UM11036

Point of Sales (POS) Reader Solution - Quick Start Guide

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User manual
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Document information

Info	Content
Keywords	Point of Sales (POS) Reader Solution, K81, PN5180, TDA8035, CLRC663
Abstract	This document intends to describe all steps that should be applied in order to start with the POS Reader Solution kit

Revision history

Rev	Date	Description
1.3	20190527	TWR-POS-CLRC663 HW added
1.2	20170207	PN5180 Firmware update procedure added
1.1	20161116	Update for CES release
1.0	20161110	First release

Contact information

For more information, please visit: http://www.nxp.com

1. Introduction

The K81 point-of-sale (POS) Card Reader Solution is a collection of hardware, software enablement, middleware and specialized application-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.

Fig 1. POS Reader Solution Kit box

All details about the solution can be found on the NXP webpage:

www.nxp.com/products/reference-designs/point-of-sale-pos-reader-solution:SLN-POS-RDR

2. POS Reader Solution kit

2.1 Kit Content

Fig 2. Kit Content

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

2.1.1 TWR-POS-K81

This is the core of the SLN-POS-RDR system. This board embeds the K81 microcontroller, external flash, an LCD display and the secure pin pad.

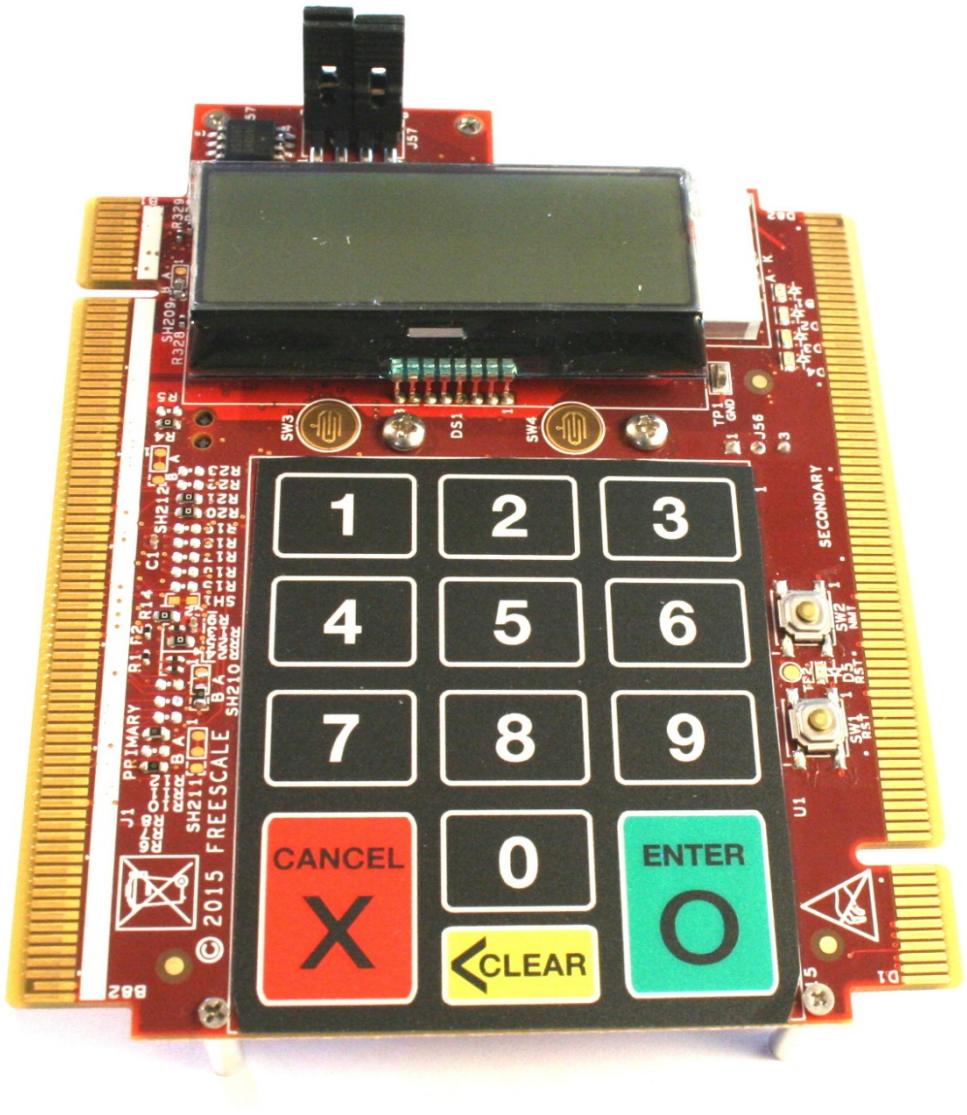


Fig 3. TWR-POS-K81

2.1.2 TWR-POS-PN5180

2.1.2.1 Presentation

This is the card interface board. It allows reading Contact and Contactless payment cards. This board embeds NXP's PN5180 (contactless frontend) and TDA8035 (contact frontend)

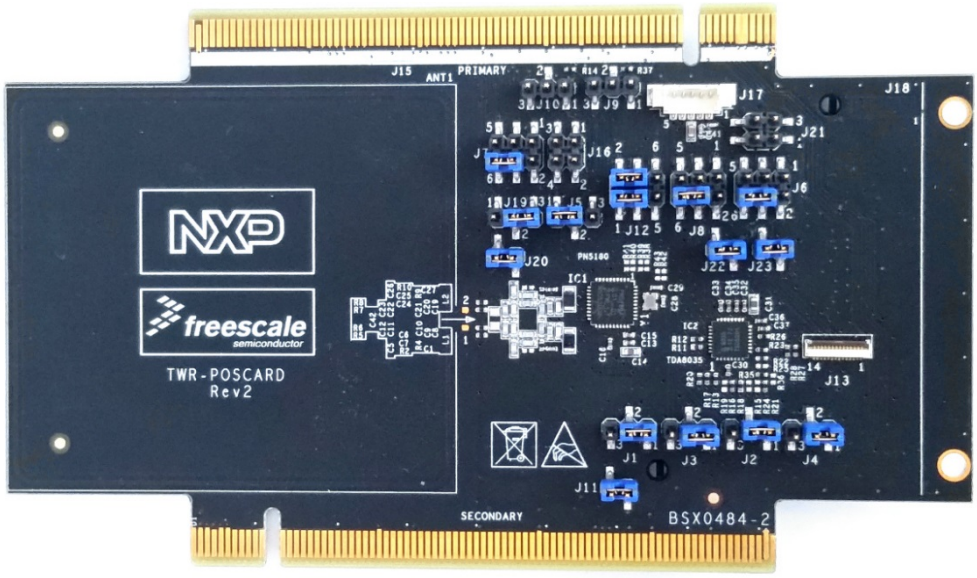


Fig 4. TWR-POS-PN5180

2.1.2.2 Jumper settings

The jumpers on the TWR-POS-PN5180 are used to connect this board to different CPU modules. The setting for these jumpers, to be used in this kit, is the one seen in Fig 4. Below table gives the position of each jumper to be used in this RDR-POS-SLN:

Table 1. TWR-POS-PN5180 Jumper setting for RDR-POS-SLN

Jumper name	Setting	Jumper name	Setting
J1	1-2	**J2**	1-2
J3	1-2	**J4**	1-2
J5	1-2	**J6**	4-6
J7	4-6	**J8**	4-6
J9	Open	**J10**	Open
J11	1-2	**J12 1-3-5**	1-3
J12 2-4-6	2-4	**J16 1-2**	Open
J16 3-4	Open	**J19**	2-3
J20	1-2	**J21**	Open
J22	1-2	**J23**	1-2

2.1.3 TWR-POS-CLRC663

2.1.3.1 Presentation

This is the card interface board. It allows reading Contact and Contactless payment cards. This board embeds NXP's CLRC663 (contactless frontend) and TDA8035 (contact frontend)

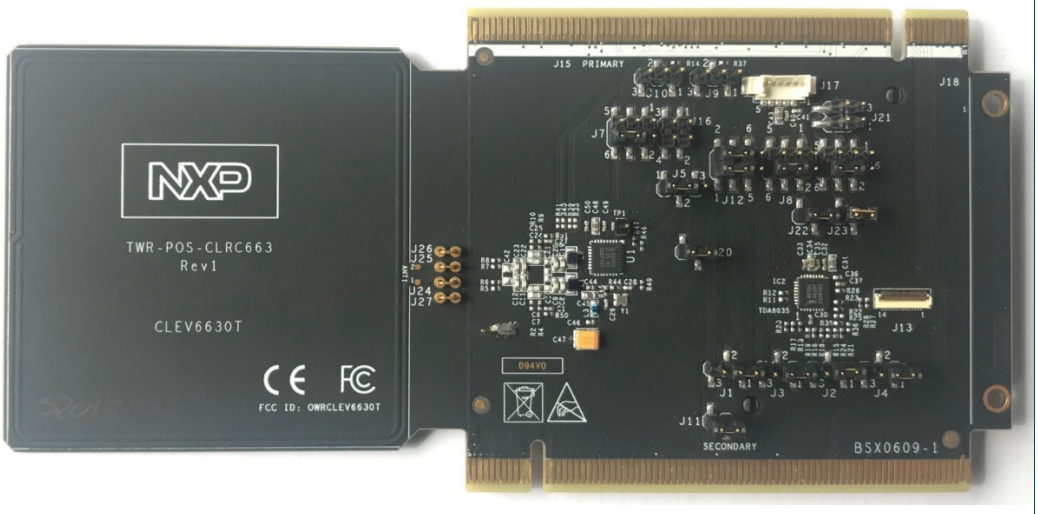


Fig 5. TWR-POS-CLRC663

2.1.3.2 Jumper settings

The jumpers on the TWR-POS-CLRC663 are used to connect this board to different CPU modules. The setting for these jumpers, to be used in this kit, is the one seen in Fig 4. Below table gives the position of each jumper to be used in this RDR-POS-SLN:

position of each jumper to be used in this RDR-POS-SLN:

Table 2. TWR-POS-CLRC663 Jumper setting for RDR-POS-SLN

Jumper name	Setting	Jumper name	Setting
J1	1-2	**J2**	1-2
J3	1-2	**J4**	1-2
J5	1-2	**J6**	4-6
J7	4-6	**J8**	4-6
J9	Open	**J10**	Open
J11	1-2	**J12 1-3-5**	1-3
J12 2-4-6	2-4	**J16 1-2**	Open
J16 3-4	Open	**J19**	2-3
J20	1-2	**J21**	Open
J22	1-2	**J23**	1-2

2.1.4 TWR-LCD

This is an LCD module board. This LCD touchscreen is used to interact with the user: display information and get inputs from the user.

