Prolin2.X User Guide

V 1.0.7

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Revision History

Date	Version	Note	Author
2015-06-27	V1.0.0	Draft	Prolin team
2016-01-26	V1.0.1	1. Add instruction of U disk download. 2. Modify driver program.	Prolin team
2016-3-14	V1.0.2	1. Add instruction of application package management. 2. Add description of the corresponding relationship between the models and OS. 3. Add instruction of changing startup logo. 4. Add the function of two-dimension code displaying all of the terminal information in TM. 5. Add notice of downloading OS by PCLoader. 6. Add description of authorization mechanism.	Prolin team
2016-4-15	V1.0.3	1. TermAssist updated to 3.0.3 version. 2. Add package signing instruction. 3. Add system startup instruction.	Prolin team
2016-5-4	V1.0.4	1. TermAssist updated to 3.0.5 version. 2. Add commands and return value instruction of XCB service. 3. Add time zone setting function.	Prolin team
2016-5-17	V1.0.5	1. Modify description of 5.3 ScriptEdit. 2. Modify description of 3.3 Driver Program.	Prolin team
2016-8-1	V1.0.6	1. In 3.3 Driver Program, added some notes about driver installation under Windows system and added driver installation under Linux system. 2. In section 3.1.6 installation, Added the description of data file	Prolin team

		installation.	
2016-8-11	V1.0.7	1. In section 4.4.1 AIP and section 4.4.2 AUP, added examples of packaging AIP and AUP and also added the instruction on how to install big size application by installing its sub-packages. 2. In section 4.3.3 U Disk Download, added the instruction of installing device firmware upgrade package (FWP) and startup logo through USB flash drive. 3. In section 4.4, added 4.4.4 FWP package installation instruction. 4. In section 4.3.1, added the interface of Auto UDisk Load in TM to implement the auto downloading function of USB flash driver at the POS terminal startup.	Prolin team

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1 Overview

Prolin operating system is developed by PAX Company which supports application running on the PAX POS terminal. In the following context, we call it “Prolin OS”.

This user guide applies to the Prolin-2.4 or higher version, and it mainly introduces the usage of Prolin POS terminal and TermAssist, installation and update of Prolin system and application.

1.1 Glossary

Table 1-1 Glossary

Glossary	Specification
POS terminal	In this document, it refers to D200, S900, S920, S300, S800, P^X7 and P^X5 POS terminals.
Firmware	In this document, it refers to the binary programs written in the flash memory of POS terminal.
Font library	The font set, which contains foreign language, Chinese and other relevant digital characters.
Application package	Including AIP, AUP and OPT format packages.

User Public key	To encrypt plaintext or verify a digital signature.

1.2 Acronym Definitions

Table 1-2 Acronym Definitions

Acronym	Definitions
TM	Terminal Manager
POS	Point of Sale
AIP	Application Installation Package
AUP	Application Update Package
TLK	Terminal Loading Key
TMK	Terminal Master Key
OPT	System Optional Component Package

1.3 Prolin SDK

For details about Prolin SDK, please refer to “Prolin SDK Operating Guide”.

1.4 Document Conventions

Conventions used in this document and their corresponding meanings are listed below:

NOTE

【Giving notes.】

CAUTION

【Caution for general problems.】

【Warning for crucial problems.】

2 POS Terminals

2.1 Terminal Introduction

 **D200 Wireless POS Terminal**	PAX's beautifully designed D200 integrates with any mobile payment app running on IOS or Android smart device via Bluetooth, Wi-Fi, GPRS or cable connection. The D200 offers the latest PCI PTS 3.x security, SRED and Visa PayWave & MasterCard PayPass contactless certification. Apple Inc. has given the D200 a special certification called MFi meaning that Apple has tested and approved the D200 to meet the highest performance standards for integration with any iPad or iPhone. Ensuring transactional security with PCI PTS 3.x certification, the D200 streamlines payment into a unique personal program, and you can now take all your value-added applications on the D200 to provide a high-tech and user-friendly customer interaction.
 **S300 Integrated Retail PINPAD**	PAX's S300 is the latest integrated retail payment solution for multilane merchants who wish to offer high levels of transactional security combined with contactless, e-Signature, magnetic stripe and Chip & PIN. With state of the art levels of security design, including PCI PTS 3.x and SRED, the S300 protects and encrypts all transaction information. Featuring a large color touch screen and loudspeaker, the S300 comes with a 32- bit ARM11 processor and massive amounts of memory for exceptional multimedia performance. Providing various ports for extensive functionality, the S300 offers everything merchants could want in a sleek, stylish payment device. PAX's S300 is the world's most innovative PINpad powered by the secure and flexible platform.

 **S800 Countertop Payment Terminal**	PAX's S800 is the world's most innovative countertop payment terminal powered by a secure and flexible Linux operating platform. This supports rapid development of customized and secure software applications that give new meaning to the concept of payment and value added services. The S800 comes in a compact and stylish form factor, equipped with large color screen, wide choice of connectivity options and built-in NFC capability to enable mobile and contactless transactions. The S800 packs a 32-bit ARM11 processor and massive amounts of memory via Micro SD to deliver exceptional performance.
 **S900 Mobile Payment Terminal**	PAX's S900 is the world's most innovative mobile payment terminal powered by a secure and flexible Linux operating platform, featuring extended life battery, state of the art color touch screen and GPRS or 3G connectivity. It is the ideal solution for high-end retail and hospitality environments. The S900 offers inbuilt NFC capability to accept mobile and contactless transactions, a powerful 32-bit ARM11 processor and massive amounts of memory via Micro SD to enable exceptional processing and multimedia performance. The POS operating system of S900 supports rapid development of customized and secure software applications that give new meaning to the concept of payment and other value-added services.
 **S920 Wireless POS Terminal**	PAX's S920 is designed for the hospitality and restaurant industry, offering portability and ease of use in such environments. It is new and lightweight. Its wireless connectivity options include 4G, 3G (WCDMA), WiFi and Bluetooth. S920 uses 32-bit high-performance ARM CPU and large capacity memory, wide choice of connectivity options and built-in NFC capability to enable mobile and contactless transactions.
 **PX7 Retail Multi-Lane Terminal**	PAX's P^X7 – is a multi-channel PINPAD, support traditional magnetic strip car and IC card, integrated with "non-contact, signature, pin input" function. The high-speed processor and large memory support a broad range of payment and value-added applications. The P^X7 offers options for adding a contactless card reader, magnetic card reader, and IC card reader.

 **P^{X}5 Retail Multi-Lane Terminal**	PAX's P^{X}5 is a fully featured customer-facing, multimedia POS device which offers retailers an innovative branding channel. Combining high-security payment, outstanding durability and EMV2000 compliance, the P^{X}5 features a responsive LCD touch screen and electrostatic pen to enable electronic signature capture and excellent finger touch responsiveness. The high-speed processor and large memory support a broad range of payment and value-added applications. The P^{X}5 offers options for adding a contactless card reader, magnetic card reader, and IC card reader.

Table 2-1 Relationship between models and OS

Models	Major Version of Prolin OS
D200, S300, S800, S900, S920	Prolin-2.4
P^{X}5, P^{X}7	Prolin-phoenix-2.5
Q80, D220	Prolin-cygnus-2.6

2.2 D200 Appearances and Basics

D200 adopts Prolin-2.4 operating system. It has one Micro USB port and one RS232 port with Mini USB socket.

Figure 2-1 D200 appearance and its ports

There are two ways of supplying power for D200:

1. Supplied by external power .

   When the battery is absent, connect computer to the terminal with USB cable or use USB adaptor to supply power, and WIFI, RF or GPRS modules cannot be used.

2. Supplied by built-in battery.

Pressing the power key on the right-upper corner of the terminal for more than 3 seconds can power on/off the terminal. After D200 starts up, screen and keyboard backlight can be switched on/off by pressing the power key..

2.3 Appearances and Basic Operations of S Series Model

The S series POS terminals mainly include S300, S800, S900 and S920. S series models adopt Prolin-2.4 operating system. Their appearances are as follows:

Figure 2-2 Appearance and key descriptions of S800

Figure 2-3 Appearance of S900 and S300

Figure 2-4 Appearance of S920

After S800, S900 or S920 connects to the adaptor, just long press the power key (which corresponds to cancel key on keypad) to power on/off the terminal. S920 only has a USB port on the left side. S900 has one power port, one serial port and one downloading USB port at the bottom of the terminal.

S300 is a PINPAD device. The terminal will power on as soon as it connects to the adaptor.

2.4 Appearances and Basic Operations of P^X7&P^X5

Figure 2-5 P^X7&P^X5 appearances

P^XX series models adopt Prolin-phoenix-2.5 operating system. And the appearance of P^X7 and P^X5 are very similar; their basic operations are just like S series POS terminals. The screen size of P^X7 is 7 inches while the size of P^X5 is 5 inches. There is no power key, the terminal will start up automatically when it is powered on. For more information, please refer to "Prolin P^XX Programming Guide".

3 Tools

Prolin related tool set includes three parts, which are TermAssist, XCB and driver program.

3.1 TermAssist Introduction

TermAssist is a supporting tool developed by PAX Company. It is used to install or update Prolin OS, configuration files, application software, data files, font libraries and user public key etc.

3.1.1 Running Environment

1. WINDOWS XP/7/8, 32/64 bit
2. 1G memory space
3. 10G free disk space
4. Installed Prolin USB driver. For more information, please refer to 3.3 Driver program.

3.1.2 Functions

1. Support connecting to the POS terminal with USB, serial port and Ethernet.
2. Install or uninstall application, user public key or data files on the POS terminal.
3. Integrate SysLoader tool to update Prolin OS. SysLoader only supports USB connection to the POS terminal.

3.1.3 TermAssist Installation

Unzip *TermAssist-x.x.x.zip* file to a random directory. Files after unzipping are as follows:

Double click on  TermAssist.exe to start TermAssist, the main interface is shown as below:

Figure 3-1 TermAssist main interface

At the bottom of interface, there is a status bar shows the current version and connection status.

Green color: wait for connection

Red color: disconnected

Blue color: Data is being transmitted.

Descriptions of TermAssist interface buttons are as follows:

Table 3-1 Descriptions of interface button

Button name	Description
Home	It is used for viewing or uninstalling application, system files, system information etc. and also for

	debugging.
Setting	It is used for setting the connectivity and language.
Installer	It is used for installing the package files, data files, user public key and script files.
Tools	Integrated SysLoader tool, it is used for downloading system firmware, configuration files and startup logo etc. And ScriptEdit tool is used for editing *system.list* file.

3.1.4 Connection

Before TermAssist starts to do install or uninstall operation, it needs to connect to the POS terminal with Ethernet, USB or serial port.

Table 3-2 Connection types and models

Connection type	Models
USB	S300, S800, S900, S920, D200, P^X5, P^X7
Ethernet	S300, S800, P^X5, P^X7
Serial port	S800, S900, D200, P^X5, P^X7

USB cable is commonly used to connect the TermAssist to POS terminal, and the connecting steps are as follows:

1. Configure XCB service on POS terminal
   1) Start the POS terminal and enter TM interface.
   2) Select “1.System Config” in the main menu, enter the password; the default password is “123456”.
   3) In “System Config” menu, select “1.XCB Service”, and then select USB. (The default connection mode is USB.)

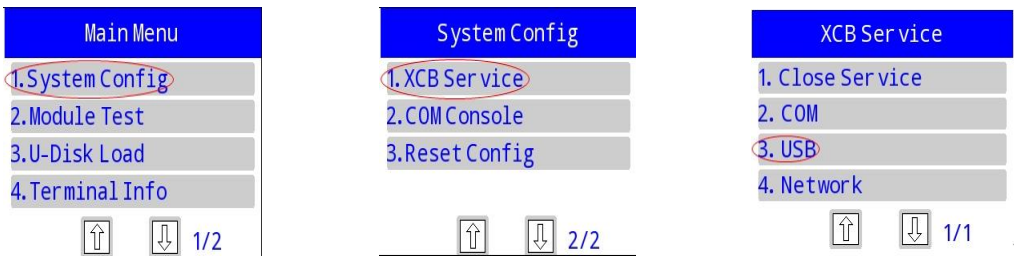
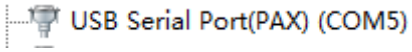


Figure 3-2 Setting the XCB connection mode in TM

CAUTION

In XCB Service menu, if USB was not selected but the user uses USB cable to connect POS terminal to computer, then TermAssist won’t be able to recognize the POS terminal.

2. Connect the TermAssist to POS terminal
   1) Start the POS terminal and connect it to the computer with USB cable.
   2) After installing the Prolin USB driver on PC (for more information about USB driver, please refer to 3.3 Driver Program;), POS terminal will be virtualized as 

(here the COM5 is allocated by computer randomly) in device manager on PC.
   3) Start TermAssist and enter the main interface, then click on 

to enter the setting interface. Select "Serial Port" connection mode, and select the COM5 in COM channel as follows:

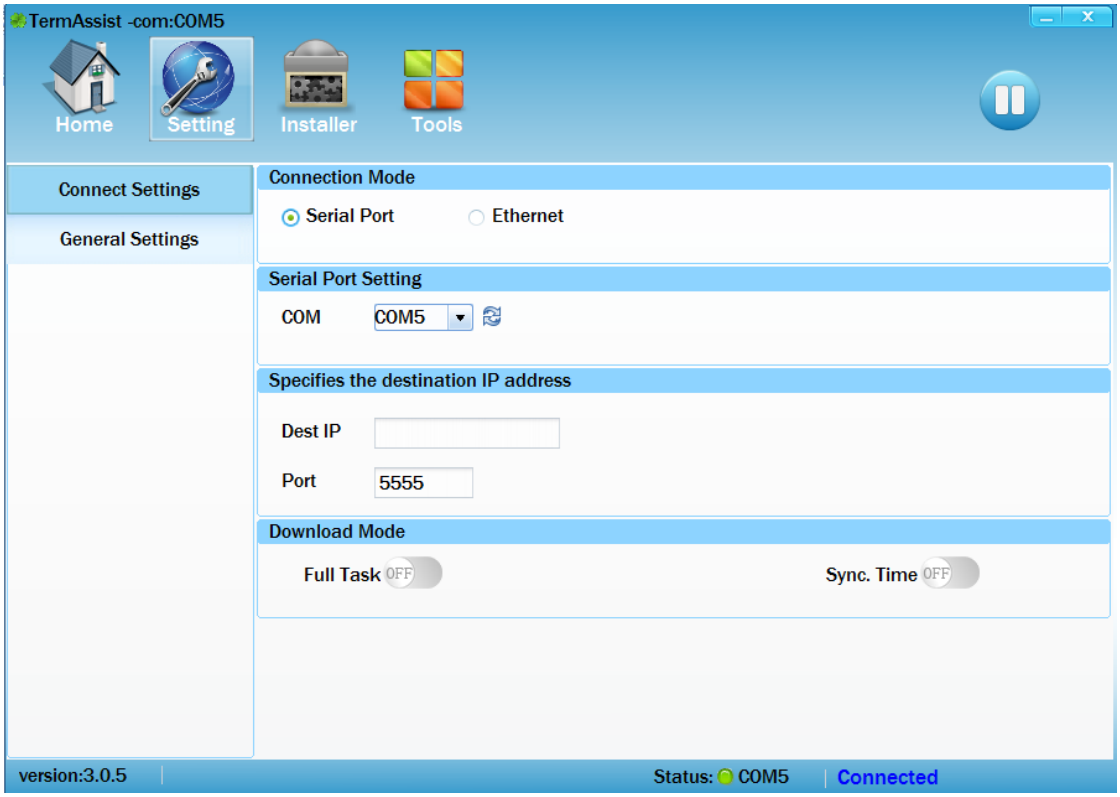


Figure 3-3 TermAssist setting interface

There are two functions in Download Mode: "full task" and "sync. time". In full task mode, all selected package files, data files and PUKs will be installed when clicking on  button; if full task mode is closed, only the files in current page will be installed. Sync. time mode controls whether to synchronize the time on terminal with the time on PC.

   4) Click on  on the upper right corner of TermAssist, then "Please wait, Refreshing…"will be displayed on the bottom right corner. Later on, the status will change to "connected" as below:

Figure 3-4 Connected successfully

3.1.5 View and Control

- **View the application information**

Click on 

to view the POS information; click on "MAINAPP" to unfold the application information list; click on  to delete the application; clicking on "MAINAPP" again will fold the list.

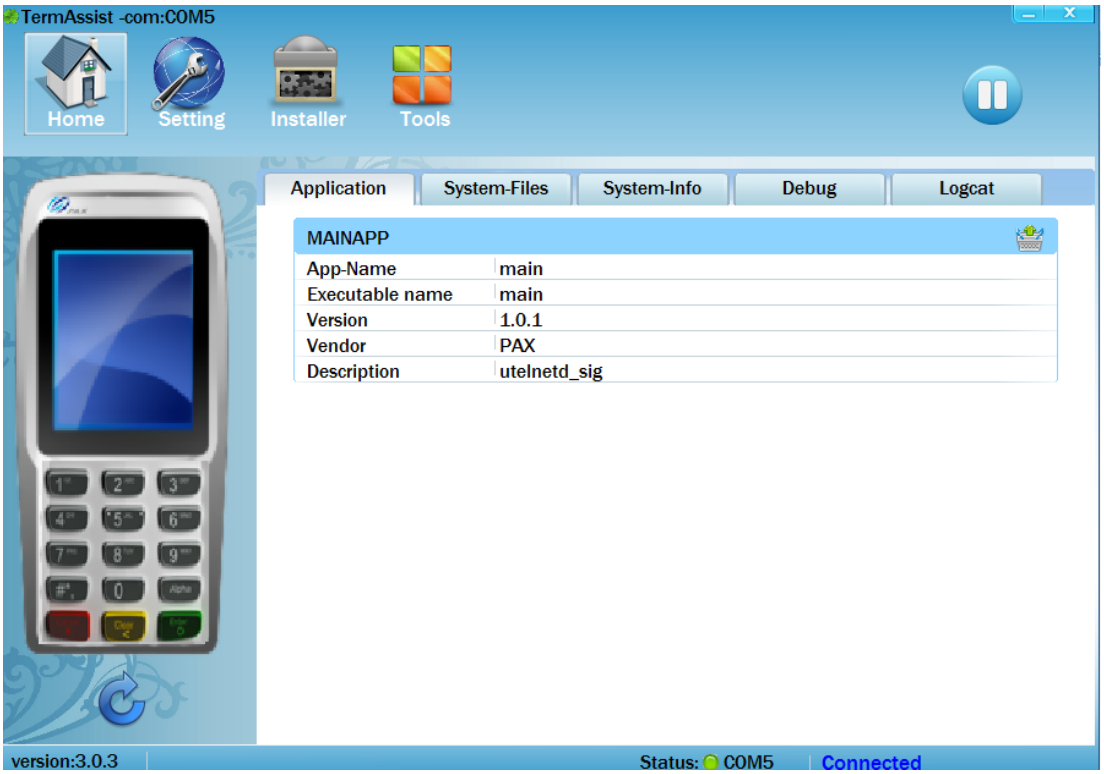


Figure 3-5 View application information

- **View PUK and font library information**

Click on "System-Files" to view the installed font library and PUK information; click on  to delete the corresponding file.

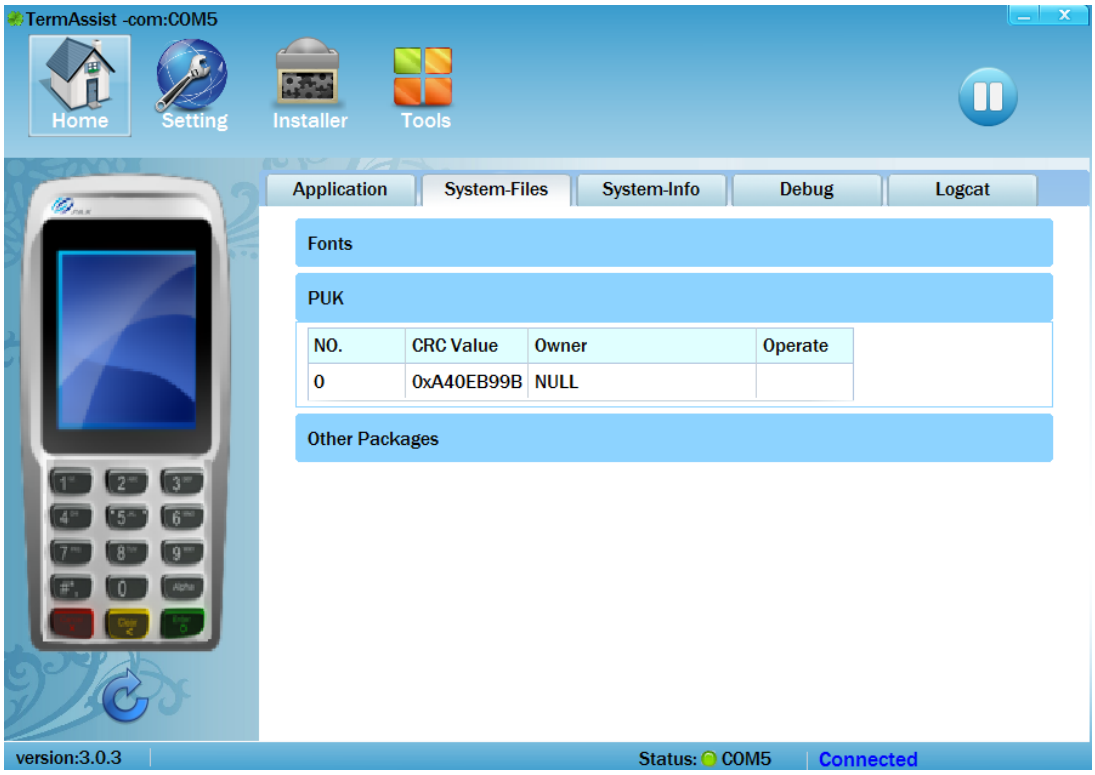


Figure 3-6 View PUK, font library information

- **View system version and configuration file information**

Click on "System-Info" to view the system version information. In "Basic Information" list, the current model is P^X5, version number is Prolin-2.5.2[D2]. The detailed configuration information is shown in the "System configuration parameters".

