NXP Semiconductors
Solution Quick Start Guide

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Linux Point of Sale (LPOS) Reader Solution Quick Start Guide

Contents

1. Introduction

The Linux Point of Sale (LPOS) Reader Solution is a collection of hardware, software enablement, middleware and specialized segment-specific software for the point-of-sale market. This document describes how to start with the kit: use it for payment application demonstration and start working with the dedicated software.

2. Solution Kit

The individual components of the POS Reader Solution Kit are described in the below subsections.

Figure 1. Assembled TWR-LPOS-RDR Solution

2.1. TWR-POS-i.MX6UL

The primary board of the Linux POS Reader Solution is the TWR-POS-i.MX6UL. It's a Tower module featuring the MCIMX6G3CVM05AB – an ARM® Cortex®-A7 @ 528 MHz core (with Arm TrustZone and NEON MPE), 32KB instruction and 32KB data L1 Cache, 128KB L2 Cache, Boot ROM (HAB, 96KB), OCRAM 128KB, Secure RAM 32 KB, 512MB DDR3L, Dual Quad SPI controller, 2x MMC 4.5/SD 3.0/SDIO Port, 2x USB 2.0 OTG, TRNG, Crypto Engine (AES with DPA, TDES/SHA/RSA), Tamper Monitor, Secure Boot, SIMV2/EVMSIM X 2, OTF DRAM Encryption, PCI4.x compliance profile.

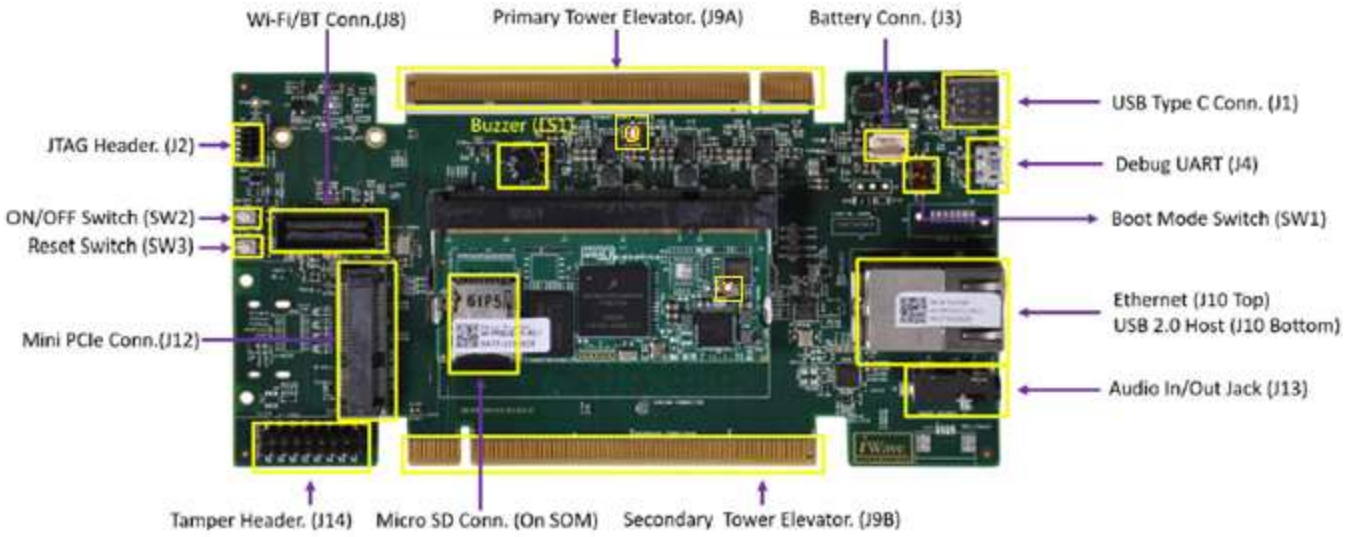

Figure 2. TWR-POS-i.MX6UL Board

2.2. TWR-POS-PN5180

The card reader interfaces are provided via the TWR-POS-PN5180. This board has the NXP PN5180 chip to enable the NFC interface and the TDA8035 to enable the smartcard contact interface. The TWR-POS-PN5180 also provides the ability to add a magnetic stripe reader (MSR) via J13. Figure 3 shows the important components of the TWR-POS-PN5180. The PN5180 interfaces to the iMX6UL via the **ECSPI1** port and the TDA8035 via the **EMVSIM2** port 0 of the iMX6UL-TWR-POS.

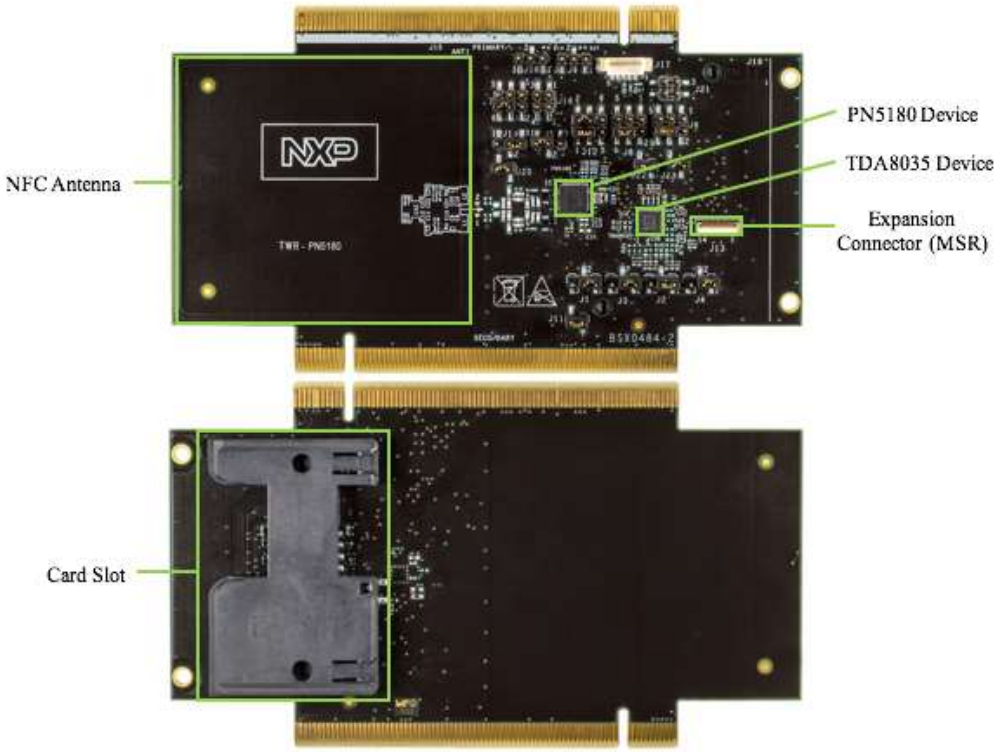

Figure 3. TWR-POS-PN5180 Board

Table 1. TWR-POS-PN5180 Jumper Settings

Jumper	Option	Setting	Imx6UL I/O Pin	Tower edge
J4	SPI Clk selection	1-2	ECSPI1_SCLK(LCDIF_DATA20	B7
J20	PN5180 – nRST	1-2	GPIO1_IO19(UART1_RTS_B)	B8
J1	SPI SS0	1-2	ECSPI1_SS0(LCDIF_DATA21	B9
J3	SPI MOSI	1-2	ECSPI1_MOSI(LCDIF_DATA22)	B10
J2	SPI MISO	1-2	ECSPI1_MISO(LCDIF_DATA23)	B11
J19	PN5180 BUSY	2-3	GPIO3_IO24(LCDIF_DATA19)	B58
J5	PN5180 IRQ	1-2	GPIO3_IO23(LCDIF_DATA18)	B62
J23	ICC VSEL (on IO expander)	1-2		
J9	SIM DATA	1-2		
J7	SIM CLK	1-3		
J10	SIM CLK	None		
J11	SIM CLK	None		
J6	SIM (SC) PD	3-5		
J8	ICC RST	1-3		
J12	ICC CMDVCC	3-5		
J12	ICC INT (on IO expander)	4-6		
J21	MSR UART	1-2		
J21	MSR UART	3-4		

2.3. TWR-PINPAD

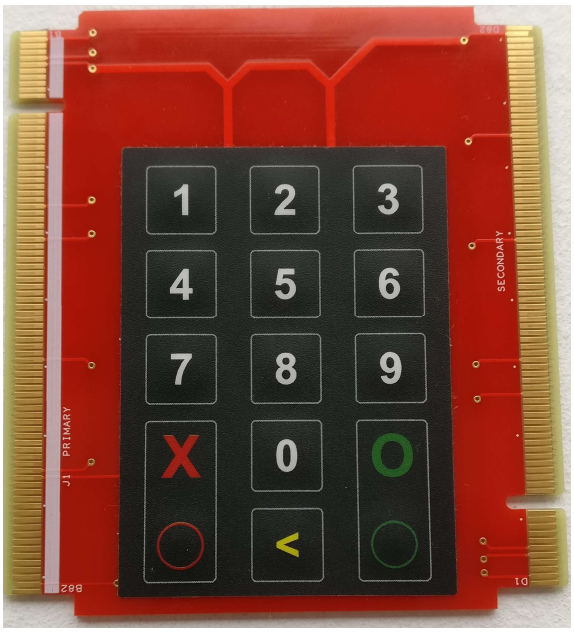

Figure 4. TWR-PINPAD board

The mechanical PINPAD board is connected to the iMX6UL GPIO pins through the tower system.

2.4. iWave-LCD

This iWave LCD is used to provide a rich graphical display to the Linux POS Reader Solution. It interfaces to the iMX6UL via the **LCDIF** port. The LCD is 16bit RGB with 480x372 resolution.