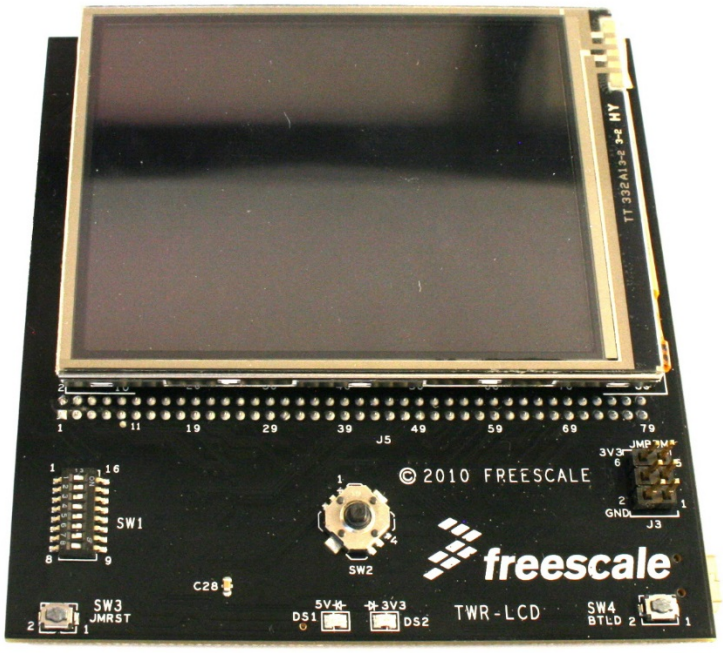


Fig 6. TWR-LCD

2.1.5 TWR-Elev

These are the connection boards. They are needed to connect all feature boards together

Fig 7. TWR-Elev

2.1.6 Accessories

2.1.6.1 Cables

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

2.1.6.2 Battery

A CR2032 Button Cell battery is provided. The battery has to be inserted in the battery slot on the TWR-POS-K81 board

2.1.6.3 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.

Fig 8. Sample card

2.2 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.

2.2.1 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”

2.2.2 Assemble the Hardware

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

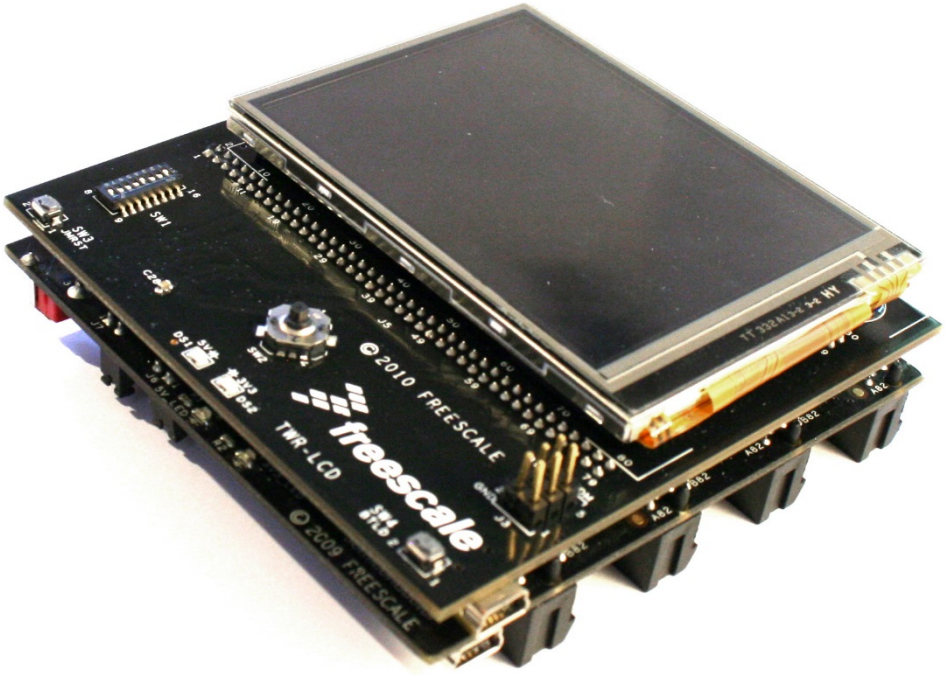


Fig 9. TWR-LCD connected on TWR-Elev primary

TWR-POS-K81 and TWR-POS-PN5180 or TWR-POS-CLRC663 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 10.

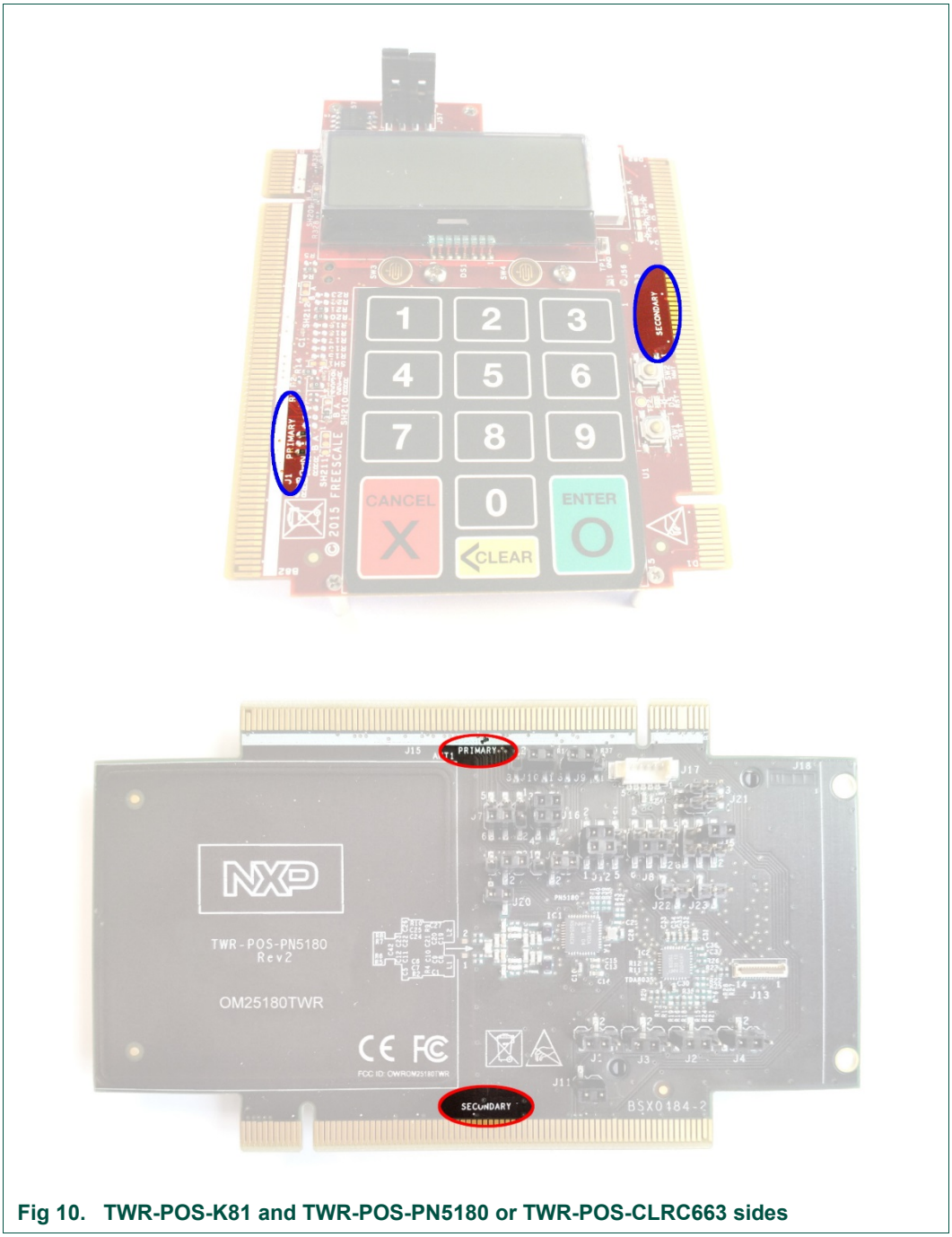


Fig 10. TWR-POS-K81 and TWR-POS-PN5180 or TWR-POS-CLRC663 sides

The most convenient way is to have the K81 board on the top connector, and the PN5180 or CLRC663 board on the bottom connector:

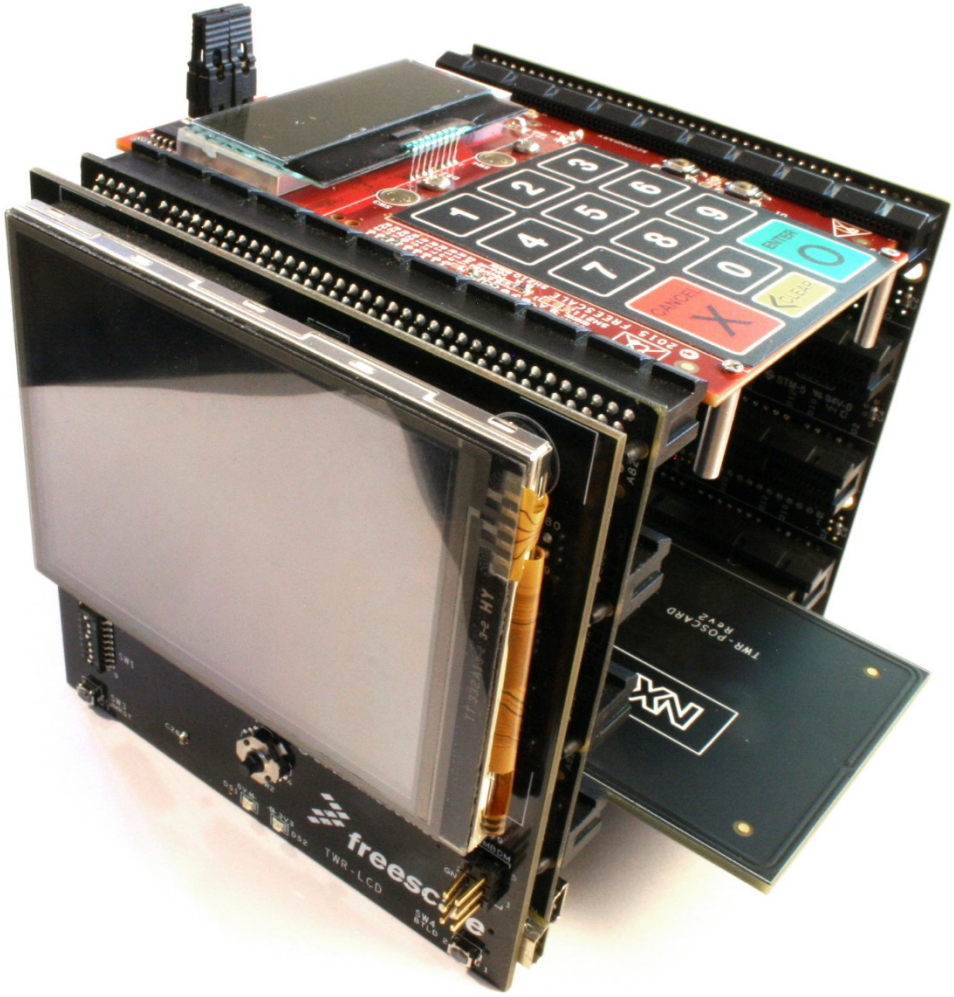


Fig 11. SLN-POS-RDR Hardware mounted

The battery has to be inserted in the battery slot, underneath the TWR-POS-K81 PCB:

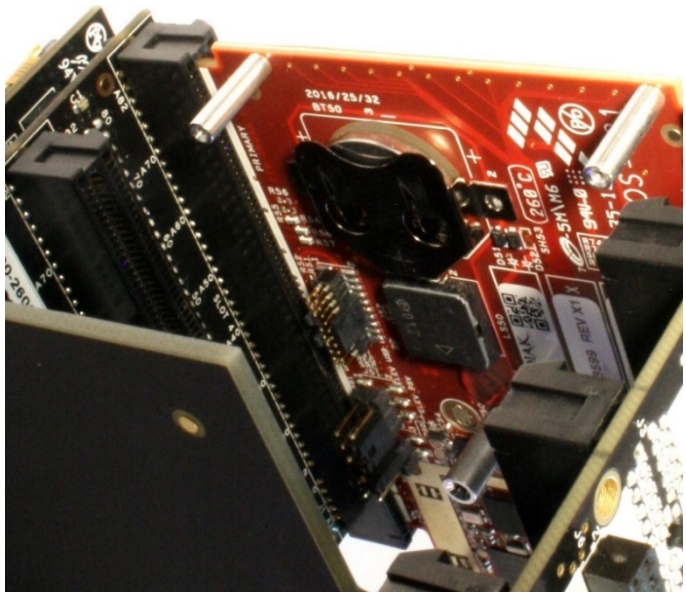


Fig 12. Battery location

To insert the battery in the right way, the + symbol has to be on top (visible), as seen in next figure:

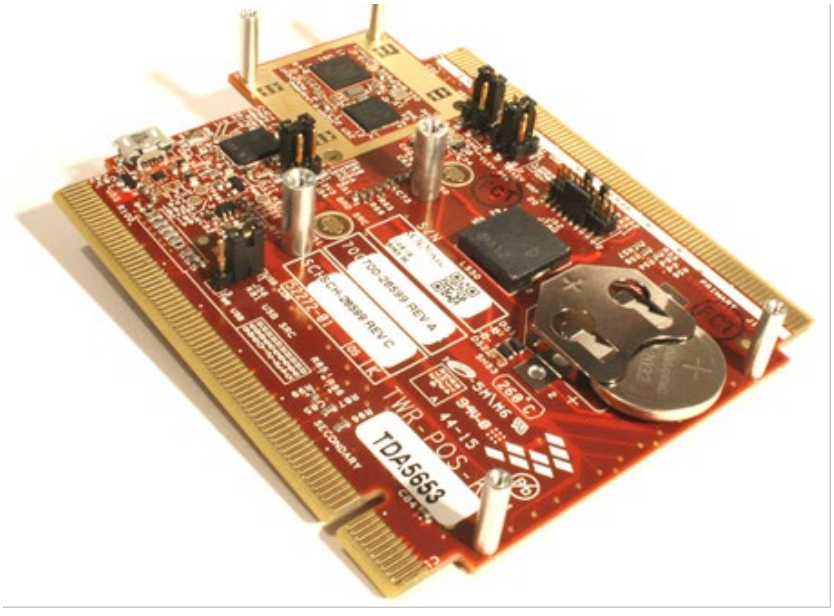


Fig 13. Battery position

2.3 USB Connections

The Kit presents 3 USB connectors:

- One Mini USB on the TWR-Elev board
- One Mini USB on the TWR-LCD board
- One Micro USB on the TWR-POS-K81 board

See Fig 15 and Fig 16 for each connector's location.

In order to operate the Tower Kit, both the Micro USB, underneath TWR-POS-K81 board, and the Mini USB on the TWR-ELEV board have to be used.

Micro USB has to be connected to the host computer (running the high-level application) and the TWR-ELEV mini USB 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.

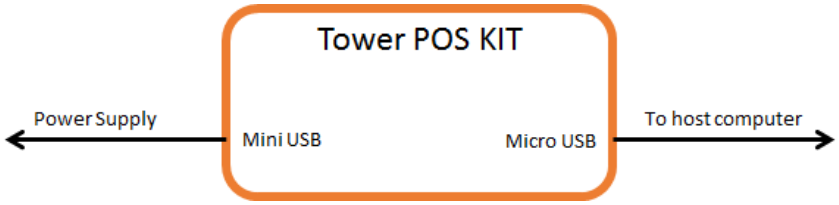


Fig 14. Connections for demo operations

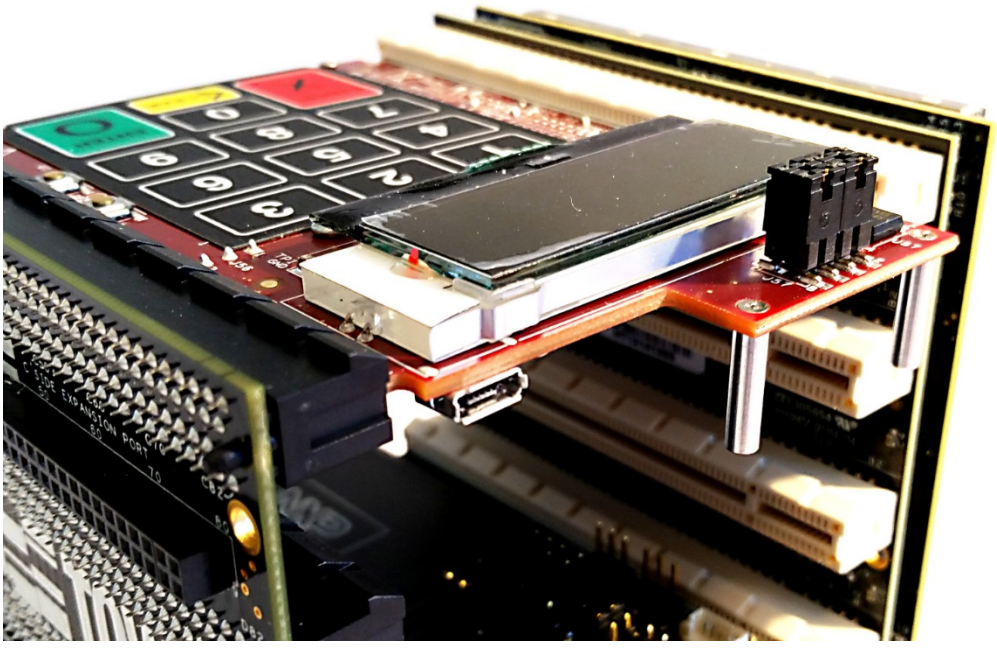


Fig 15. Connector location – Micro USB

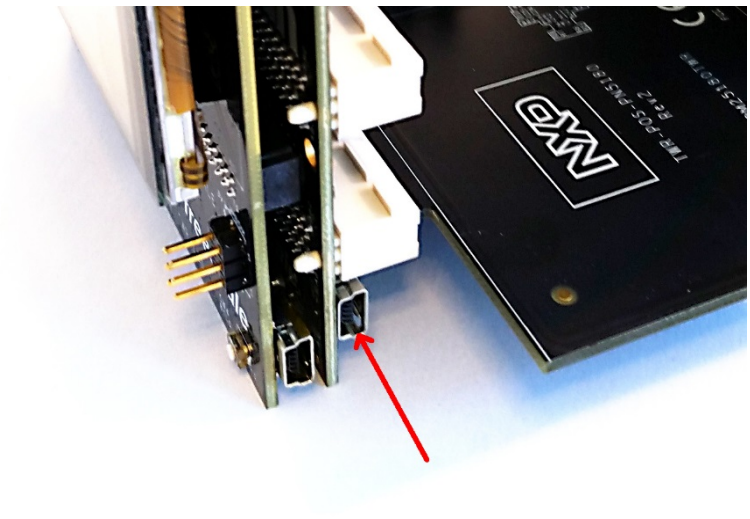


Fig 16. Power supply connector location – Mini USB

2.4 TWR-ELEV Power Switch

A switch is mounted on the TWR-ELEV board. This switch is used to turn ON or OFF the power supply from the TWR-ELEV USB connector.

For the SLN-POS-RDR to operate, the switch has to be in the ON position (top) shown in Fig 17, otherwise there will be no power from this TWR-ELEV connector.

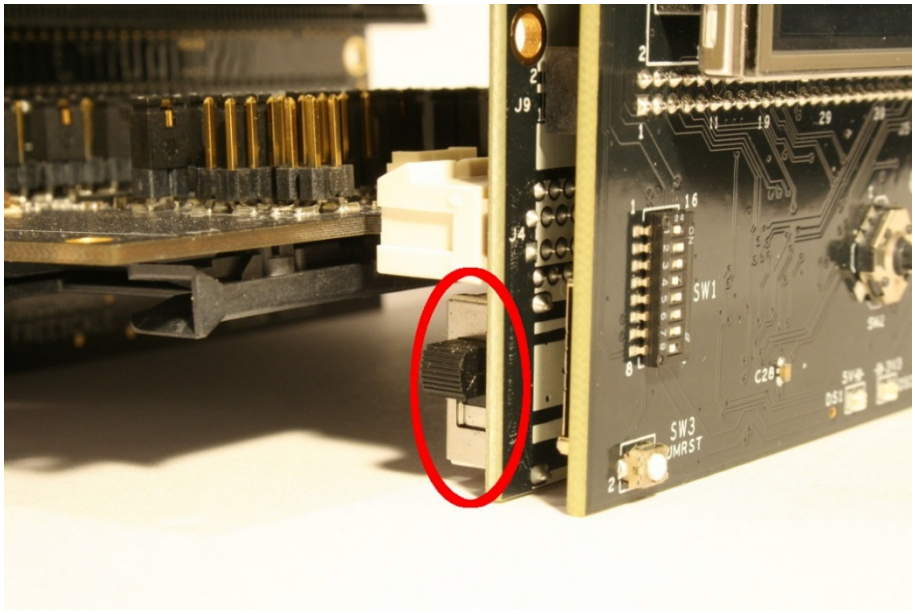


Fig 17. TWR-ELEV – Power switch ON position

3. Demonstration

3.1 Setup the environment

After the Hardware is assembled and connected, the computer has to be set up in order to operate the payment demonstration: the TWR_POS_K81 module embeds a USB to Serial converter, accessed through the mini USB port connected to the computer.

When this USB is connected, the host computer should display an unknown device in the device manager.

The dedicated driver for this device has to be installed so that the computer gets a new COM port that will be used to connect to the POS Reader Solution Kit. This can be done following the below steps:

1. Locate the .inf file for this driver: It is delivered with the software package. It is called fsl_ucwxp.inf and is located in the folder **“boards\twrposk81\demo_apps\payment_demo\cardtek_ihs_app”**
2. Open the device manager
3. Locate the unknown device. This should be a device with a Yellow Bang, named “MCU VIRTUAL COM DEMO”. See Fig 18.
4. Right click on this device, and choose “Update Driver Software”
5. Select “Browse my computer for driver software”
6. “Let me pick from a list…”
7. “Show all devices” then “Next”
8. “Have Disk”
9. Click “Browse”, navigate to the folder containing the above mentioned .inf file, and select this .inf file.
10. Windows should propose a Virtual COM port (see Fig 19). Select it then click “Next”
11. Note that Windows may show a warning saying that the driver is not digitally signed. To install it anyway, the computer must be configured to disable driver signature enforcement.

    If the computer is not correctly configured, it can be done following Microsoft help.

    E.g. https://msdn.microsoft.com/en-us/windows/hardware/drivers/install/installing-an-unsigned-driver-during-development-and-test

    Note that the above link may not give the exact process depending on the computer OS version.
12. Windows may then show some messages asking to confirm that you want to install this driver. Accept by selecting “Install this driver Software anyway”
13. Windows will install the driver
14. When the driver is installed, it may happen that Windows shows a message informing that the driver cannot start. In such a case, unplug then plug back the USB connection. This should restart the driver, so that it is seen as running (no error) in the device manager (see Fig 20).