Figure 3-7 View system version and configuration information

- **Use Telnetd server to do the console operation**

TermAssist tool provides Telnetd service to access Prolin console, and this way only applies to the situation when prolin_debug_level is not zero. The operations are as follows:

1. Complete the connection between TermAssist and POS terminal. In the home page, click on “Debug” and enter Telnet operation interface as follows:

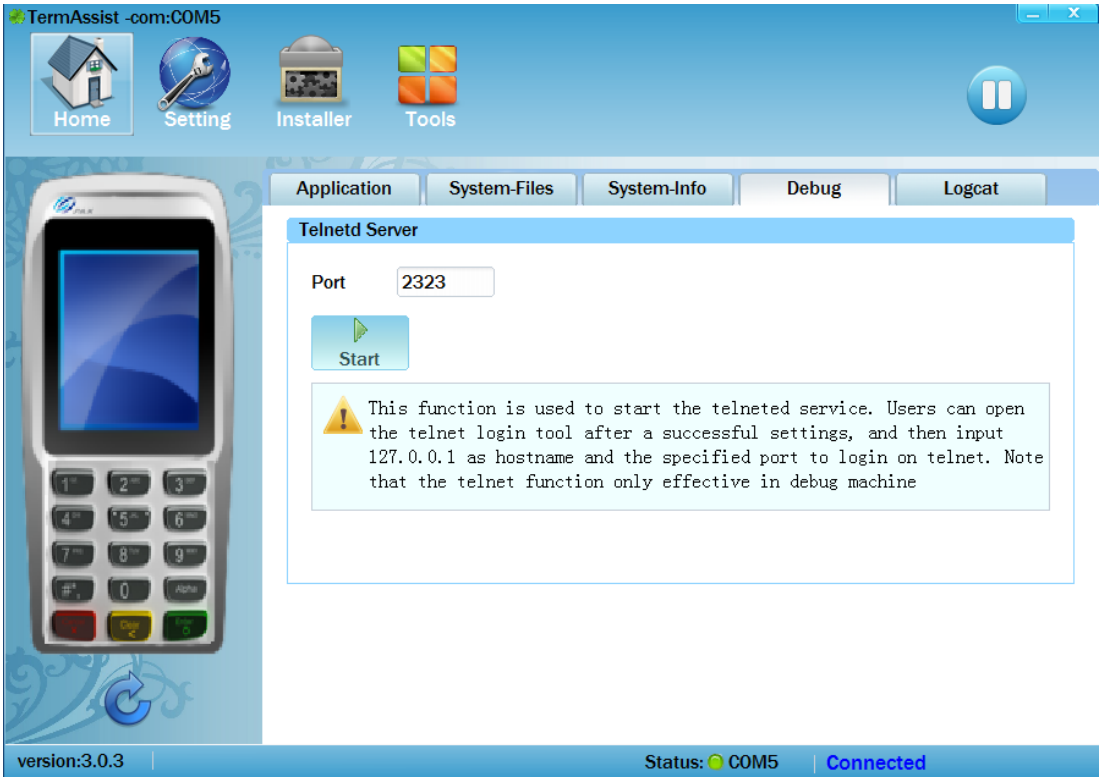


Figure 3-8 Telnet service interface

2. Click on “start” to start Telnet service shown as below:

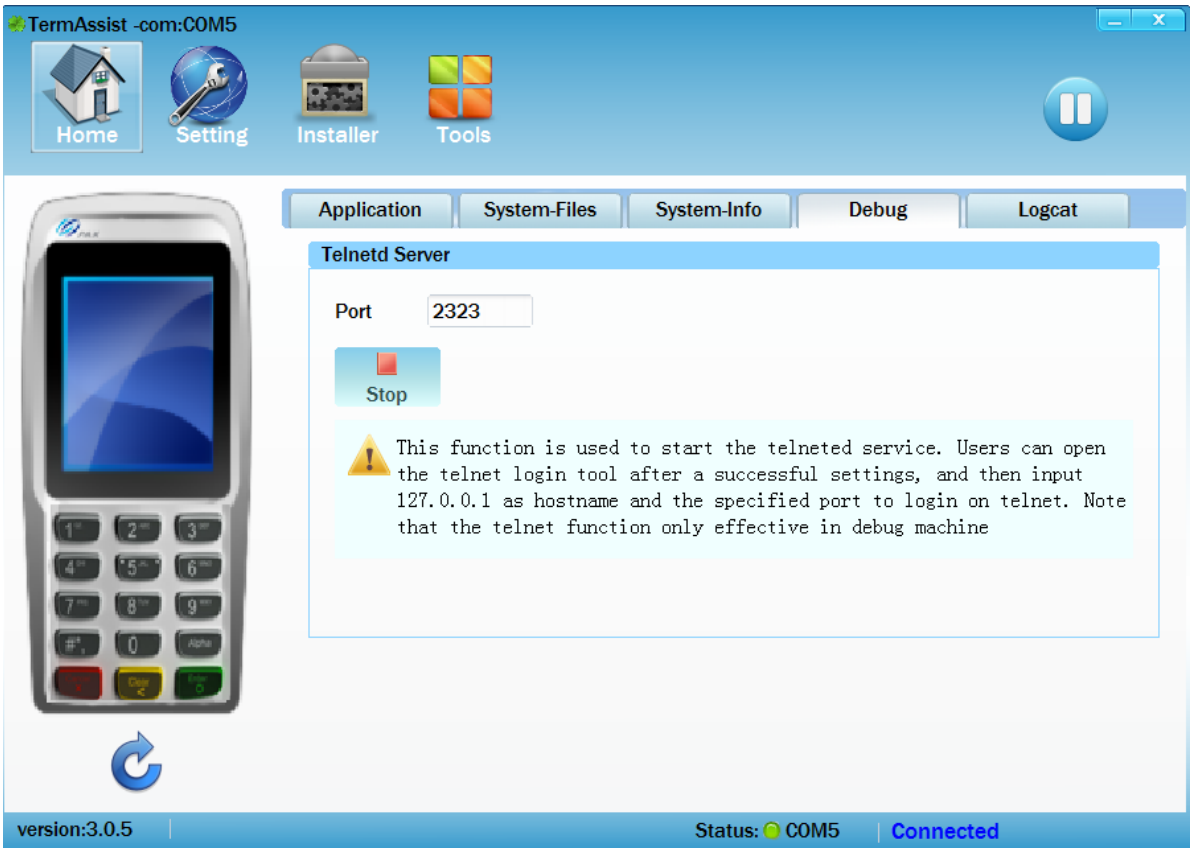


Figure 3-9 Start Telnetd Server

3. Open the Telnet login tool on PC, such as putty, the setting interface is shown in figure 3-10, set "Host Name" to "127.0.0.1" and Port to "2323", select "Telnet" as the connection type, then click on "Open", an interface will appear , then input "MAINAPP" to log in (figure 3-11).

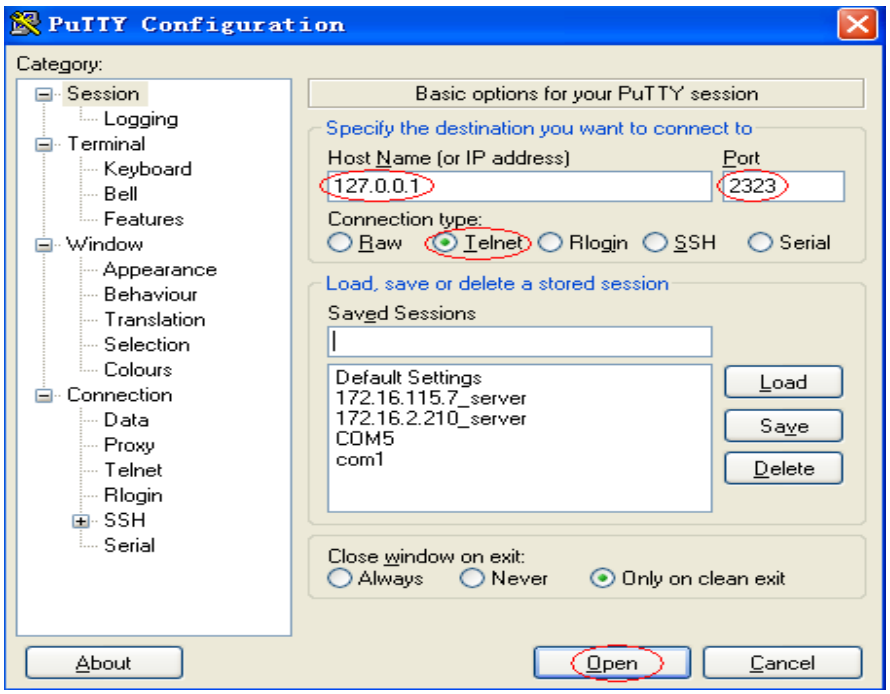


Figure 3-10 PuTTY configuration

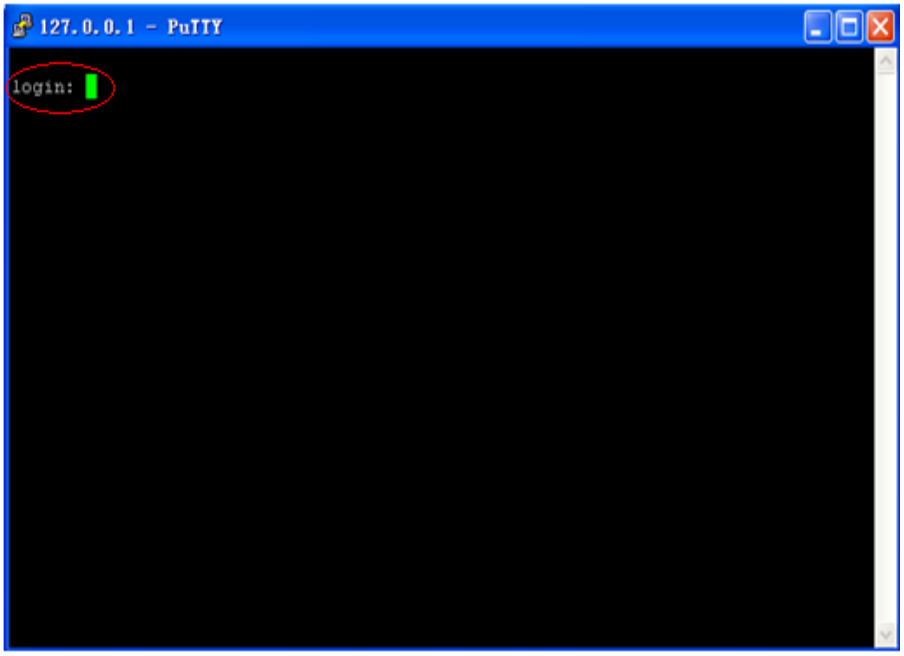


Figure 3-11 PuTTY login

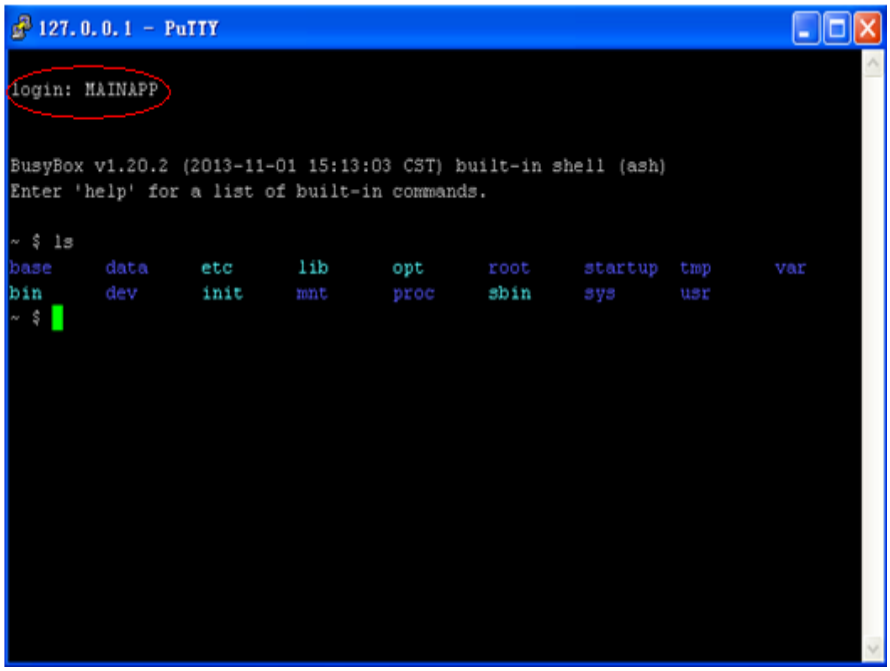


Figure 3-12 Access the console successfully

4. To finish the console operation, close console interface, then click on “Stop” in “Debug” interface. The XCB service will be disconnected later on. If user needs to open the debug mode again, XCB connection should be established first.

- **View log information**

For TermAssist 3.0 or higher version, users can view log information through “logcat” menu. Select “Logcat” menu under “Home” page, and enter system log interface.

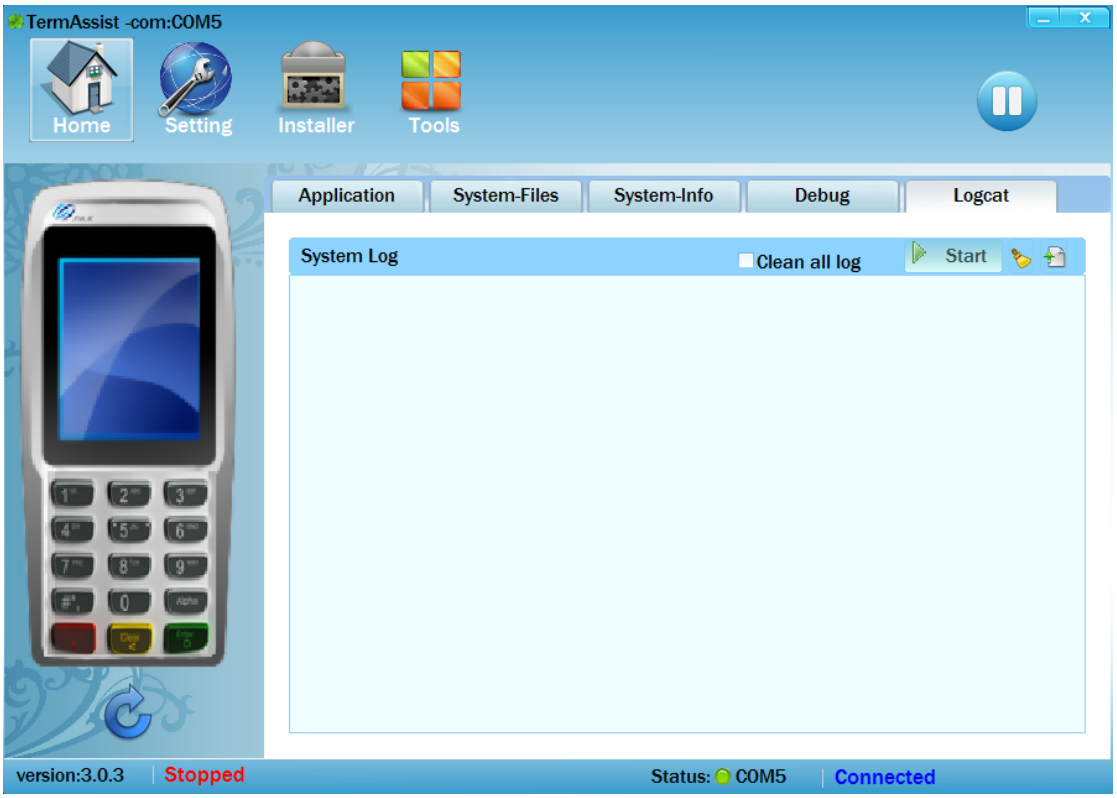


Figure 3-13 System log interface

Click on “Start” to view all the log information, interface is as follows:

Figure 3-14 Viewing system log interface

Click on  to clear all the log information in this page, and click on  to export the log information to the PC. Clicking on "Stop" will exit from the viewing interface, while checking "Clean all log" and clicking on "Stop" will clear all the log information in the terminal and exit.

3.1.6 Installation

After POS terminal sets up XCB connection with TermAssist tool, TermAssist can be used to download and install application and PUK file etc. The steps are as follows:

Click on 

to enter download interface.

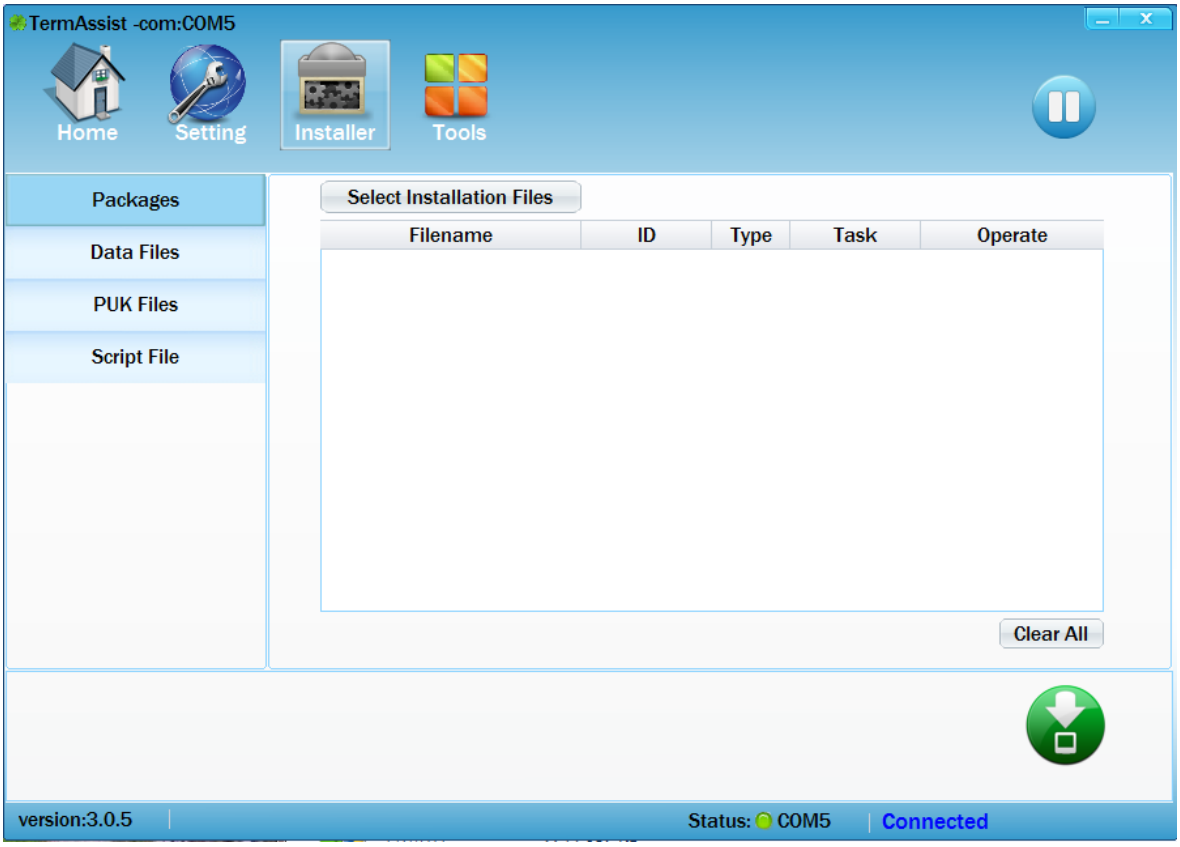


Figure 3-15 Installer interface

- **Packages installation**

The default selection on the left side is "Packages". In this menu, click on "Select Installation Files" to choose the application to download (The format of package file can be .aip, .aup, .opt, .fwp, .pkg and .tar.gz), shown in figure 3-15.

Click on  on the bottom right corner. “Installing…XXXX, Please wait” will display on the bottom-left corner and “Please wait, installing …” on the bottom-right corner. When they disappear, it means the application has been downloaded successfully.