Figure 5. iWave LCD

2.5. TWR-ELEV

TWR-ELEV is the standard set of boards used for expansion for the NXP Tower platform. It contains a primary (white connectors) and secondary (black connectors) elevator boards that are keyed to prevent inserting boards the wrong way. The elevator boards also contain expansion ports on the side, which is what the iWave LCD is plugged into in the POS Reader Solution. The 3.3V regulator on the primary elevator is not used as the source for the 3.3V rail, it is supplied by the TWR-POS-K81 board instead. The mini-USB on the TWR-ELEV is used as a source to the 5V rail. Power through the mini-USB on the TWR-ELEV is necessary to provide enough power to the entire system.

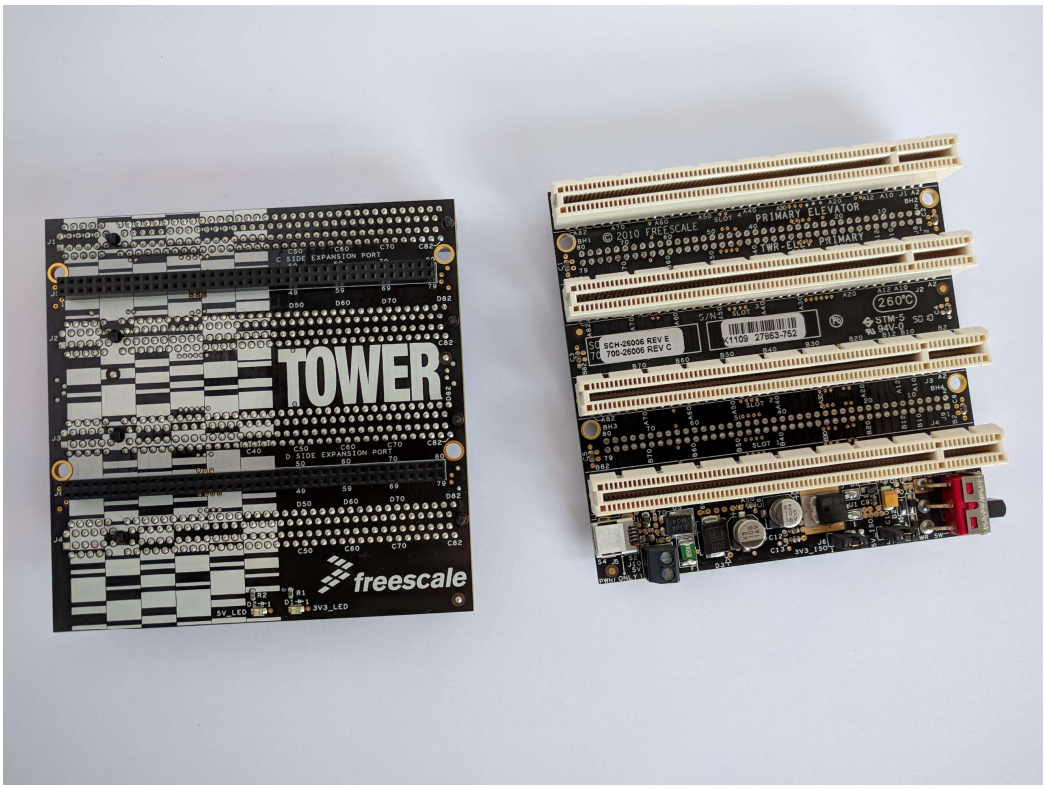

Figure 6. NXP Tower Platform

Table 2. TWR-POS-K81 Jumper Settings

Jumper	Option	Setting	Description	Default
J6	3.3V TWR-ELEV Rail Source Selection	ON	Use 3.3V regulator from primary TWR-ELEV	OFF
		OFF	Use 3.3V regulator from elsewhere. (POS-K81 board)	
J7	5V TWR-ELEV Rail Source Selection	ON	Use 5V from primary TWR-ELEV mini-USB	ON
		OFF	Use 5V from elsewhere.	

2.6. Accessories

2.6.1. Cables

Two USB cables are provided: One USB Type-C to provide power to the system, and one USB Micro to interface with a computer.

2.6.2. Battery

A CR2032 Button Cell battery is provided. The battery has to be inserted in the battery slot on the TWR-LPOS-RDR board.

2.6.3. Sample Card

One sample card is included. It is a demo Payment card with dual interface (Contact + Contactless). The card embeds a secure processor with JCOP OS, running a payment application.

This payment application can be accessed through Contact or Contactless interface.

Figure 7. Sample Card

2.7. Setup the kit

The kit is delivered already assembled, but in case it is received disassembled or is disassembled during operation, the next chapters describe how to assemble it.

2.7.1. TWR-Elev Primary and Secondary boards

It is important for the next steps to differentiate the Primary and Secondary TWR-Elev boards. Depending on the version, the name of the board can be written:

“Secondary board” or “Primary board” on the inner side (i.e the side with the 4 female PCI connectors).

If the name is not printed on the board, the Primary can be found by its marking “**A** side expansion port” and “**B** side expansion port”, while the Secondary board embeds “**C** side expansion port” and “**D** side expansion port”

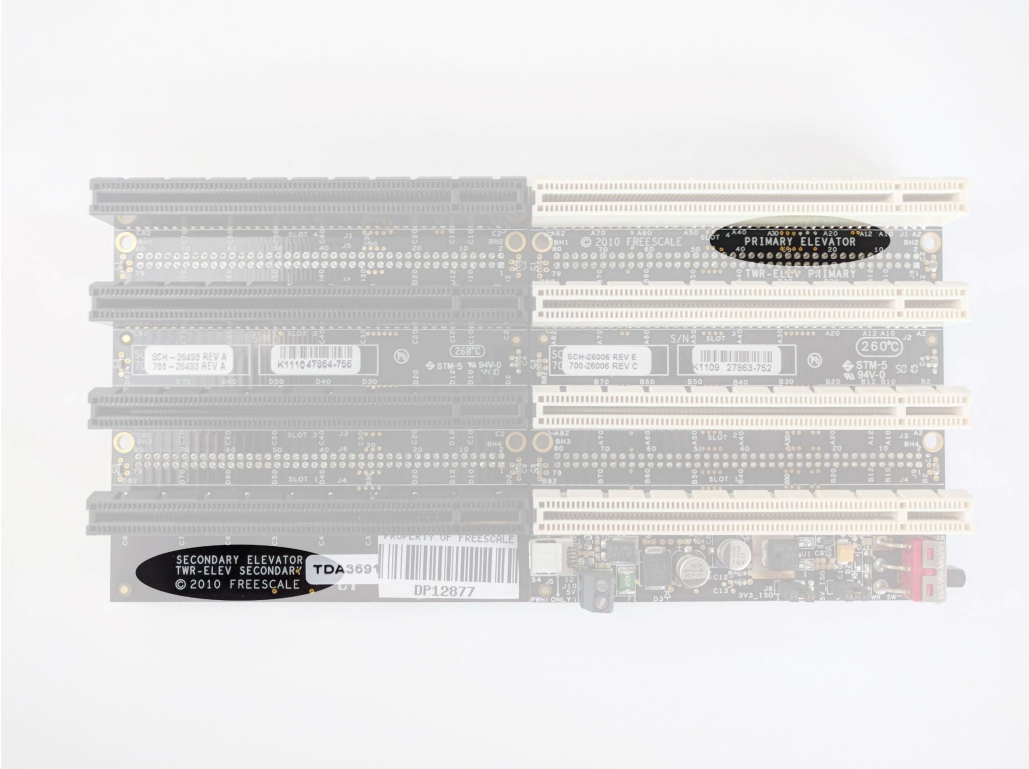

Figure 8. Primary and Secondary TWR-Elev boards

2.7.2. Assemble the Hardware

The TWR-LCD has to be connected on the outside of TWR-Elev Secondary board.

Figure 9. TWR-LCD connected on TWR-Elev Secondary

TWR-POS-K81 and TWR-POS-PN5180 have to be connected in the TWR-Elev PCI slots.

The primary and secondary connectors of each board have to be connected respectively on the primary and secondary TWR-Elev boards. The side can be recognized by its marking on each board as shown in Fig 12 and Fig 13 and Fig 14.

