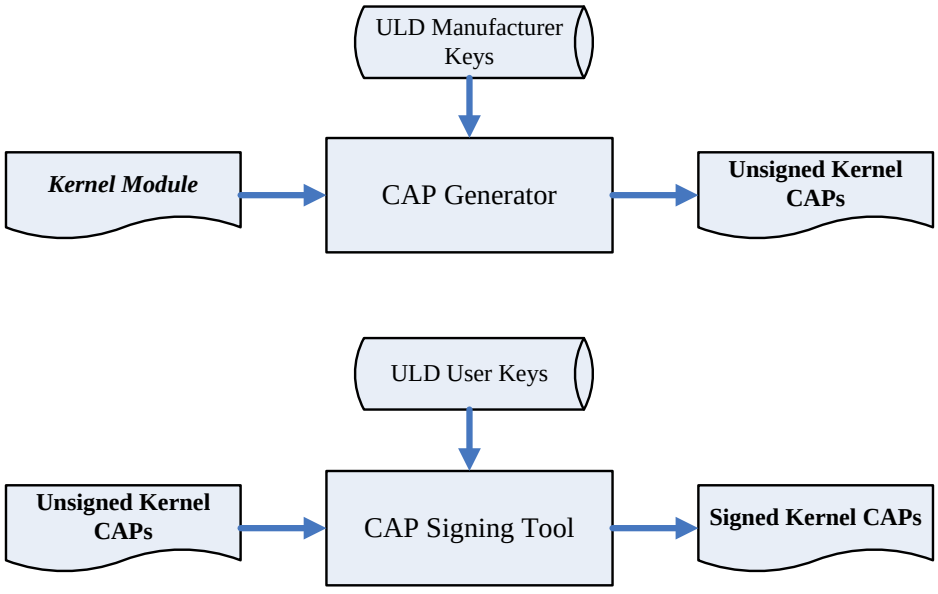
The ULD Manufacturer keys are managed and maintained by the manufacturer. The manufacturer uses these keys to generate kernel CAP files for updating the system. However, the system is not permited to be updated with these kernel CAP files directly generated by the manufacturer. This is because only the user can have the privilege to decide whether the system is to be updated. Therefore, before system

updating, the kernel CAP files must be “signed” via ULD User Key to get the user permission. For simple expression, we call the kernel CAP files generated by the manufacturer as “unsigned kernel CAP(s)” and call the kernel CAP files “signed” by the user later as “signed kenel CAP(s)”.

Notes:

1. Tthe kernel modules are encrypted by a random-generated 3DES key, which is retrieved from the Key Encryption Block of the CAP by ULD Manufacturer Key Encryption Key, not directly encrypted by ULD RSA Key.

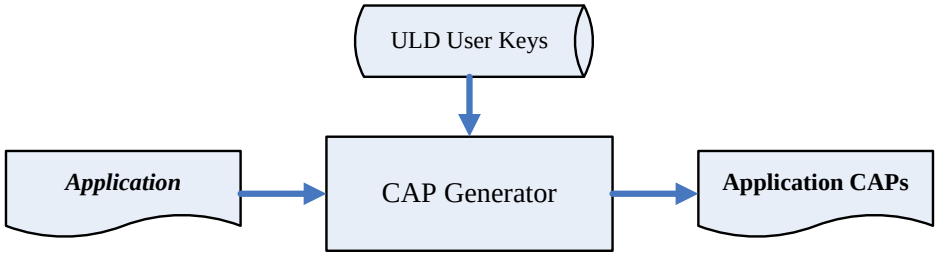
2. The “sign” action via ULD User Keys actually is done by” the second encryption”. “The second encryption” is done by using the random-generated 3DES key, which is encrypted by ULD User Key Encryption Key, to perform Triple DES encryption again on the cipher data segment of the kernel CAP files. This ensures that the system cannot retrieve the correct data from the kernel CAPs without the user permission.



4.1.2. ULD User Key

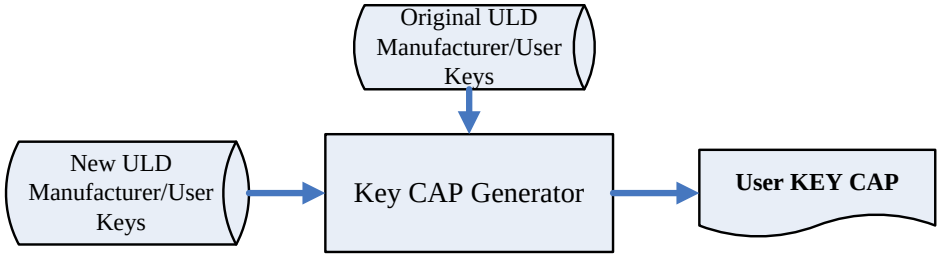
ULD User Key are used to encrypt and sign the user/shared applications. In addition, they are as goalkeepers to prevent the system updating without user permission. This is done by the kernel CAPs which are encrypted and signed by the manufacturer having to perform the “signed’ action via ULD User Keys.

Notes: Applications are encrypted by a random-generated 3DES key, which is retrieved from the Key Encryption Block of the CAP by ULD User Key Encryption Key, not directly encrypted by ULD RSA Key.



4.1.3. Key Change

The ULD RSA Keys are able to be changed. The system uses a special CAP file, KEY CAP, for the manufacturer and user to change their own keys. The KEY CAP contains a new set of ULD keys (Key Encryption Key and Signature Key). These new keys are encrypted and signed via the original keys. In other words, if the user would like to change the ULD User Keys, they have to use their original ULD User Keys with the new ULD User Keys to generate a KEY CAP.



4.2. File Signing

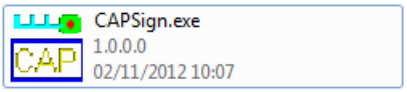
4.2.1. Signing Kernel Module

Castles will release new version of kernel module in “unsigned” form. This files required to sign with ULD User Key before it can load to terminal.

Castles Technology provideds a tool named “CAP Signing Tool” to perform this task.

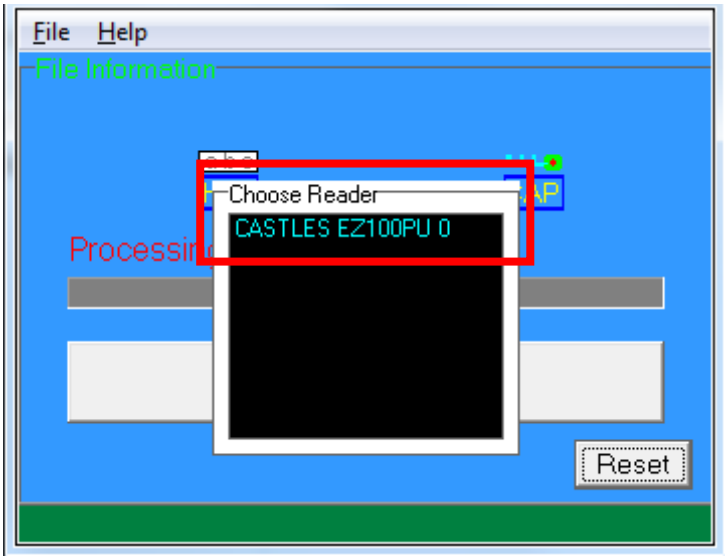
The CAP Signing Tool is located at:
C:\Program Files\Castles\VEGA3000\tools\Signing Tool

- Run CAP Signing Tool

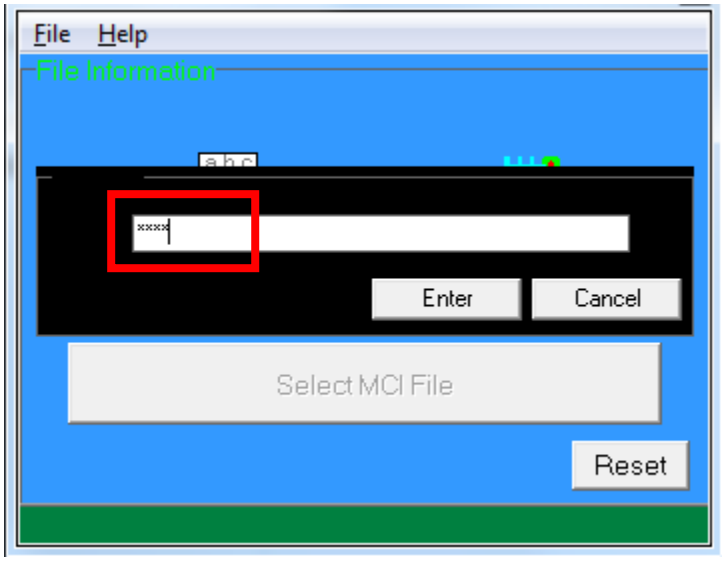


(VEGA3000)

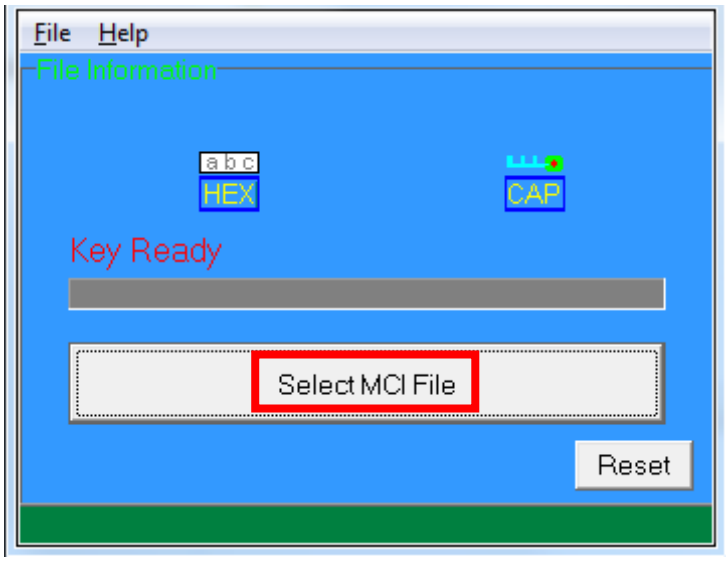
- Insert Key Card and select smart card reader



- Enter Key Card PIN



- CAP Signing Tool is ready, press “Select MCI File” button to browse the file.



- Output file will be located in “signed” folder.

4.2.2. Signing User Files

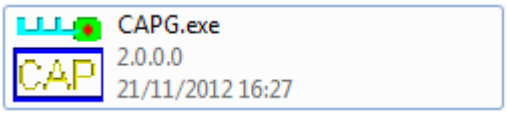
Following files are required to sign before load to terminal. This is to ensure the application data and codes confidential and integrity. The output fille will be “CAP” file which is file format defined by Castles.

- User application
- User application data files
- User application library
- Font file
- Share library
- Share files
- System setting
- Key CAP (Manufacturer ULD Key Set)

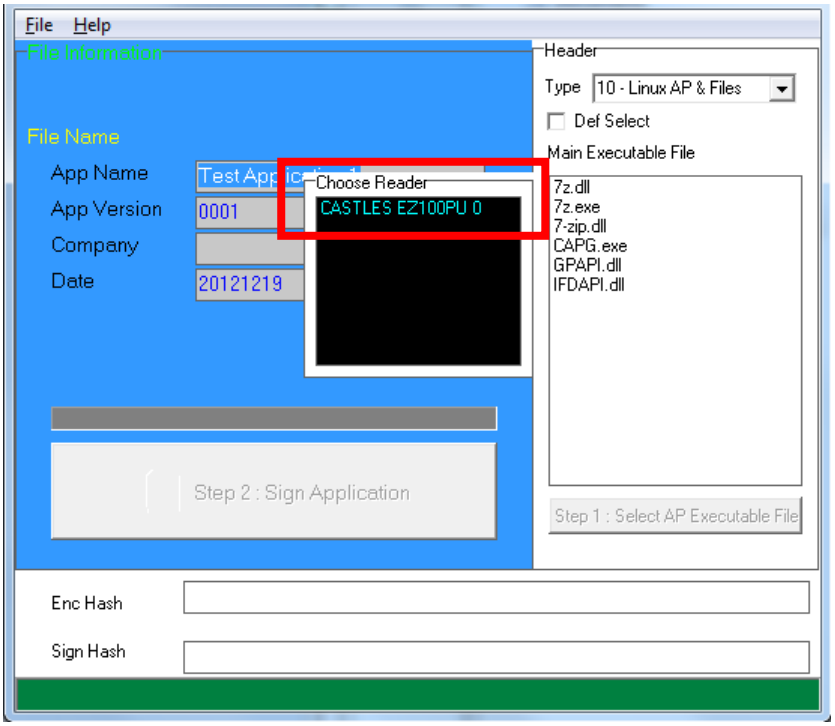
Castles Technology provided a tool named “CAP Generator” to perform this task.