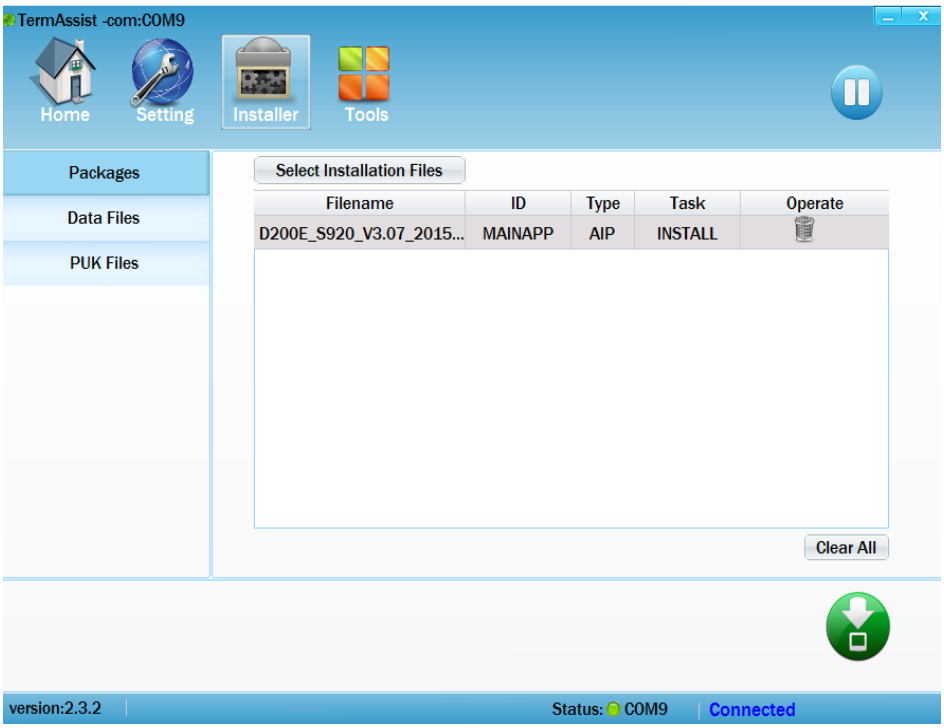


Figure 3-16 Select an AIP file to download

- **Data files installation**

Users can install data files of APP according to their needs. In “Installer” page, click on “Data Files” on the left and select the ID of APP. Then click on “Select Data Files” to select the files that need to be installed, and click on  to start installation. Clicking on “Clear All” will clear all the listed tasks. Before the corresponding data files are installed, the APP must be installed first. And the data files will be installed in the */data* folder of corresponding APP.

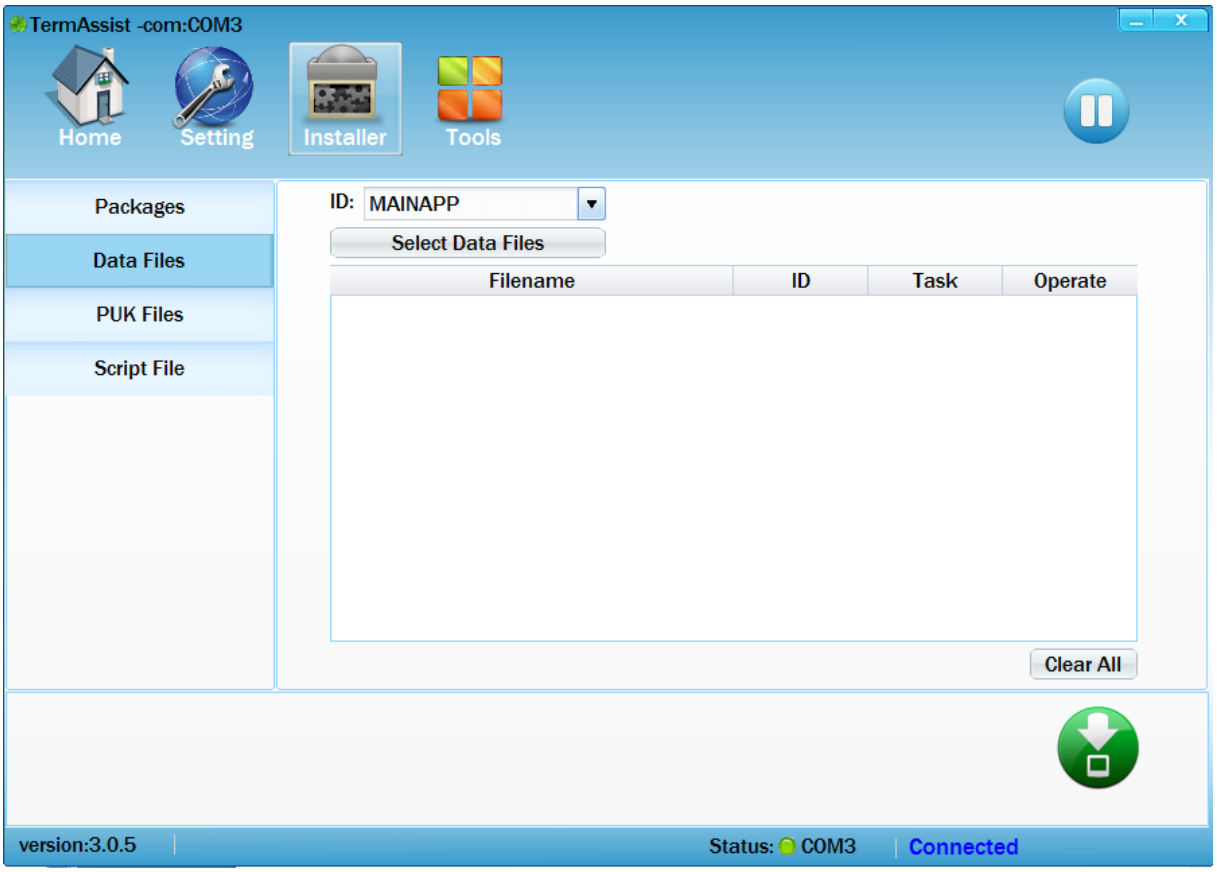


Figure 3-17 Install data files

- **PUK files installation**

Only TermAssist 2.3 or higher version supports downloading PUK files for POS terminal with authorized mechanism; otherwise, the following situation will occur as follows:

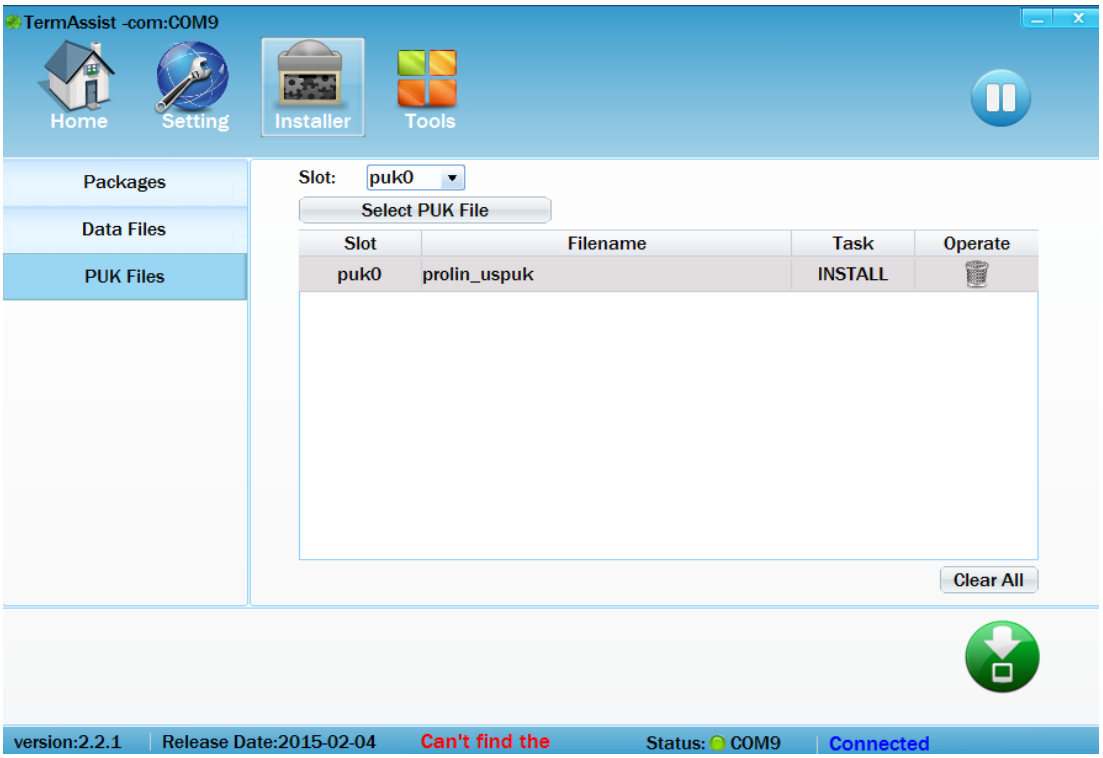


Figure 3-18 “Can’t find the file” situation

The POS terminal with authorization mechanism refers to the one that has installed the Prolin-2.4.39 or higher version OS. For TermAssist 2.3 or above version, it can download the PUK files for POS terminal with authorization or non-authorization mechanisms, but their download interfaces are different shown in figure 3-19 and figure 3-20.

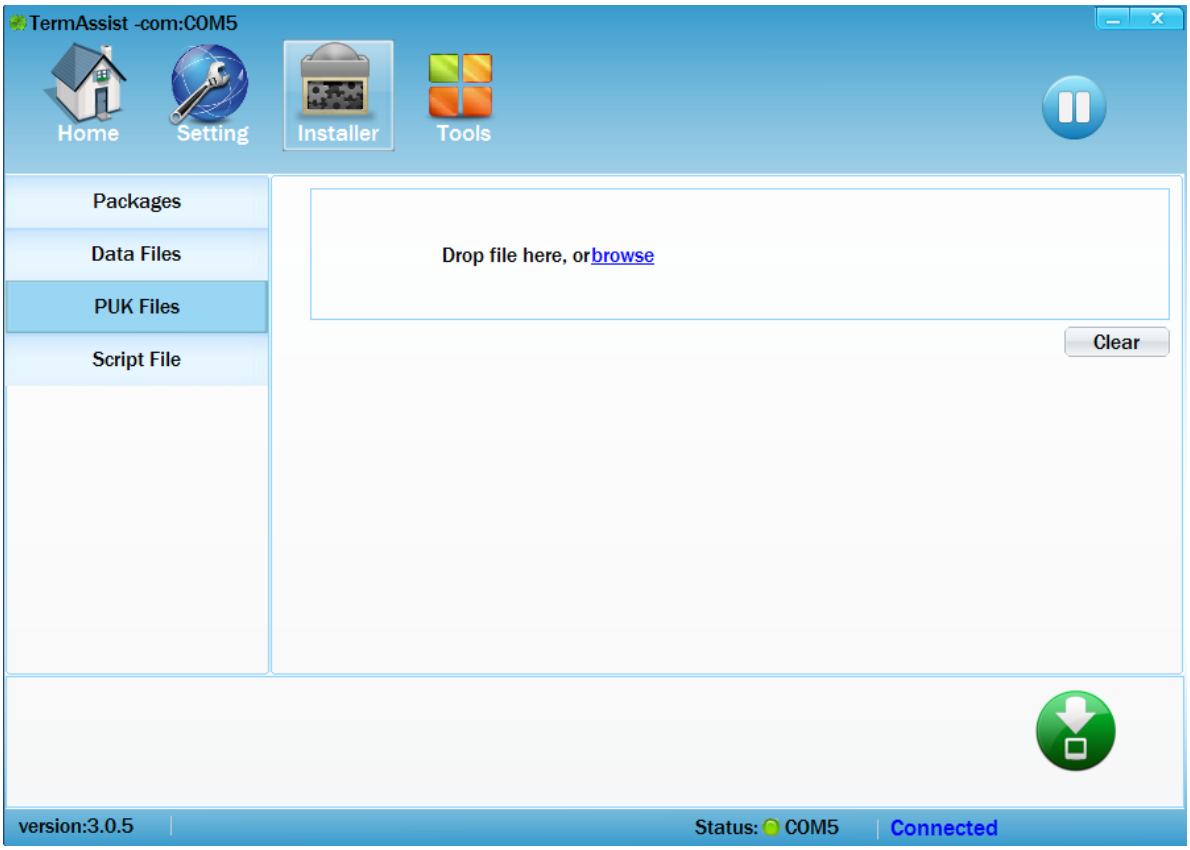


Figure 3-19 Download PUK file for POS terminal with authorization mechanism

For POS terminal with non-authorization mechanism, select "PUK Files" in "Installer" interface, click on "Slot" to select the slot number (puk0~puk8) to store the PUK file, and then click on "Select PUK File" to select the PUK file.

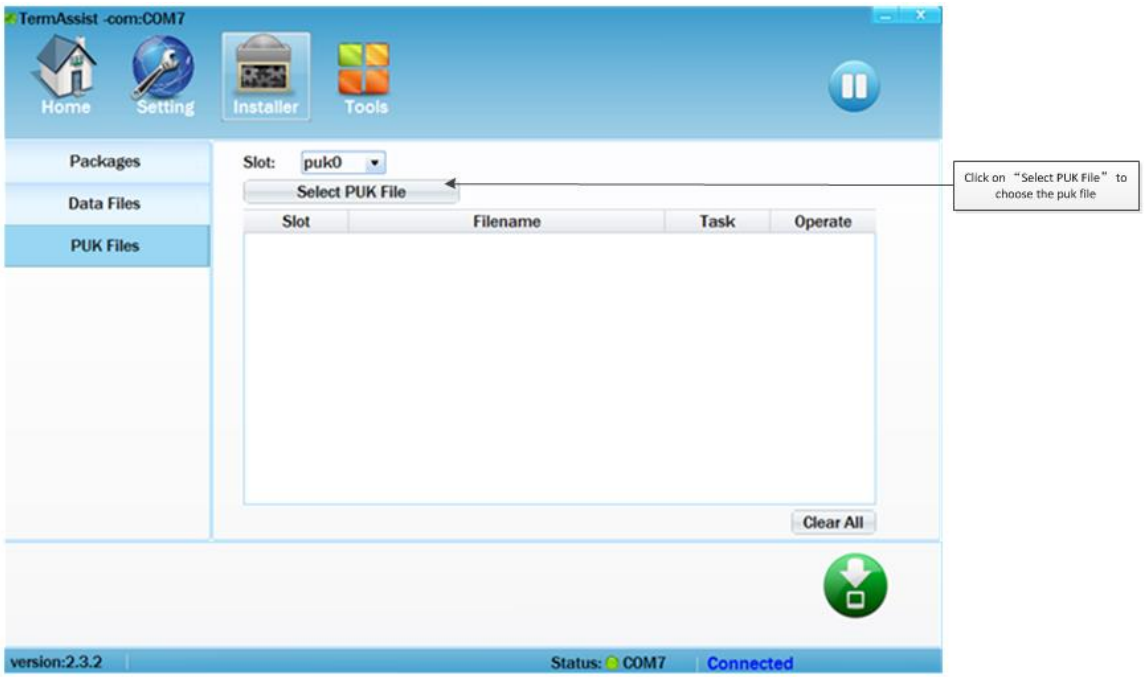


Figure 3-20 Download PUK file for POS terminal with non-authorization mechanism

At last, click on download button  , a dialogue box will be displayed in figure 3-20, click on “OK” to complete installation; click on “Cancel” will cancel the operation.

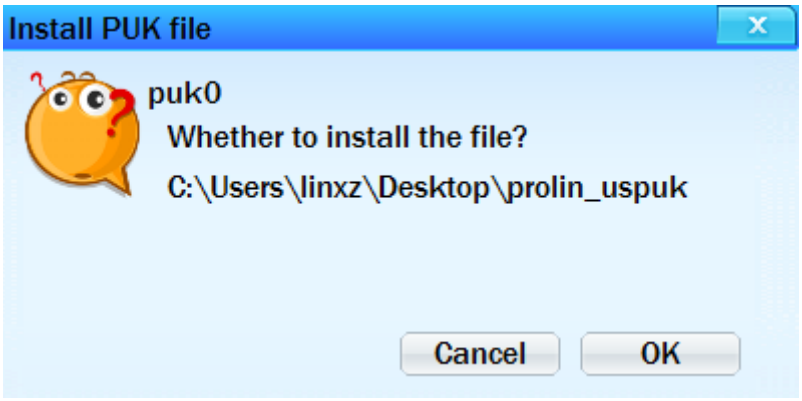


Figure 3-21 Install PUK file

- **Script Files Installation**

User can create a System.list file, and download it to the POS terminal through Script Files menu or USB-disk. And then user can install the AIP, AUP, application parameters, OPT, US_PUK, OS firmware package written in the system.list. For information about USB-disk download and the format of system.list file, please refer to the 4.3.3 U Disk Download. Script file interface is as follows:

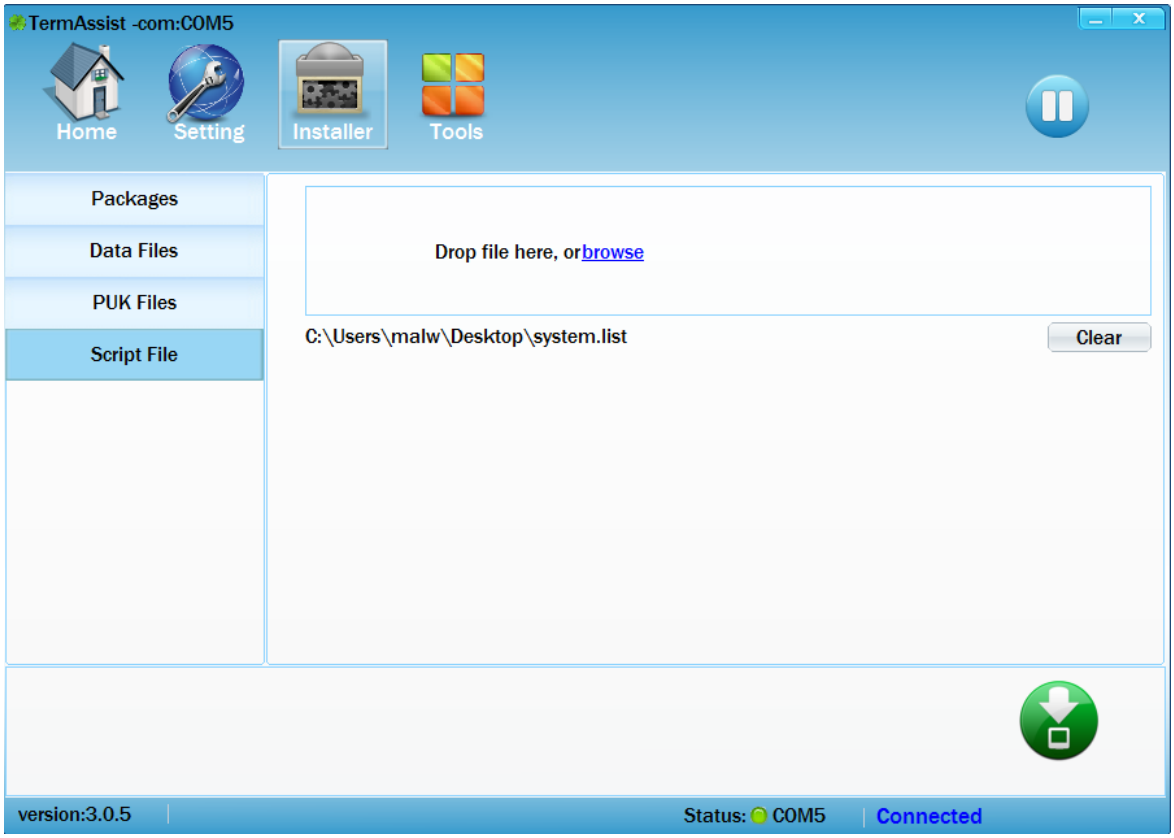


Figure 3-22 Install system.list file

3.1.7 Uninstallation

After POS terminal connects to the TermAssist successfully, the installed application, font library and user public key files can be uninstalled through TermAssist.

- **Application uninstallation**

In figure 3-23, the "application" option in the home page will show the application information. Clicking on  on the right side will delete the installed application without any notification.