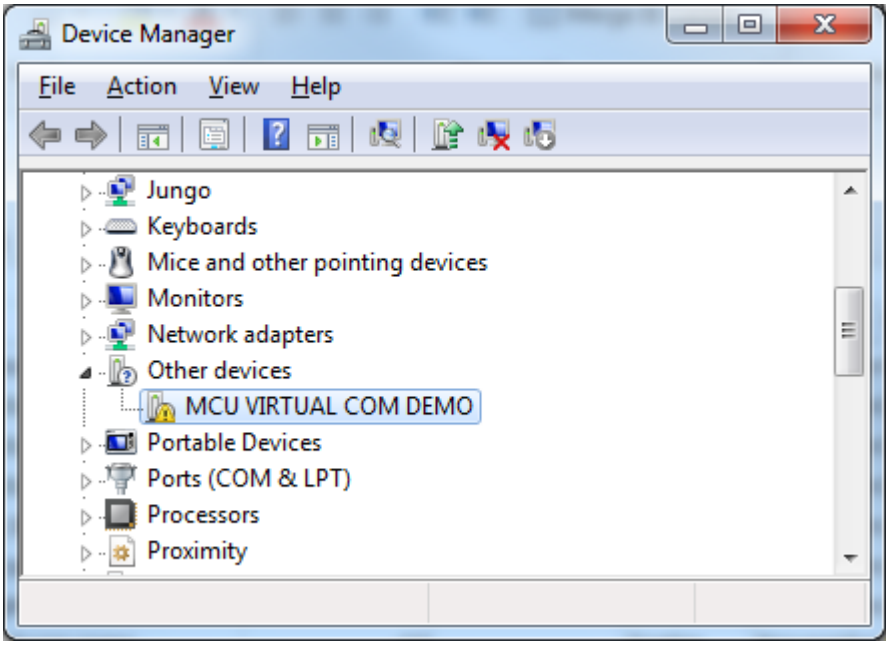


Fig 18. Uninstalled COM port driver

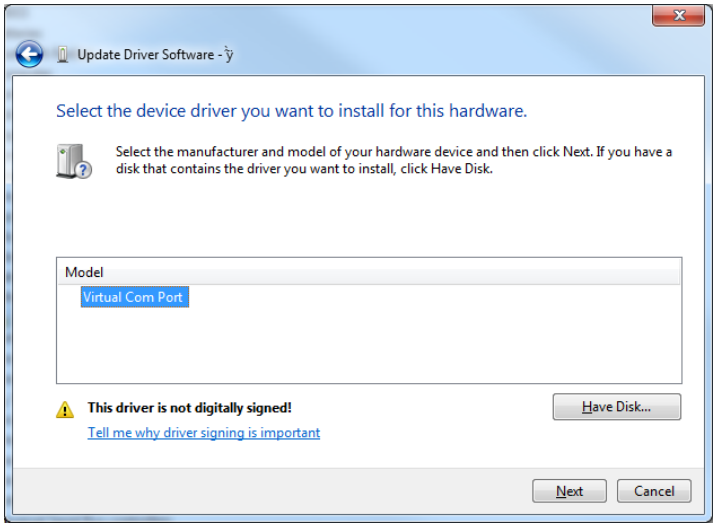


Fig 19. Select proposed driver for Virtual COM port

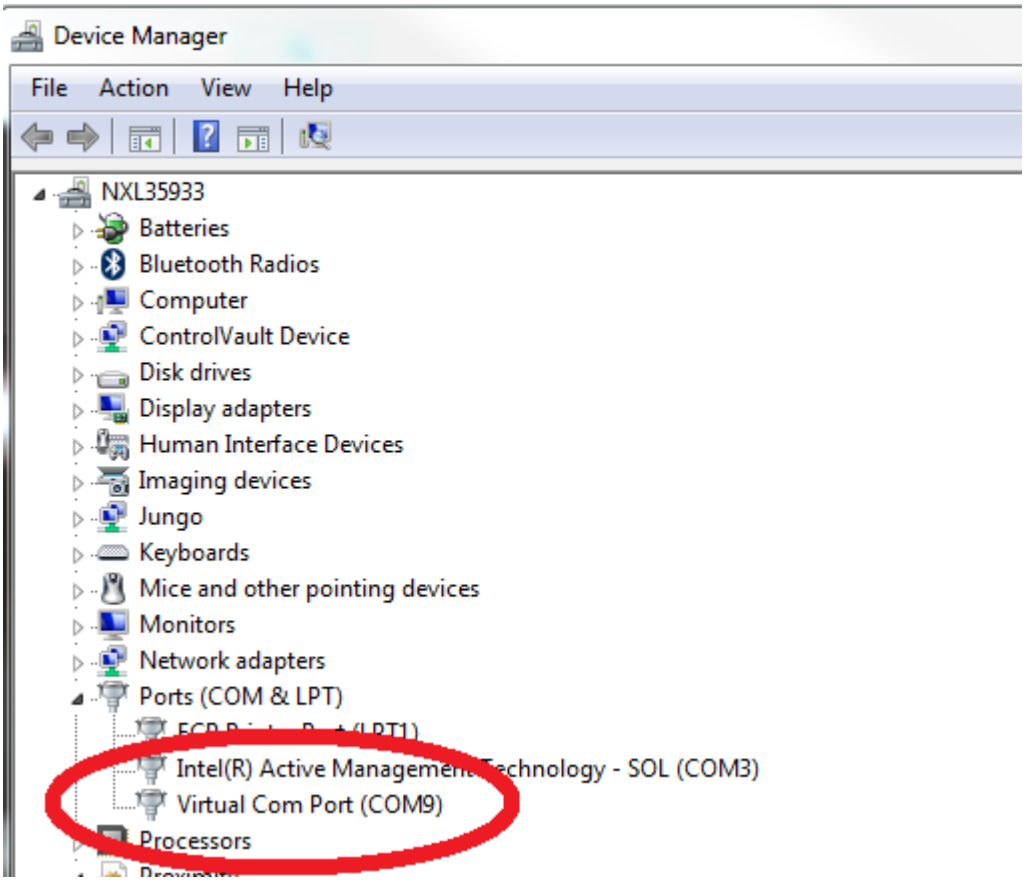


Fig 20. Installed driver

3.2 First power-up of the kit

At first power-up, the POS-RDR-SLN kit will ask for a calibration of the side LCD screen. This calibration requires the user to touch the screen at two specific locations.

To do so, touch the screen on the displayed crosses when prompted See Fig 21 and Fig 22.

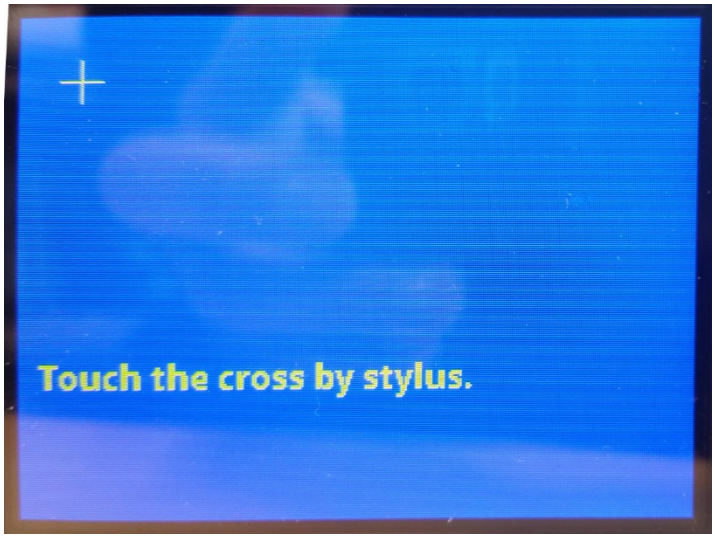


Fig 21. LCD Screen - Calibration #1

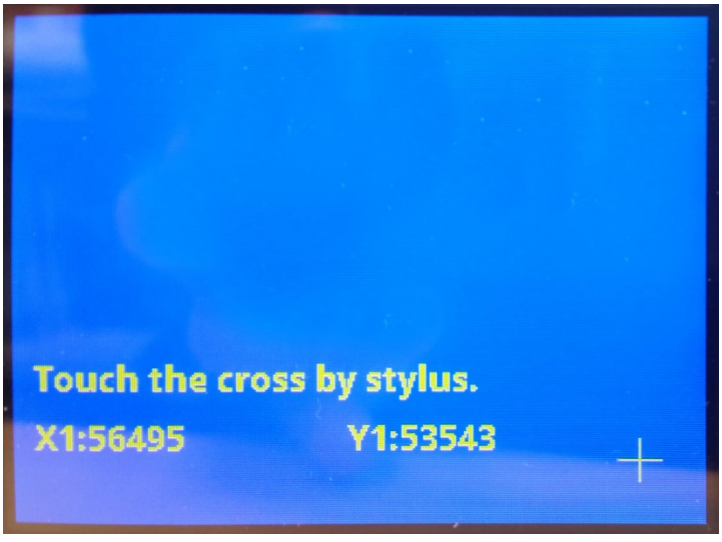


Fig 22. LCD Screen - Calibration #2

Right after this operation, the LCD will display the demo screen. See next chapter.

3.3 Payment Demo application

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

The following chapters describe the way to use the default demonstration. For more details, refer to [2].

3.3.1 Launch the demonstration

To start the demonstration:

1. Plug the POS Reader Kit Mini USB (power)
2. Plug the Micro USB to the computer (communication). Note the COM port value assigned in the device manager.
3. Launch the Issuer Host Simulation (IHS) Tool that can be found in the SW release package, in the folder K81POSCR_SW_Release\boards\twrposk81\demo_apps\payment_demo\cardtek_ihs_app

   The tool is the application named “IHS.exe”.