The CAP Generator is located at:
C:\Program Files\Castles\VEGA3000\tools\CAPG (KeyCard)

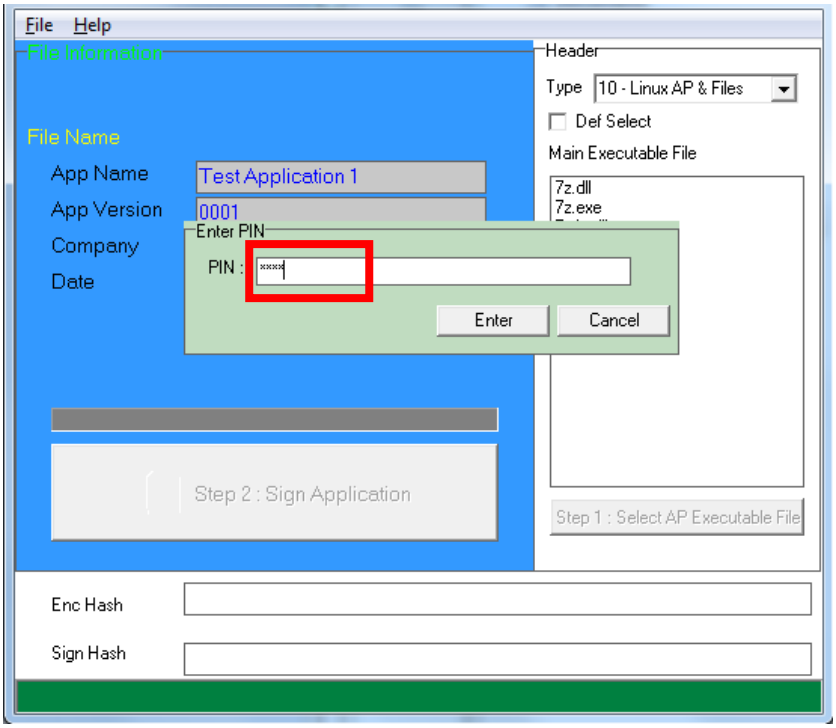
- Run CAP Generator



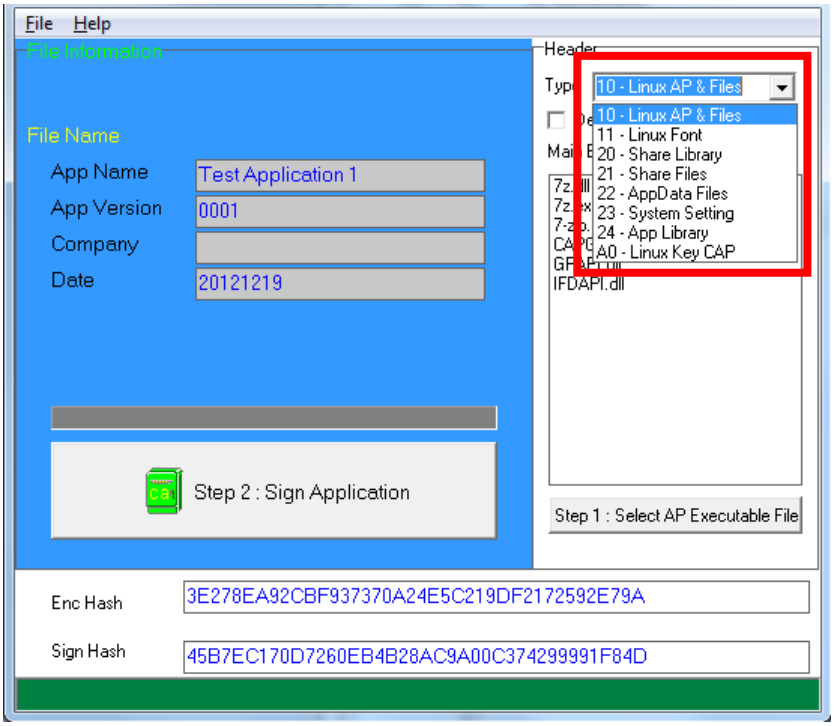
- Insert Key Card and select smart card reader



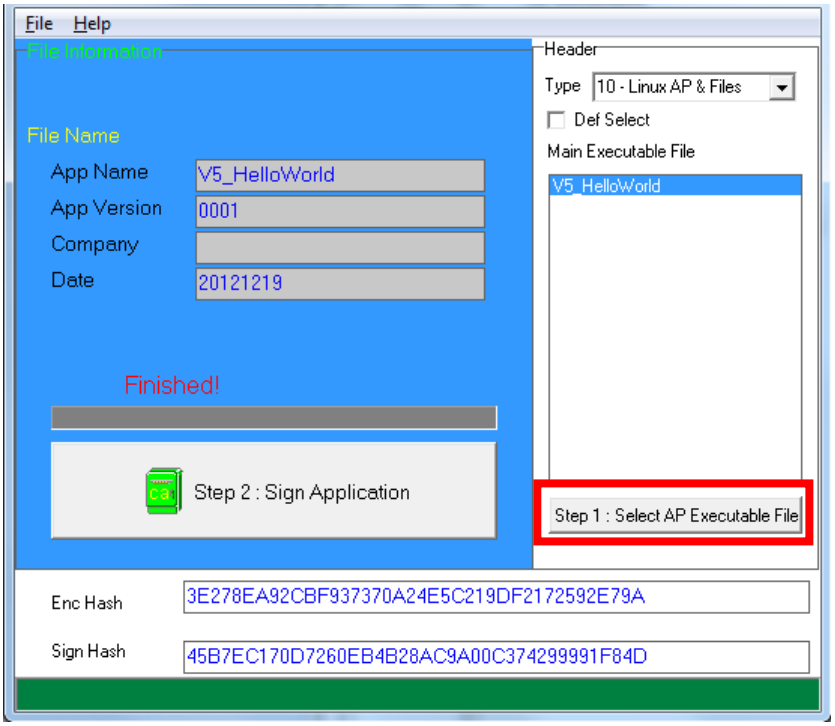
- Enter Key Card PIN



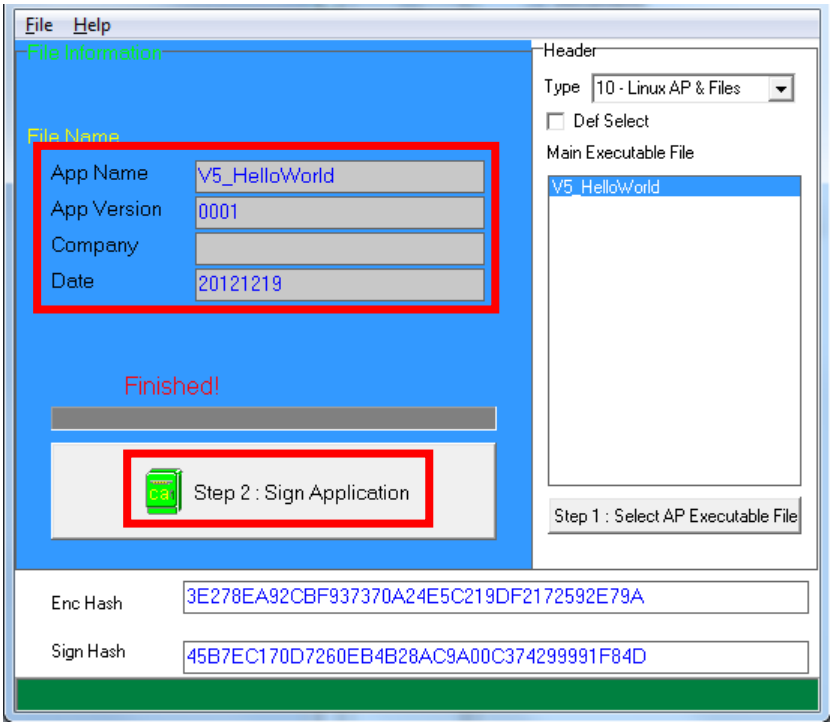
- CAP Generator is ready, select the correct Type from the list.



- Press “Step 1: Select AP Executable File” to select file to sign. This is valid for all the files to sign.



- Enter file details and press “Step 2: Sign Application” to sign the file. This is valid for all the files to sign.



- The output file will be in a set. A “mci” file with one or more “CAP” files.CAP file contents the signed file binaries, where MCI file contents the list of CAP files.

App.CAP

App.mci

Note: If user would like to load multiple set of signed file, create a new file with extension of “mmci”. Then put the mmci file contents with the list of mci file.

MultiApp.mmci

4.3. File Loading

There are several ways of loading file to VEGA3000terminal.

- Download by User Loader
- Download by removable media
- Download by user application
- Download by Castles TMS

User Loader is a tool provided by Castles Technology. It's the formal way to download file to terminal.

User may implement their own ways of updating application or files using CTOS API provided, **CTOS_UpdateFromMMCI().**

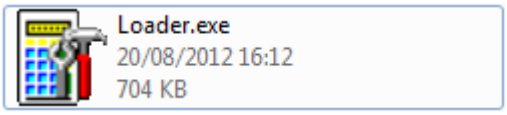
Castles TMS (CTMS or CASTLES Terminal Management System) is provided by Castles Technology. It's use to perform remote download via Ethernet, GPRS/UMTS or modem.

4.3.1. Download by User Loader

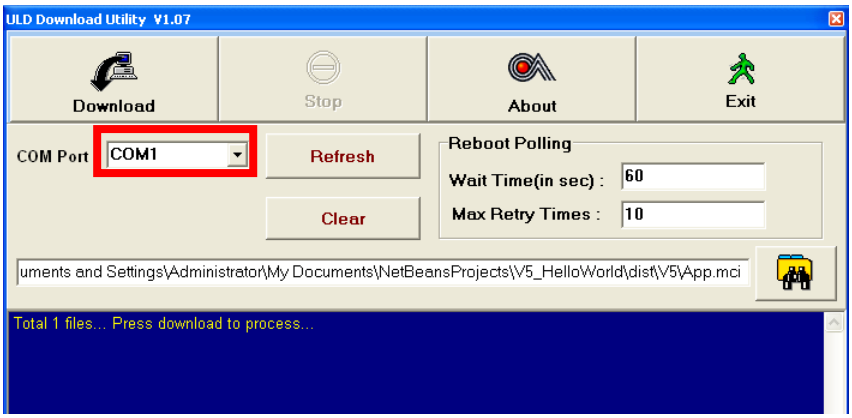
The User Loader works for VEGA3000.