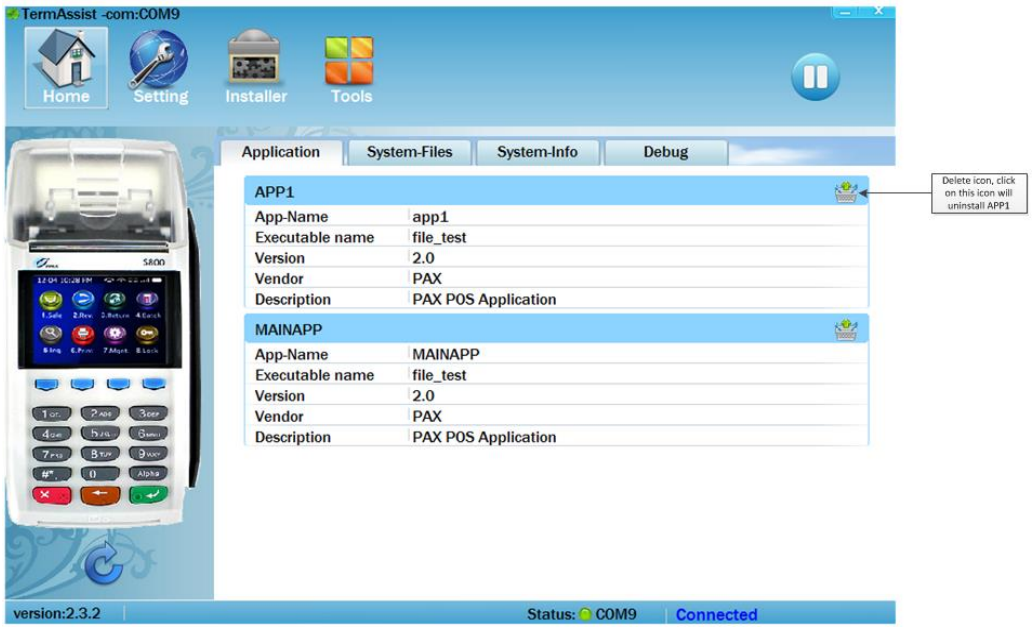


Figure 3-23 Delete Installed Applications

- **System files Uninstallation**

In the main page, "system file" menu shows font library and user pubic key. The font library can be uninstalled by clicking on  on the right side. For POS terminal with non-authorization mechanism, TermAssist can delete the PUK file directly, while for POS terminal with authorization mechanism, PUK file can't be deleted by clicking on  icon, and the differences between the two are as follows:

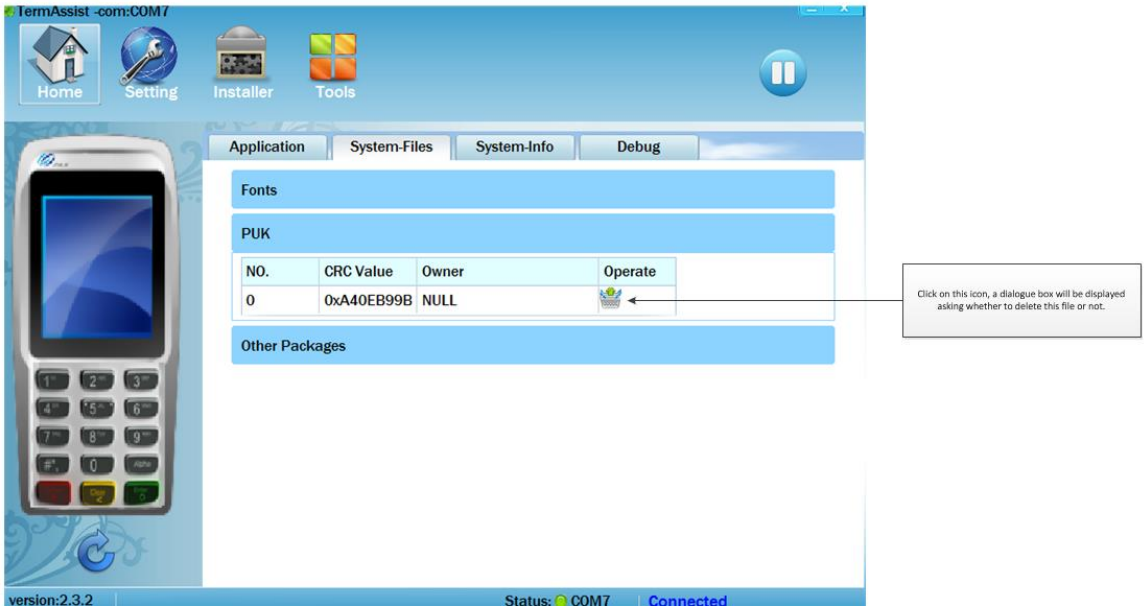


Figure 3-24 Delete PUK for POS terminal with non-authorization mechanism

Figure 3-25 Delete PUK for POS terminal with authorization mechanism

When uninstalling PUK for POS terminal with non-authorization mechanism, the dialog box will be prompted shown in figure 3-26. Click on “OK” to complete the uninstallation, or click on “Cancel” to cancel the uninstallation.

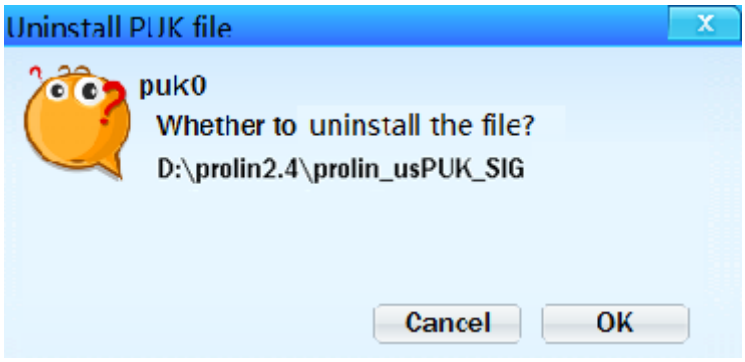


Figure 3-26 Prompted dialog box

- **Method of deleting PUK file for POS terminal with authorization mechanism**

Authorization mechanism supports up to 3 CS_PUKs in chain structure. Signature of installed CS_PUK is verified by the former CS_PUK shown as follows:

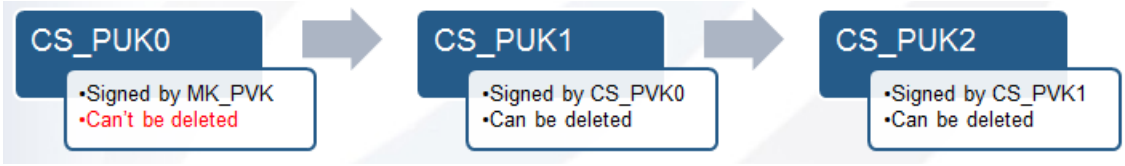


Figure 3-27 Relationship among PUKs for POS terminal with authorization mechanism

For example, downloading CS_PUK1 signed by CS_PVK2 will delete CS_PUK2. The CS_PUK0 cannot be deleted.

3.1.8 SysLoader

- **Starting SysLoader**

SysLoader only supports connecting to the POS terminal with USB. The steps of starting SysLoader are as follows:

1. Starting TermAssist download tool, click on  as follows:

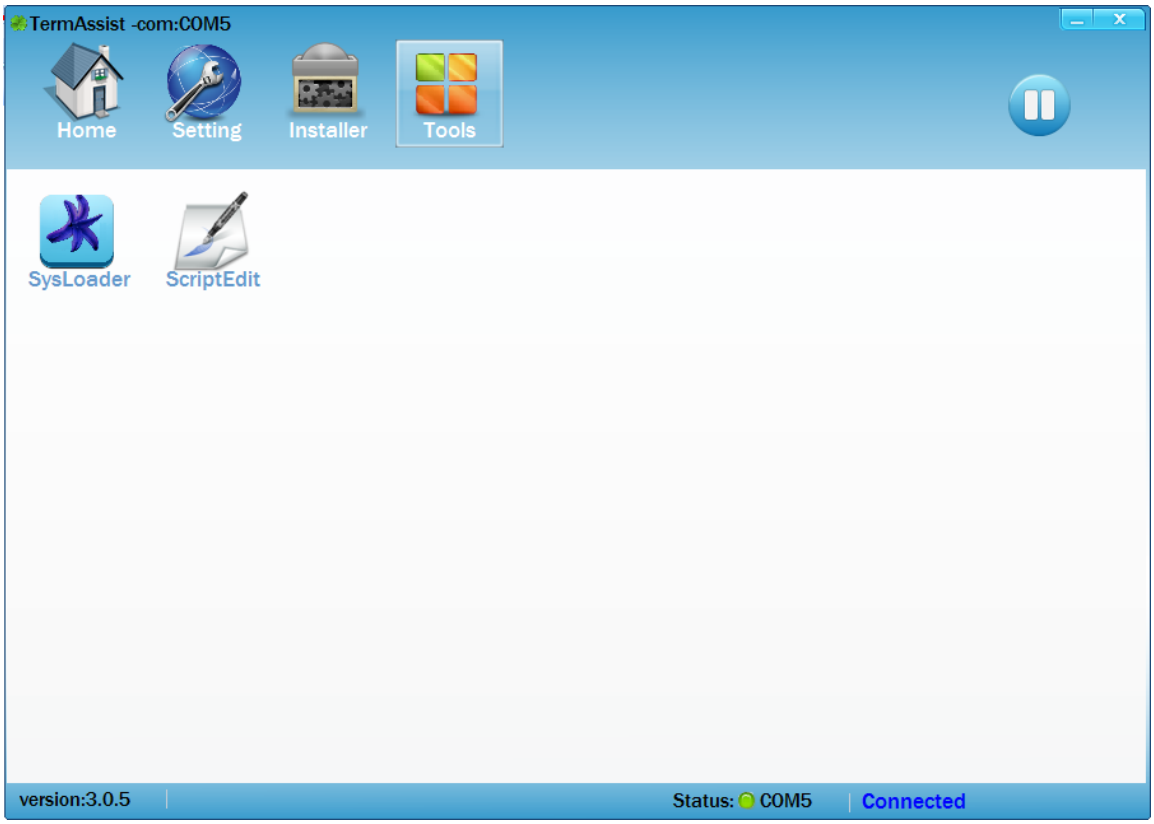


Figure 3-28 TermAssist tool interface

2. Click on  to start SysLoader, the interface will be displayed as follows:

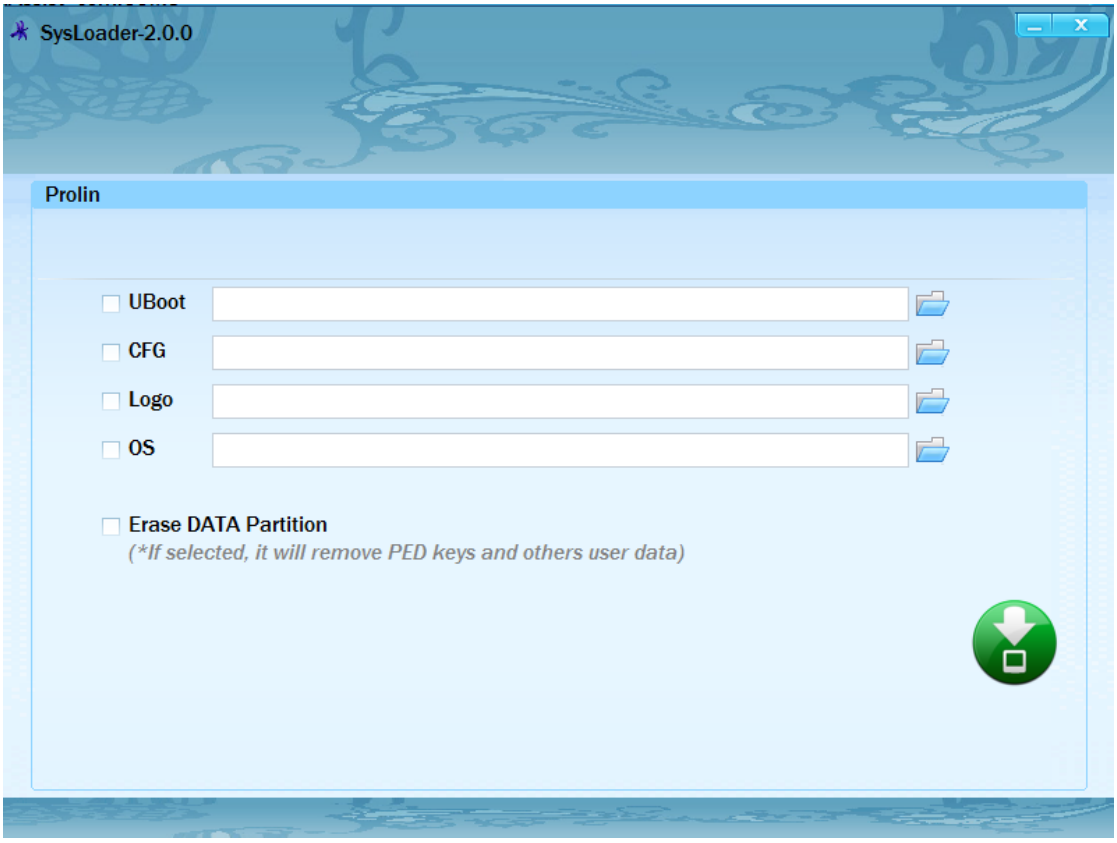


Figure 3-29 SysLoader interface

Table 3-3 SysLoader interface description

Area	Description
Selecting download file area	Including Boot, CFG, Logo and OS.
Erase DATA partition command	Erase application, font library etc, it will cause PED soft tamper. After PED has been unlocked, TM will get started.
Start downloading/erasing button	Start downloading

- Erase Data Partition

In Sysloader main interface, if the Erase DATA Partition box is checked, content of user data partition such as application and font library will all be erased.

CAUTION

For Prolin-2.4.51 terminals with Bluetooth module, Bluetooth library is installed separately. So after erasing data partition, Bluetooth library needs to be installed again.

3.1.9 ScriptEdit

To simplify the operations, users can edit system.list file by ScriptEdit tool.

ScriptEdit tool is integrated into TermAssist tool set. Click on 

in "Tool" page of TermAssist and enter ScriptEdit interface, and it is shown as follows:

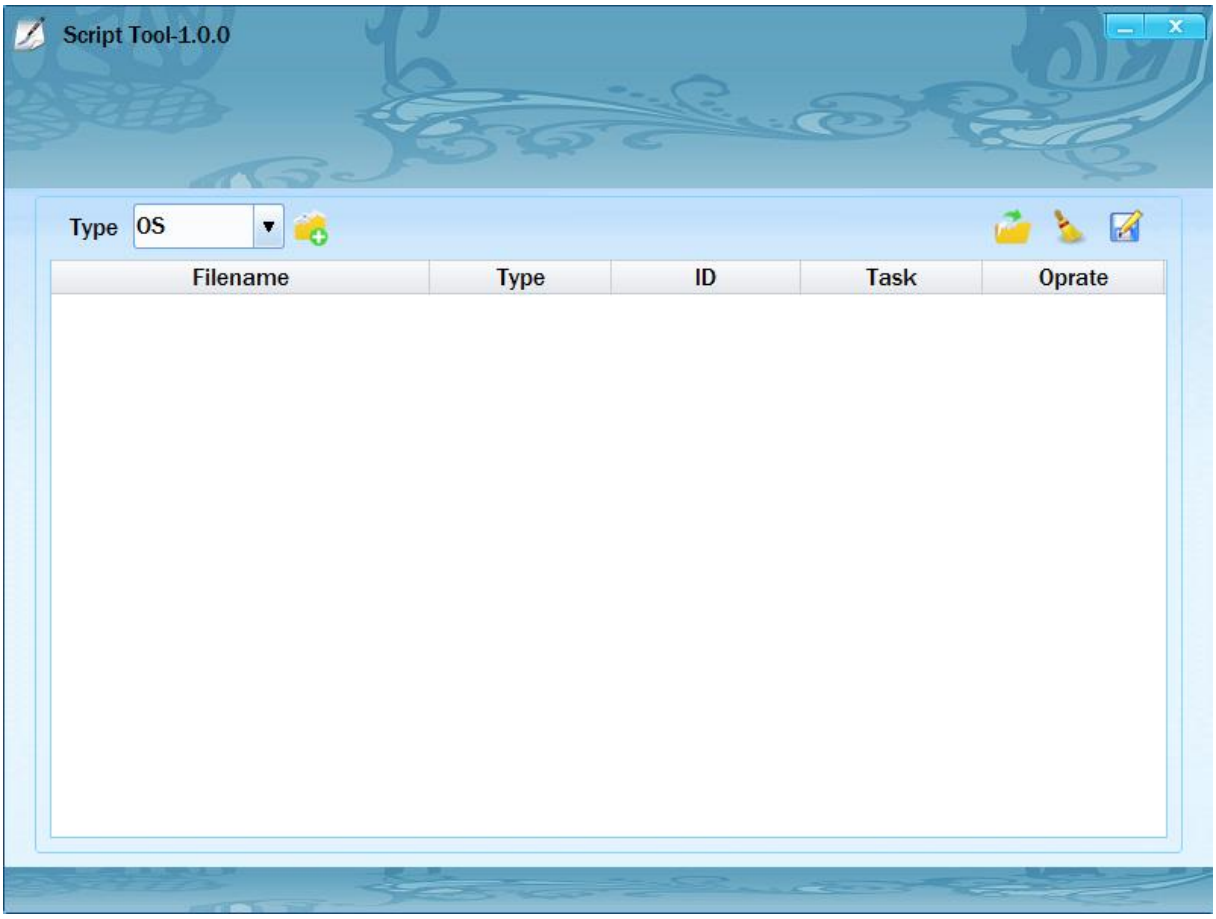


Figure 3-30 ScriptEdit interface

Steps of editing system.list file are as follows:

1. Select the task type in “Type” list, and click on  to add a task. When selecting “Data Files” or “Delete App”, application ID needs to be filled in; when selecting “Delete Opt”, OPT name needs to be filled in.

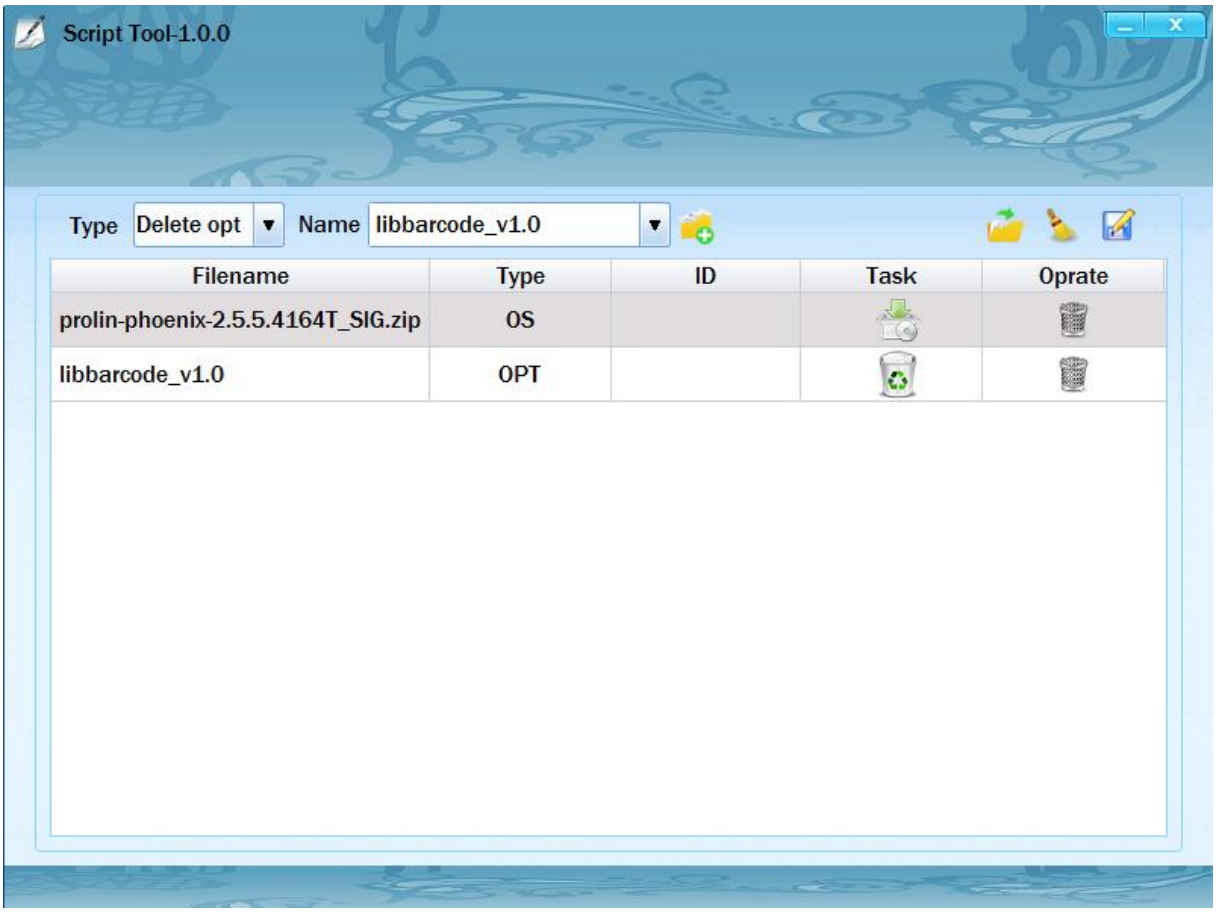


Figure 3-31 Edit task

Icon  indicates an installation task; while  indicates an uninstallation task. Clicking on  will delete the corresponding task.

2. Clicking on  will clear the current editing task list; clicking on  will save the current task list as a xxx.list file to the local. The .list file is shown as follows:

```
[os]
package=prolin-phoenix-2.5.5.4164T_SIG.zip
[ipkg-remove]
pkg1=libbarcode_v1.0
```

Figure 3-32 system.list file

In addition, clicking on  will open an existed script file, and users can check the task list.