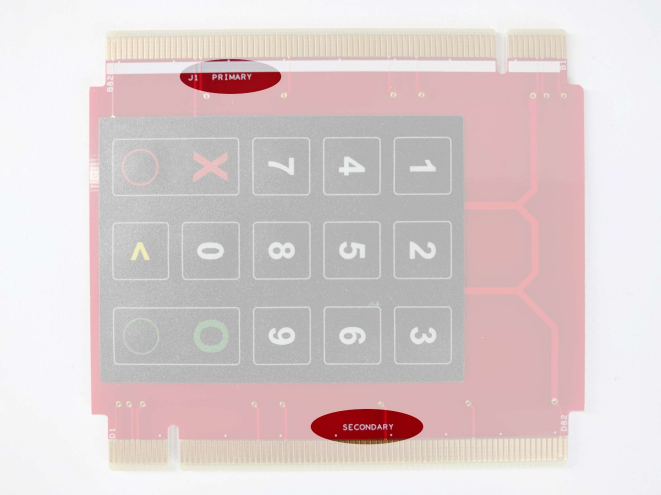

Figure 10. TWR-POS-PINPAD sides

Figure 11. TWR-POS-PN5180 sides

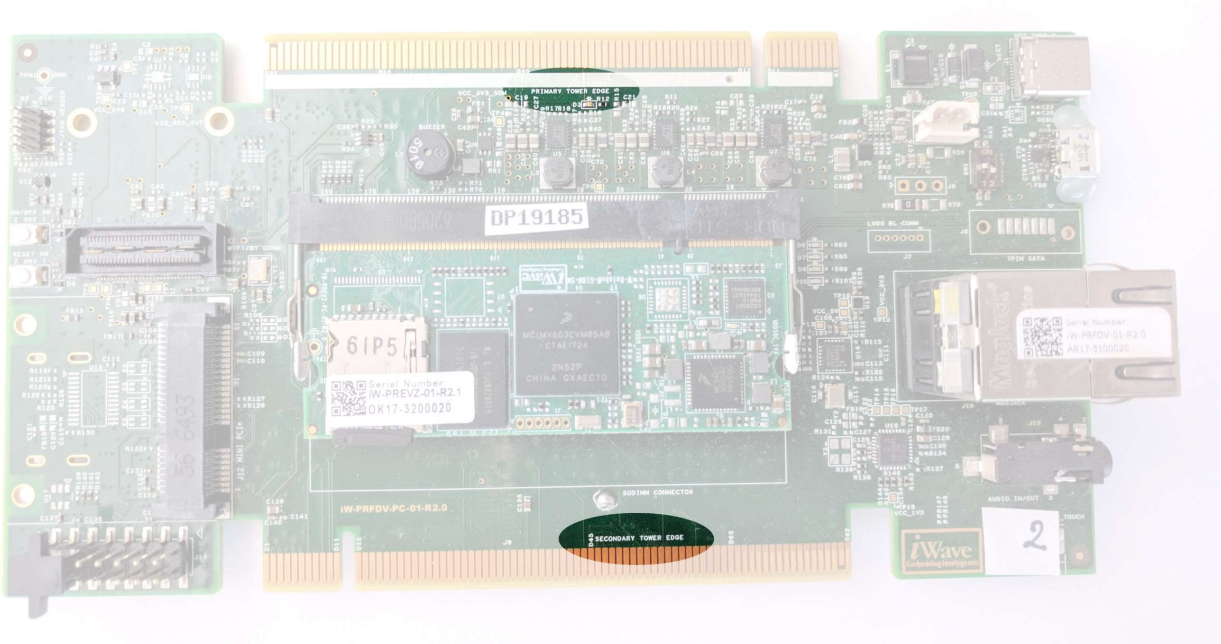

Figure 12. TWR-POS-i.MX6UL Board sides

The TWR-LCD ribbon has to be connected to the board as shown in Fig 15 and Fig 16.

Figure 13. TWR-LCD ribbon connected to TWR-LPOS-RDR #1

Figure 14. TWR-LCD ribbon connected to TWR-LPOS-RDR #2

The battery has to be inserted in the battery slot, underneath the TWR-POS-K81 PCB. To insert the battery in the right way, the + symbol has to be on top (visible), as seen in next figure:

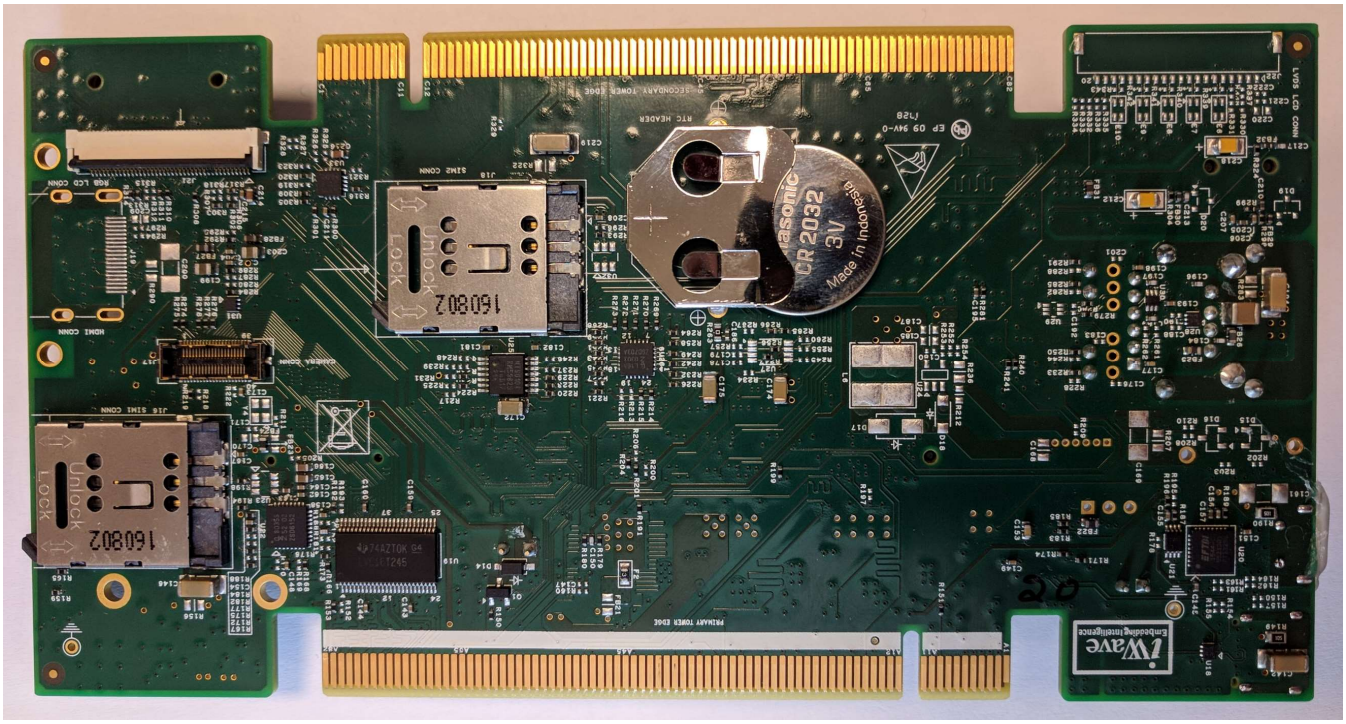

Figure 15. Battery location and position

2.8. USB Connections

The Kit presents 2 USB connectors:

- One USB Type-C on the TWR-LPOS-RDR board
- One Micro USB on the TWR-LPOS-RDR board

See Fig 18 for each connector's location.

In order to operate the Tower Kit, both the Micro USB and the USB Type-C on the TWR-LPOS-RDR board have to be used.

Micro USB has to be connected to the host computer (running the high-level application) and the USB Type-C has to be connected to a power source (either from a computer USB or from a power socket USB). Both are needed to ensure the Kit will have enough power to operate in all modes.

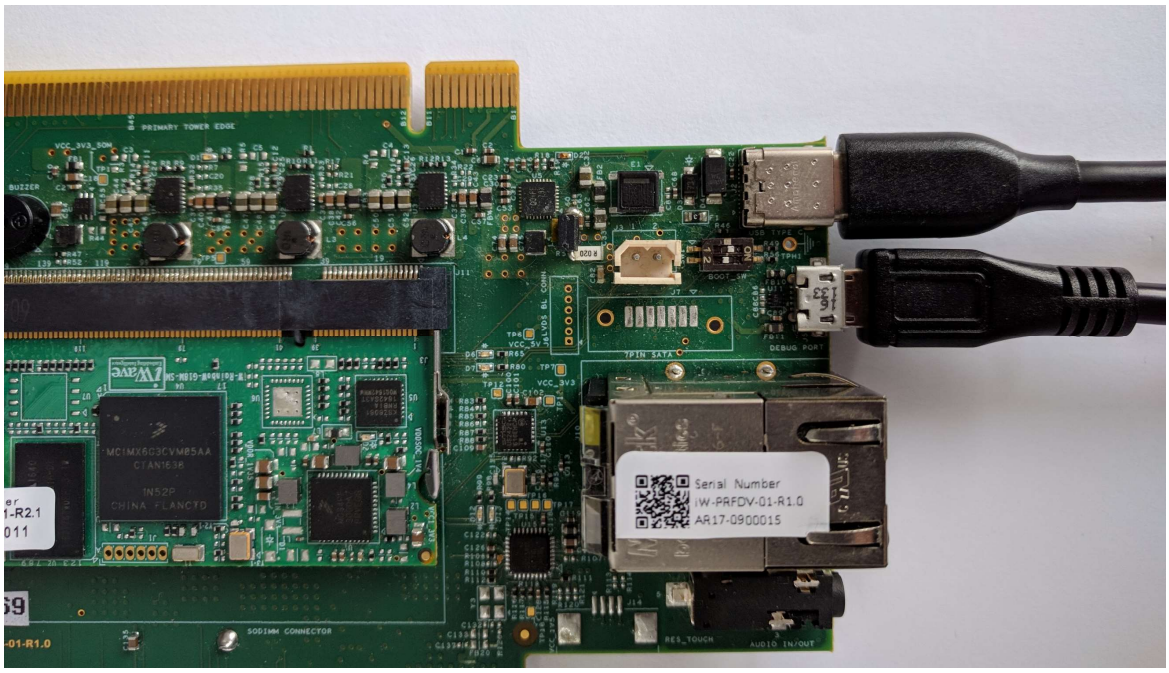

Figure 16. Connectors location

3. Demonstration

3.1. Payment Demo application

This application demonstrates a full payment application using a sample payment card, and an issuer payment application, running on a Windows machine. This tool is called “Issuer Host Simulator” (IHS).

The following chapters describe the way to use the default demonstration.