The Loader is located at:
C:\Program Files\Castles\VEGA3000\tools\Loader

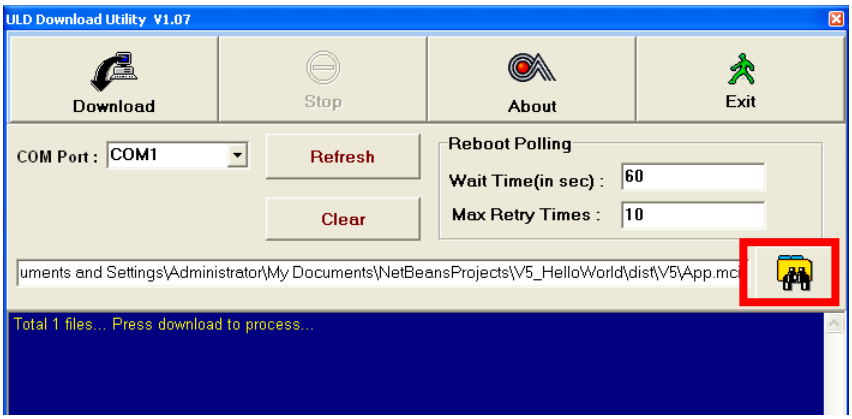
- Run User Loader



- Select COM port

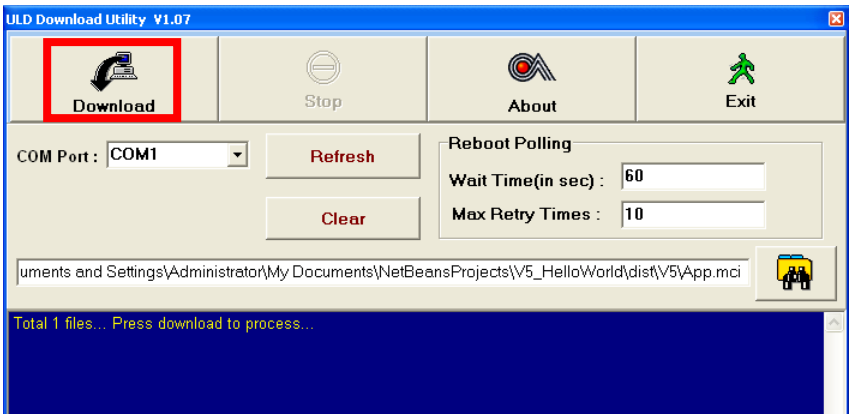


- Browse and select mci file or mmci file

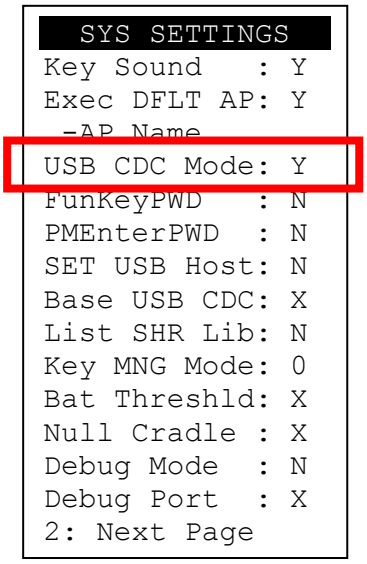


- Setup terminal to enter download mode
  - Press [0] button in Program Manager (PM)
  - Press [1] button to select “1. Download AP“
  - Press [1] button again to select download via RS232 or USB

- Press “Download” button to start.



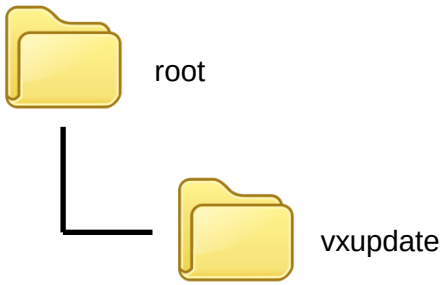
Note: To download using USB cable, terminal must enable CDC mode. Set USB CDC Mode to Y.



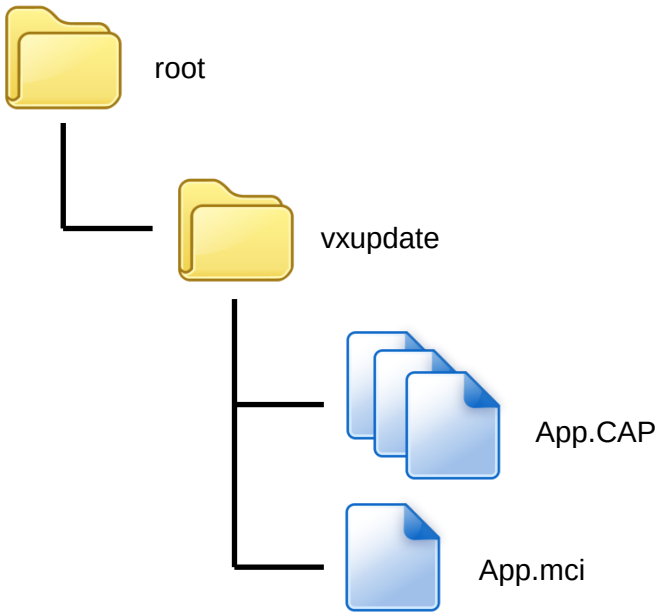
4.3.2. Download by Removable Media

The file download process can be achieved without PC by using removable media, USB flash drive or MicroSD memory card. We recommend don't put unwantedfile to removable media, as it will increase the time during detection.

- Create a folder name "vxupdate" under root directory.



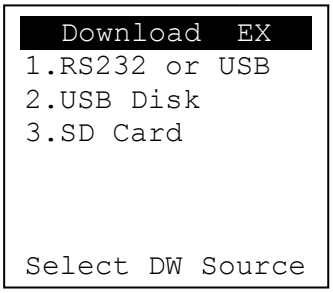
- Place the mci file and cap file to "vxupdate" folder.



Note: If user would like to load multiple application, create a new file with extension of "mmci". Then put the mmci file contents with the list of mci file.

- Insert removable media to terminal, and select the removable media type in “Download AP” menu.

  Download AP Menu

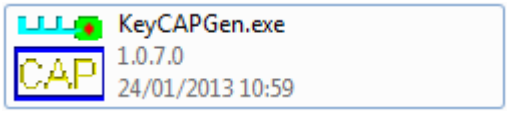
  - Press [2] button to select USB flash drive.
  - Press [3] button to select MicroSD card.

- Finally, terminal will process the file “vxupdate” folder.

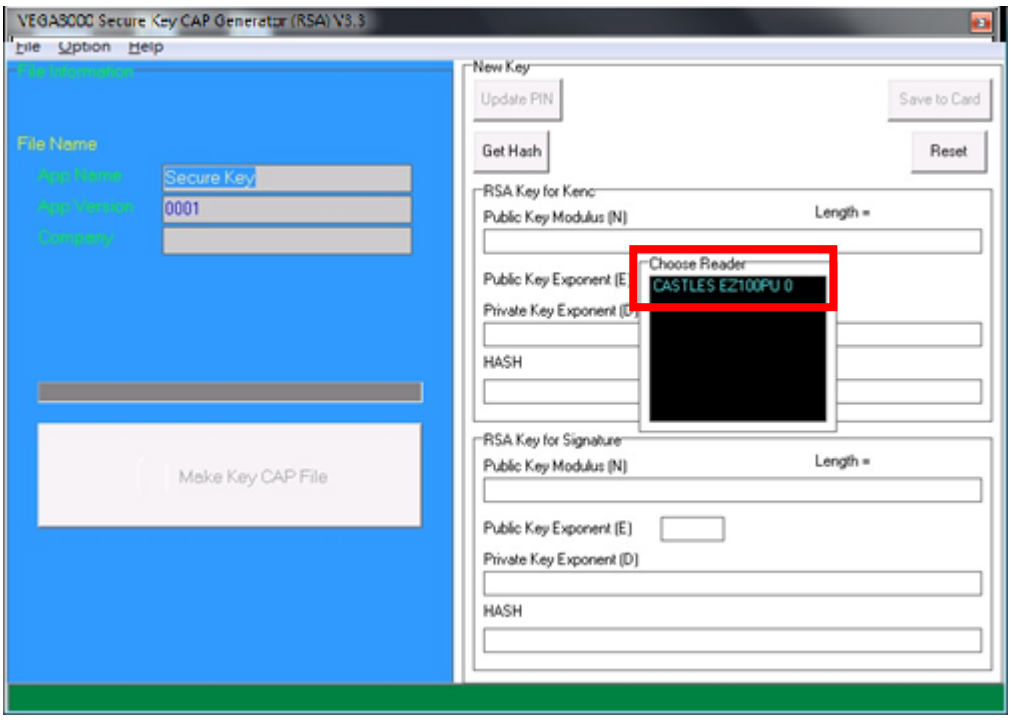
4.4. Changing ULD User Key

User may change their ULD User Key Set stored in Key Card. Castles Technology provided a tool named “Secure Key Generator” to perform this task.

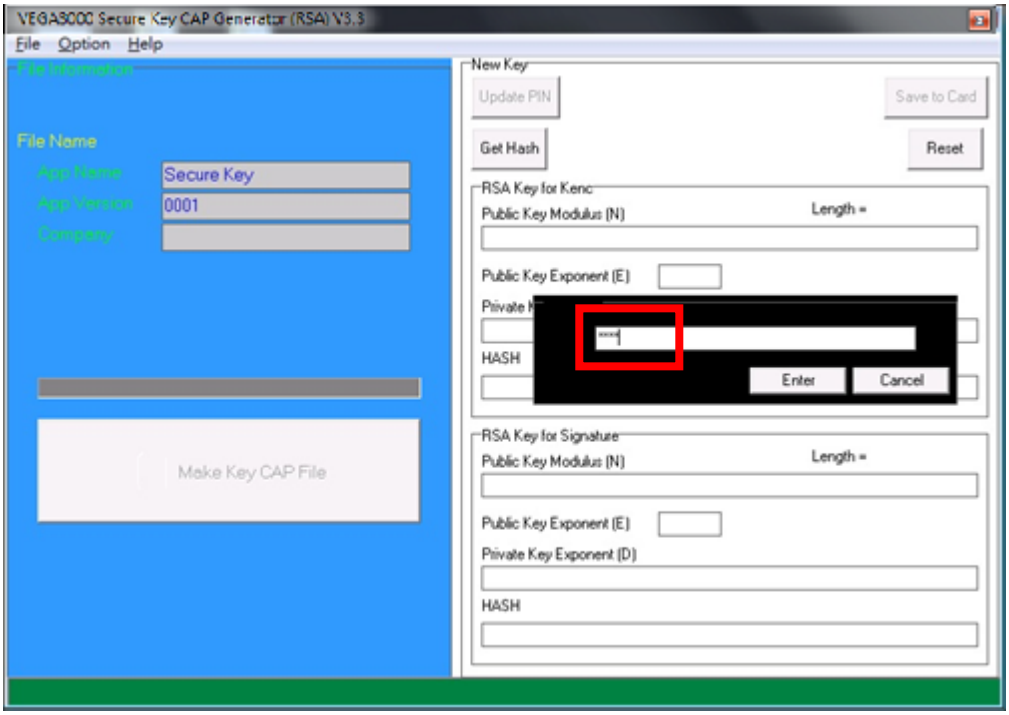
- Run Secure Key Generator



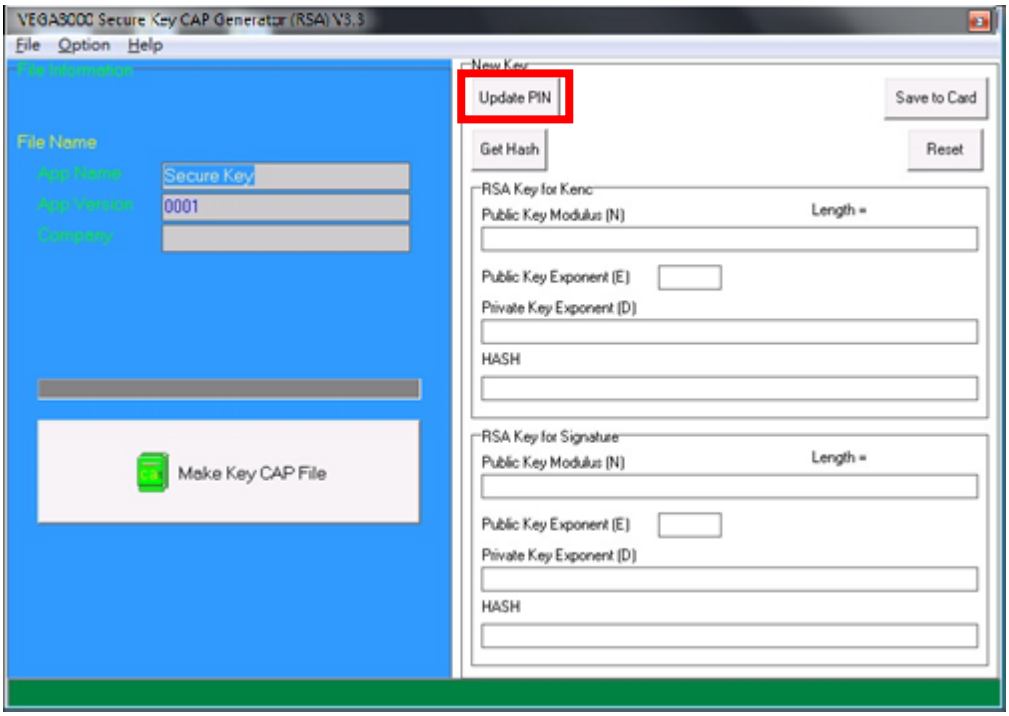
- Insert Key Card and select smart card reader



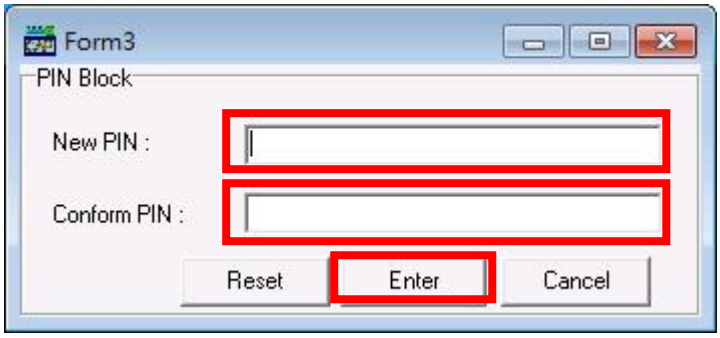
- Enter Key Card PIN, default PIN is “1234”.