CAUTION

The processing sequence is not affected by the order of the script task list. The priority is as follows:

1. Delete APP

2. Delete OPT
3. Install OS
4. Install PUK
5. Install APP
6. Install OPT
7. Install FWP

3.2XCB

XCB is a multi-function command tool which connects to the simulator or device of Prolin platform, and it has following features:

1. Use the command line to communicate with simulator or device.
2. Several connection modes. XCB can connect to a simulator or a device through serial port or TCP/IP physical link.
3. Several connection links. Several logical links can be created to connect to the POS terminals at the same time.

3.2.1 XCB Service

Prolin provides serial port, Ethernet and USB modes to connect to the XCB client. It is used for diagnosing, debugging and configuring Prolin OS etc. Some of the XCB commands are shown as follows:

Table 3-4 XCB service function list

Command	Description	Note
kill/start	Start or stop XCB service on PC.	
connect	Connect XCB server to simulator.	
telnet	Log in terminal remotely.	Some of Linux shell commands are available after login.
Installer	Install/uninstall application software, user public key and update operating system.	Prolin operating system can only be updated but not deleted.
Forward	Establish connection between a specified local socket and a specified remote socket.	
devinfo	Check and get terminal information.	

disableme	Stop XCB service on PC.
switch-channel	Switch XCB service channel of POS terminal.

3.2.2 XCB Client

XCB client tool is needed when accessing XCB service, PAX provides a cross-platform XCB command line client tool. In this document, we take the CMD tool in Windows as an example to illustrate the usage of XCB client tool.

The basic steps of using XCB service are as follows:

1. Execute *xcb start-server* to start XCB daemon;
2. Execute *xcb connect* to connect device;
3. Execute other commands;
4. Execute *xcb disconnect* to disconnect the device;
5. Execute *xcb kill-server* to end the local XCB daemon.

xcb start-server is an optional command. If executing *xcb connect* directly to build the connection with the device, the XCB service will start when there is no XCB daemon running. Specific outputting message refers to Appendix 2.

- **Start and stop**

Before using XCB client, open the XCB service on PC. Also make sure that XCB service on PC is stopped when quitting XCB client.

Table 3-5 XCB command (1)

Command	Description
xcb start-server	Start the XCB service on PC.
xcb kill-server	Stop the XCB service on PC.

- Connect and disconnect

Table 3-6 XCB command (2)

Command	Description	Example
xcb connect ip:port	Connect to the POS terminal through TCP mode, default port number is 5555.	xcb connect 127.0.0.1:5555
xcb disconnect ip:port	Disconnect through TCP mode.	xcb disconnect 127.0.0.1:5555
xcb connect com:comport	Connect POS terminal through RS232 mode.	xcb connect com:COM1 xcb connect com:/dev/tty/S0(linux)

- **Telnet function**

Telnet function makes the user log in the telnet server of remote device or emulator through local host easily. The commands entered in the local machine can run in the server, and the server will bring the result to the local device, just like operating the server console directly. This realizes the remote operating and controlling of server, and it is convenient for users to debug and check.

This function can only be realized on the debug machine.

Table 3-7 XCB command(3)

Command	Description	Example
xcb telnetd [port]	Start telnetd server, the default port is 2323; If telnet client connects to the local telnetd monitor port, a proxy process will be generated on the device or emulator, which will make telnet client create a terminal that connects to the device or emulator.	xcb telnetd xcb telnetd 2323 xcb –s com:COM1 telnetd /*Sample command of connecting to telnetd*/
xcb kill-telnetd [port]	Close telnetd server	xcb kill-telnetd xcb kill-telnetd 2323 xcb –s com:COM1 kill-telnet

- **Installation and uninstallation of system firmware and application**

Table 3-8 XCB command (4)

Command	Description	Example
xcb installer aip <aip-file>	Install application	xcb installer aip “d:\\TestApp.aip”
xcb installer uaip <appid>	Uninstall application whose ID name is appid.	xcb installer uaip MAINAPP
xcb installer aup <aup-file>	Install application update package	xcb installer aup “d:\\TestApp.aup”
xcb installer appdata <appid> <data-file list>	Install specified application data file.	xcb installer appdata MAINAPP “d:\\logo.bmp d:\\config.ini”
xcb installer puk	Install user public key file	Non-authorization

<puk-file>		mechanism: xcb installer puk 0 “d:\\key_sig.puk” Authorization mechanism (Prolin-2.4.39 or higher): xcb installer puk “d:\\key_sig.puk”
xcb installer opt <opt-file>	Install system firmware and font library file	xcb installer opt “d:\\simsum.tar.gz”
xcb installer uopt <opt-id>	Uninstall system firmware and font library file.	xcb installer uopt simsum
xcb installer firmware-kernel <img-file>	Install the kernel file of system firmware.	xcb installer firmware-kernel “d:\\kernel-2.4.img”
xcb installer firmware-ramdisk <img-file>	Install the ramdisk file of system firmware.	xcb installer firmware-ramdisk “d:\\ramdisk-2.4.img”
xcb installer firmware-base <img-file>	Install the base file of system firmware.	xcb installer firmware-base “d:\\base-2.4.img”

- **Forward command**

Table 3-9 XCB command (5)

Command	Description	Example
xcb forward <local> <remote>	Set up the connection between the socket specified by PC and socket specified by remote device.	xcb forward tcp:2323 localfilesystem:/tmp/gdb-id xcb forward tcp:5555 tcp:2323
xcb killforward <local> <remote>	Disconnect the PC from device/simulator.	xcb killforward tcp:2323 localfilesystem:/tmp/gdb-id xcb killforward tcp:5555 tcp:2323

- **Disableme command**

Table 3-10 XCB command (6)

Command	Description
xcb disableme	Close XCB server on POS terminal.

- **Switch-channel command**

Table 3-11 XCB command (7)

Command	Description
xcb switch-channel <lan/usb>	Switch the XCB server link to LAN/USB on POS terminal, andthe setting takes effect immediately.

- **Other Commands**

Please refer to Appendix 2.

3.3 Driver Program

- **Install driver in Windows system**

When using TermAssist to download system file or application for the first time, the USB driver needs to be installed. When POS terminal connects to PC, the USB driver will be installed automatically. If the auto-installation failed, please enter */tools* directory in TermAssist folder and run "USBDriver.exe" to install the USB driver.

1. If computer has already installed the former version of USB driver (and if the version number is lower than 2.7.0.0), then please update the USB driver tools\USBDriver.exe first.
2. If TermAssist of 3.X version cannot download application normally, please update the USB driver tools\USBDriver.exe manually.
3. TermAssist of 2.X and 3.X version cannot be mixed with each other; otherwise, the downloading may fail.

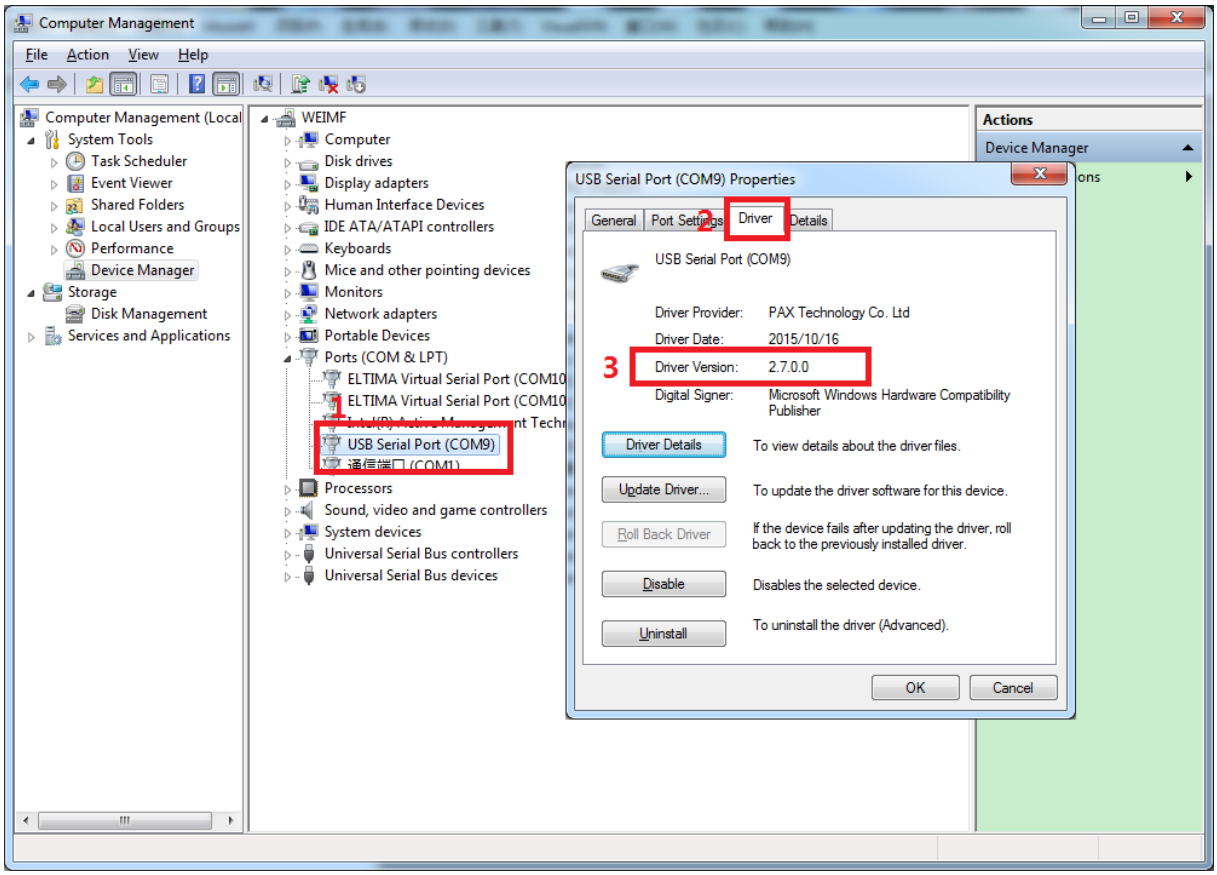


Figure 3-33 The method of viewing the USB driver version number

- **Install driver in Linux system:**

TermAssist doesn't support the automatic installation of USB driver, so the user needs to install the driver manually. And the steps of installation are as follows:

1. Install driver compiling environment;
   Due to the Linux kernel, Linux drivers are released as source code, and they can be installed to the target platform only after customized compilation.
   The installation of the driver compiling environment in Linux desktop distro is mainly about the installation of compiling tool and the kernel tree. And the installation methods described in the context are online installation. The software update source needs to be configured first.
   1) Install driver compiling environment in Fedora
      a) Open the terminal, and input the *su* command to switch to the administrator account.
      b) Install the compilation tool: *yum -y install gcc*.
      c) Install the kernel tree: *yum -y install kernel-devel-$(uname –r)*.
   2) Install driver compiling environment in Debian
      a) Open the terminal, and input the *su* command to switch to the administrator account.

b) Install the compilation tool: *apt-get install build-essential*.

c) Install the kernel tree: *apt-get install linux-headers-$(uname -r)*.

3) Install driver compiling environment in Ubuntu

By default, the driver compiling environment is installed in Ubuntu, if it needs to be reinstalled, please refer to the method of installing driver compiling environment on Debian.

4) Install driver compiling environment in openSUSE

a) Open the terminal, and input the *su* command to switch to the administrator account.

b) Install the compilation tool: *zypper install gcc make*.

c) View the Distro information: *uname -r*, the result is *(linux kernel version) – (desktop distro)*.

For example, "2.6.31.5-0.1-default" indicates that the current kernel version is "linux-2.6.31.5-0.1" and the desktop distro is "default". The version of openSUSE includes "default" and "desktop".

d) Taking the default version as an example, command of searching for the matching kernel tree of the current kernel version: *zypper se -s kernel-default-devel*.

It will display the contents in format as below:

```
S | Name | Type | Version | Arch | Repository
--+---------------------+---------+---------------+------+--------------------
v | kernel-default-devel | package | 2.6.31.14-0.6.1 | i586 | openSUSE-11.2-Update
v | kernel-default-devel | package | 2.6.31.14-0.4.1 | i586 | openSUSE-11.2-Update
v | kernel-default-devel | package | 2.6.31.14-0.2.1 | i586 | openSUSE-11.2-Update
v | kernel-default-devel | package | 2.6.31.14-0.1.1 | i586 | openSUSE-11.2-Update
v | kernel-default-devel | package | 2.6.31.12-0.2.1 | i586 | openSUSE-11.2-Update
v | kernel-default-devel | package | 2.6.31.5-0.1.1 | i586 | openSUSE-11.2-Update
```

The last line is the matching kernel tree of the current kernel version.

e) Install the kernel tree: *zypper in kernel-default-devel-2.6.31.5-0.1.1*.

2. Install and uninstall driver:

- Installation based on source file

a) Open the terminal, and enter the drive file directory, then use the *su* command to switch to the administrator account.

b) Compile the driver: *make*.

c) Install the driver: *make install*.

d) Uninstall the driver: *make uninstall*.

e) After connecting to the POS USB device, the device name will be created dynamically. The name format is /dev/ttyPos0, /dev/ttyPos1..... And it can support up to five devices at the same time

- Installation based on binary driver file

Only when the kernel version and release number of Linux system are the same as the binary driver file, can the binary driver file be installed to the system. For example, the driver compiled in openSUSE 11.2 cannot be installed in the openSUSE11.3, and driver compiled in openSUSE cannot be installed in Fedora.

On Linux PC, the driver name of POS USB is ttyPos.ko.

Install driver:

a) Open the terminal, and enter the directory of ttyPos.ko, then use the *su* command to switch to the administrator account.
b) Install driver program: *install -D -m 644 ttyPos.ko /lib/modules/$(uname -r)/ttyPos/ttyPos.ko*.
c) Detect all modules: */sbin/depmod -a*.

Uninstall diver:

a) Open the terminal, and use the *su* command to switch to the administrator account.
b) When the driver program is idle, remove the driver program automatically: *modprobe -r ttyPos.*
c) Uninstall driver program: *rm /lib/modules/$(uname -r)/ttyPos/ttyPos.ko.*
d) Detect all modules: */sbin/depmod –a.*

4 Usage

This chapter describes the usage of Prolin, including system component, startup process, TM, the installation of software application and system update etc.

4.1 System Components

Prolin system components contain the followings:

Table 4-1 System components

Component Name	Function Description	Note
Boot	Start Prolin OS	System firmware
Configuration file	The configurations and files set of environment for system loading.	System firmware
Startup logo	The screen will display the logo when starting the terminal.	System firmware
Prolin operating system	It is used for supporting the application software.	System firmware
Software application	It is independent of Prolin OS and used for realizing specific functions, such as doing the transaction.	

4.2 System Startup

The process of starting up Prolin system is as follows:

1. After powering on the POS terminal, the LCD screen of POS will show “starting Prolin OS” for about 10 seconds.
2. LCD will display SELF-TEST for less than 1 second, and then display “SUCCESS” for less than 1 second.
3. If the terminal is in Release state and has installed the software application, the application will get started; otherwise, TM will get started as follows:

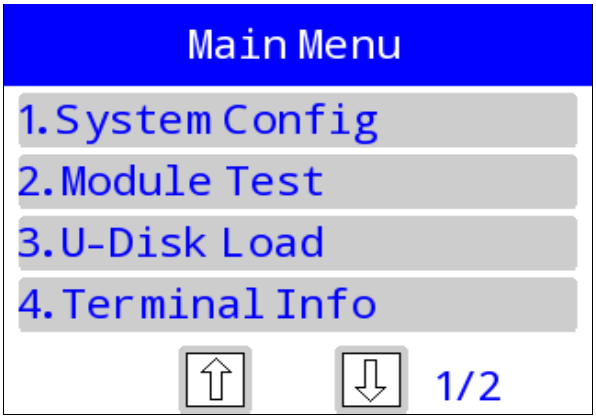


Figure 4-1 TM main menu interface

4. If the terminal is in Debug state, LCD displays warning interface shown as follows. Press “2” at this time, and TM will get started. If the terminal has installed the software application, pressing “Enter” or not pressing any button will start the application; otherwise, TM will get started.

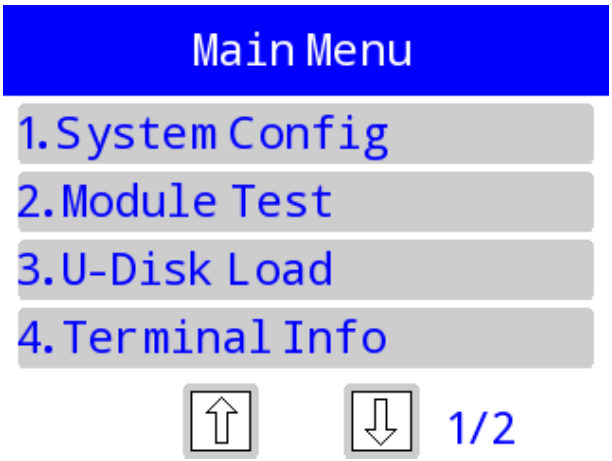
Figure 4-2 Warning interface

4.3 TM

TM is short for Terminal Manager. It is a built-in terminal management software with following features:

1. **System Config:** including date, volume and backlight, speaker volume, brightness and screen calibration, local network, communication port, wireless network and restore to factory settings etc.;
2. **Module Test:** detect the functions of the card reader, communication module, screen, touch screen, printer, keyboard, speaker and application signature verification;
3. **U-disk Download:** Download such as application, data files from the USB flash drive;
4. **Terminal Info:** View system software and hardware information;
5. **Crash Report:** Export the related information of the abnormal termination of application to the USB flash drive;
6. **PED:** The entrance to the PED module management.
7. **Safety Info:** View system safety information.

TM menu may vary with the existence of corresponding module. For example, if terminal does not support the Ethernet module, TM will not display the Ethernet configuration options. After TM starts up, it will enter the main menu, the interface shows as follows:



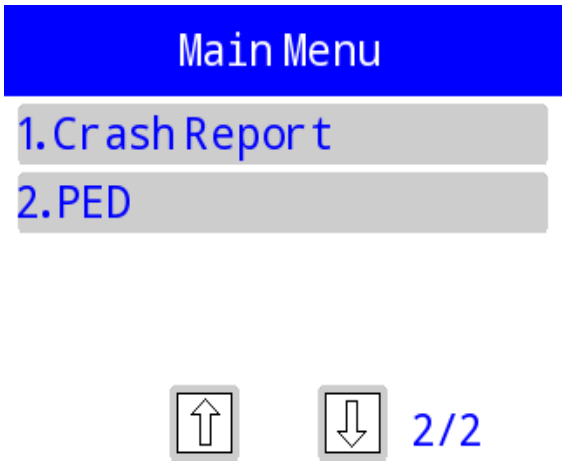


Figure 4-3 TM main menu interface

4.3.1 System Configuration

Password is needed when entering [System Config] of TM. The default password is "123456". It is recommended that users should change the default password through following steps: [1.System Config] -> [1.System Setting] -> [4.Password], and then set a new password with 6 to 20 digits.

After entering the [System Config], the interfaces are shown as below:

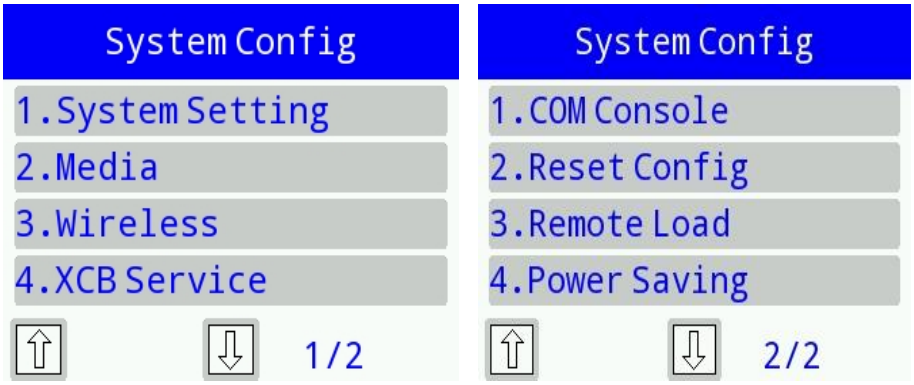


Figure 4-4 TM system configuration interface

- **System Setting**

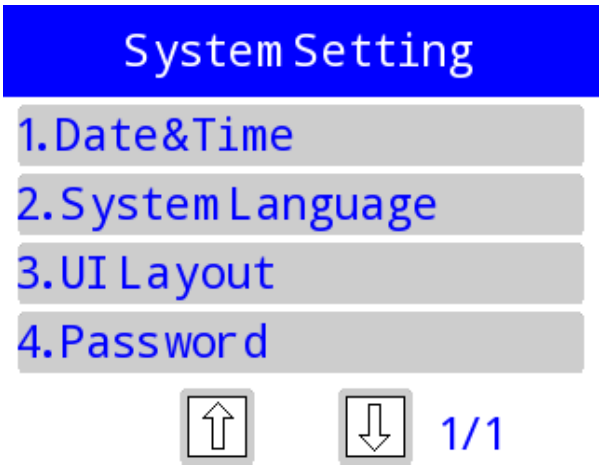


Figure 4-5 TM system settting interface

Date&Time: Set date and time.

System language: set system language. TM supports English, simplified Chinese and traditional Chinese. The default language is English.