3.2. Launch the demonstration

To start the demonstration:

1. Plug the POS Reader USB type C (power)
2. Plug the Micro USB to the computer (communication)
3. Note the COM port value assigned in the device manager. (see Figure 17 and Figure 18)

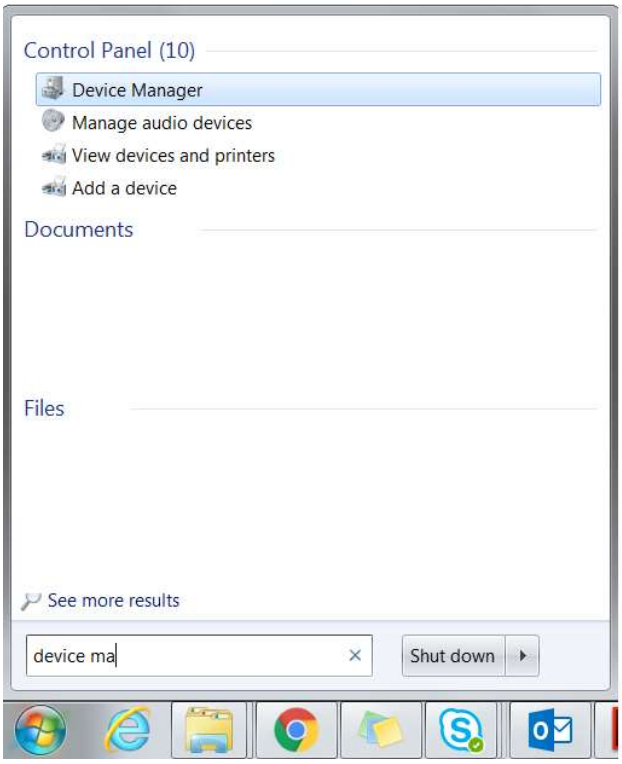

Figure 17. Device Manager

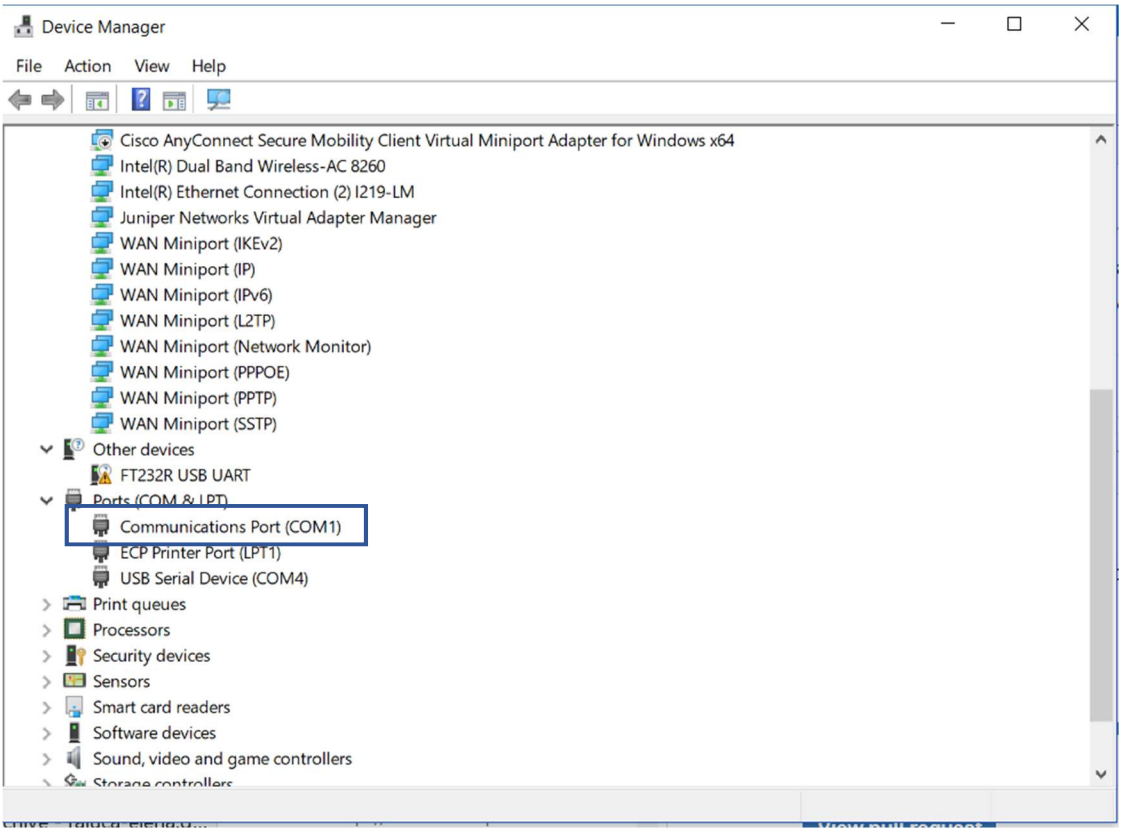

Figure 18. Communication port

4. If you do not see the USB Serial Device, you have to manually install the Driver (iMX_BulkIO_Driver) (Figure 20)

Figure 19. Device Manager

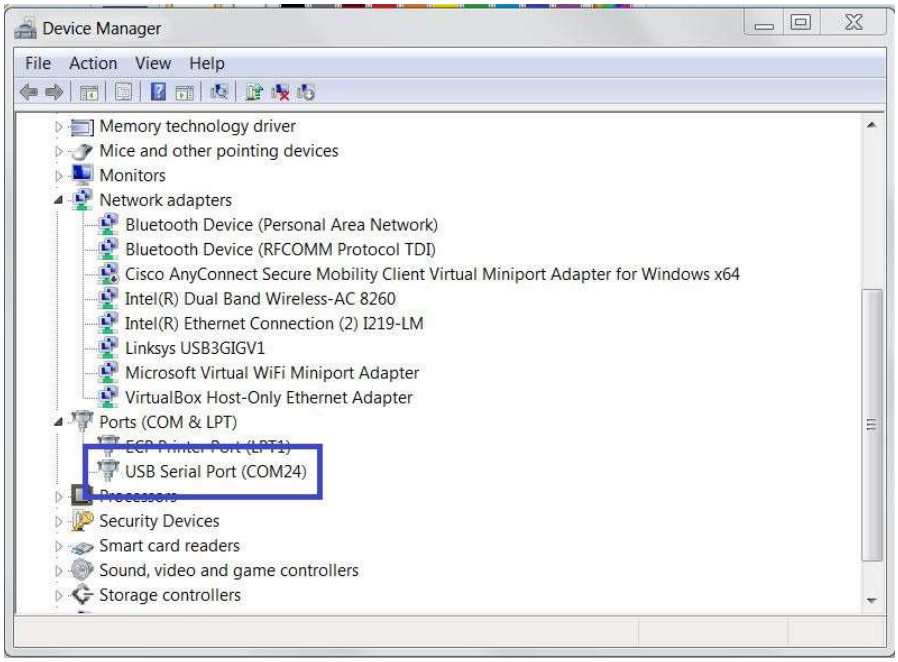

Figure 20. USB Serial Port

5. Launch PuTTY or another serial console client you prefer and connect to the board using the COM port previously assigned and **115200** as baud rate. (see Figure 18)
6. Login into the board (using **root** username and no password).

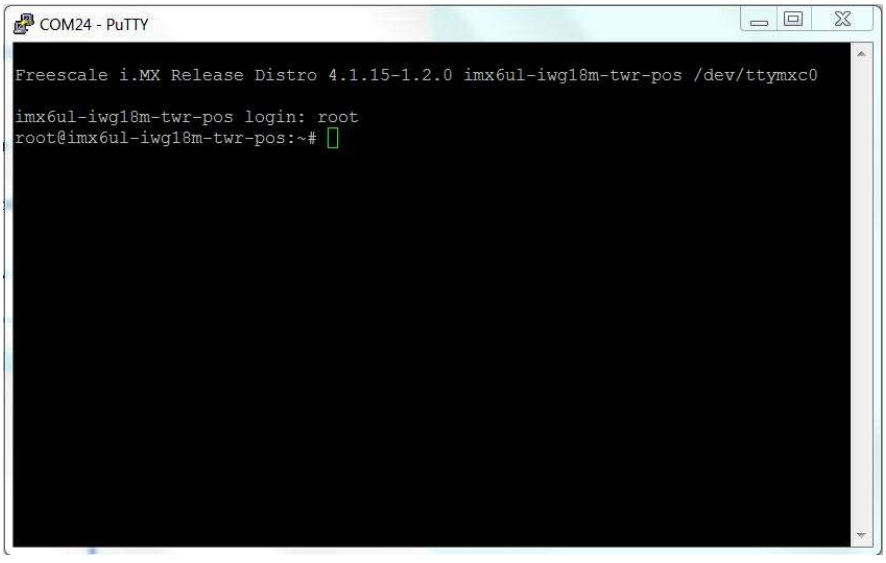

Figure 21. Login screen

7. Launch the Issuer Host Simulation (IHS) Tool. The tool is the application named “IHS.exe” (see Figure 24)
8. There are two ways to establish the communication between the board and the IHS:
    a. Using a serial connection:
        i. On the board, select Config