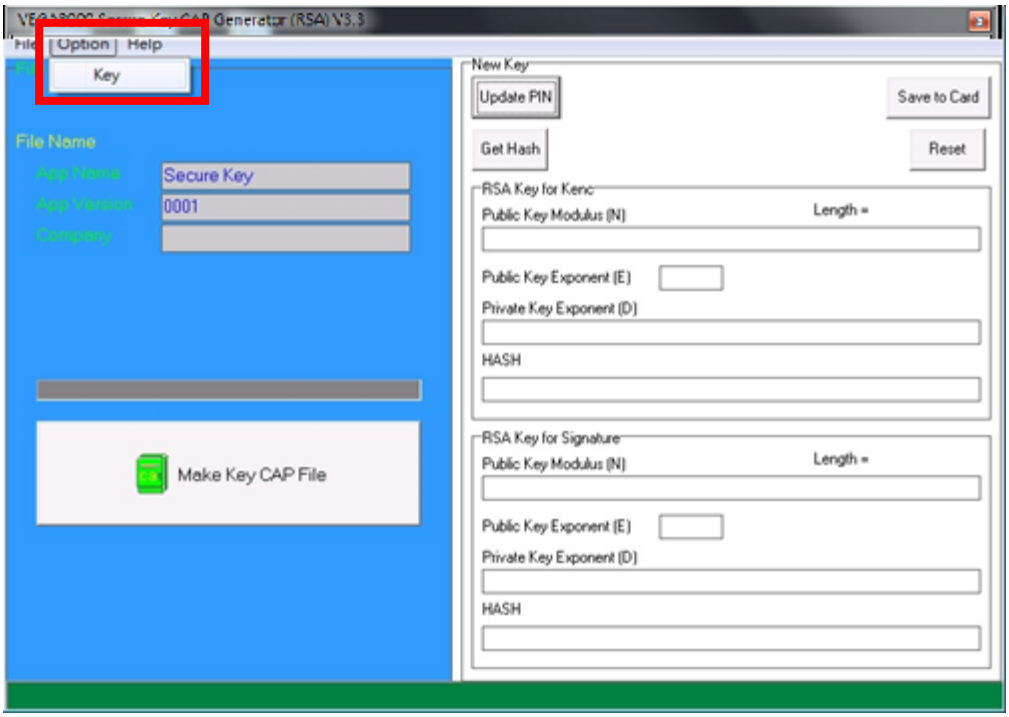
- To change Key Card PIN, press “Update PIN” button. If not, please skip this steps.

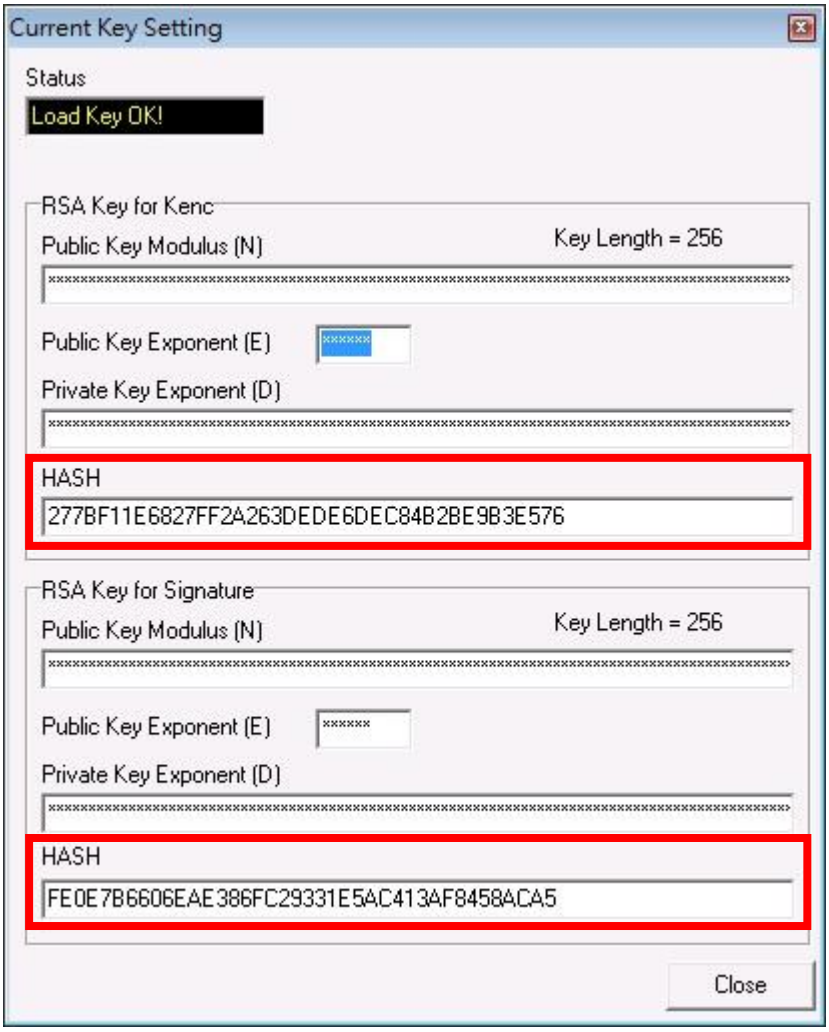


- Enter new PIN, enter new PIN again to confirm, then press [Enter] button to change PIN in Key Card.

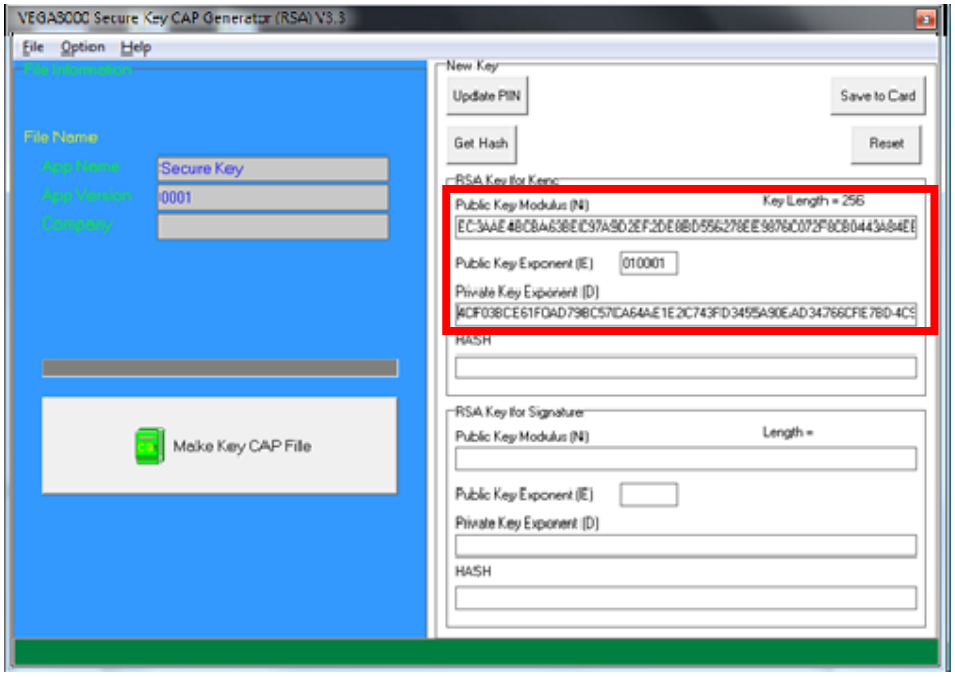


- To view current key set hash value, goto “Option” and select key.

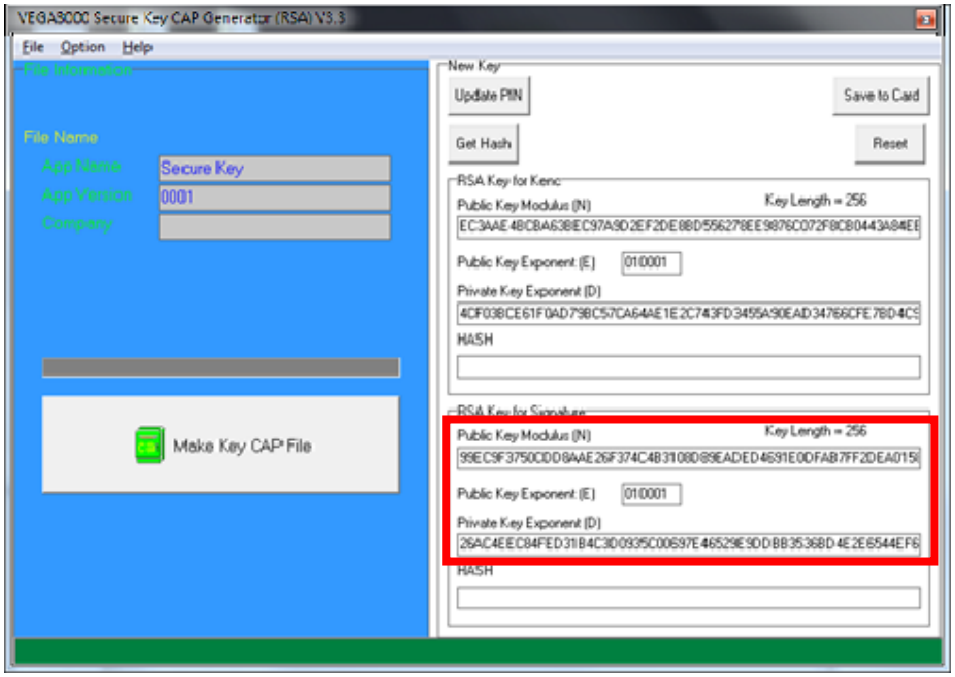




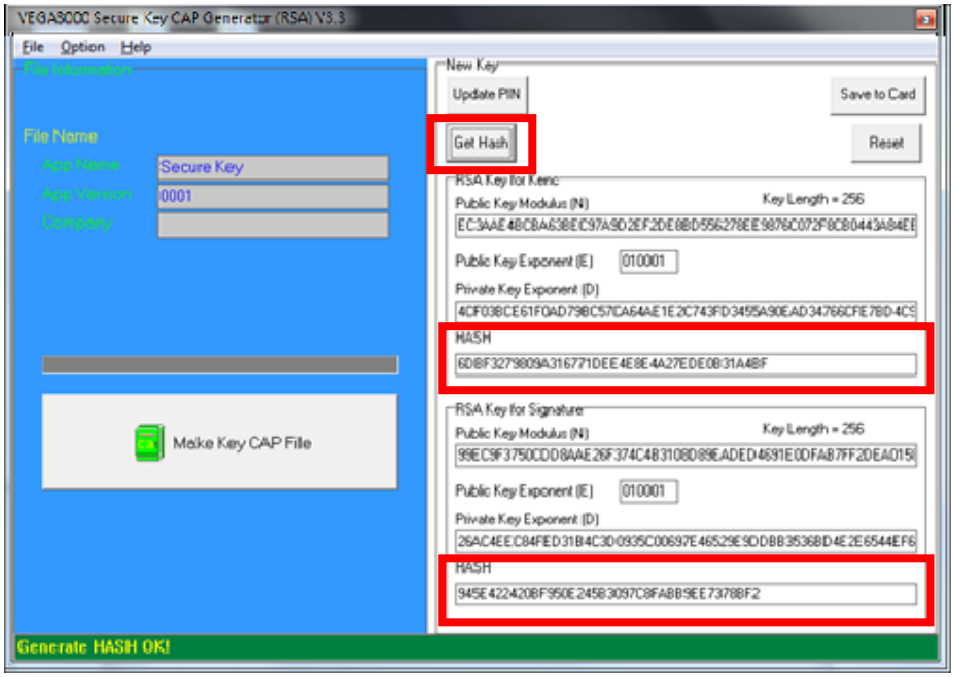
- To generate new user key set
  - Please generate the RSA key by yourself,thelength of the RSA key set should be 2048 (bits).
  - Copy RSA key components to RSA Key for Kenc in Secure Key Generator.