UI Layout: set the interface style which includes black text on a white background, blue text on yellow background, blue text on white background, red text on white background. The default is blue text on white background.

Password: set password which is needed when entering "System Config" menu. Select "4.Password"-> input original password -> input new password ->input new password again. If they match, an interface will be prompted that the setting succeeds.

- ## Media

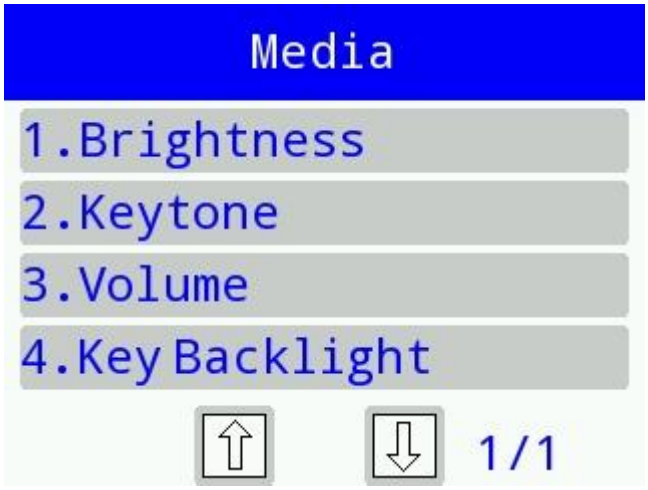


Figure 4-6 TM media interface

Brightness: set the brightness of screen.

Keytone: open or close the key tone.

Volume: set the volume of speaker.

Key Backlight: turn on/off the key backlight. The default state is off.

- **Ethernet**

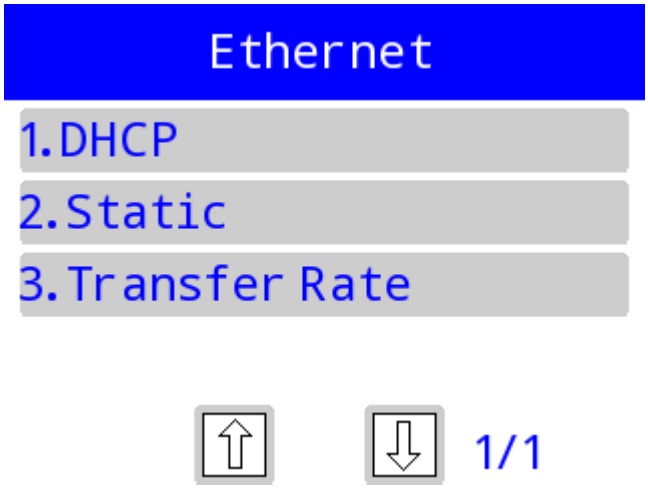


Figure 4-7 TM ethernet interface

DHCP: the system will keep obtaining the dynamic IP until it gets the IP successfully. To stop the process, press 【Cancel】. "Config Finished" interface will be displayed if obtaining the dynamic IP successfully.

Static: its submenu includes IP setting, subnet mask, gateway, master DNS and slave DNS. Choose the corresponding option to see the details.

Transfer Rate: set the transfer rate which includes auto, 10M and 100M half-duplex, 10M and 100M full-duplex.

- **Mobile network**

It only applies to the model with wireless module.

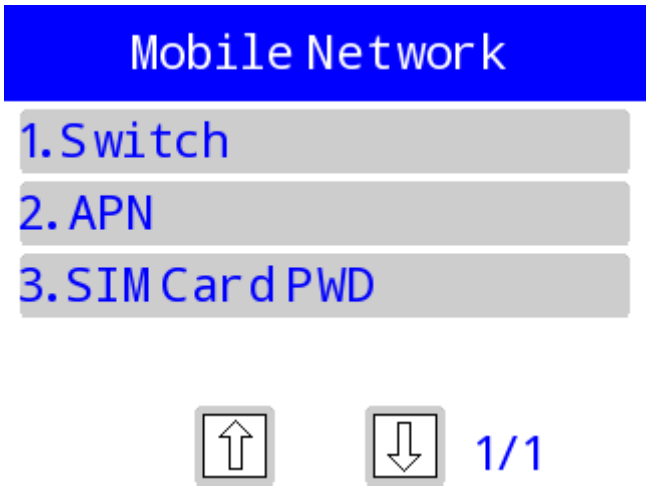


Figure 4-8 TM mobile network interface

Switch: switch on/off the GPRS/WCDMA module. After opening this module, signal strength will be shown.

APN: set APN, APN user name and password. The input format is character mode. Each interface of APN will prompt the original value. The settings will take effect only after reboot.

SIM card password: set the PIN of SIM card.

- ## XCB Service

This menu provides functions of selecting XCB channel and stopping XCB service. XCB is used for downloading and debugging. For more information about XCB, please refer to 3.2 XCB.

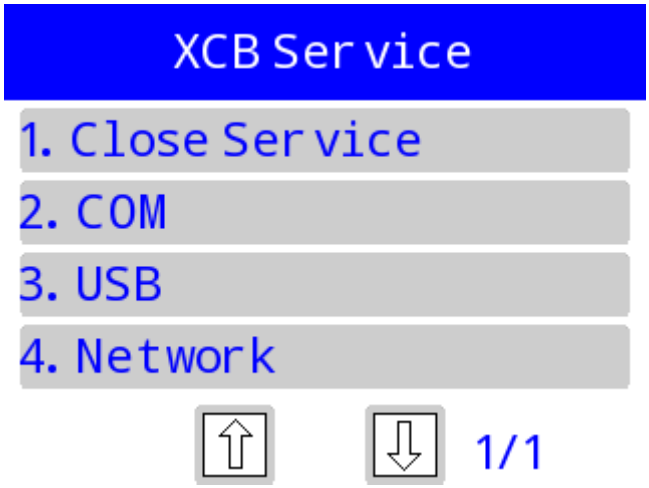


Figure 4-9 TM XCB service interface

- ## Serial Port console

For Debug version device, it is used for the serial port downloading or other modules. For Release version device, users will be prompted that this function is not available.

Selecting [1.Open] will take effect immediately without restarting; otherwise, selecting [2.Close] must restart to take effect.

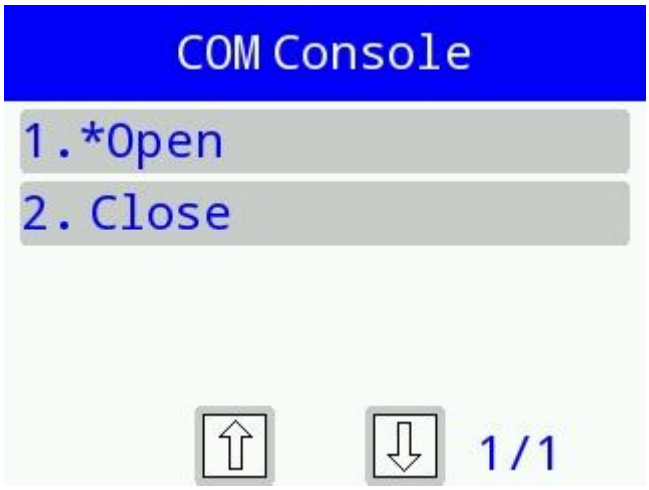


Figure 4-10 TM COM console interface

- **Restore Factory Setting**

Restore all the system parameters to default values.

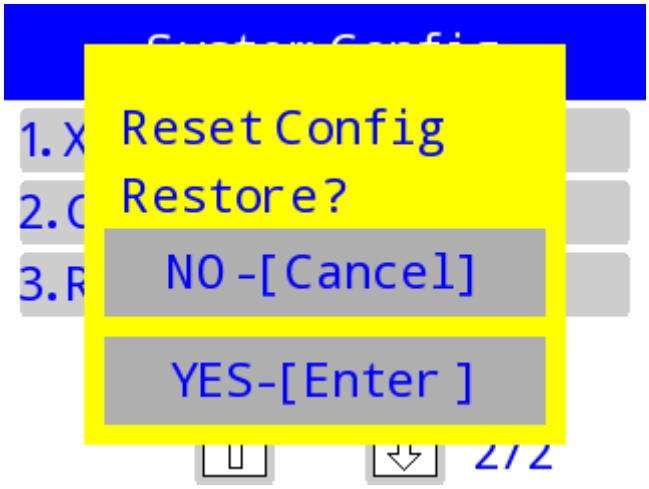


Figure 4-11 TM reset configuration interface

- **Power Saving**

Figure 4-12 TM power saving interface

Standby Time: set the screensaver time.

1) Setting it to 0 means forbidding the system from entering the screensaver automatically.
2) Setting it to be not more than 30s, system will take 60s by default.
3) Setting it to be more than 30s, system will take the setting value.

Sleep Time: set the sleep time.

1) Setting it to 0 means forbidding the system from entering sleep state,
2) Setting it to be non-zero means the system will enter sleep state after setting time starting from screensaver state.

Deepsleep Time: set the time from sleep state to deep sleep state.

- **Auto UDisk Load**

Figure 4-13 TM USB flash driver auto downloading interface

After selecting open or close, the setting will take effect immediately.

If “open” is selected, and the terminal starts up with an inserted USB flash driver, the USB flash driver will be recognized automatically and files from USB flash driver will be downloaded to the POS terminal. For more information, please refer to 4.3.3 U Disk Download .

4.3.2 Module Test

Module test is used to detect the main function modules for the terminal, including card reader, communication module, screen, touch screen, printer, keyboard, speaker and application signature verification. Interface shows as below:

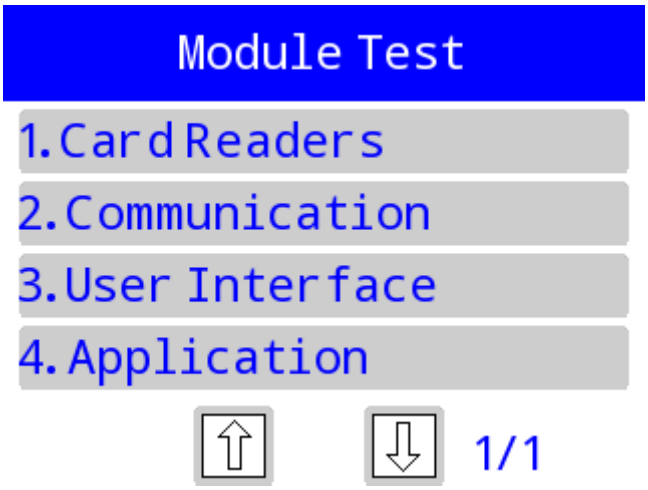


Figure 4-14 TM module test interface

- **Card reader**

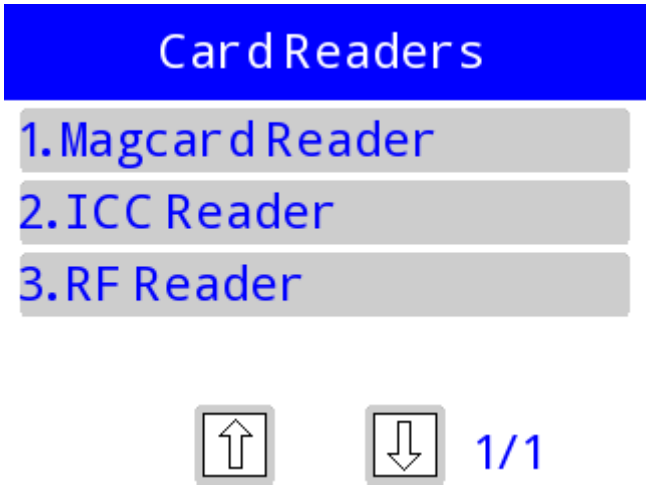


Figure 4-15 TM card readers interface

Magcard Reader: detect the magnetic card, the machine prompts "Please Swipe…", it will stay in waiting state till【Cancel】is pressed to quit. If the system detects the magnetic card, it will read or exchange the card data. If the operation fails, the system will return the error code.

IC card Reader: detect IC card, including user card and SAM card. When detecting user card, if user card has already been inserted into the card slot, the card will be detected directly; if not, the screen will prompt "please insert an IC card". After the card has been inserted, it will start to detect. When detecting SAM card, TM will read slot 1, 2 and 3 automatically. If the driver does not exist, "NO" will be prompted; if the reading fails, "ERR" will be prompted; if the reading succeeds, "OK" will be prompted.

RF card Reader: detect the RF card, including A card, B card, FeliCa card and M1 card. Its operation is similar to Magcard reader.

Communication

Communication detection includes Modem module detection, wireless module detection and Ethernet module detection. The interface shows as follows:

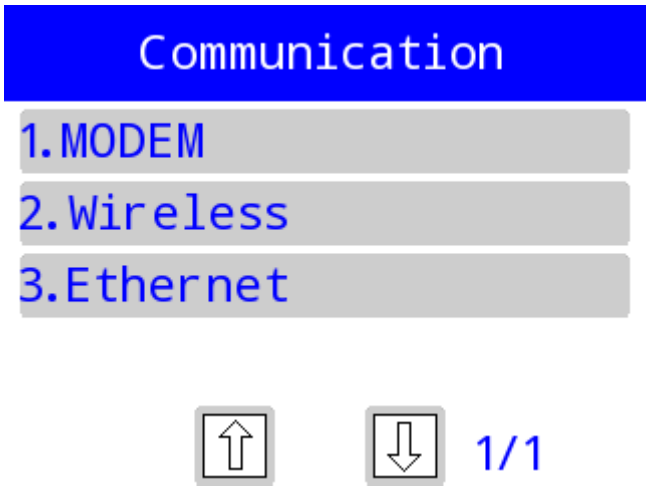


Figure 4-16 TM communication interface

Modem: Modem detection, steps are as follows:

1) Select synchronous or asynchronous mode.
2) Set the communication rate. For synchronous mode, TM provides the following baud rate for detecting: 1200, 2400 and 9600; for asynchronous mode, TM provides the following baud rate for detecting: 1200, 2400, 9600 and 57600.
3) Set the timeout, the valid range is 0~300 minutes.
4) Input a 1~13 digits phone number.
5) Set connecting times of Modem connection, the valid range is 1~255.
6) Set the number of sending data. The sending data is "1234567890".

Wireless: wireless network detection, mainly to test GPRS or CDMA connection state. When the system detects the device has already logged in GPRS, only the host IP address and timeout are needed; otherwise APN, user name and password are also needed.

Ethernet: Ethernet detection.

1) Input IP address of PING host.
2) Input duration time of PING, unit: second.
3) Set timeout. The valid timeout range is 3,000~3,600,000ms; otherwise, the parameter is invalid;
   If there is an error, then error code will be displayed. If the PING operation is over time, timeout will be prompted. At the same time, TM will calculate the times of PING operation, and PING operation will last for duration time.

CAUTION

When inputting network address, it is required to input in "XXX.XXX.XXX.XXX" format. For example, if the network address is "192.168.12.0", then the input address must be "192.168.012.000"; otherwise, "Invalid Addr" will be displayed, and press 【Enter】to return to inputting network address.

- **User Interface**

Including the tests of LCD screen, touch screen (S800 does not support this module), printer, keyboard, speaker and others.

Figure 4-17 TM user interface

LCD: LCD screen test. The screen will display different colour blocks. Press 【Enter】or 【Cancel】 to quit the test, and if other keys are pressed, the colour blocks will translate laterally.

Printer: detect printer states. It will return error code if failed, and it will print the contents of the system information if successful.

Keyboard: keyboard test. The screen will display the key value of the pressed key. Press twice on 【1】 within 1 second to quit the test.

Speaker: speaker test. Play an audio file to detect the state and performance of the speaker, and error code will be returned on failure.

4.3.3 U Disk Download

TM will install or uninstall AIP, AUP, application parameters, OPT, US_PUK ，OS firmware package, device firmware upgrade package(FWP), startup logo by reading system.list file in the root directory of USB flash drive. Steps are as follows:

1. Create a system.list file in plain text in the root directory of USB flash drive, file format refers to following system.list format.

2. Enter TM interface, insert the USB flash drive to POS terminal, and select "U-disk load" option. If there is only one system.list file, the installation/uninstallation will be performed automatically. If there are multiple system.list files, a system.list file list will be shown. User can select corresponding file to install/uninstall. File list interface is as below:

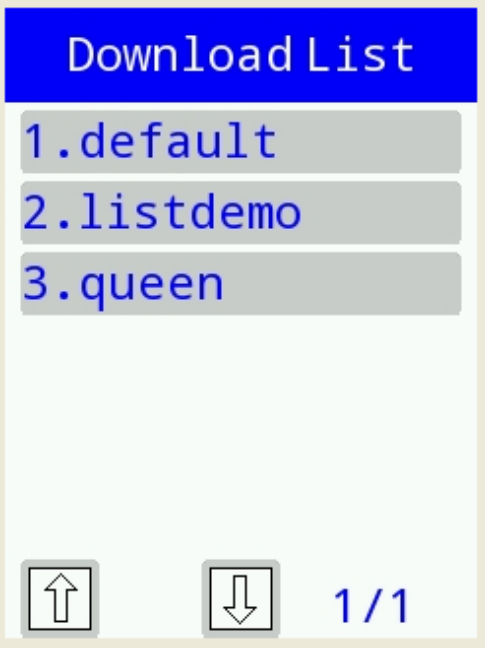


Figure 4-18 system.list file list interface

3. After installing or uninstalling, pull out the USB flash drive.

- **System.list Format**

Format of system.list can be concluded as follows:

[*section*]

[*id_value*]=[*string_value*]

Format specifications are as follows:

1. [*section*] represents various tasks such as [os], [app], [ipkg-install], [ipkg-remove] and [us_puk].
2. If user needs to install multiple app files in the same system.list file, sections named [appN] shall be unique and in the order of smallest to largest. Functions are different according to [*id_value*] in [app]. Details are as follows:

```
[app0]
package=xxx.aip    /*Package represents installing AIP.*/
[app1]
```

```
upgrade1=app1.aup      /*Upgrade1 represents upgrading AUP.*/
[app2]
id=MAINAPP      /* APP ID that application parameters will be installed.*/
appdata1=CTGTBL.DAT      /*Appdata1 represents the definition of application parameter.*/
```

3. System.list file must be stored in the root directory of USB flash drive. File to be installed can be stored in a folder. For example: xxx.aip is stored in hotel directory of root directory, and the corresponding format is:

```
[app0]
package=hotel/xxx.aip
```

- **Naming Format of Multiple system.list Files**

Prolin supports up to 16 system.list files, and the naming format is xxx-system.list. Midline "-" must exist; otherwise, analysis will fail. Download list will only display xxx. For example, file named "listdemo-system.list" will be shown as "listdemo"; file named "system.list" will be shown as "default" at the top of the list; and if there is another file named "default-system.list", it will also be shown as "default" but not at the top of the list. In order to avoid misunderstanding, it is not recommended to use "default" as file name.

- **System.list File Example**

1. Install OS:

```
[os]
package = prolin-2.4.47.3976T.zip    /* OS can only be installed one at a time. */
```

2. Install AIP:

```
[app0]
package=xxx.aip
[app1]
package=yyy.aip /*According to this format, users can install several AIPs at one time. */
```

3. If the AIP already exists, it is recommended to delete the existing AIP first. For example:

```
[app-remove]
app1=MAINAPP /*Delete /data/app/MAINAPP. */
[app0]
package=xxx.aip /*Install MAINAPP again.*/
```

4. Install AIP data:

```
[app0]
id=MAINAPP
appdata1=file1
appdata2=file2
appdataN=fileN #N=1,2,3,….
```

5. Upgrade AUP:

```
[app1]
upgrade1=app1.aup
upgrade2=app2.aup
upgradeN=xxxx-11.aup #N=1,2,3,….
```

6. Install OPT:

```
[ipkg-install]
file1=xxx.tar.gz
file2=xxxx.tar.gz
fileN=xxxxxx.tar.gz #N=1,2,3,….
```

7. Uninstall OPT:

```
[ipkg-remove]
pkg1=file1
pkg2=file2
pkgN=fileN #N=1,2,3,….
```

8. If the OPT already exists, it is recommended to delete the existing OPT first. For example:

```
[ipkg-remove]
pkg1=phoenix-dev-r570     /*Delete OPT.*/
[ipkg-install]
file1=phoenix-dev-r570.tar.gz
```

9. Install US_PUK:

```
[us_puk]
puk0=puk1.puk
puk1=puk2.puk
```

For multiple US_PUK files, PUK files must conform to the relevant verification relations. For more details, please refer to "Prolin US_PUK Instruction".

10. Install FWP:

```
[fwp]
package=cipher_chip01-08-r22_SIG.fwp
```

11. Install startup LOGO:

```
[logo]
file=logo.bmp
```

- **Prompts of USB Download**

1. Download Error

In the process of downloading, if file does not exist or file signature verification failed, the downloading will be paused, and interface is shown as below. User can press [Cancel] to exit, or press [Enter] to continue to download the rest files.

Figure 4-19 Download failure interface

2. Download Completed

After downloading completed, a list will show the number of successful and failed missions.