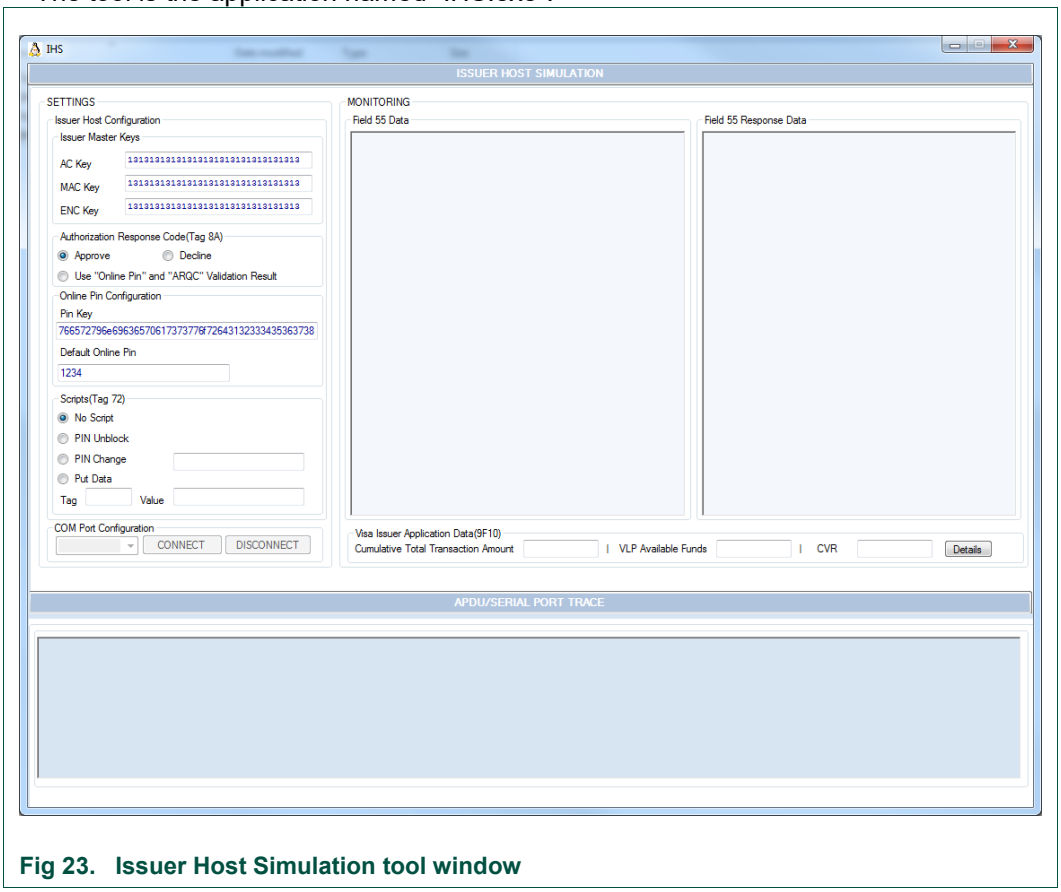


Fig 23. Issuer Host Simulation tool window

4. In the COM Port configuration window, select the COM port value noted at step 2.

5. Click on “Connect”.
6. !! First time only !! – The first time the IHS is connected to the tool, it will download some configuration files. Wait for this process to finish, then the demo can be used.
7. The TWR-ELEV LCD (color LCD) asks to pick an action: “Config” or “Payment”.

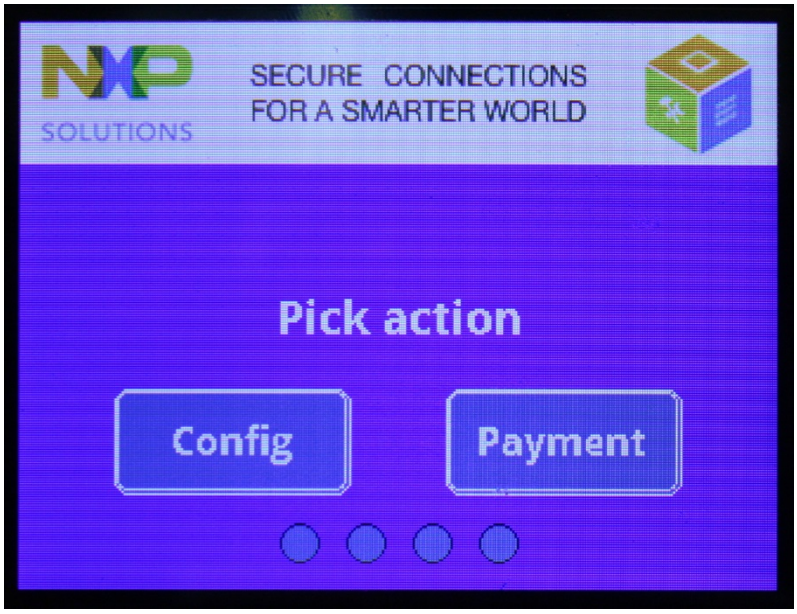


Fig 24. Demo start screen

8. Select “Payment” by touching the screen
9. The application asks to enter a transaction amount. This value has to be entered with the secure pin pad on top of the solution. (e.g. 15.00 can be entered)

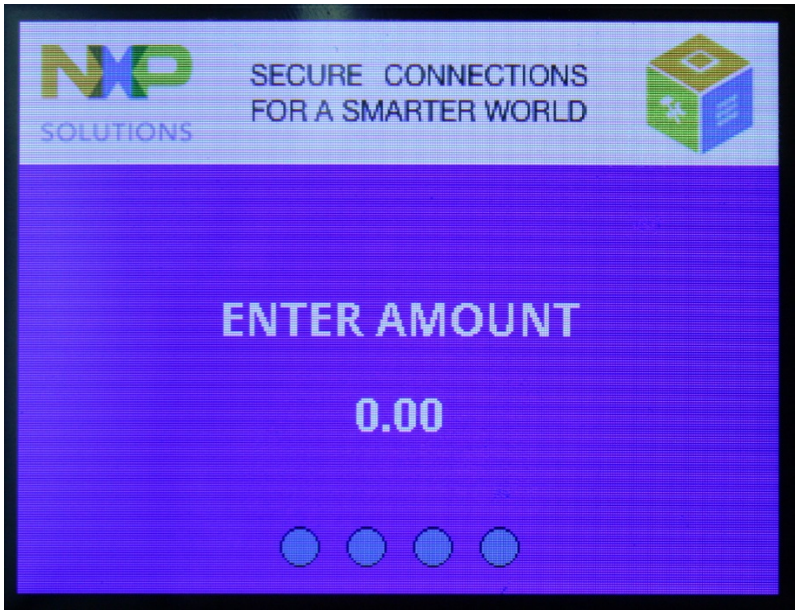


Fig 25. Enter amount screen

10. The amount is displayed on both LCD screen: on the TWR-POS-K81 2 lines LCD, and on the side color LCD.

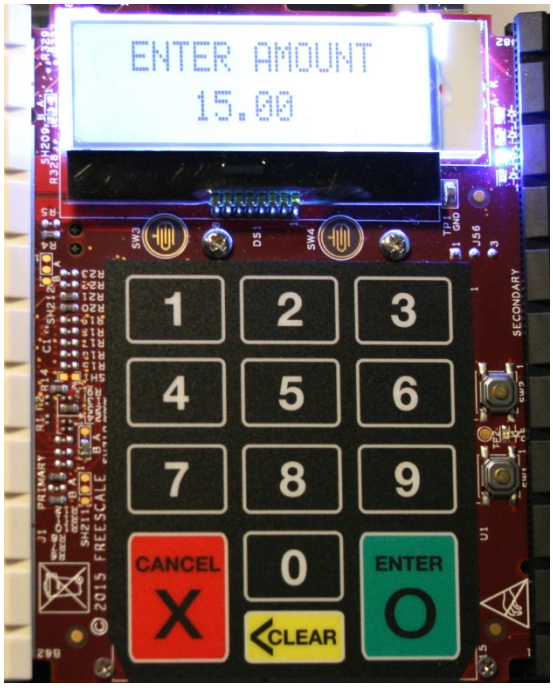


Fig 26. Pin pad - Enter amount

11. Press “Enter” on the secure pin pad to validate the amount.
12. The LCD screens ask to insert or tap a card. From this point, Contact or Contactless transactions can be used. For contact transaction, go to step 13, and for contactless operation, go to step 15.
13. Contact operation
    a. Insert the sample card into the Contact Smart Card reader (located under the TWR-POS-PN5180 module or TWR-POS-CLRC663 module). The smart card has to be inserted with contacts and prints on top:

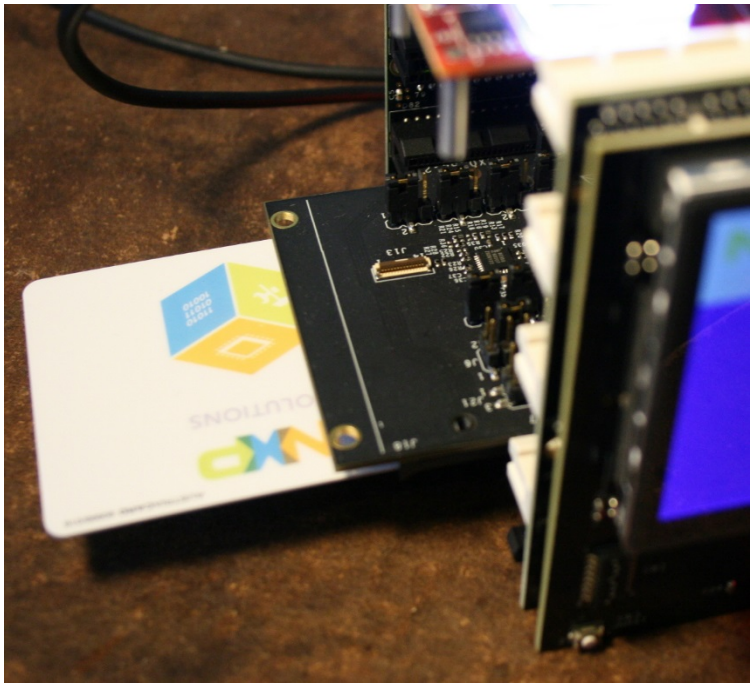


Fig 27. Contact card insertion

    b. The process continues and you are requested to enter the card PIN. Enter the 4 digits pin code on the TWR-POS-K81 module pin pad, then press Enter. The default pin code is “1234”.
    c. If the POS Reader Solution is connected to the IHS, and the IHS is active, the LCD Screen will show “Online Approved – Remove Card”, and the transaction information will be displayed in the IHS dedicated window.

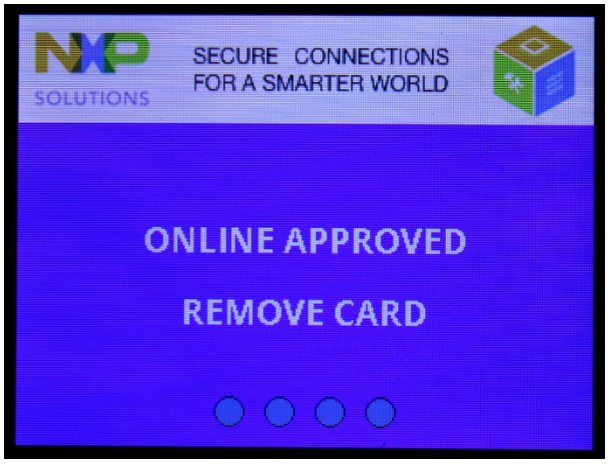


Fig 28. Online approved

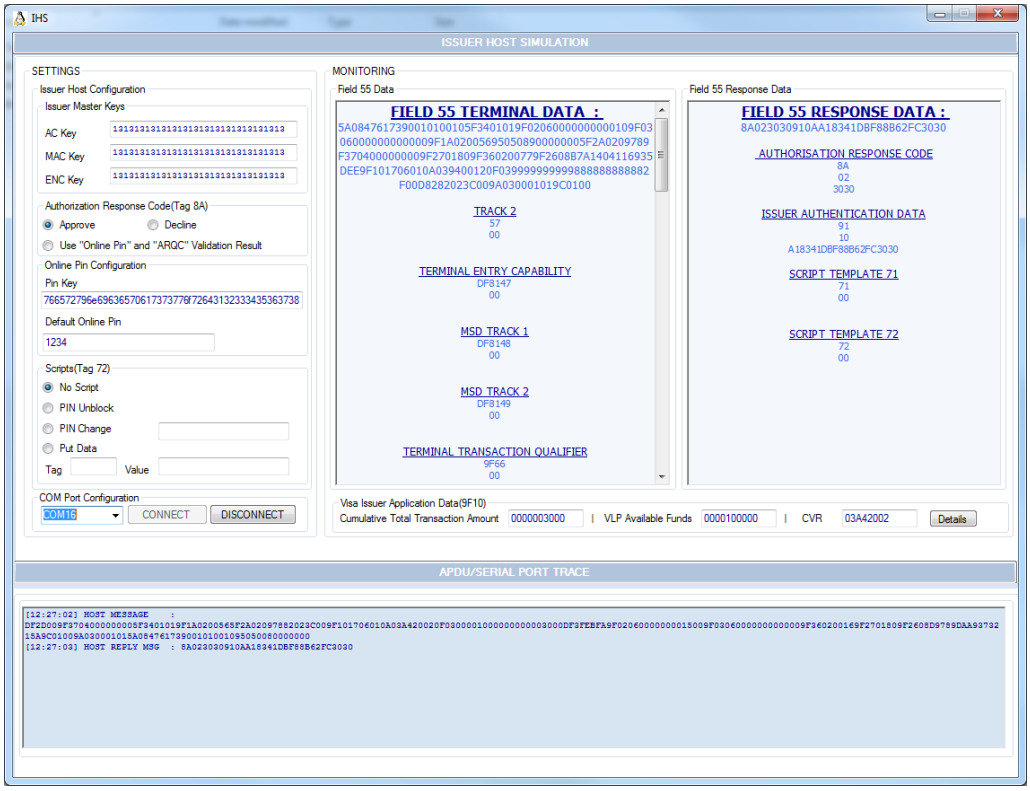


Fig 29. IHS - Transaction details

d. If the POS Reader Solution is not connected to the IHS, the LCD will display “Offline Approved – Remove card”