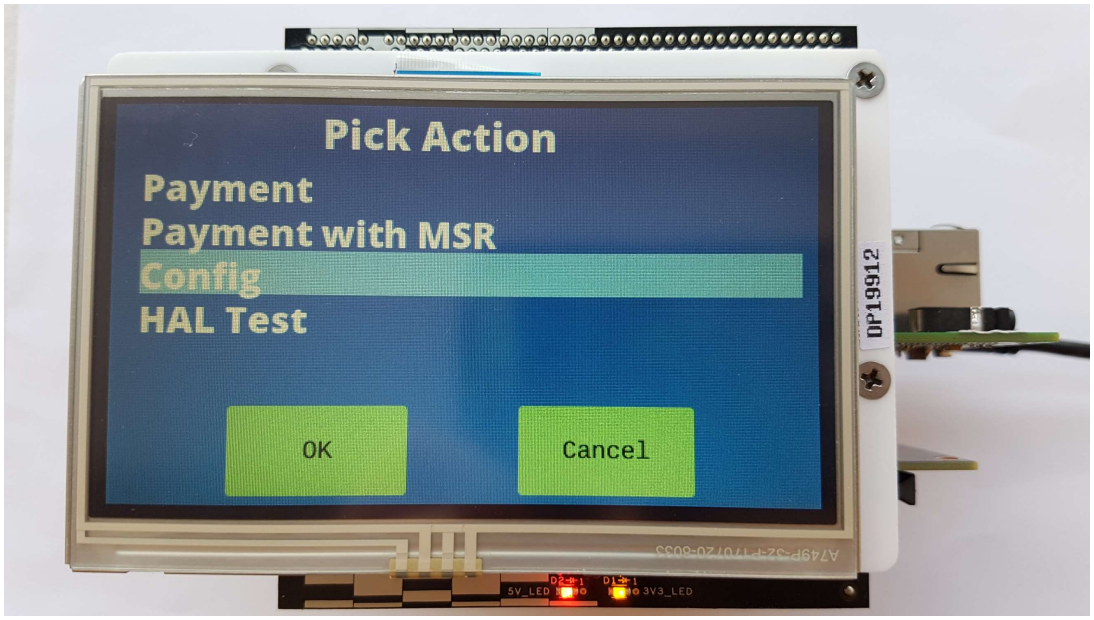

Figure 22. Config

        ii. Select Connection Type

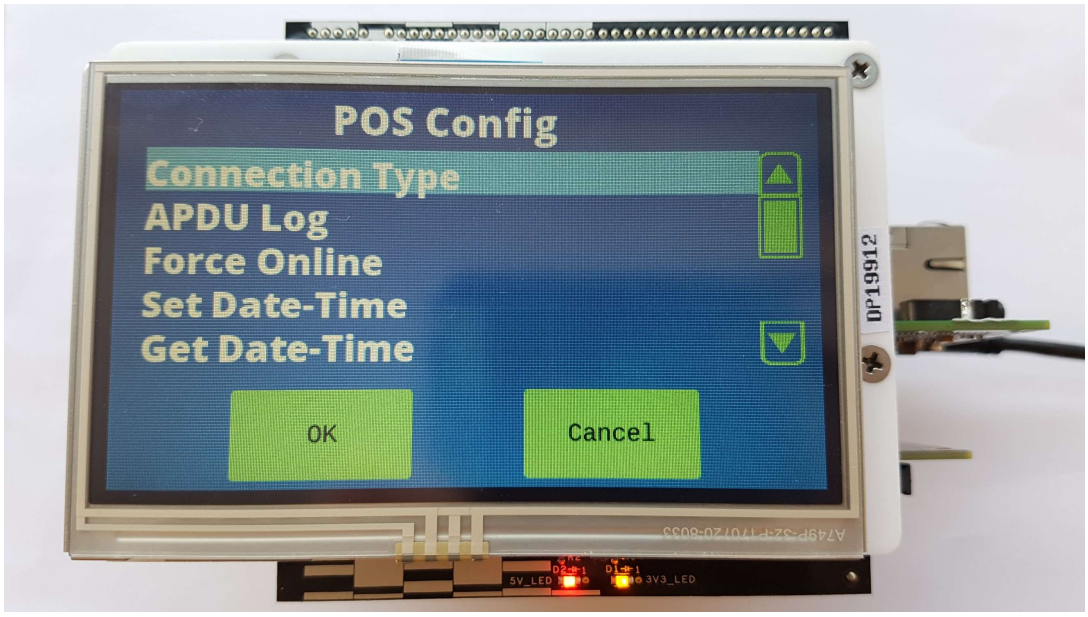

Figure 23. Connection type

iii. Select Serial connection

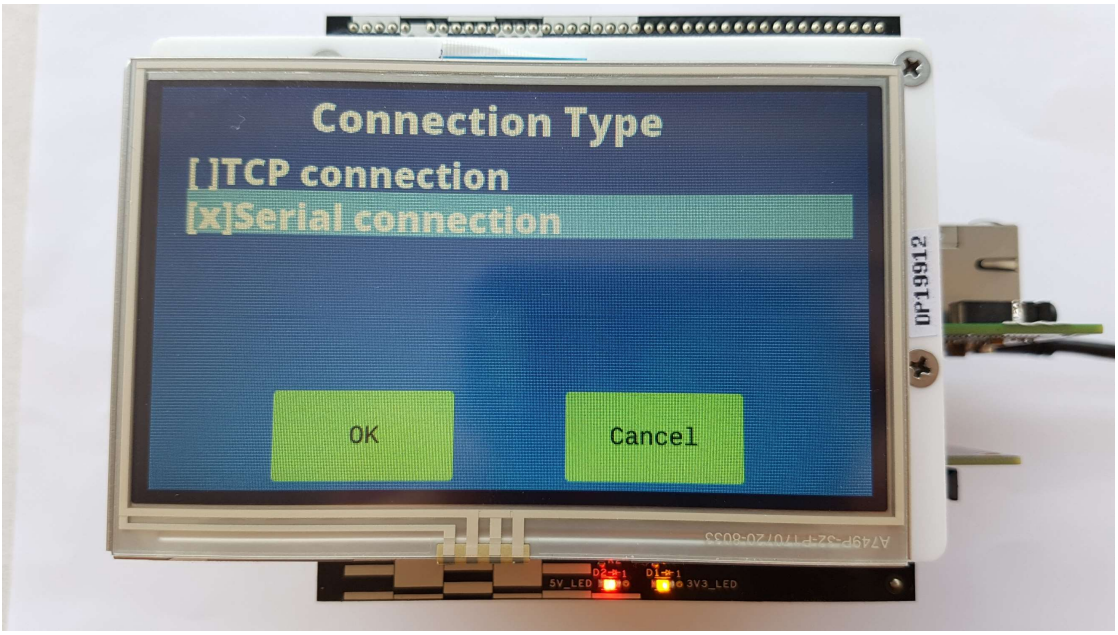

Figure 24. Serial connection

iv. Select Cancel

v. Select Save (Figure 26)

vi. In IHS select Serial Mode, select the COM port corresponding to the USB Serial (see Figure 20) and click connect.

b. Using an ethernet connection:

i. Make sure your board is plugged either to the internet, or in the same local network as the machine running IHS.

ii. On the POS, follow steps 8.a.i and 8.a.ii

iii. Select TCP connection (Figure 24)