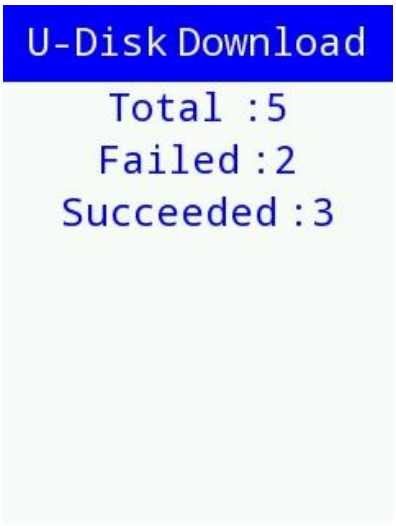


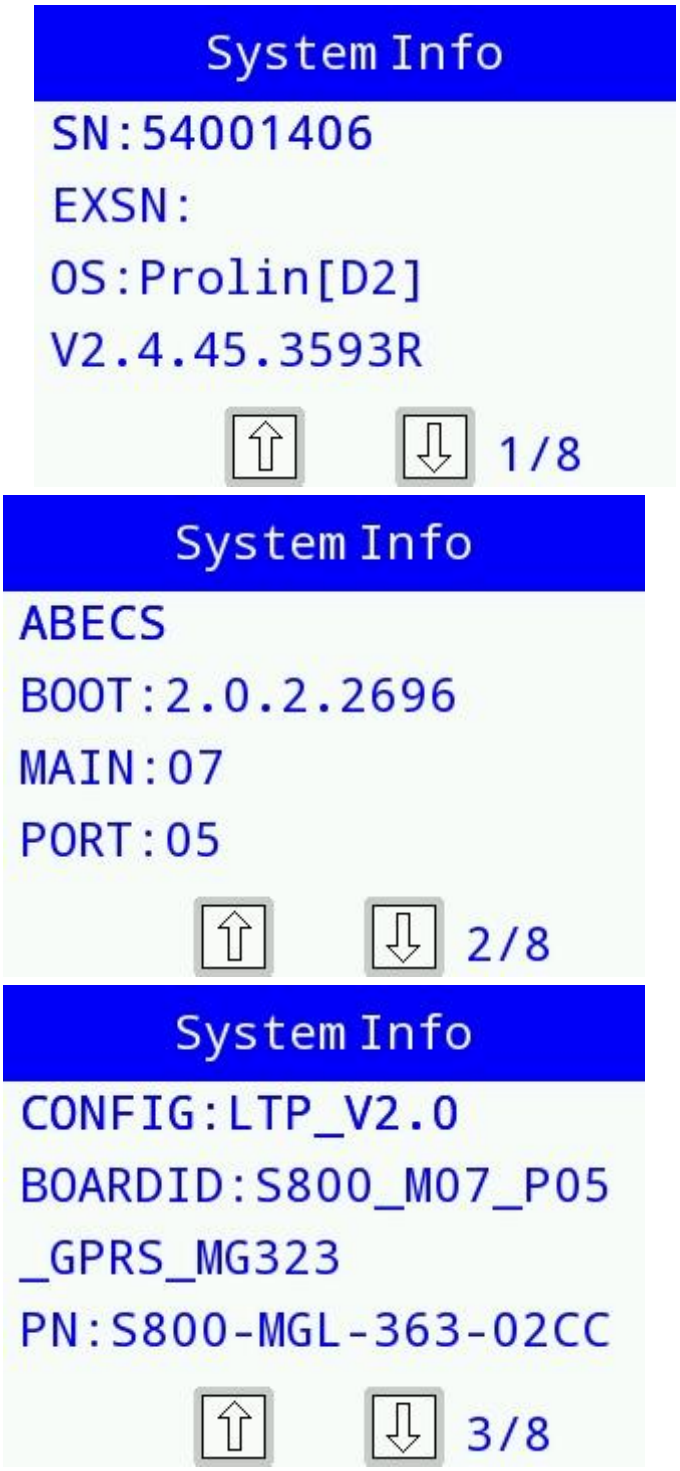
Figure 4-20 Download completed interface

4.3.4 Terminal Information

This is mainly used to display the terminal and version information. After entering this option, a QR code will be displayed. Users can scan the QR code to get all of the terminal information. The interface is shown as follow:

Figure 4-21 QR code interface

Press the Up/Down key, Enter key or Cancel key to view the terminal information. IMEI and MAC information depends on whether the corresponding modules exist or not. In addition, if the security level of system is greater than 0, the system information of Debug version will be attached with [Dx]. D represents Debug, and x represents security level.


System Info
SN:54001406
EXSN:
OS:Prolin[D2]
V2.4.45.3593R
1/8
System Info
ABECS
BOOT:2.0.2.2696
MAIN:07
PORT:05
2/8
System Info
CONFIG:LTP_V2.0
BOARDID:S800_M07_P05
_GPRS_MG323
PN:S800-MGL-363-02CC
3/8

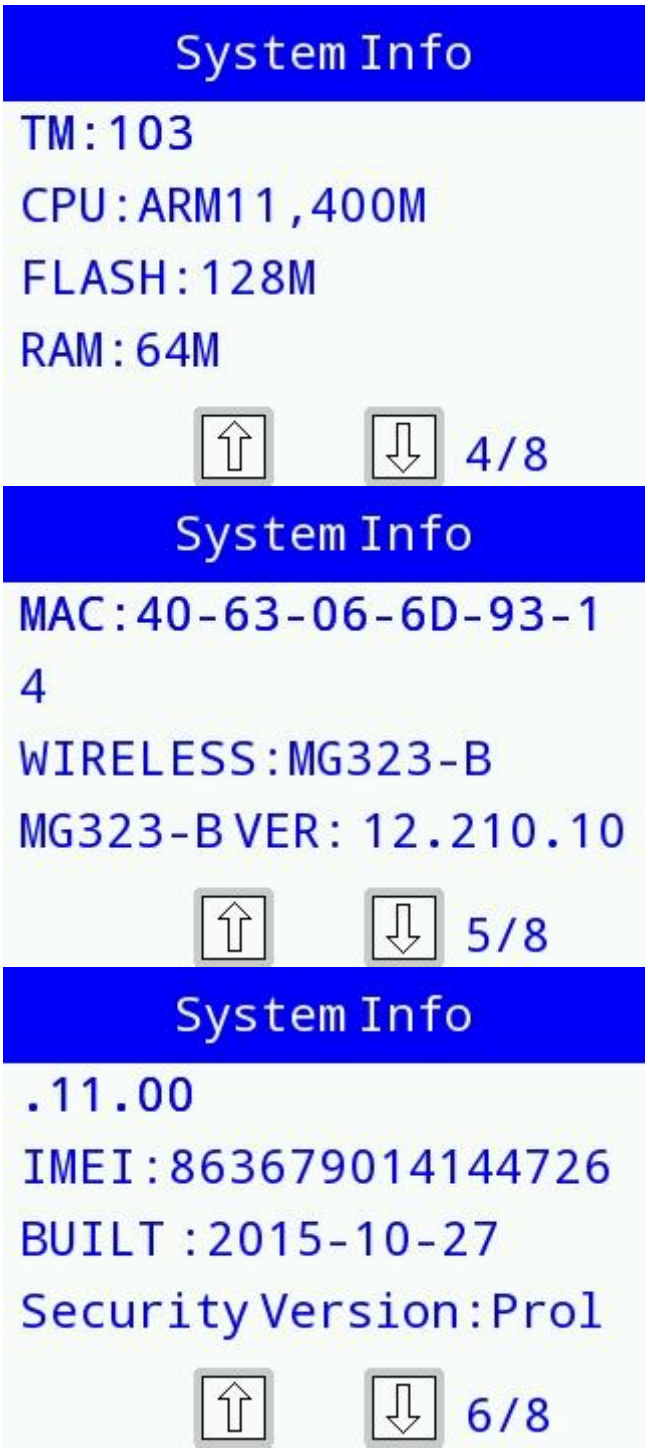

System Info
TM:103
CPU:ARM11,400M
FLASH:128M
RAM:64M
4/8
System Info
MAC:40-63-06-6D-93-1
4
WIRELESS:MG323-B
MG323-B VER: 12.210.10
5/8
System Info
.11.00
IMEI:863679014144726
BUILT :2015-10-27
Security Version:Prol
6/8

Figure 4-22 System information interface

4.3.5 System Report

System report includes crash report, attack report and diagnosis, which are used for saving crash information, tamper information and log information, respectively. Interface is as follows:

Figure 4-23 System report interface

If application terminates abnormally, on-the-spot information including the status of register will be generated. User can export the information to *tombstomes/ XXXXXXXX-YYYYMMDD_hhmmss/* directory of USB flash drive. *XXXXXXXX* is the series number of POS terminal, and *YYYYMMDD* is date and time information.

This function only supports exporting the information to USB flash drive.

4.3.6 PED

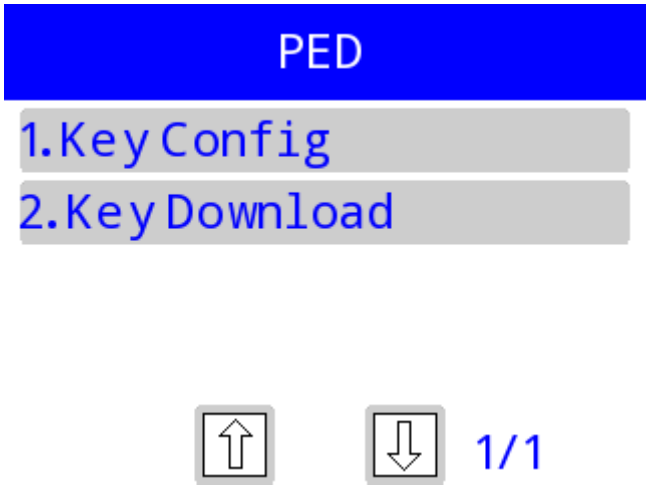


Figure 4-24 TM PED interface

- **Key Configuration**

Entering [1.Key Config] for the first time will require user to reset password, the default password of A and B are “000000” for prolin-2.4 system or “00000000” for

Prolin-phoenix-2.5 system, while S800's password is "111111". After entering password, the menu shows as below:

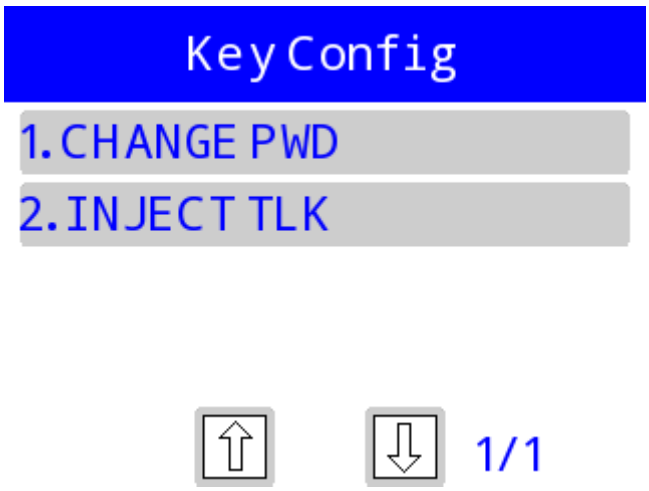


Figure 4-25 TM key configuration interface

Change Password: modify the password of administrator.

Inject TLK: after entering "Inject TLK", select the length of TLK. Then input the first part and second part of TLK in sequence. At last, confirm whether the KVC value of injected TLK is right or not. It will be injected successfully after confirming.

- Key Download

User can download key or format PED using PC download tool through serial port. If the debugging console is being used, the following interface will be prompted:

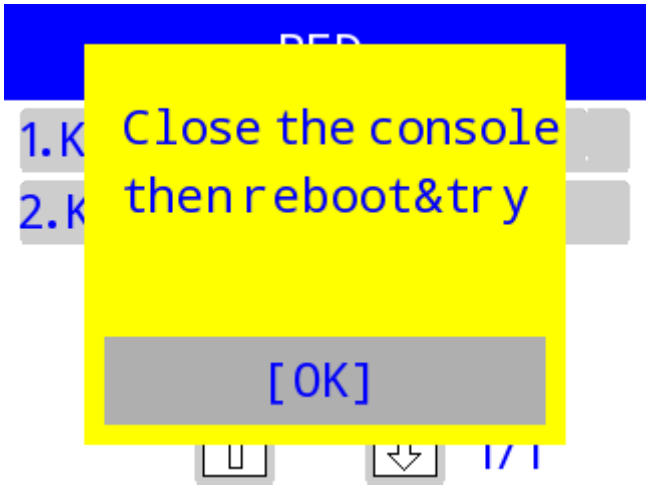


Figure 4-26 "Debugging tool being used"prompt

4.4 Application Package Management

Prolin applications are divided into main application and sub-application according to different ID. Main application's ID must be MAINAPP, while sub-application's ID can be self-defined. There may be several sub-applications but only one main application. When the device starts up, Prolin will start the main application by default.

Prolin application packages can be classified into AIP, AUP , OPT and FWP packages.

Table 4-2 Application package instruction

Application package	Format	Naming format	Specification
AIP	zip	xxxx.aip	Application installation package
AUP	zip	xxxx.aup	Application upgrade package
OPT	tar.gz	xxxx.tar.gz	Optional system components package
FWP	zip	xxx.fwp	Device firmware package

The third party application software can be downloaded to the POS terminal by TermAssist tool or U-disk load menu of TM. After installing the application software, Prolin will start the application software by default as follows:

Figure 4-27 Interface after starting the POS terminal

4.4.1 AIP

- **Packaging AIP**

AIP file can be packaged manually or through Prolin SDK tool. It is in the form of zip package with .aip suffix. To package AIP file, compress required files such as executable file

and *appinfo* file together to a zip format package and change the suffix of zip package to .aip. An example of packaging AIP file is as follows:

Assume that application named HelloWorld contains an executable file *HelloWorld*, *appinfo* file and *res* directory. Use compression tool to compress them to a zip format package, and then change package's suffix to .aip. User can also use command line in Linux system: *zip -r HelloWorld.aip appinfo HelloWorld res/*.

- **Installation**

User can install AIP through TermAssist tool, "U-disk load" function of TM or API.

1. Install with TermAssist

After POS terminal connects to TermAssist tool, TermAssist can be used to install AIP. For more details, please refer to 3.1.6 Installation.

2. Install with "U-disk load" function of TM

Users can install AIP through "U disk load" function of TM. Specific operations are as follows:

   1) Copy the AIP files to the root directory of U disk. And create a plain text file system.list as the downloading task file in the root directory of USB flash drive. Specific file format refers to 4.3.3 U Disk Download.
   2) Insert the USB flash drive to POS terminal and select "U-disk load" option. Then the installation will be performed automatically.

3. Install with API

Call OsInstallFile( ) to install AIP. The function prototype is as follows:

int OsInstallFile(const char *Name, const char *FileName, int FileType);

For more details, please refer to "Prolin API Programming Guide".

- **Directory Instruction**

AIP package should at least contain executable file and appinfo file of the application, and these files need to be stored in root directory. And it can also contain other needed executable files, system dynamic libraries and resource files. Users can create subdirectories like *bin*, *lib*, *res* and so on, and put the related files in corresponding subdirectories. Files in AIP don't support soft link.

After the installation is completed, appinfo file of AIP package will be stored in /data/appinfo/<appname>/, while other files will be stored in /data/app/<appname>/, and the original directory structure will be reserved.

- **Get Application Information**

Call OsGetAppInfo( ) to get installed application list and related information. The function prototype is:

int OsGetAppInfo(ST_APP_INFO AppInfo[], int InfoCnt);

For more details, please refer to "Prolin API Programming Guide".

- **Uninstallation**

User can uninstall AIP through TermAssist tool, "U-disk load"function of TM or API.

1. Uninstall with TermAssist

After POS terminal connects to the TermAssist tool, click on 

, "Application" menu of main interface will display the installed application information (Figure 4-27). And click on  on the right of the application name to complete uninstallation.

Figure 4-28 Installed application information

2. Uninstall with "U-disk load" function of TM

Operations of uninstalling with USB are similar to installing with USB:

1) Create a plain text file named system.list in the root directory of USB flash drive. Specific file format refers to 4.3.3 U Disk Download.

2) Insert the USB flash drive to POS terminal and select "U-disk load" option. Then the uninstallation will be performed automatically.

3. Uninstall with API

Call OsUninstallFile( ) to uninstall application. The function prototype is:

int OsUninstallFile(const char *AppName, int FileType);

For more details, please refer to "Prolin API Programming Guide".

- **Update**

There are two ways to update applications. One is to update through AUP, and the other is to update by installing a new AIP, in this case, the original application should be uninstalled first; otherwise, it will be overwritten.

4.4.2 AUP

AUP is short for application upgrade package, and it is used for updating installed applications. When installing AUP, there must be an installed application which has the same ID with AUP; otherwise, the installation will fail.

- **Packaging AUP**

Similar to package AIP, AUP is also a compressed package in zip format. To package AUP, compress the *appinfo* and other related files to a zip format package, then change the package's suffix to .aup. An example of packaging AUP is shown as follows.

Assumed application named HelloWorld needs to update some of its library and resource files. Place those files that need to be updated to the *lib* and *res* directories. Then use compression tool to compress *lib* and *res* directories with *appinfo* file together to a zip format package. After that, change the package's suffix to .aup. User can also use the command line in Linux system to compress them: *zip -r HelloWorld.aup lib/ res/ appinfo*.

- **Installation**

User can install AUP through TermAssist tool, "U-disk load" function of TM or API.

1. Install with TermAssist

For detailed operations of installing AUP with TermAssist, please refer to 3.1.6 Installation.

2. Install with "U-disk load" function of TM

Operations of installing AUP with "U-disk load" function of TM are similar to installing AIP, the only difference is the content of system.list file. For details, please refer to 4.3.3 U Disk Download.

3. Install with API

Call OsInstallFile( ) to install AUP. The function prototype is as follows:

int OsInstallFile(const char *Name, const char *FileName, int FileType);

For more details, please refer to "Prolin API Programming Guide".

- **Directory Instruction**

AUP stores application files that need to be updated, and the appinfo file must exist in order to show which application needs to be updated, while bin file is not necessary. And files in the AUP package does not support soft link. After update is completed, the directory structure is the same as AIP's. The new added files will be stored in the corresponding directories and the existed files (such as appinfo file) in POS will be replaced. A specific example is shown as follows:

Assumed that there is an application named app1 on POS terminal, under the directory of /data/app/app1, there are subdirectories such as *lib* and *res*. Of which, *lib* contains two files named file2 and file2 and *res* contains three files named file3, file4 and file5 respectively. Now the task is to update the lib/file1, lib/file2 and res/file5 and add two new files named file6 and file7 to *res* directory. Therefore, lib/file1, lib/file2, res/file5, res/file6, res/file7 and appinfo (appinfo ID must be the same as that of app1) must be included when generating AUP package. After installing AUP package on the terminal, file1, file2, file5 and appinfo will be updated, and file6 and file7 will be added to /data/app/app1/res/.

When using the AUP package to update the application, user only needs to install the files that need to be updated and added instead of installing the whole application package again, which makes application update less time-consuming and more convenient.

This special feature can also be used for installing application with big size by installing the sub-packages respectively. A specific example is shown as follows:

When installing AIP package, AIP package will be unzipped to /var/tmp directory. Since the space size of /var/tmp directory is limited, sometimes the big size application can't be installed directly and need to be taken apart into AIP and AUP packages to install separately. Assumed that a big size application named app2 contains *appinfo* file, app2 (executable file) and three directories *bin*, *res* and *lib*. And each of the three directories takes up relatively large space. Then user can take the application apart into three installation packages which are *app2.aip* (including appinfo, app2 and *bin* directory), *aup1,aup* (including appinfo and *res* directory) and *aup2.aup* (including appinfo and *lib* directory). Noted that AIP package must be installed before AUP package.

4.4.3 OPT

OPT is used for installing font libraries, dynamic libraries and other optional system components. Name format of OPT is optname-x.x.tar.gz, in which optname refers to the

optional component's name and x.x refers to the version. Midline "-" must exist; otherwise, the version cannot be recognized.

Libraries installed by OPT are all public libraries, which are stored in /opt/lib, and all the applications can access them. While libraries installed by AIP or AUP are private libraries, which are stored in */data/app/<appname>/lib*, and only the application named *appname* can access them.

Capability adopted by Prolin does not support LD_LIBRARY_PATH settings. If applications need to link public library (/opt/lib) and private library (/lib) automatically, users should add the automatic library link path of /opt/lib and /lib to the Makefile which is used to compile the application. For example: *-Wl,-rpath=//opt/lib -Wl,-rpath=./lib*. In SDK, these two paths have been added already, so it is not necessary to add paths manually when developing applications with SDK.

Compressing OPT Package

OPT package is compressed in tar.gz form. To compress OPT package, user only needs to compress the font library file, dynamic library file into tar.gz zipped package, and examples are as follows:

1. Compress Font Library

Take the wqy-bitmapfont as an example, create "fonts" directory, and put font library file "wqy-microhei.ttc" into "fonts" directory. And then compress the "fonts" directory into tar.gz form with zip tools. Using tar command under Linux platform can also compress the package. For example: *tar zcvf fonts-wqy-microhei-0.2.0-beta.tar.gz fonts/*.