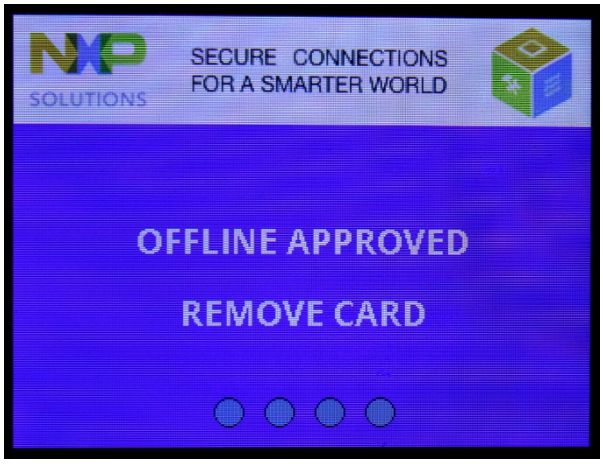


Fig 30. Offline approved

14. You can now remove the card. The setup is ready for the next operation.

15. Contactless operation
    a. When the POS asks to “Insert or Tap a Card”, the sample card can be tapped on the TWR-POS-K81 board antenna:

Fig 31. Contactless card tap

b. This operation does not request a pin code to be entered. When the card is detected, the transaction is processed and the POS displays “Offline Approved – Remove Card”

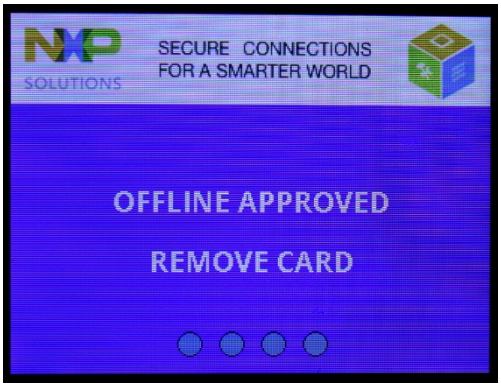


Fig 32. Offline approved

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”:

Fig 33. Factory reset #1

Then scroll down the configuration screen to display “Factory Reset”

Touch “Factory Reset” and then “OK”:

Fig 34. Factory reset #2

The system will reset its data internally. Several screens will be seen:

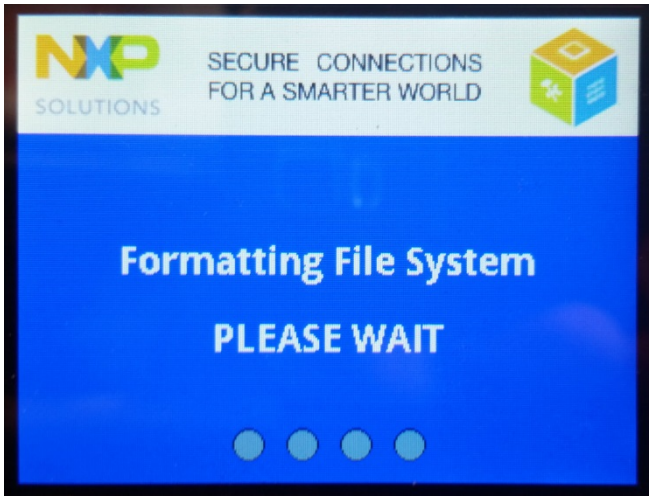


Fig 35. Factory reset #3

The process is finished when the screen shows back the “POS Config” menu screen. At this point, the HW has to be reset: unplug the two USB cables, and plug them back.

The system will restart with the screen calibration. See 3.1.

4. POS Reader Solution Software

4.1 Introduction

The POS Reader Solution kit is delivered with a pre-installed software running the Payment Demo application.

The Software code can also be obtained directly from NXP. Contact your direct NXP representative to get access to this software.

The software is delivered in a package containing source code from NXP and libraries from third companies.

The folder tree from this SW code delivery is as follows:

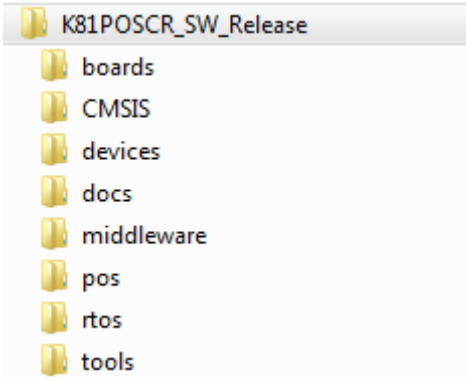


Fig 36. Software Delivery – Folder tree

The “boards” folder contains the demonstration example projects that are prepared for two IDEs (Integrated Development Environment): IAR and KDS.

Other folders contain source code and libraries for all embedded features.

For deeper details about the SW content, refer to [1].

4.2 Software project

To open the software project, edit, compile and load the Software into K81 target, 2 IDEs can be used: IAR and KDS.

4.2.1 Debug Probe – J-Link

The program download into the K81 requires a J-Link probe to be connected between the computer and the K81 target.

J-Link probe is used for this purpose and can as well be used to debug the program running in the K81 target. This connection requires at a minimum a J-Link Base probe, and a 19-pin Cortex-M Adapter, to connect the probe to the K81 module:

https://www.segger.com/jlink_base.html

https://www.segger.com/jlink-adapters-19pin-cortexm.html

Probe drivers should be automatically installed during the installation of the IDE.

The probe and the adapter are not part of the kit. They have to be purchased separately.

The first time the probe is used, its driver has to be installed. Driver and instructions can be found under JLINK website: choose the “J-Link Software and Documentation Pack” download:

https://www.segger.com/downloads/jlink

4.2.2 Debug information (printf)

Some debug information can be received through UART, using a Serial board extension.

Fig 37. TWR-SER

This board is not part of the kit, but can be purchased directly from NXP:

TWR-SER NXP Web page

In order to use this board and display the printf messages from the software, the TWR-SER module has to be inserted in the POS-RDR-SLN Kit. As for the other modules, the primary and secondary interfaces have to match the right side of the TWR-ELEV boards.

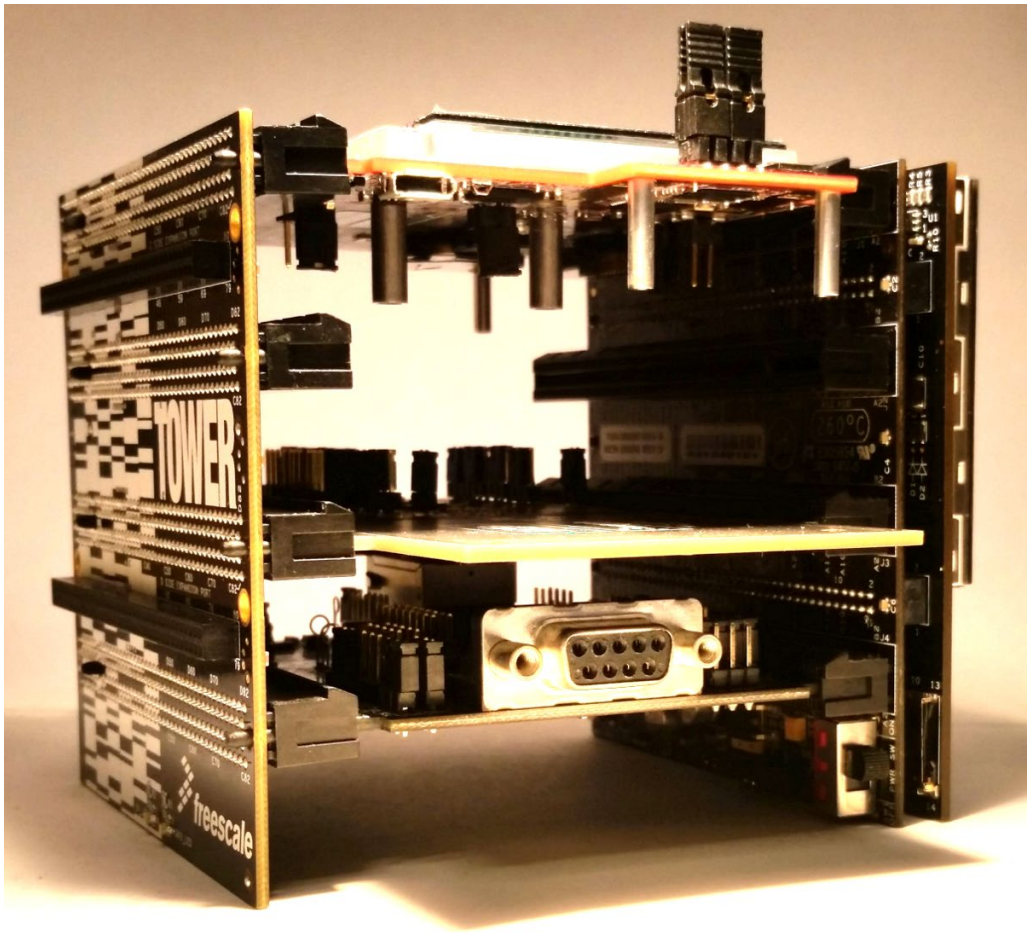


Fig 38. TWR-SER in the POS-RDR-SLN Kit

Once inserted, the Serial port seen in Fig 38 has to be connected to a computer COM port. On the computer, open a COM port terminal, with a speed of 115200 bps, and the data will be displayed as the software runs.

4.2.3 Using IAR

This chapter describes how to open and run the project Payment Application Demo.

IAR must be pre-installed with a valid license before going through these steps.

The minimum required IAR version is 7.70.0.