- Generate second RSA key set for Signature.

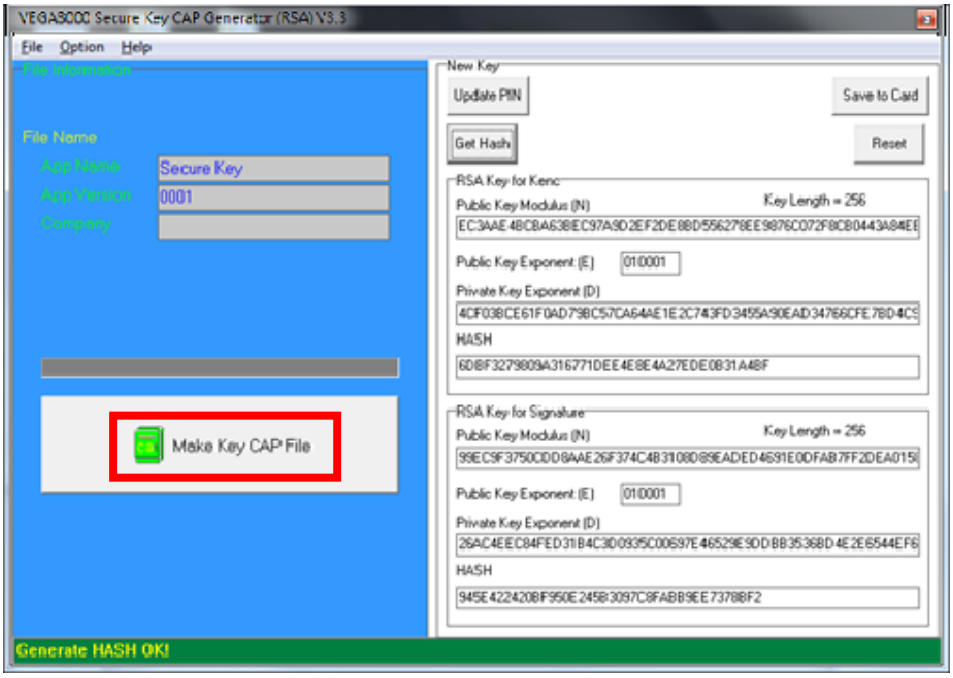


- Click [Get Hash] button to calculate the hash value for key sets.

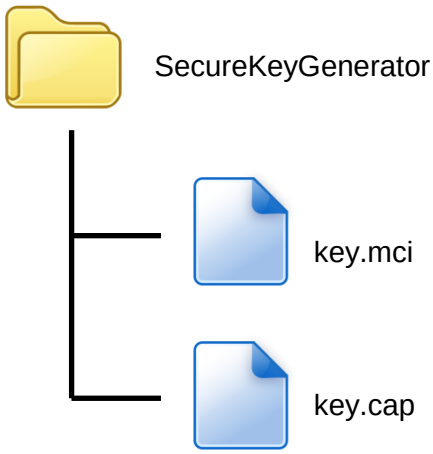


- Please copy down all the values into a text file and keep in a safe place. You will need this if you need to create duplicate Key Card.

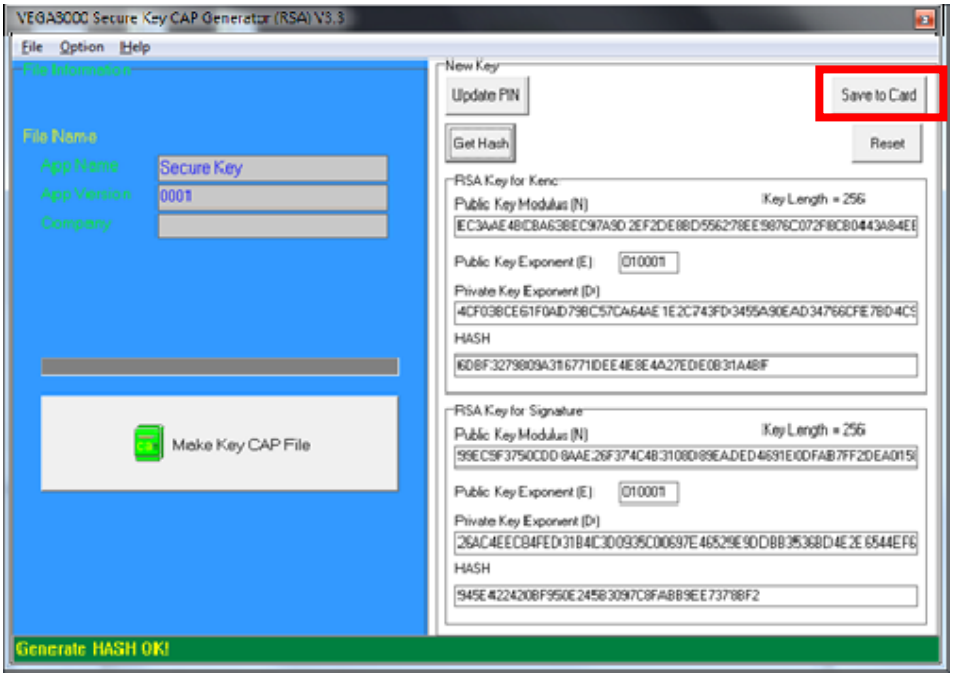
- To generate the key CAP for the newly generated user key set, press [Make Key CAP File] button.



- The output file will be located in the Secure Key Generator folder.



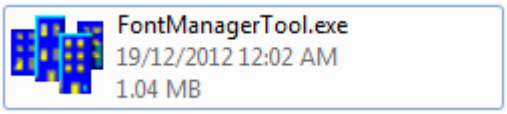
- To update the newly generated key set to Key Card, press [Save to Card] button to write the key set to Key Card.



5. Font Management

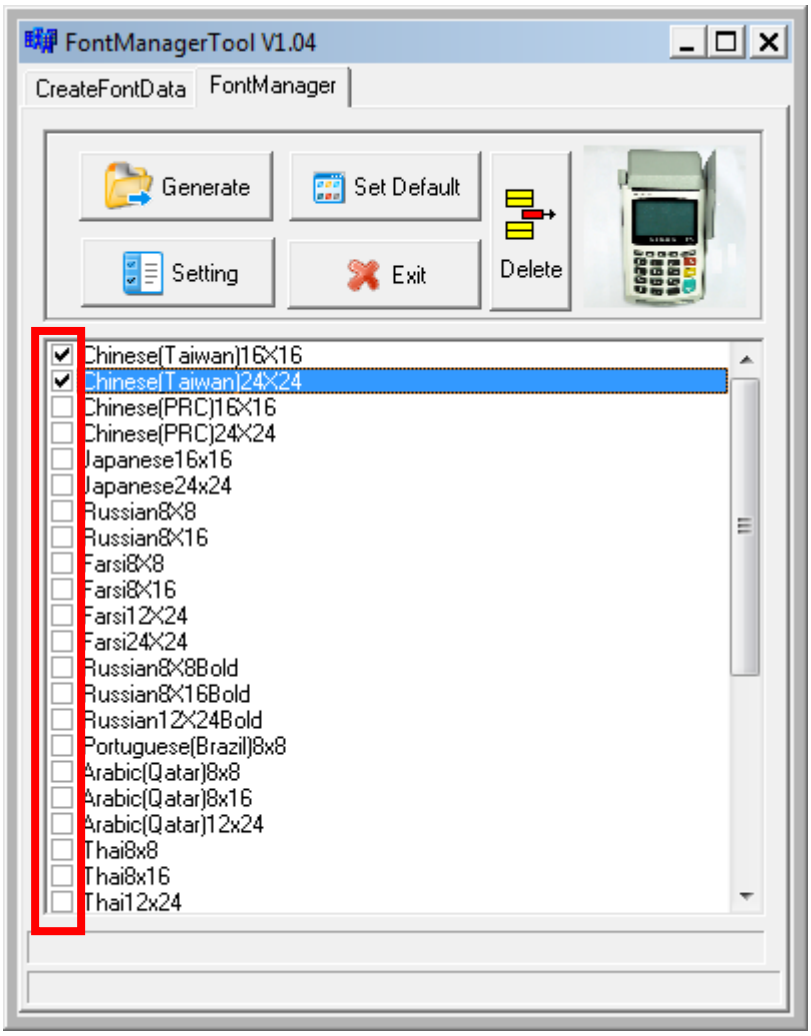
5.1. Loading New Font

- Run FontManager.exe

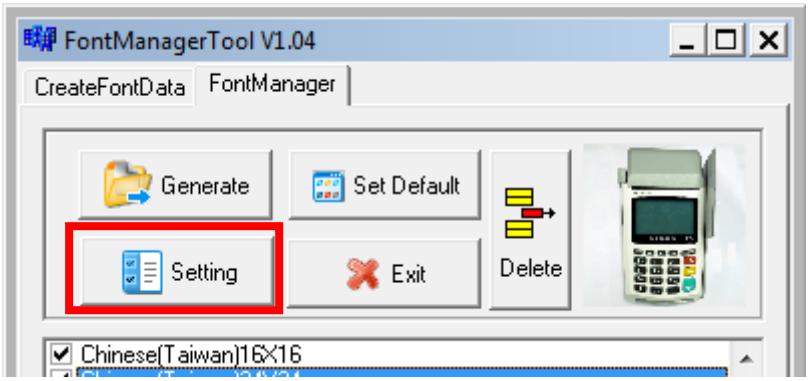


Located at C:\Program Files\Castles\Font Manager

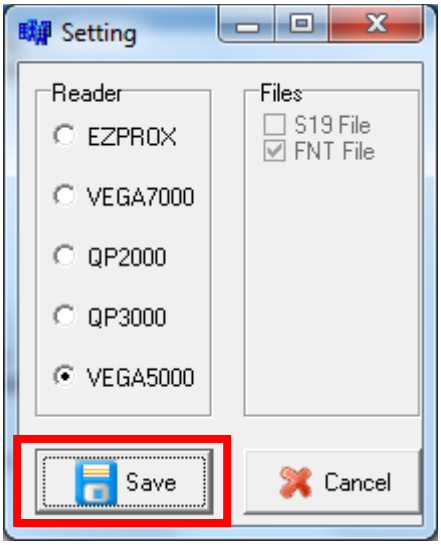
- Select font to download



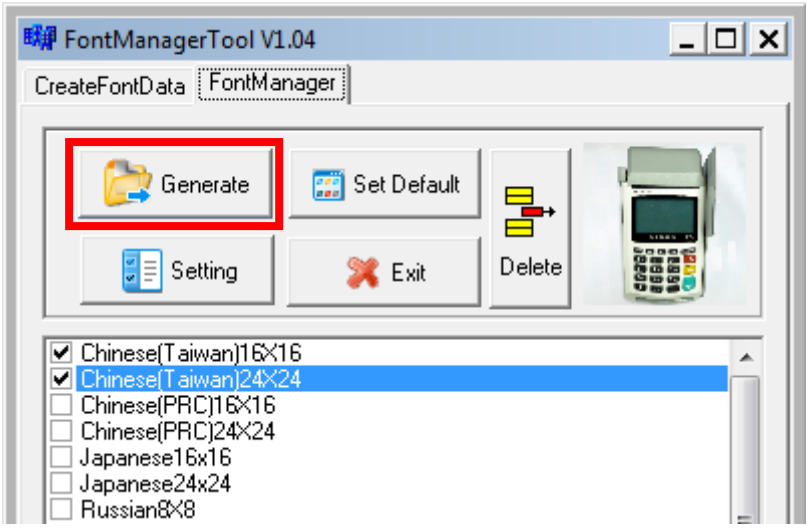
- Press [Setting] button to configure terminal type.