iv. Select Cancel

v. Select Save

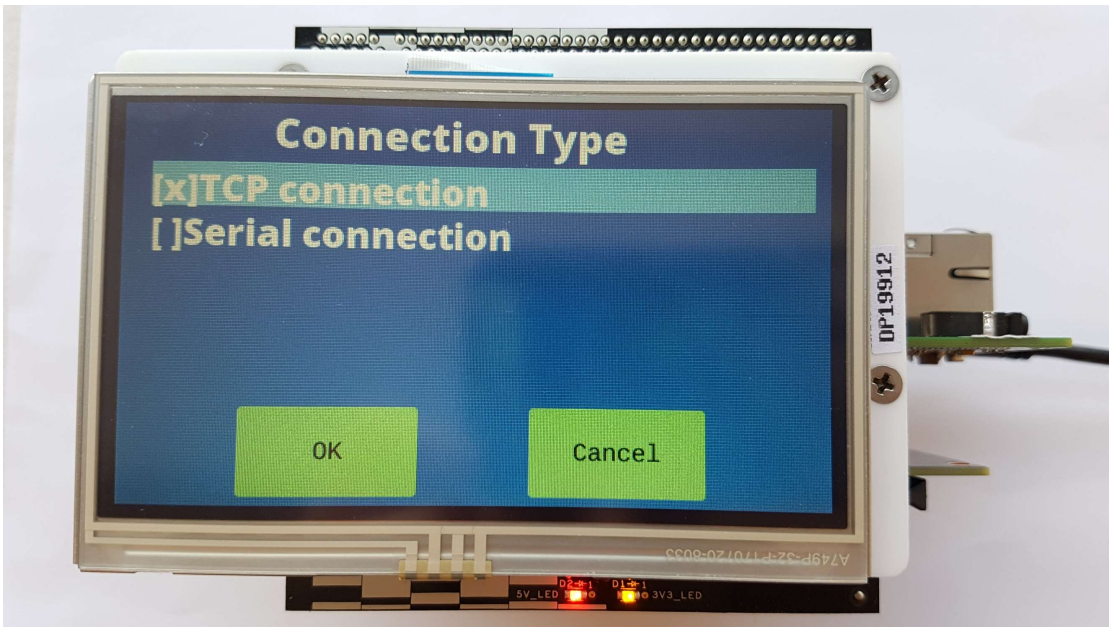

Figure 25. TCP connection

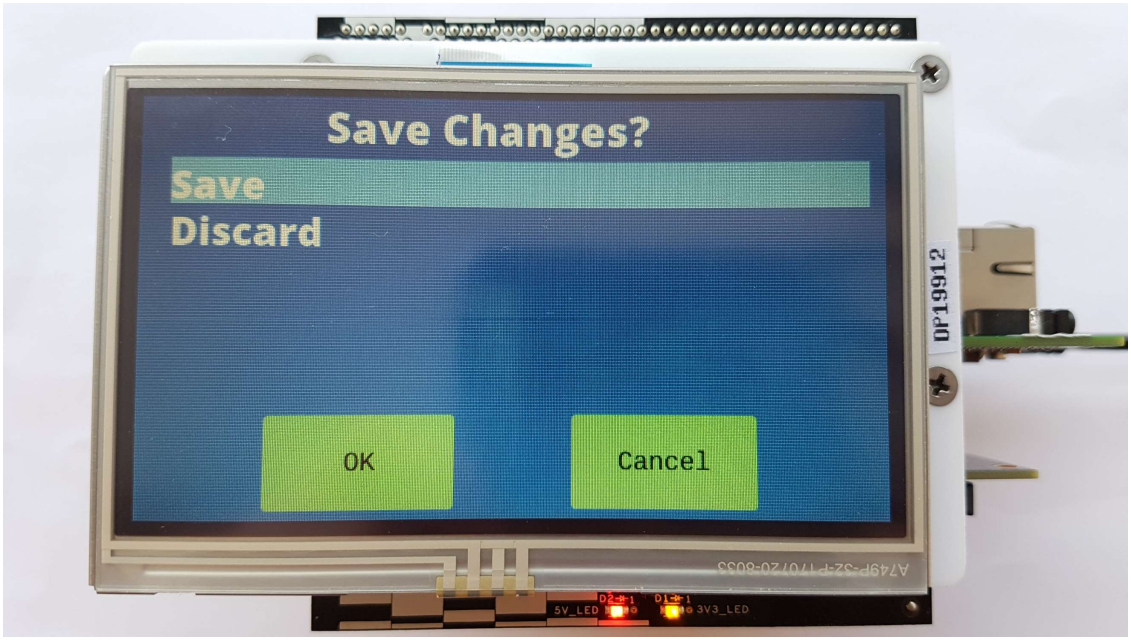

Figure 26. Save

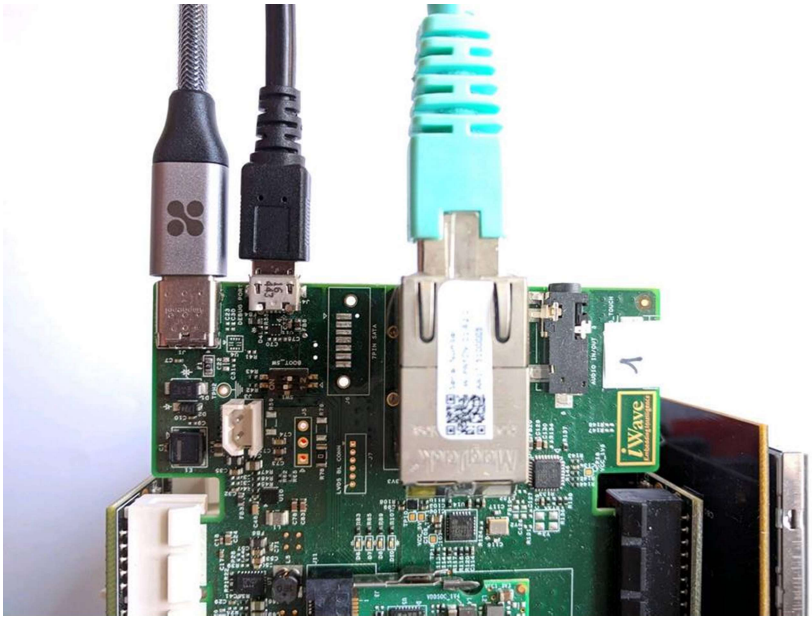

Figure 27. Board connected to ethernet

vi. By default the board receives an IP address using dhcp. To set a static IP address on your board you must edit the file **/etc/network/interfaces** by commenting (or removing) the line **iface eth0 inet dhcp** and adding the following lines, in the section corresponding to ethernet connections (use the IP/network address of your choice, the following is just an example):

iface eth0 inet static

address 192.168.7.2

netmask 255.255.255.0

network 192.168.7.0

gateway 192.168.7.1

vii. Restart the network interface by typing **ifdown eth0** followed by **ifup eth0**.

viii. Find the IP address of the machine running IHS. One way to do this is: open a command prompt and type ipconfig; note the IP value.

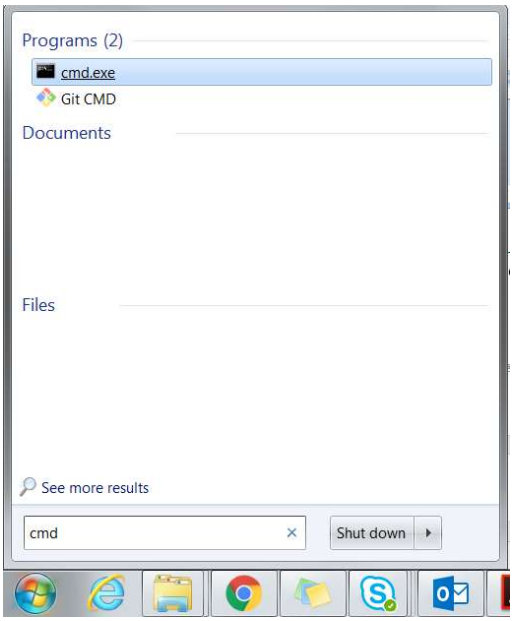

Figure 28. Command Line

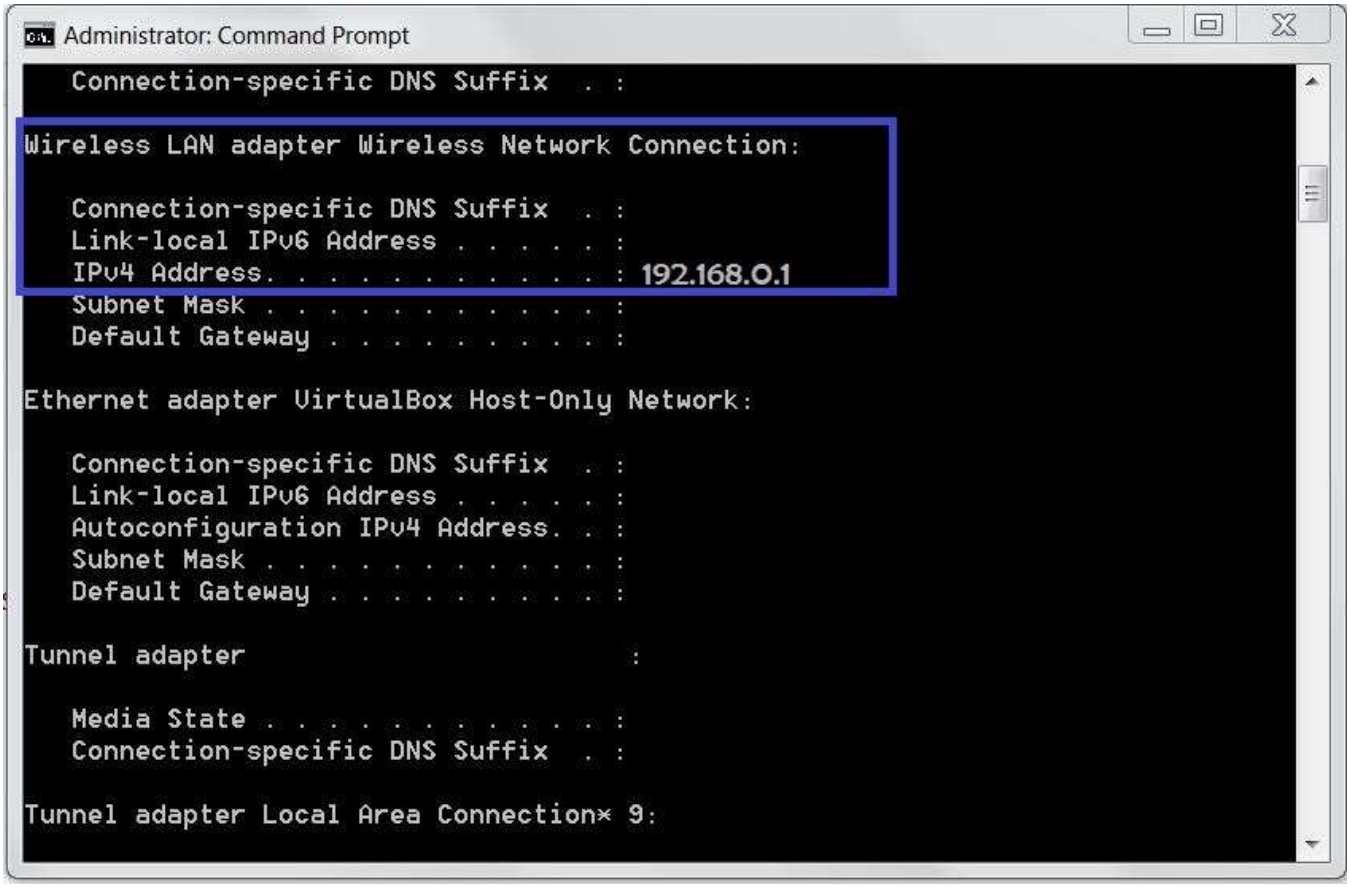

Figure 29. IP address

ix. Set the ip of the machine running IHS after first time boot, on the board. To do this, run the script **pos-set-ip.sh** located in the **/usr/bin** folder on the POS.

x. In IHS select Network Mode and click connect.