4.2.3.1 Open the project and compile

1. Locate the .eww file from the demo project folder:

   K81POSCR_SW_Release\boards\twrposk81\demo_apps\payment_demo\iar

2. Double click on the .eww file. It will open the project in IAR.

Alternatively, if the .eww files are not linked to IAR, the following step have to be done. Otherwise, jump to step 6.

3. Open IAR
4. Select File>Open>Project and browse to the folder containing the IAR project file (extension is .eww).
5. Select the file payment_demo.eww

   The project contains two subprojects: Payment_demo and lib_pos:

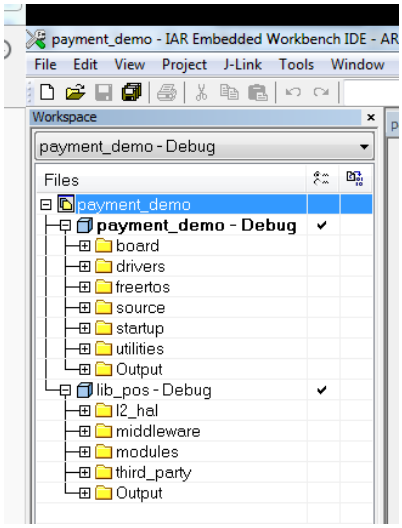


Fig 39. Payment Demo project tree

   The Payment_demo project is the main application. It requires the lib_pos library to compile.

   The compilation must then start with this lib_pos project.

6. Right click on the lib_pos project, and select Make

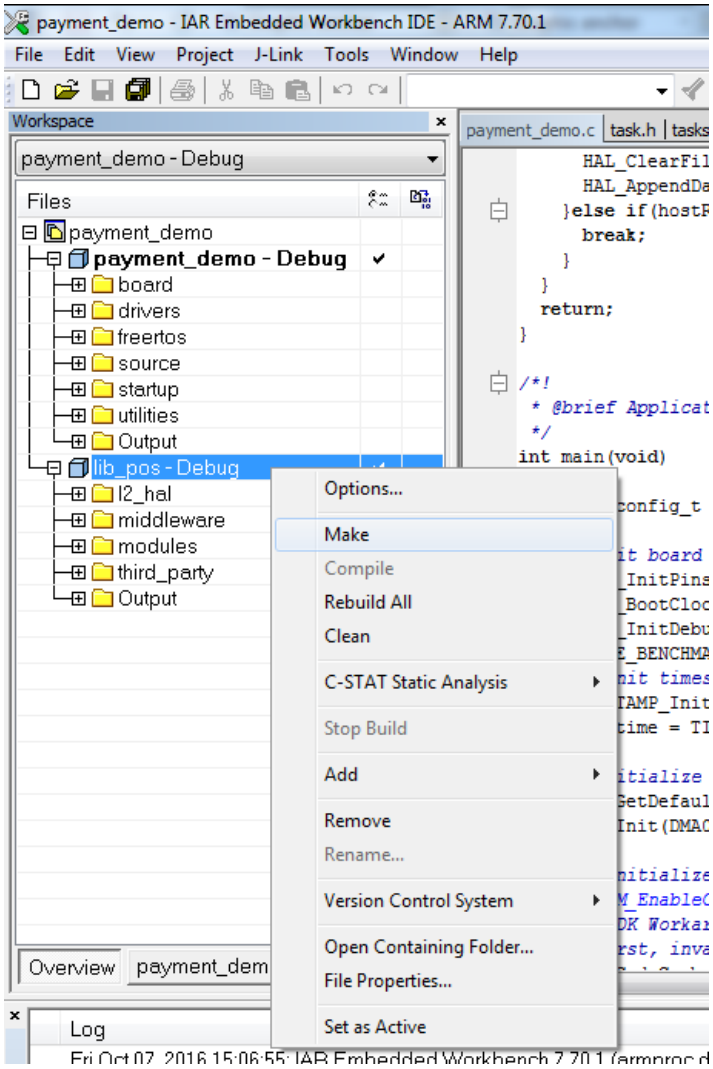


Fig 40. Start compiling – lib_pos

7. Once the lib_pos library is compiled, a library lib_pos.a must be found in K81POSCR_SW_Release\boards\twrposk81\demo_apps\payment_demo\iar\lib_pos\debug (if debug configuration mode is used)
8. Build the Payment_demo app by right-clicking on the payment_demo solution, and choosing “Make”.
9. The software is now built and can be loaded into the POS Reader Solution K81 target.

4.2.3.2 Download Software

Downloading Software requires the J-Link probe to be connected to the computer over USB, and to the TWR-POS-K81 module, through the 19-pin Adapter. See Fig 41.

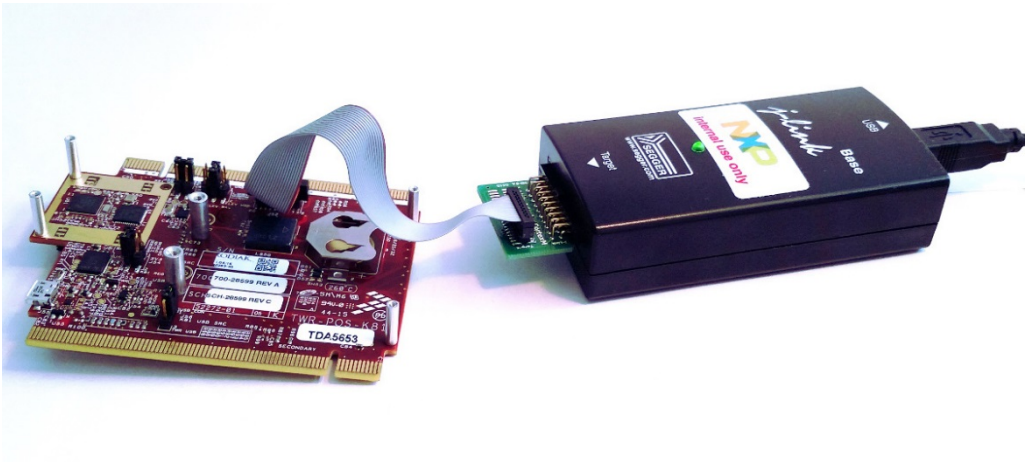


Fig 41. J-Link probe connections

The J-Link probe has to be connected to the connector shown in Fig 42.

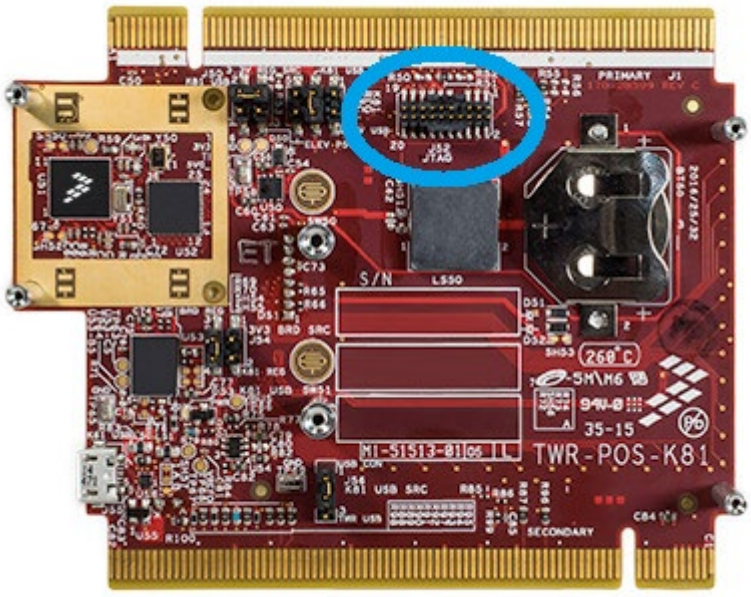


Fig 42. J-Link connector location on TWR-POS-K81 bottom side

With the probe connected and the kit powered, select Project >Download>Download Active Application in IAR.

Note: The K81 must be powered to perform this application.

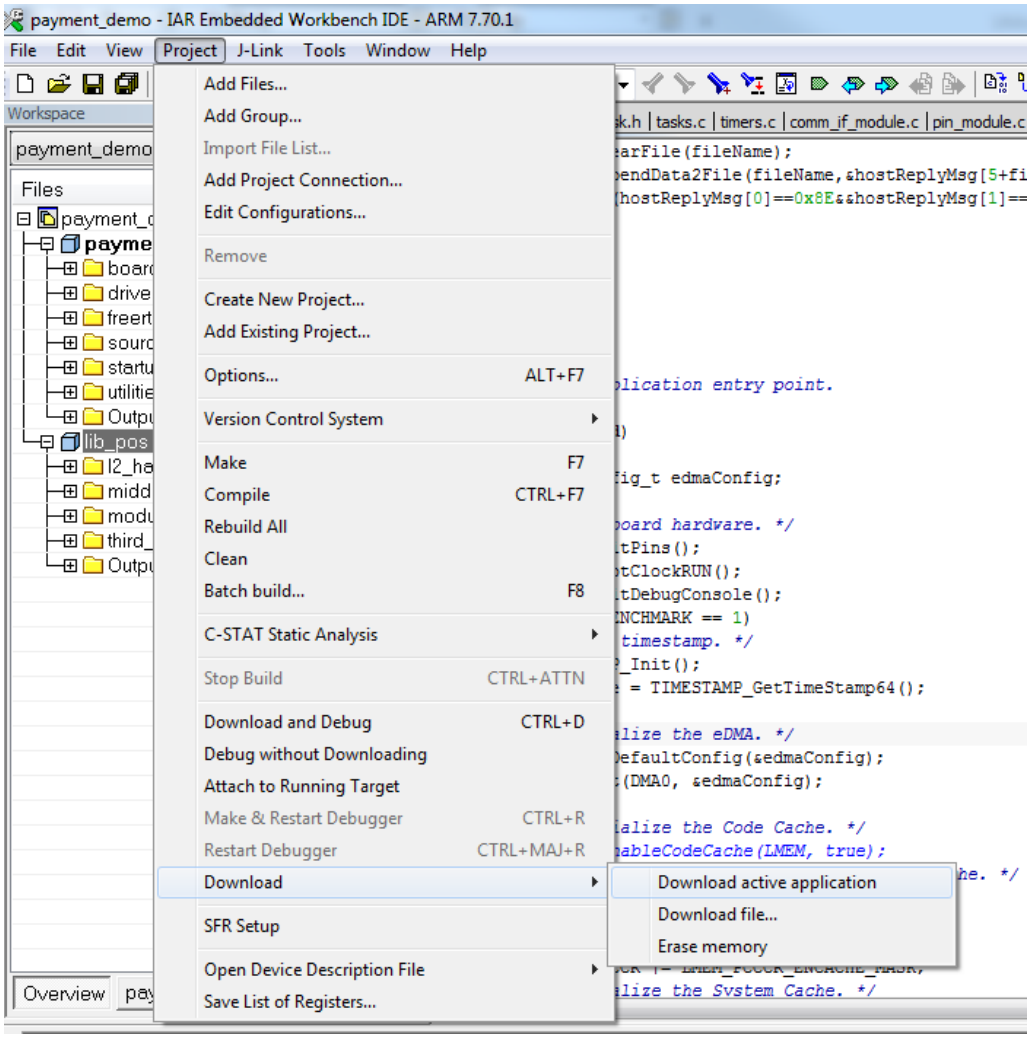


Fig 43. IAR Download application

4.2.3.3 Debug Software

To run the software in debug mode, the same J-Link probe can be used with the same connection.