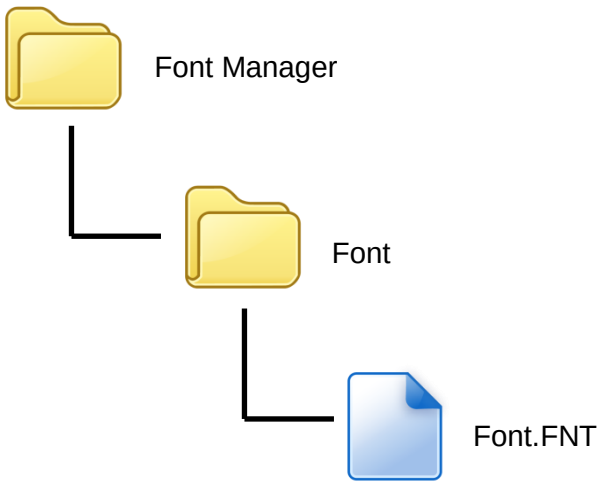
- Select **VEGA5000**, press [Save] button to save and return font manager.



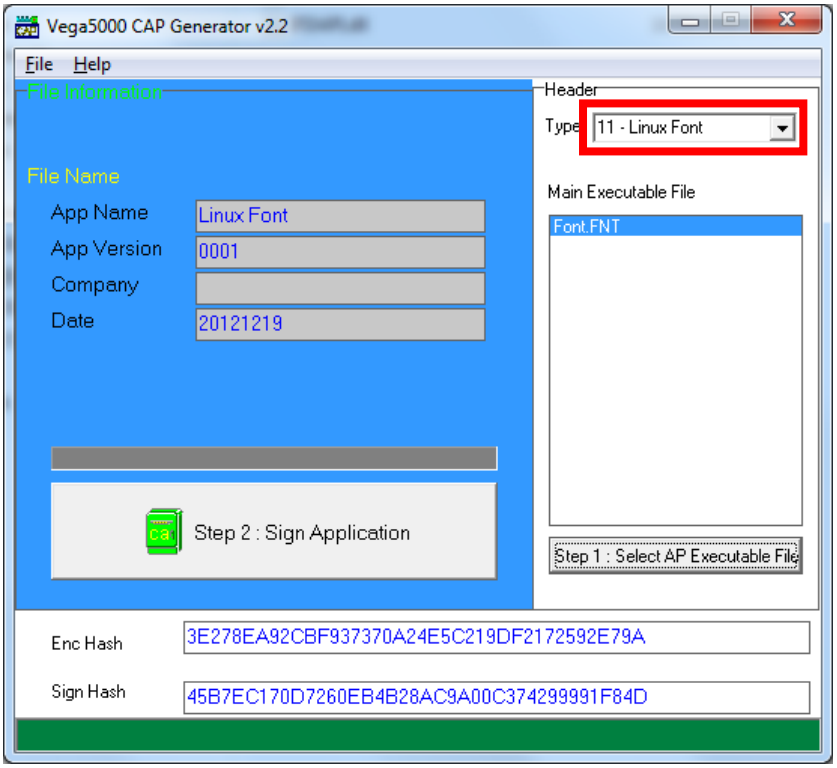
- Press [Generate] to create the font file.



- Output file “Font.FNT” will be located at sub-directory named “Font” in “Font Manager” folder.



- Sign the file using CAP Generator, the type must set to “11 – Linux Font”.



- Lastly, download the signed file (CAP file) to terminal using Loader.

5.2. Custom Font

User may create font they preferred for displaying or printing on terminal.

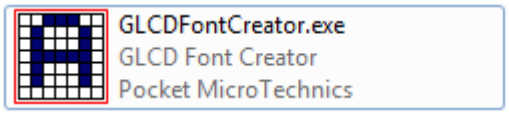
There are two zone defined:

Zone 0x00 ~ 0x7F – ASCII characters, you may replace with the font type preferred or your own language character set.

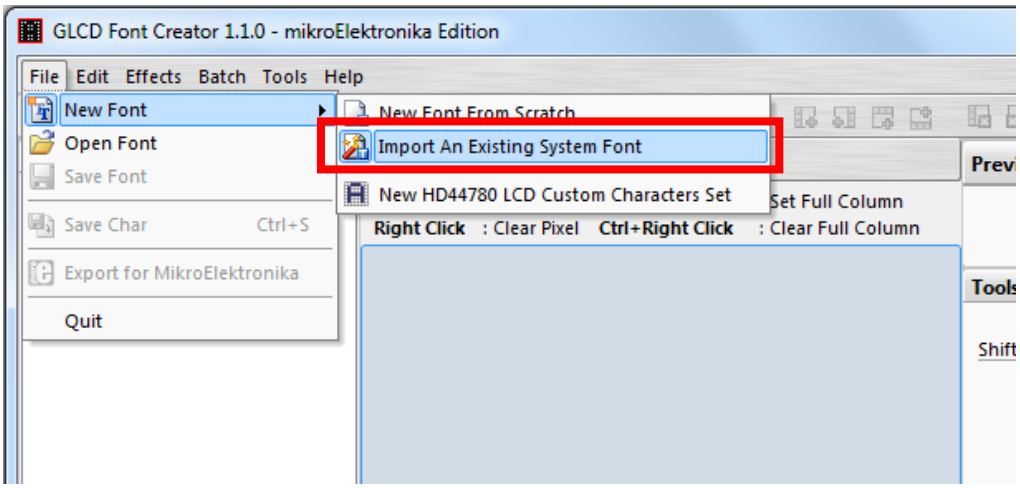
Zone 0x80 ~ 0xFF – Free to use, you may use for symbols.

Following steps demonstrate how to create a 12x24 font.

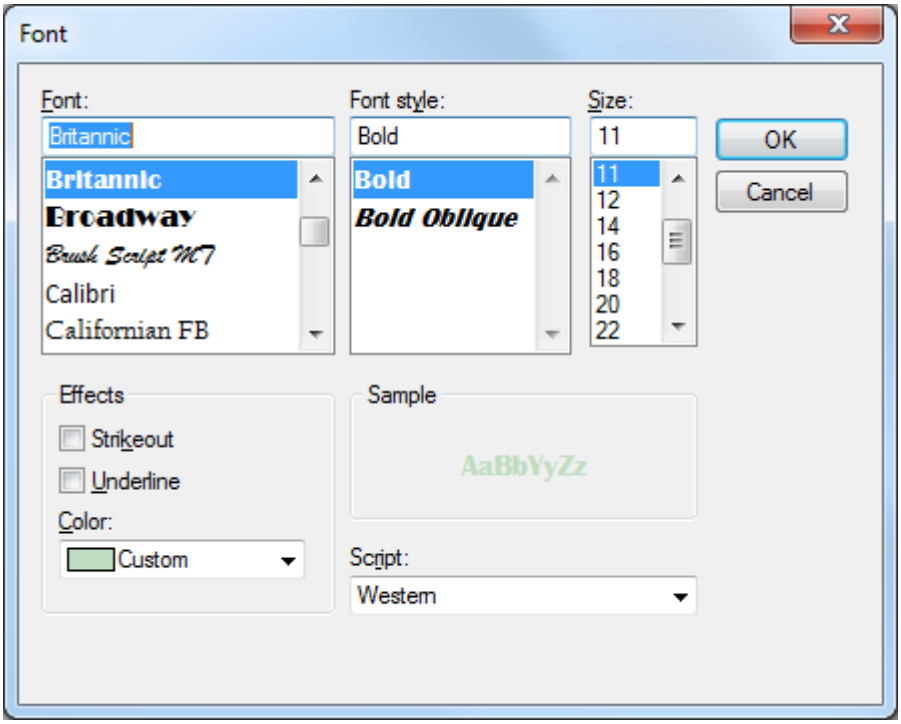
- Run GLCD Font Creator



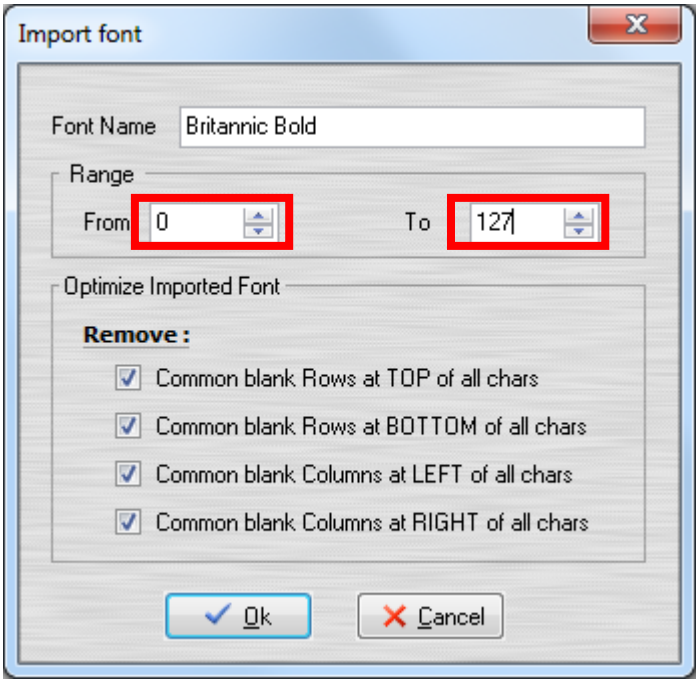
- Select [File] ⇨ [New Font] ⇨ [Import An Existing System Font]



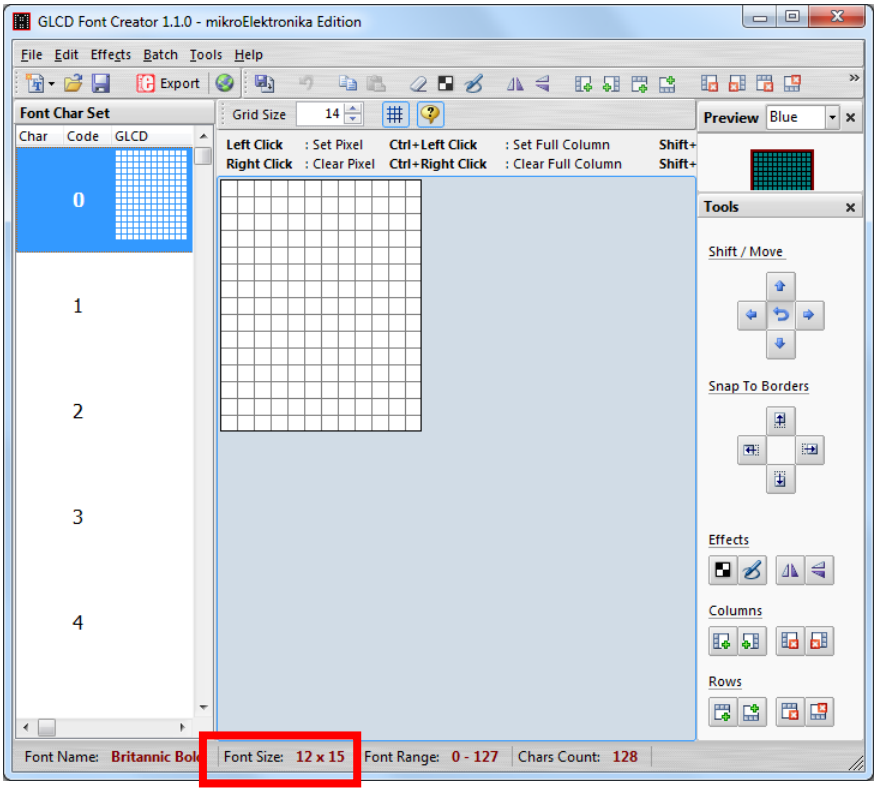
- Select the font needed, simply choose a font size. The final value of font size should be determine by the minimum pixel width. You may need to repeat this steps few times to find the best fit font size.