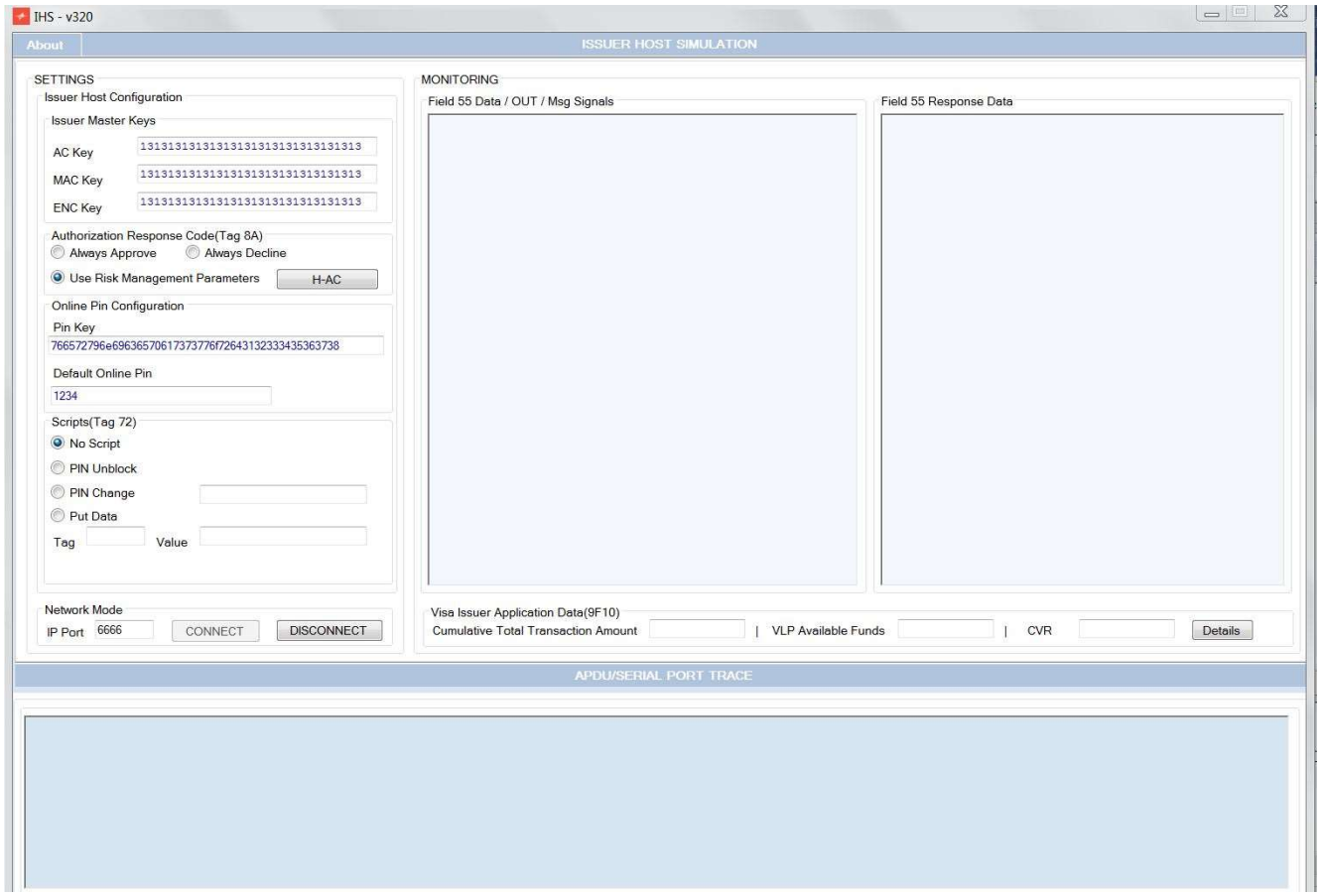

Figure 30. IHS

9. !! First time only !! – The first time the POS is connected to IHS, it will download some configuration files. Wait for this process to finish, then the demo can be used.

10. The TWR-ELEV LCD lets you pick and action: “Payment” or “Config”

The payment-demo application launches by default when the system starts. This app is located in **/opt/payment-demo** folder. To restart/start/stop the application the **/etc/init.d/payment-demo** can be used with one of the arguments **restart/stop/start.**

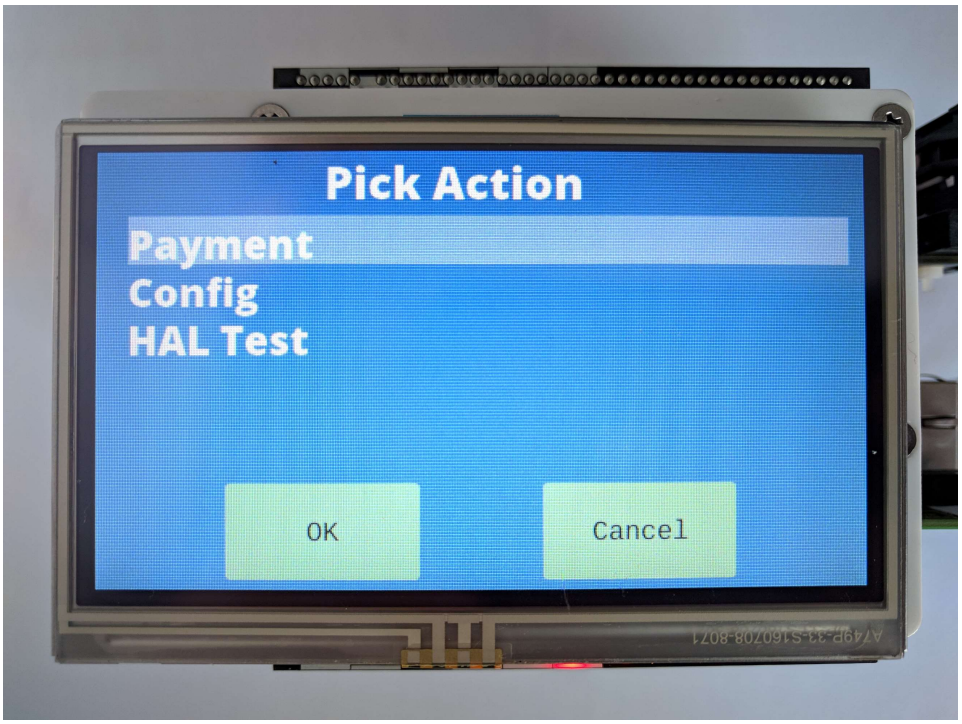

Figure 31. Demo start screen

11. Select “Payment” by touching the screen.
12. The application asks to enter a transaction amount (e.g. 15.00 can be entered). This value has to be entered with the secure pinpad.

Figure 32. Enter amount screen

13. Press “Enter” on the secure pin pad to validate the amount.
14. The LCD screen shows to insert or tap card. From this point, Contact or Contactless transaction can be used. For contact transaction, go to step 19 and for contactless operation, go to step 21.

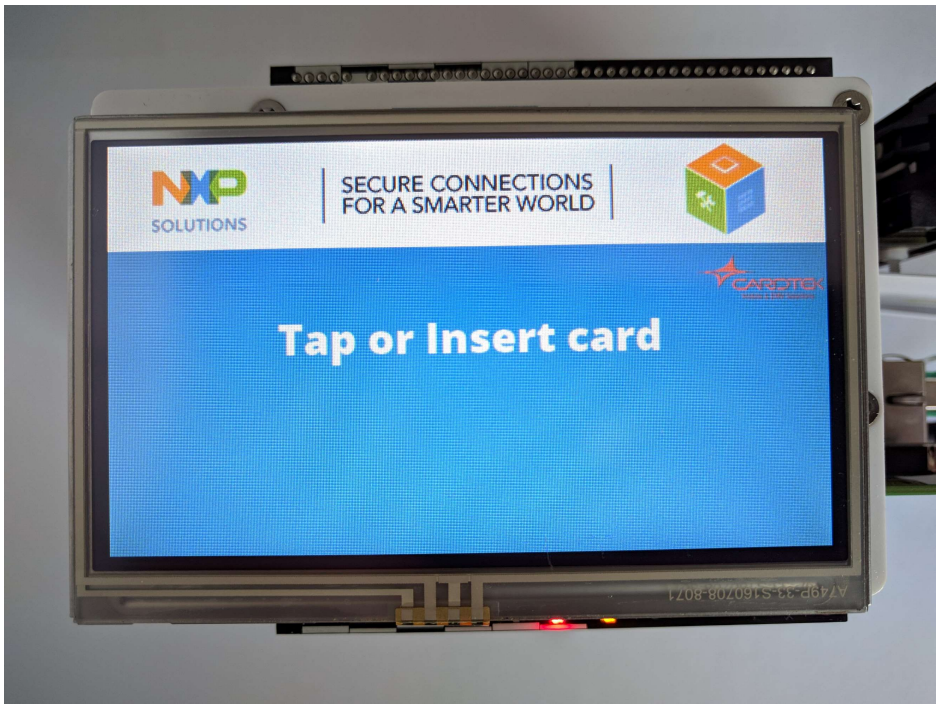

Figure 33. Insert card screen

15. Contact Operation
    a. Insert the sample card into the Contact Smart Card slot (located under the TWR-POS-PN5180 module). The smart card has to be inserted with contacts and prints on top:

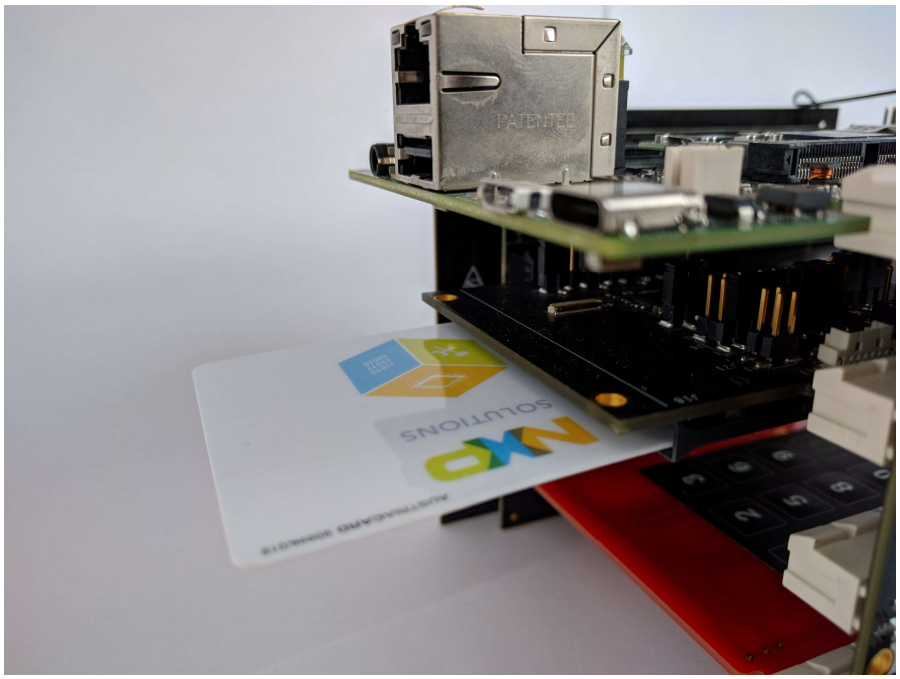

Figure 34. Contact card insertion

b. The process continues and you are requested to enter the card PIN. Enter the PIN code (default: 1234) on the TWR-POS module pin pad, then press Enter.

Figure 35. Enter PIN

c. If the POS Reader is connected to the IHS, and the IHS is active, the LCD Screen will show “Approved” then “Remove Card” and the transaction information will be displayed in the IHS dedicated window. For amounts under a certain threshold depending on the

configuration, the transaction can be approved offline and in such cases the IHS will not display transaction details.