2. Compress Dynamic Library

Take the libstdcpp as an example, create "lib" directory, and put dynamic library file "libstdc++.so.6.0.16" into "lib" directory. And then compress the "lib" directory into tar.gz form with zip tools. Using tar command under Linux platform can also compress the package. For example: *tar zcvf libstdcpp-6.0.16.tar.gz lib/*.

3. Compress Bluetooth Library

There are three directories in Bluetooth library, including bin, lib and include, which are used for storing the executable files, dynamic library files and header files, respectively. Compress those three directories together as a tar.gz format package. Using tar command under Linux platform can also compress the package. For example: *tar zcvf bt-1.0.1.tar.gz bin/ lib/ include/*.

Installation

User can install OPT package through TermAssist tool, "U-disk load" function of TM or API.

1. Install with TermAssist

For detailed operations of installing OPT with TermAssist, please refer to 3.1.4 Installation.

2. Install with "U-disk load" function of TM

Operations of installing OPT with "U-disk load" function of TM are similar to installing AIP, the only difference is the content of system.list file. For details, please refer to 4.3.3 U Disk Download.

3. Install with API

Call OsInstallFile( ) to install OPT. The function prototype is as follows:

int OsInstallFile(const char *Name, const char *FileName, int FileType);

For more details, please refer to "Prolin API Programming Guide".

Directory Instruction

Users can create directory in OPT file according to their needs. It is recommended to store classified files in *fonts*, *lib*, *bin*, *include* and other directories respectively. Soft link is only supported in *lib* directory of OPT.

After installation is completed, all files of OPT will be stored in */opt* directory of POS, and the original directory structure except *include* directory will be reserved. (Notice: When installing, *include* directory of OPT will be ignored.)

When installing OPT, optname.list and optname.version files that store file list and version of OPT will be created in */data/var/opt* directory. All of the applications have permission to check version information files of OPT.

Header files and libraries of OPT must be added to SDK when installing OPT with SDK; otherwise, SDK cannot compile.

Getting OPT Information

Call OsGetOptInfo( ) to get installed application list and related information. The function prototype is:

int OsGetOptInfo(ST_OPT_INFO OptInfo[], int InfoCnt);

For more details, please refer to "Prolin API Programming Guide".

Uninstallation

User can uninstall OPT through TermAssist tool, "U-disk load"function of TM or API.

1. Uninstall with TermAssist

After POS terminal connects to the TermAssist tool, click on 

. "System-Files" menu of main interface will display the installed fonts, PUKs and other dynamic libraries (Figure

4-28). And click on  on the right of the font or dynamic library to complete uninstallation.

Figure 4-29 OPT uninstallation with TermAssist

2. Uninstall with “U-disk load” function of TM

Operations of uninstalling OPT with “U-disk load” function of TM are similar to installing OPT, the only difference is the content of system.list file. For details, please refer to 4.3.3 U Disk Download.

3. Uninstall with API

Call OsUninstallFile( ) to uninstall OPT. The function prototype is as follows:

int OsUninstallFile(const char *AppName, int FileType);

For more details, please refer to “Prolin API Programming Guide”.

4.4.4 FWP

FWP package is used for upgrading the firmware of touchscreen, wireless module and SM chip type of devices, and it is provided by PAX.

- **Installation**

User can install FWP through TermAssist tool, “U-disk load” function of TM or API.

1. Install with TermAssist

After POS terminal connects to TermAssist tool, TermAssist can be used to install FWP. For more details, please refer to 3.1.6 Installation.

2. Install with "U-disk load" function of TM

Operations of installing FWP with "U-disk load" function of TM are similar to installing AIP, the only difference is the content of system.list file. For details, please refer to 4.3.3 U Disk Download.

3. Install with API

Call OsInstallFile( ) to install FWP. The function prototype is as follows:

int OsInstallFile(const char *Name, const char *FileName, int FileType);

For more details, please refer to "Prolin API Programming Guide".

- **Directory Instruction**

The root directory of FWP package contains an executable file *updater*, a *fwpinfo* file, and a subdirectory *res* under which the firmware is stored.

4.4.5 Package Signing Instruction

AIP or AUP signature is to sign the whole package, bin files in main directory and all files in bin directory, OPT signature is to sign the whole package and all files in bin directory, and FWP signature is to sign the whole package and *updater* file in the main directory. If there are several bin files in one package, create a directory named "bin" and put them into this directory, and then sign the package.

Resources that need to be shared among multiple application programs such as font library and video can be stored in OPT packages. OPT packages supplied by PAX are signed by MF_PVK, so that they can also run on users' terminal if users use the customized key.

Users can use either PAX US_PUK or the customized key to sign the application program.

When signature tool of earlier version signs OPT package, files in bin directory will not be signed automatically. As a result, signature tool on PC needs to be upgraded to 5.4 or higher version. Interface is as follows:

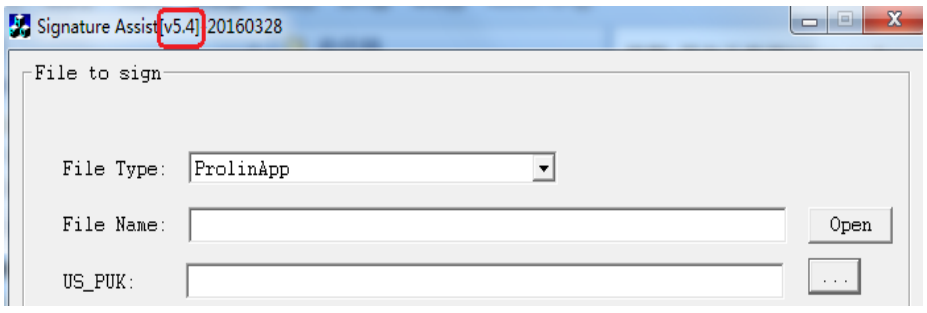


Figure 4-30 Signature tool on PC

4.5 Tamper

Prolin tamper includes hard tamper and soft tamper; there are two examples to illustrate hard tamper and soft tamper, respectively.

Figure 4-31 POS terminal hard tamper warning

The above figure shows a hard tamper caused by opening the POS terminal case, this type of tamper belongs to hard tamper.

Figure 4-32 POS terminal soft tamper warning

The tamper shown in Figure 4-31 is a soft tamper caused by PED key loss or key being damaged. For example, when using the TermAssist to update OS, if users select “Erase data partition” and execute it, a PED soft tamper will occur.

5 System Update

This chapter introduces downloading and updating of Prolin firmware.

Prolin firmware can be updated with SysLoader tool and XCB client. The differences between them are shown as below:

Table 5-1 Update comparison

Update target	SysLoader	XCB
BOOT	√	NA
Config file	√	NA
Startup logo	√	NA
Prolin OS	√	√
Erase user data partition	√	NA

For details on filename rules, please refer to Appendix1.

5.1 Update with Sysloader Tool

Before using SysLoader to update firmware, POS terminal needs to enter the firmware update mode. The steps are as follows:

1. Power off the POS terminal;
2. Connect POS terminal to PC with USB cable;

3. Hold on clear key (for S and P^X series)/download key (for D200, on the upper-left corner) and power key at the same time. For S300, plug in an adaptor and wait for the POS terminal to start up. LCD will prompt “Prolin OS update” shown as below, then release buttons;

Figure 5-1 Prolin enters the update mode

The steps of updating firmware are shown as follows:

1. Start SysLoader, check the choice box that needs to be updated and select the right file.

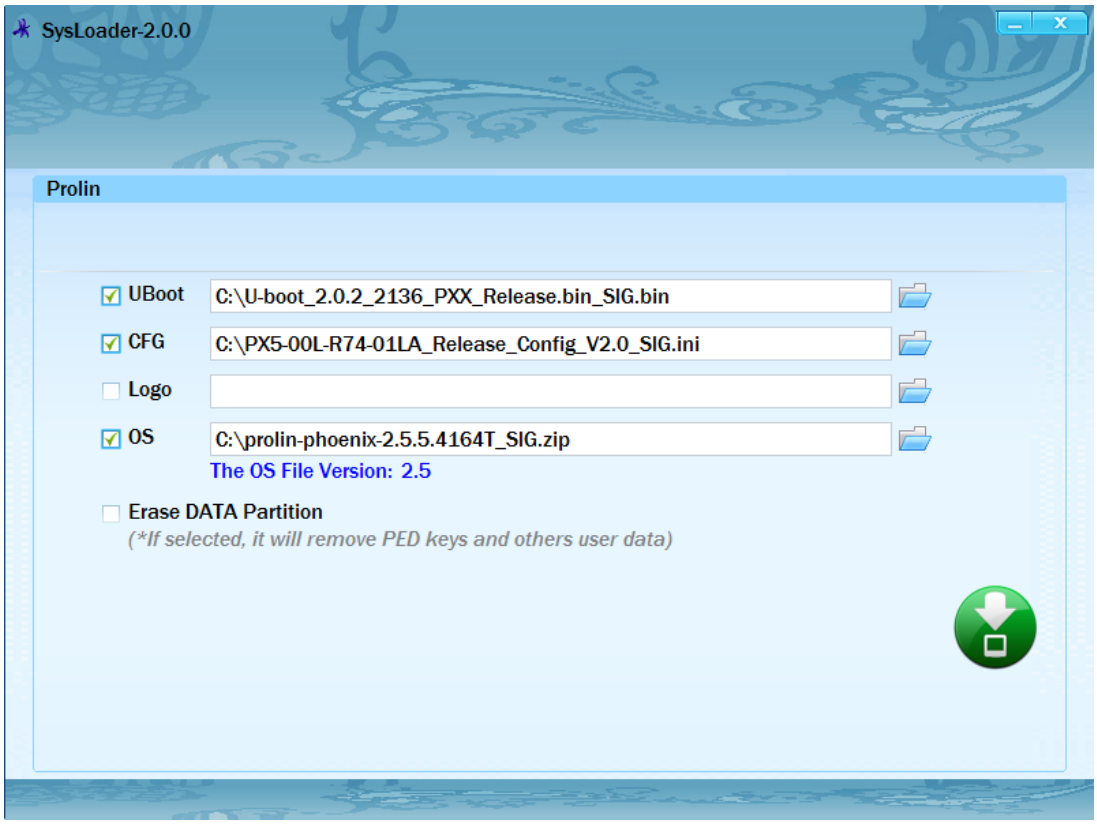


Figure 5-2 Update setting

2. Click on  and start updating. After the update is completed, SysLoader interface displays “Downloaded”, and POS terminal displays “Starting Prolin OS”.

- **Boot, CFG and Prolin OS**

When updating firmware, it is noted that different models should match with the corresponding CFG and Logo files. When downloading configuration file which does not match with the terminal, “version unmatched” will be prompted.

Prolin OS contains binary files of “kernel”, “Ramdisk” and “Base”. PCLoader can also download OS. If versions of the firmware do not match, the terminal will fail to start up, so it is recommended to download the whole package instead of unzipping the package and downloading the files separately.

- **Startup Logo**

Prolin startup logo is independent of OS and Boot, and it can only be downloaded by TermAssist separately. The logo attributes of models are listed in the table, Users can customize the logo referring to the table below.

Table 5-2 Corresponding relation of logo attributes and models

Resolution(width*height)	Bit depth(RGB)	Models
320*240	24(888)	S800, D200
240*320	24(888)	S300, S900, S920
800*480	16(565)	P^X5, P^X7
480*800	16(565)	Q80, D220

The logo which is made according to the above requirements needs to be sent to PAX and signed; otherwise, it cannot be installed into OS.

5.2 Update with XCB Client

For more information on updating Prolin with XCB client mode, please refer to System update, installation and uninstallation.

6 Authorization Scheme

Authorization scheme of Prolin includes authorization mechanism and non-authorization mechanism.

For terminals with authorization mechanism, the terminal state needs to be switched through authorization tool “Augent”, and states include Debug state, Release state and tamper cleared state. For terminals with non-authorization mechanism, the terminal state needs to be switched through configuration file, and states include Debug state and Release state. For more details of authorization tools, please refer to “Authorization Tool Operating Guide”.

Prolin-2.4 and Prolin-phoenix-2.5 system support both authorization mechanism and non-authorization mechanism, which is distinguished by Boot version. Boot version beginning with 2.x supports non-authorization mechanism, while Boot version beginning with 3.x supports authorization mechanism. Boot can update from non-authorization mechanism to authorization mechanism, but not the other way around. And Boot version cannot roll back, either. For example, Boot version of 3.0.01 cannot roll back to version 3.0.00.

Prolin-cygnus-2.6 system only supports authorization mechanism. And the boot version begins with 4.x and cannot roll back.

In the same system main version, Boot of authorization mechanism and non-authorization mechanism are different, while OS are the same.

For more details of authorization scheme, please refer to “PAX Terminal Authorization Mechanism”.

Appendix 1

File type	Filename and its suffix	Supported system version
Uboot	u-boot*.bin	Prolin-2.4
CFG	Sxxx-*.ini/factory_sxxx*.cfg	Prolin-2.4
Logo	Sxxx.bmp	Prolin-2.4
Kernel	kernel-*.img	Prolin-2.4
Ramdisk	ramdisk-*.img	Prolin-2.4
Base	base-*.img	Prolin-2.4
ZIP	ZIP package including Kernel/Ramdisk/Base file type.	Prolin-2.4

Appendix 2

Other XCB commands

Commands	Instruction
-d	Directs command to the only connected USB device, and returns an error if more than one USB device is present.
-e	Directs command to the only running emulator, and returns an error if more than one emulator is running.
-s <serial number>	Directs command to the USB device or emulator with the given serial number. Overrides ANDROID_SERIAL environment variable.
-p <product name or path>	Simple product name like 'sooner', or a relative/absolute path to a product out directory like 'out/target/product/sooner'. If -p is not specified, the ANDROID_PRODUCT_OUT environment variable is used, which must be an absolute path.
-devices	List all connected devices.

Device commands

Commands	Instruction
xcb emu <command>	Run emulator console command.
xcb logcat [<filter-spec>]	View device log.
xcb devinfo	Get device information.
xcb gettime	Get device time.
xcb settime <yyyyMMddHHmmss[tz]>	Set device time.
xcb help	Show this help message.
xcb version	Show version number.

Data options

Commands	Instruction
(no option)	Don't touch the data partition.

-w	Wipe the data partition.
-d	Flash the data partition.

Scripting commands

Commands	Instruction
xcb wait-for-device	Block until device is online.
xcb get-state	Prints: offline | bootloader | device.
xcb get-serialno	Prints: <serial-number>.
xcb blink	Blink the POS LCD.
xcb status-window	Continuously print device status for a specified device.
xcb reboot [bootloader|recovery]	Reboots the device, optionally into the bootloader or recovery program.
xcb reboot-bootloader	Reboots the device into the bootloader.

Environmental variables

Environmental variables	Instruction
XCB_TRACE	Print debug information. A comma separated list of the following values 1 or all, xcb, sockets, packets, rwx, usb, sync, sysdeps, transport, jdwp.
XCB_SERIAL	The serial number to connect to. -s takes priority over this if given.
XCB_LOG_TAGS	When used with the logcat option, only these debug tags are printed.

Printed messages and instruction of calling *xcb connect*

Printed message	Instruction
* daemon not running. starting it now on port xx * (default port number is 6037) * daemon started successfully * connected to xxx(xxx refers to port number when connecting with USB or serial port, e.g.:COM4; xxx refers to the IP address and port number of target end when	XCB daemon is not running, and XCB connection can be built with the given parameter.

connecting with network, e.g.: 172.16.162.29:5555)	
* daemon not running. starting it now on port xx *(default port number is 6037) * failed to start daemon *	XCB daemon is not running, and failed to start XCB daemon with the XCB command.
* daemon not running. starting it now on port xx *(default port number is 6037) * daemon started successfully * error: unable to connect to xxx(xxx refers to port number when connecting with USB or serial port, e.g.:COM4; xxx refers to the IP address and port number of target end when connecting with network, e.g.: 172.16.162.29:5555)	XCB daemon is not running and succeeded to start XCB daemon, but failed to connect to xcbd with the given parameter.
already connected to xxx(xxx refers to port number when connecting with USB or serial port, e.g.:COM4; xxx refers to the IP address and port number of target end when connecting with network, e.g.: 172.16.162.29:5555)	XCB daemon is running and xcbd connection has been built, and using the same parameter to connect xcbd again. **Note:** When printing this message, it doesn't indicate the existing XCB link is available, because XCB daemon cannot detect whether the device is offline. Therefore, if calling *xcb connect* to build XCB connection while the physical link has broken off, after re-connecting the device and calling *xcb connect*, this message will be printed, but real link is unavailable. Dependable operation is: calling *xcb kill-server* to quit and save the daemon and calling *xcb connect* again to build XCB connection.
adb server is out of date, killing … * daemon started successfully * connected to xxx	Current command is not compatible with the running XCB daemon. Note: If this message is printed, users need to check whether there are two versions of XCB tools. If there are two XCB tools, please confirm that the versions of the two are the same before executing other operations. Otherwise, XCB tool may work abnormally.
connected to xxx	XCB daemon is running, and XCB connection can be built with the given parameter.

Printed messages and instruction of calling *xcb devices*

Printed messages	Instruction
* daemon not running. starting it now on port xx *(default port number is 6037) * daemon started successfully * List of devices attached	When XCB daemon is not running, *xcb devices* command is called.
List of devices attached 172.16.162.29:5555 device Com: COM4 device	Lists all the devices attached to XCB daemon. Under some circumstances, message like "com: COM4 offline" may be printed, it is because the physical link has been broken off.

Printed messages and instruction of calling *xcb devinfo*

Printed messages	Instruction
* daemon not running. starting it now on port xx *(default port number is 6037) * daemon started successfully * error: device not found List of devices attached	When XCB daemon is not running, *xcb devinfo* is called.
error: device not found	When XCB daemon is running, but not connected to any xcbd server, *xcb devinfo* command is called.
<devinfo> Xxxxxxxxxxx(connecting device's information) <devinfo>	After XCB daemon connecting to a xcbd server, *xcb devinfo* command is called.
Error: protocol fault (no status)	After XCB daemon connecting to the device and physical link broken off, *xcb devinfo* command is called.
error: more than one device and emulator	When XCB daemon connected to several xcbd servers, *xcb devinfo* command is called.

Printed messages and instruction of calling *xcb installer*

Printed messages	Instruction
* daemon not running. starting it now on port xx *(default port number is 6037) * daemon started successfully * error： device not found	When XCB daemon is not running, *xcb installer* command is called.

error: device offline	When XCB daemon connected to the device and the physical link broken off, *xcb installer* command is called.
copy file start! data file is XXX.aip xx KB/s (xx bytes in xx s) copy file success! Xxxxxxxxxxxxxxxxxxxxxxxx(Messages printed when installing files. If successful installed, "installer aip done" will be printed. Other messages please refer to installer command.）	The file is installed successfully.
copy file start! data file is XXX.aip error: protocol fault (no status)	In the process of transforming file to the device, the physical link has been broken off.
error: more than one device and emulator	When XCB daemon connected to several xcbd servers, *xcb installer* command is called.

Printed messages and instruction of calling *xcb settime*

Printed messages	Instruction
* daemon not running. starting it now on port xx *(default port number is 6037) * daemon started successfully * error： device not found	When XCB daemon is not running, *xcb settime* command is called.
xcb settime ok	Succeeded to set time with XCB command.
error: more than one device and emulator	When XCB daemon connected to several xcbd servers, *xcb settime* command is called.

Printed messages and instruction of calling *xcb gettime*

Printed messages	Instruction
* daemon not running. starting it now on port xx *(default port number is 6037) * daemon started successfully * error： device not found	When XCB daemon is not running, *xcb gettime* command is called.
error: more than one device and emulator	When XCB daemon connected to several xcbd servers, *xcb gettime* command is called.

2.16-04-22 16:00:00	Succeeded to get time and print time.

Printed messages and instruction of calling *xcb reboot*

Printed messages	Instruction
* daemon not running. starting it now on port xx *(default port number is 6037) * daemon started successfully * Error: device not found	When XCB daemon is not running, *xcb reboot* command is called.
error: more than one device and emulator	When XCB daemon connected to several xcbd servers, *xcb reboot* command is called.
(No messages)	The device will reboot after 2 seconds.

Printed messages and instruction of calling *xcb disconnect*

Printed messages	Instruction
* daemon not running. starting it now on port xx *(default port number is 6037) * daemon started successfully * No such device xxx	When XCB daemon is not running, *xcb disconnect* command is called.

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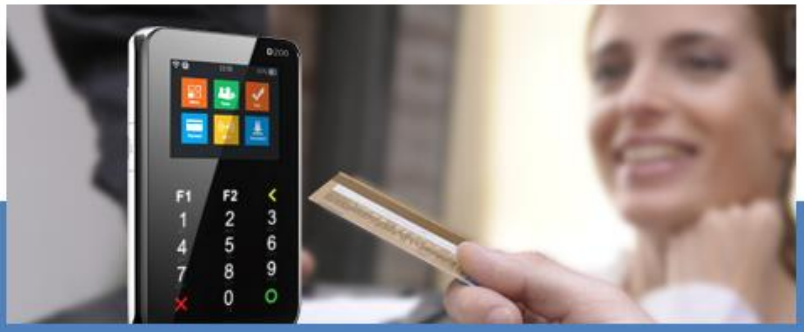

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