- Set the import range from 0 to 127.

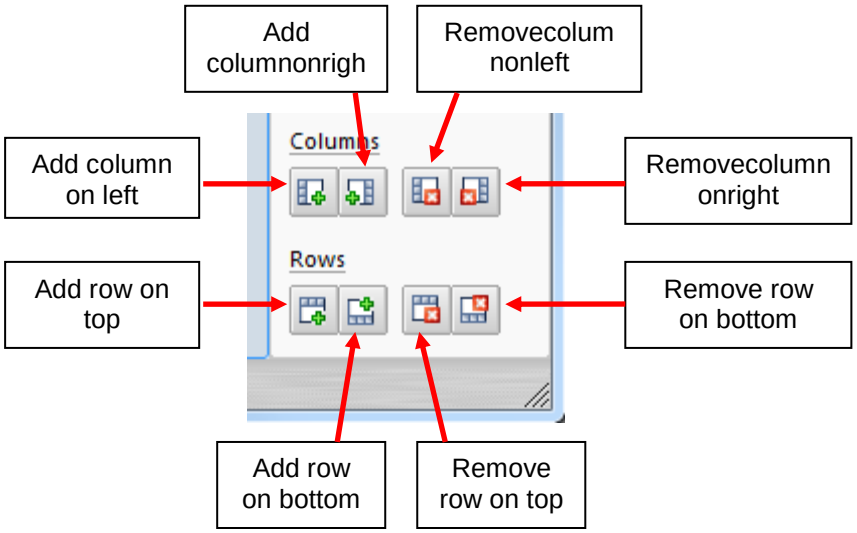


- Check the minimum pixel width and height.

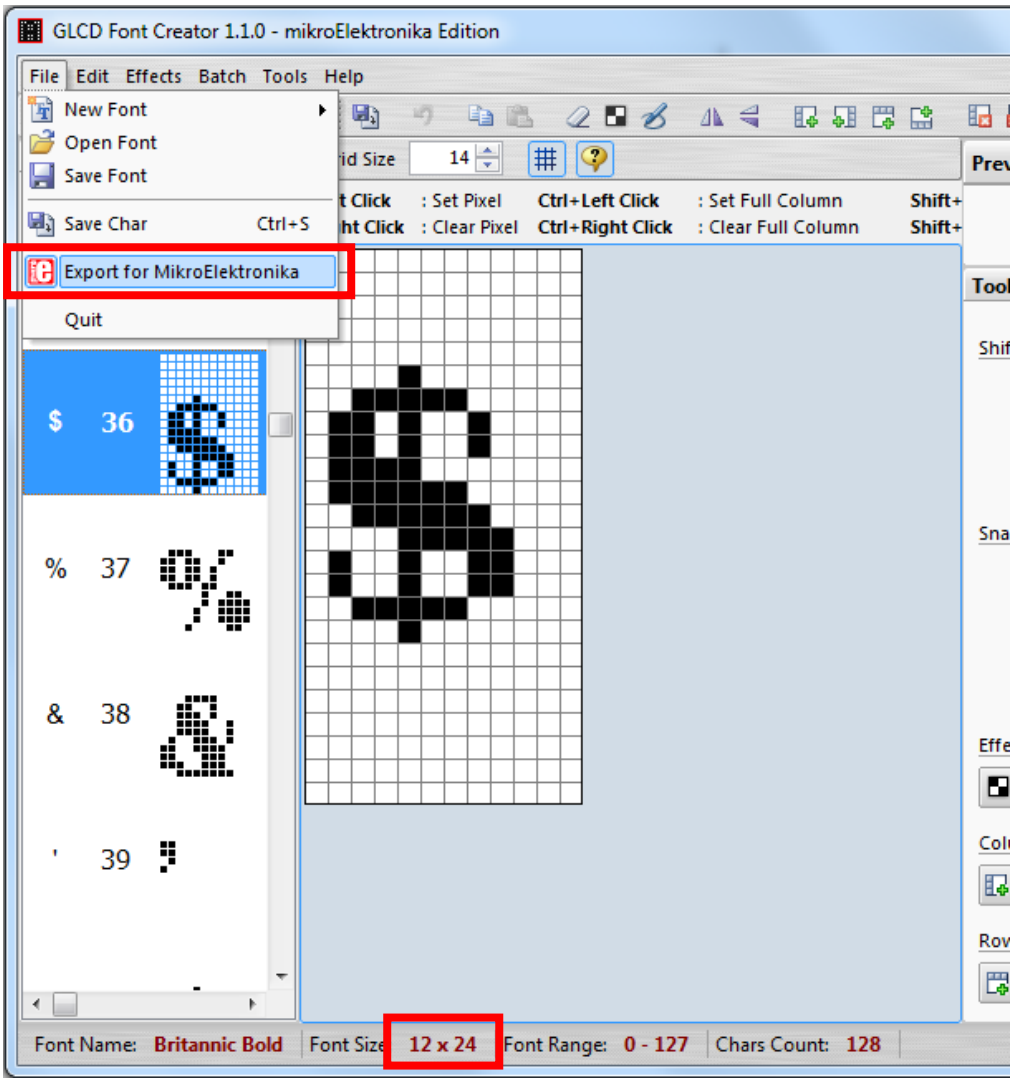


- If the pixel width of the font size is larger than expected, then you have to repeat the previous steps to import font with smaller size.

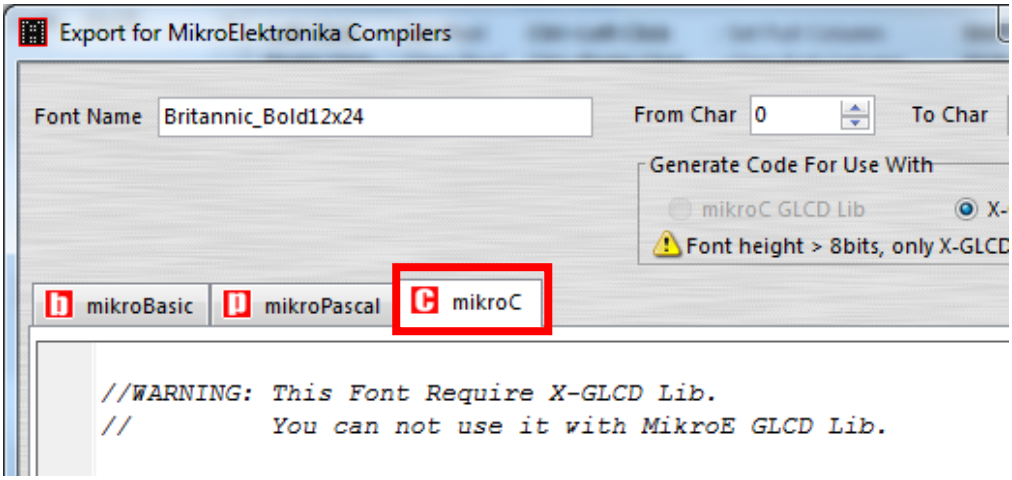
- Use the following buttons to adjust the font size to match with expected font size.



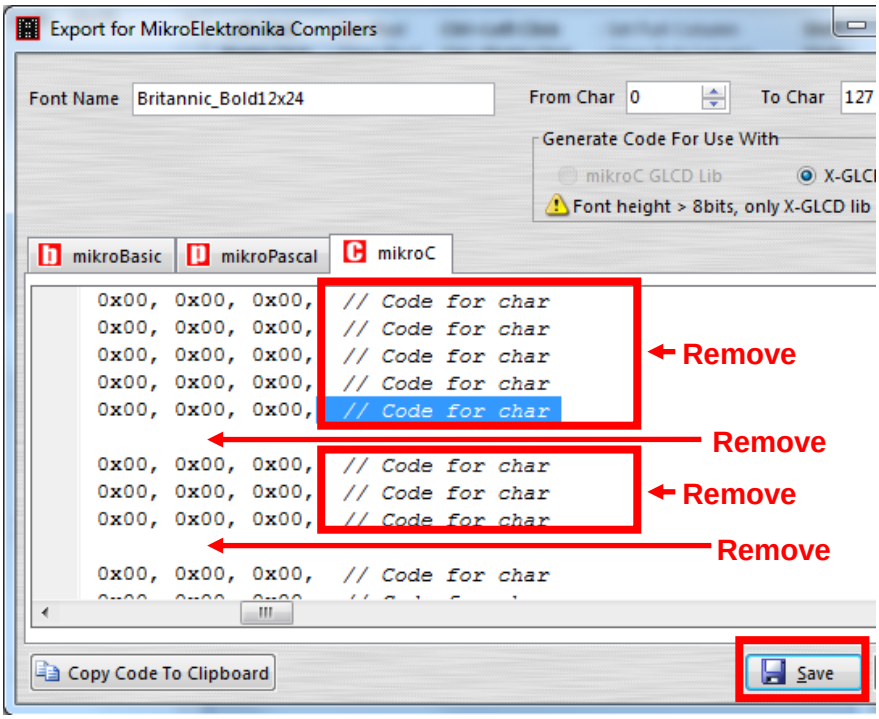
- After adjust font size, select [File] ⇨ [Export for MicroElektronika].



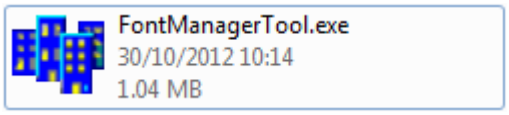
- Select output format as [mikroC].



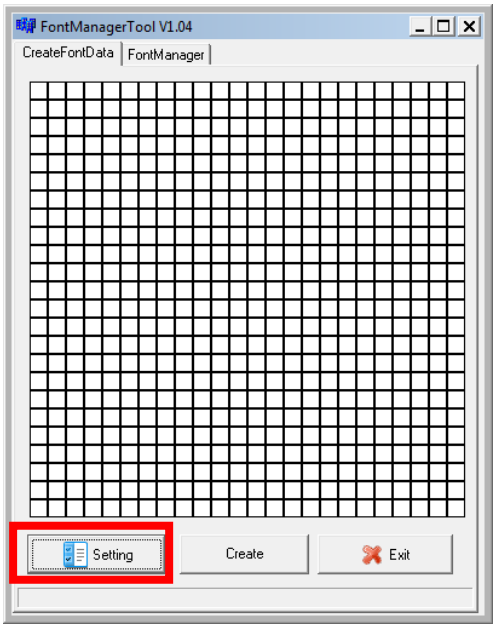
- Remove comment "// Code for char " from offset 0x00 to 0x1F. Remove empty line if found. Then click [Save] button to save to file.



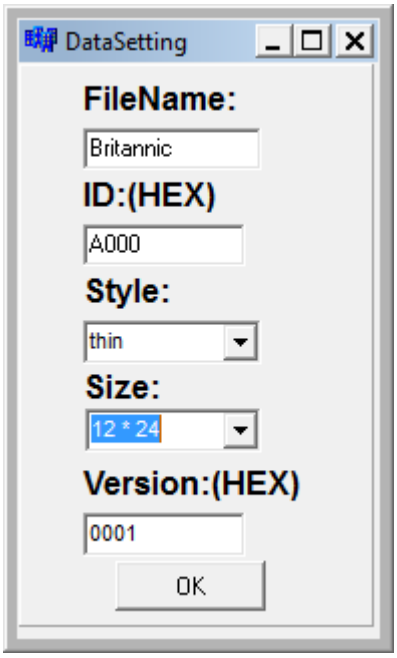
- Run Font Manager Tool.