Figure 36. Transaction approved

Figure 37. Card removal screen

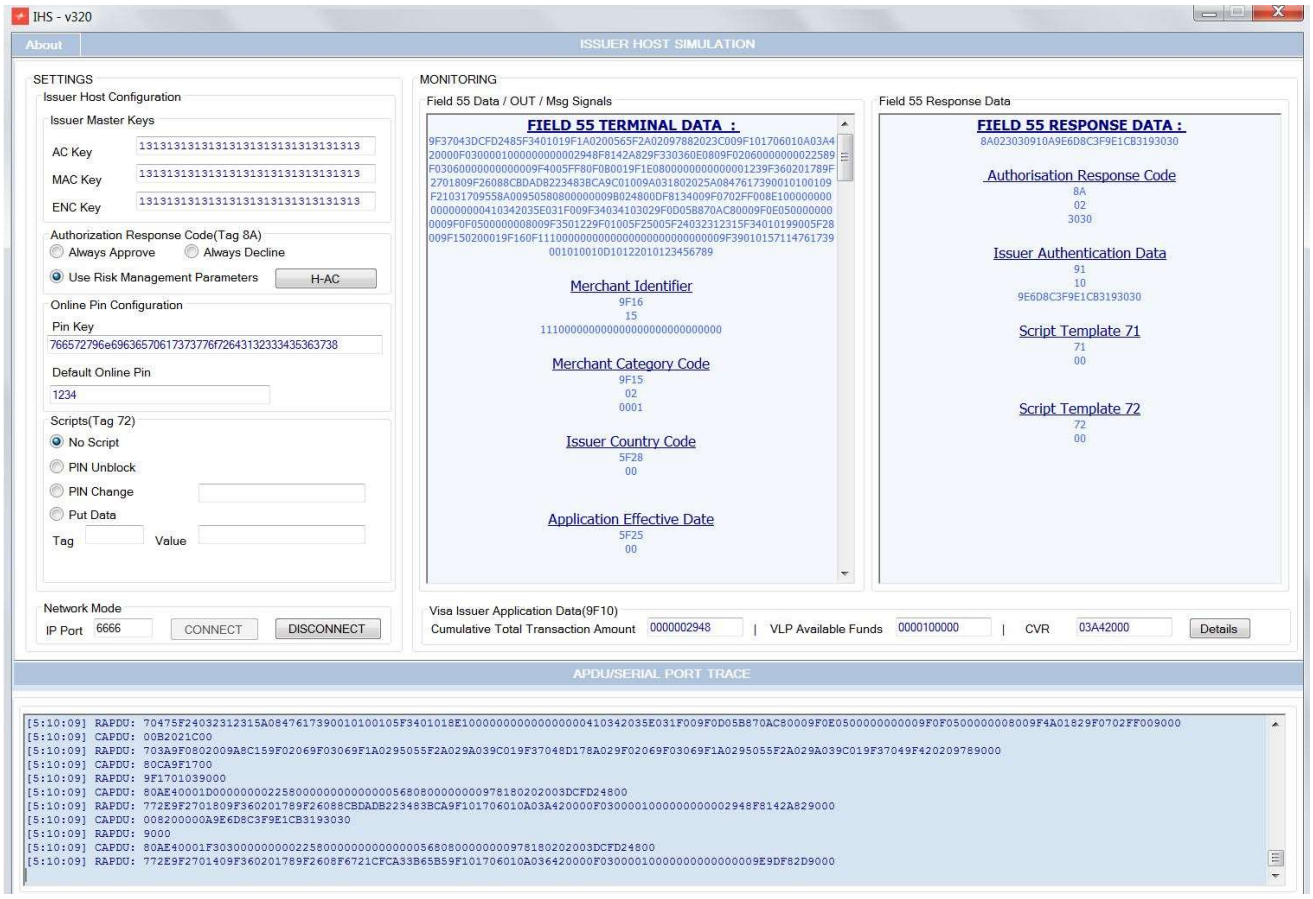

Figure 38. IHS after transaction

16. You can now remove the card. The setup is ready for the next operation.
17. The Contactless operation
    a. When the POS asks to “Insert or Tap a Card”, the sample card can be tapped on the TWR-POS-PN5180 board antenna:

Figure 39. Contactless card tap

b. If the transaction is below a certain threshold, the transaction will be approved and on the screen the “Approved” message will appear (Figure 18.).

   i. If the transaction is higher than the threshold, the PIN will be requested (Figure 35).

   ii. If the amount is too large, the transaction can’t be executed using contactless interface and the application will request using Contact interface instead.

   iii. The threshold mentioned above depends on each type of card and currency (for example, if you use a Visa payWave card in dollars, you can pay without PIN for amounts smaller that $10 and you cannot pay using contactless for amounts larger than $30).

3.3. Emvco-loopback

3.3.1. Launch the application

1. The application is located in the folder /opt/emvco-loopback.
2. Stop the payment demo app using the command: /etc/init.d/payment-demo stop
3. Start emvco-loopback using: /etc/init.d/emvco-loopback start
4. You should see on the screen the following image:

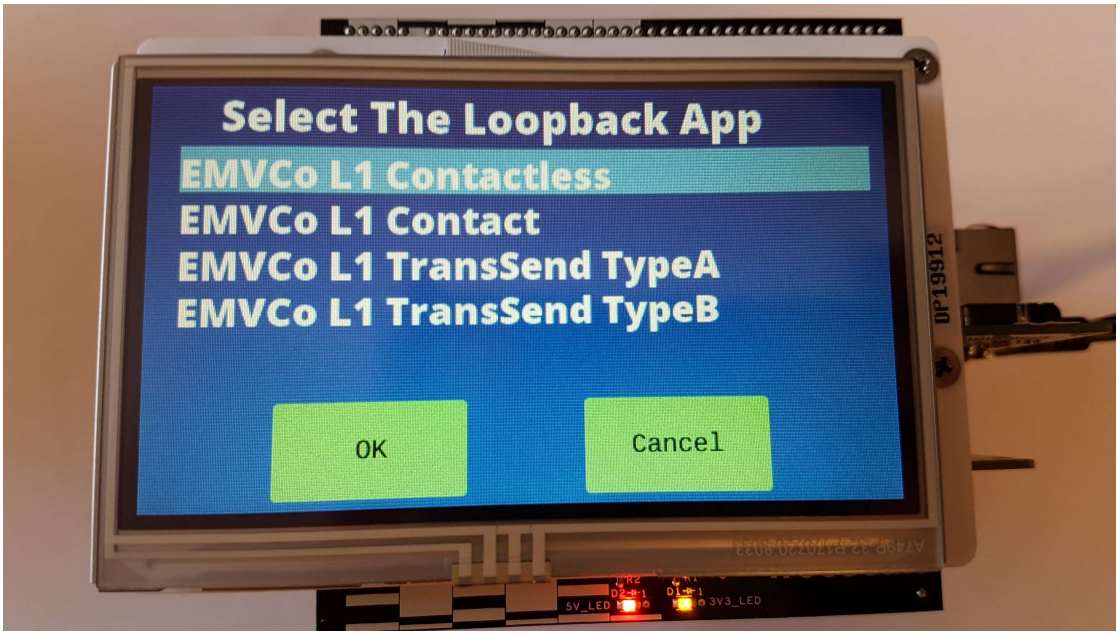

Figure 40. EMVco loopback

3.4. Factory Reset

If the system needs to be set back to its default configuration, it is possible to reset it with the factory settings.

To do so, at start-up screen, choose “Config”:

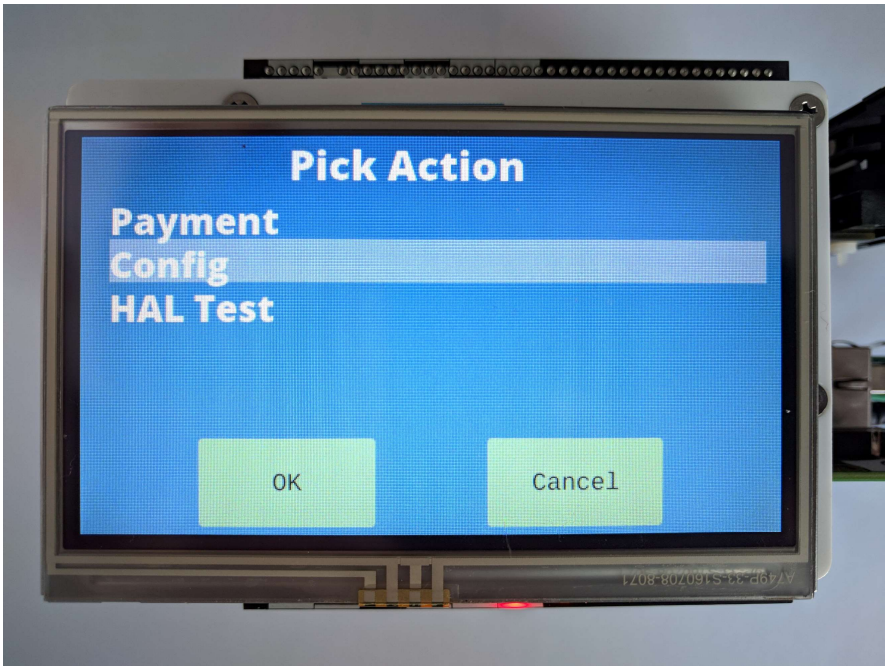

Figure 41. Factory reset #1

Scroll down the configuration screen to display “Factory Reset” then touch “Factory Reset” and “OK”:

Figure 42. Factory reset #2

4. Revision History

Table 3. Revision history

Revision number	Date	Substantive changes
1	01/2018	Initial release
2	04/2018	

How to Reach Us:

Home Page:
nxp.com

Web Support:
nxp.com/support

Document Number: LPOSRS003SQSG
Rev. 2
04/2018