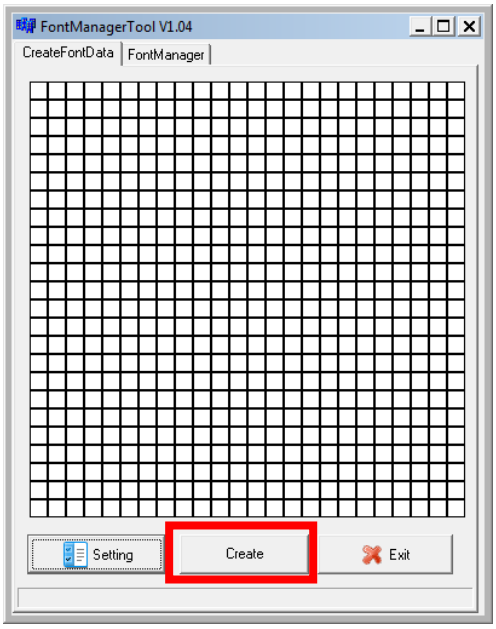
- Click [Setting] button



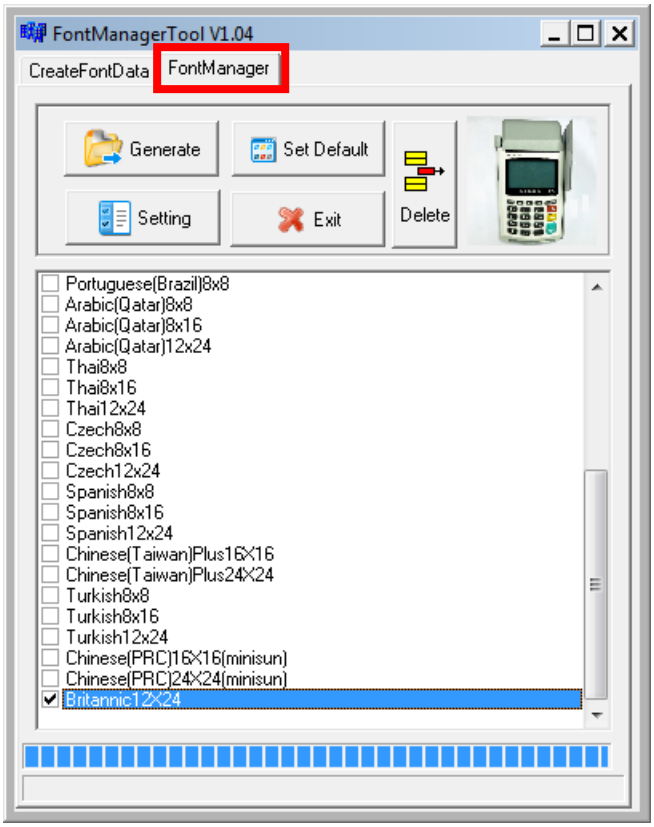
- Enter the file name, font id, and select the size.



- Click [Create] button, and select the C file previously created using GLCD Font Generator.

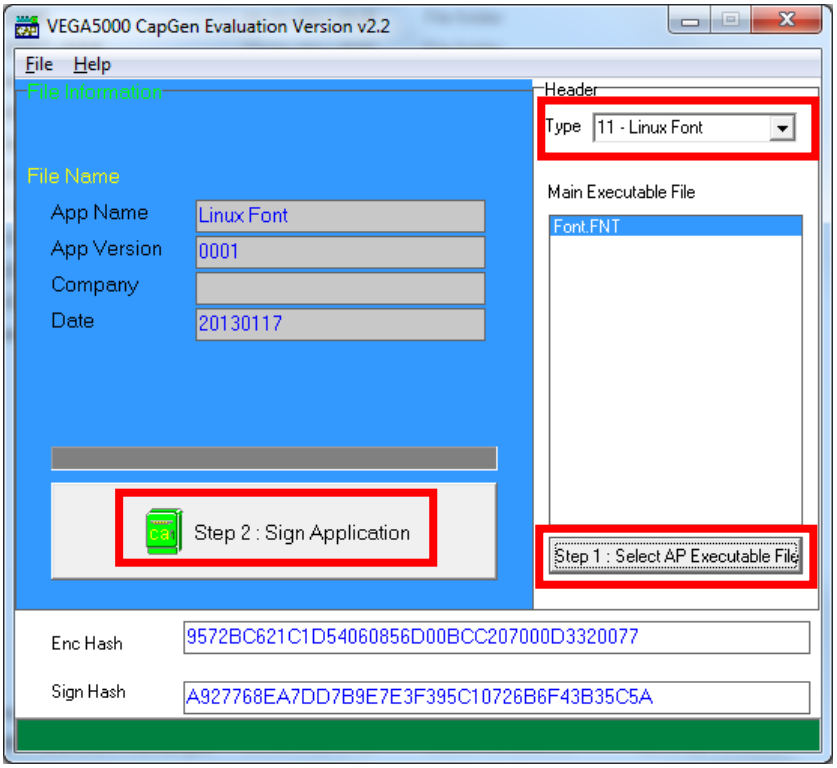


- Select [Font Manager] tab and tick the newly createdfont, and press [Generate] button to export to FNT file.



- Use CAP Generator to conver the FNT file to CAP.

  Set type to [11 – Linux Font], press [Step 1] button select the FNT file. Then press [Step 2] to generate CAP file.



- Download the font CAP file to terminal.
- In terminal application, add following code to display message using the newly created font.

```
CTOS_LanguageConfig(0xA000,d_FONT_12x24,0,d_FALSE);
CTOS_LanguageLCDSelectASCII(0xA000);
CTOS_LCDTPrintXY(1, 1, "ABCDEFGH");
```

  Or print message using the newly created font.

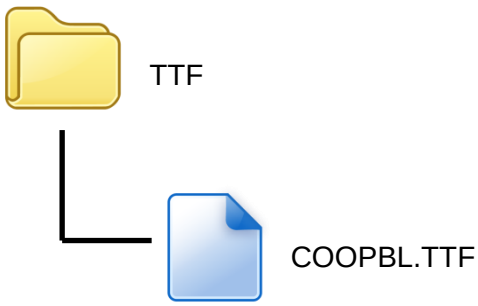
```
CTOS_LanguagePrinterSelectASCII(0xA000);
CTOS_PrinterPutString("ABCDEFGH");
```

5.3. Using TrueType Font (TTF)

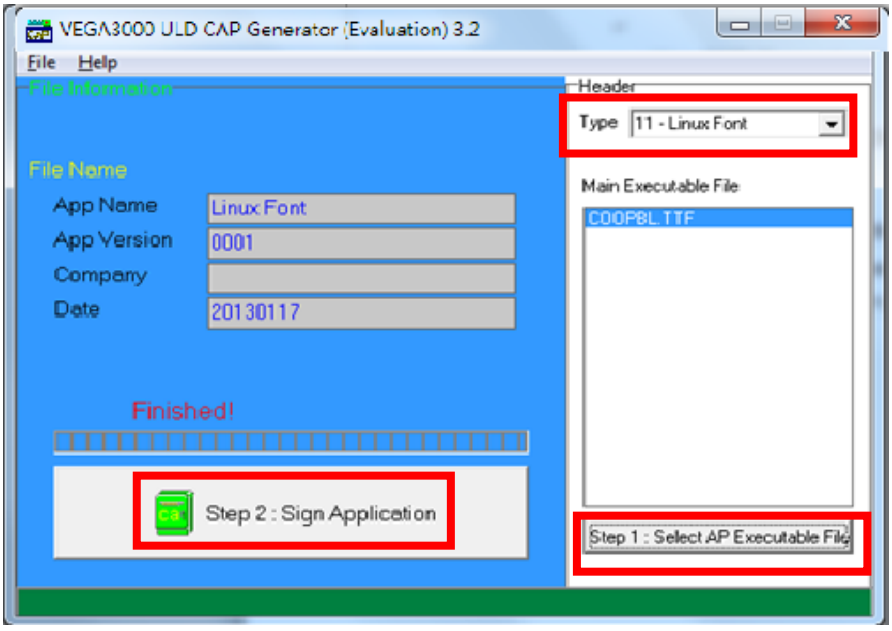
TrueType Font (TTF) is only supported in VEGA5000S terminal.You may download the TrueType font preferred to terminal for displaying or printing.

Following steps demonstrate how to use "Cooper Black" TrueType font.

- Copy the TTF file needed to a empty folder.



- Use CAP Generator to conver the TTF file to CAP.
  Set type to [11 – Linux Font], press [Step 1] button select the TTF file.
  Then press [Step 2] to generate CAP file.



- Download the font CAP file to terminal.

- In terminal application, add following code to display message using the newly added font.

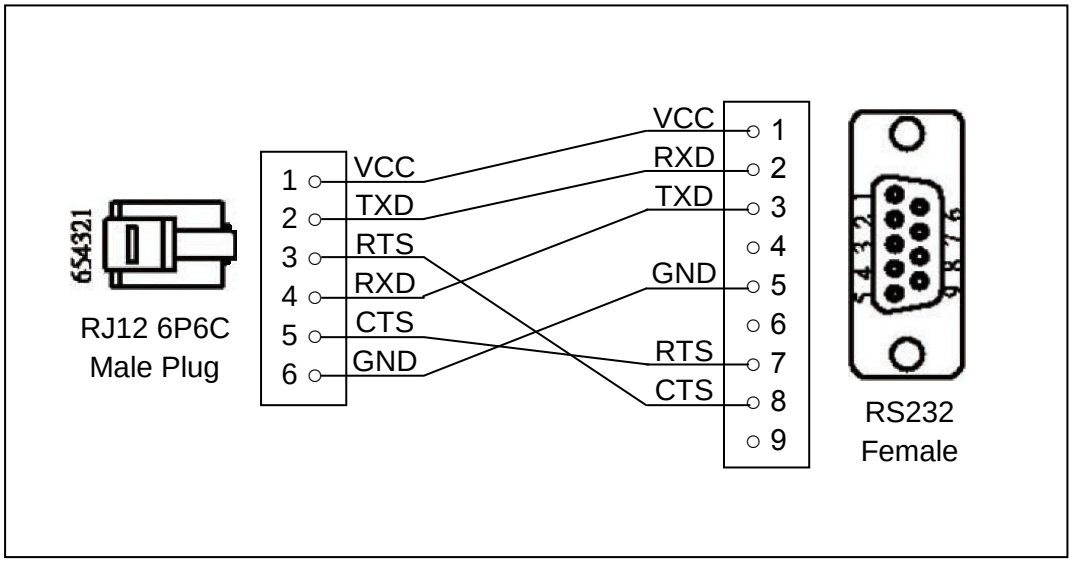
```
CTOS_LCDTTFSelect("COOPBL.TTF", 0);
CTOS_LCDFontSelectMode(d_FONT_TTF_MODE);
CTOS_LCDTSelectFontSize(0x203C); // 32x60
CTOS_LCDTClearDisplay();
CTOS_LCDTPrintXY(1, 1, "Hello World");
```

Or print message using the newly added font.

```
CTOS_PrinterTTFSelect("COOPBL.TTF", 0);
CTOS_PrinterFontSelectMode(d_FONT_TTF_MODE);
CTOS_LanguagePrinterFontSize(0x203C, 0, 0); // 32x60
CTOS_PrinterPutString("Hello World");
```

6. Technical Notes

6.1. Serial Cable PIN Assignment



7. FCC Warning

Federal Communication Commission interference statement
This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures: -Reorient or relocate the receiving antenna. -Increase the separation between the equipment and receiver. -Connect the equipment into an outlet on a circuit different from that to which the receiver is connected. -Consult the dealer or an experienced radio/TV technician for help.

FCC Caution

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
(1) this device may not cause harmful interference and
(2) this device must accept any interference received, including interference that may cause undesired operation

RF Exposure Warning

The equipment complies with RF exposure limits set forth for an uncontrolled environment. The antenna(s) used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

You are cautioned that changes or modifications not expressly approved by the party responsible for compliance could void your authority to operate the equipment.

This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body.

CAUTION

RISK OF EXPLOSION IF BATTERY IS REPLACED BY AN INCORRECT TYPE.

DISPOSE OF USED BATTERIES ACCORDING TO THE INSTRUCTIONS

~ END ~