To start the debug mode, simply click the debug button or select Project>Download and Debug:

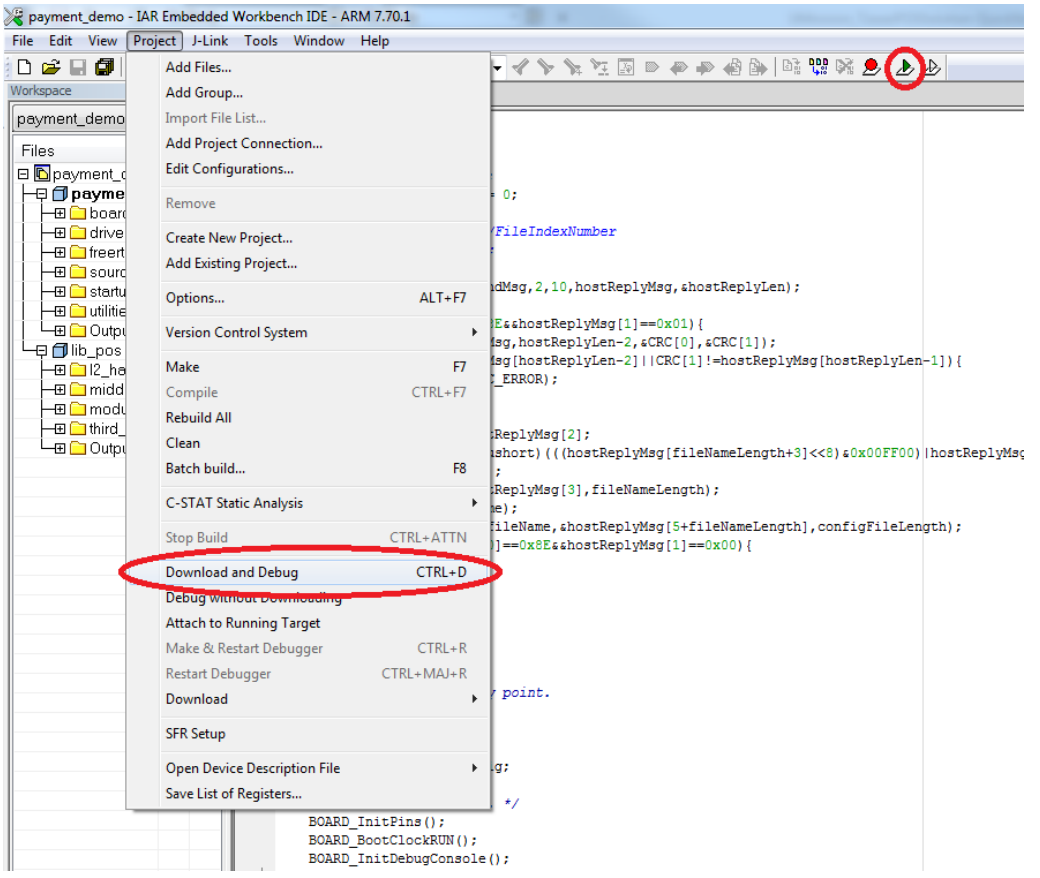


Fig 44. IAR Launch debug mode

4.2.4 Using KDS

4.2.4.1 Install and start KDS

KDS (Kinetis Design Studio) has to be installed first. The KDS installation can be found from NXP website:

www.nxp.com/products/software-and-tools/run-time-software/kinetis-software-and-tools/ides-for-kinetis-mcus/kinetis-design-studio-integrated-development-environment-ide:KDS_IDE

The minimum required KDS version is 3.2.0.

Once KDS is installed, launch the application. KDS first asks to select a folder that will become the Workspace for this KDS session.

Select any folder on the local disk. It doesn't have to contain data at first.

Remember the folder location: next time KDS will be open, this workspace will have to be selected to retrieve the ongoing projects. The workspace will not necessarily contain source code, but it will contain all configuration and information about current projects.

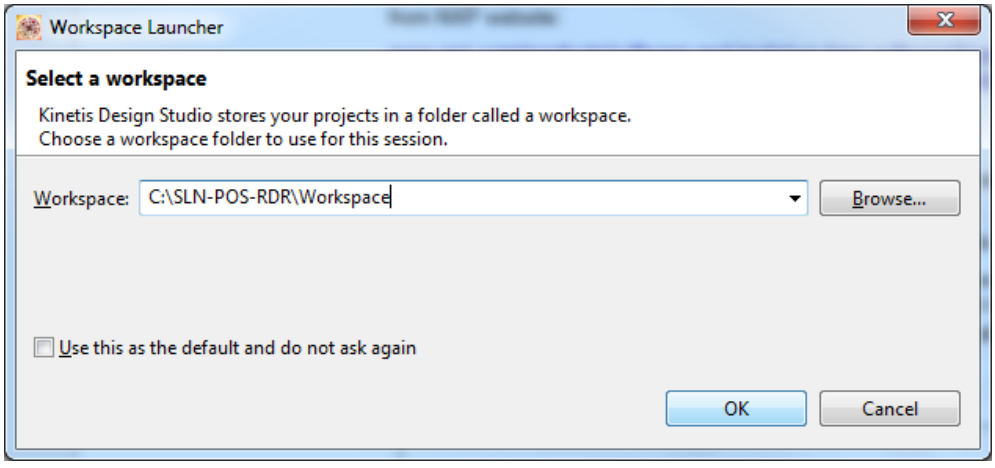


Fig 45. Select KDS Workspace

When the workspace path is selected, KDS opens with its welcome information page:

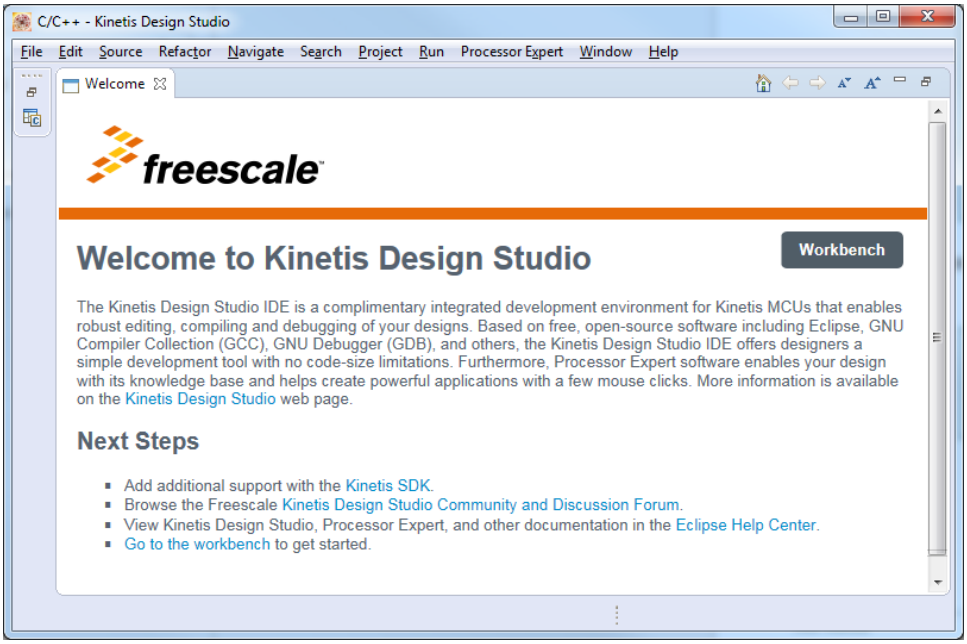


Fig 46. KDS Welcome page

Close this page, and KDS will show its default view:

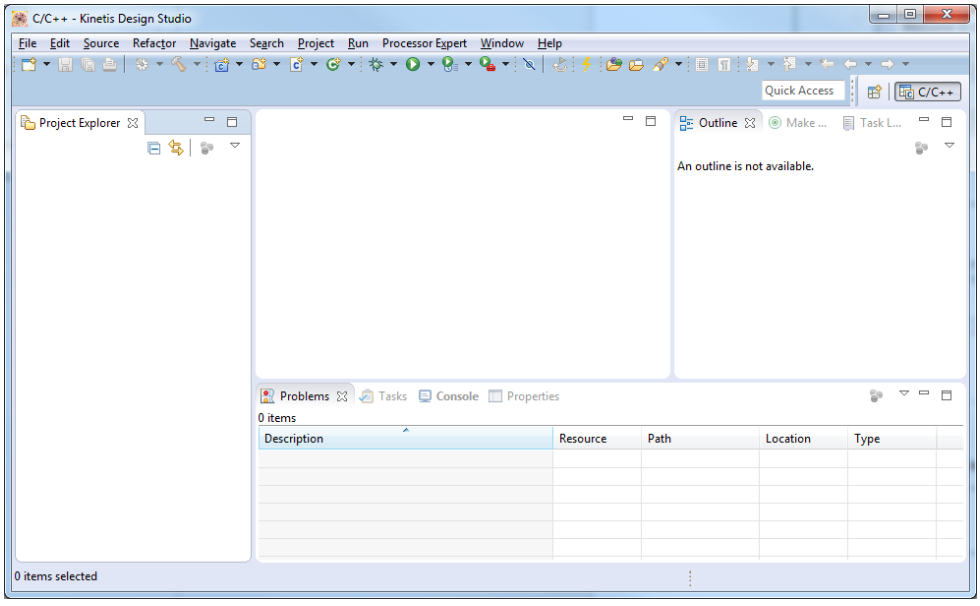


Fig 47. KDS default view – No project

4.2.4.2 Import the project and compile

From here, the Payment_demo application project can be imported, following below steps:

1. Select in the menu: File>Import
2. In the ‘Import’ Window, select ‘General’, then ‘Existing Project into Workspace’

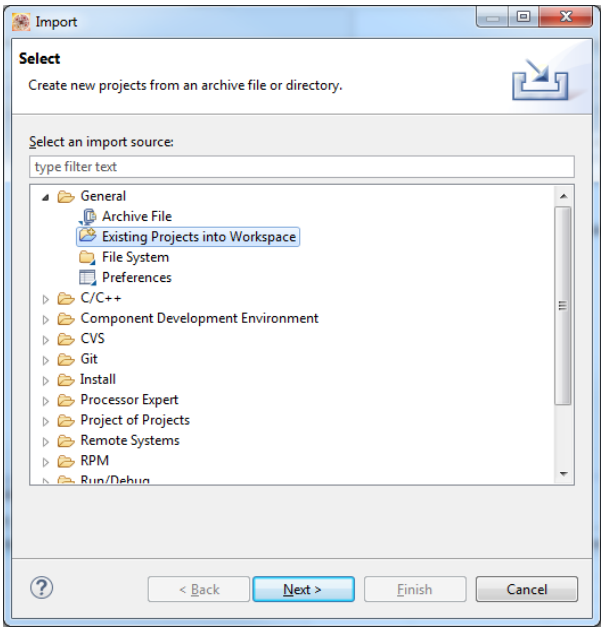


Fig 48. Import Project

3. Click ‘Next’
4. Check ‘Select root directory’, and Browse to the following folder (or enter the path to the following folder in the path field:

   K81POSCR_SW_Release\boards\twrposk81\demo_apps\payment_demo\kds
5. Then press ‘Enter’. The existing projects will be shown in the below window:

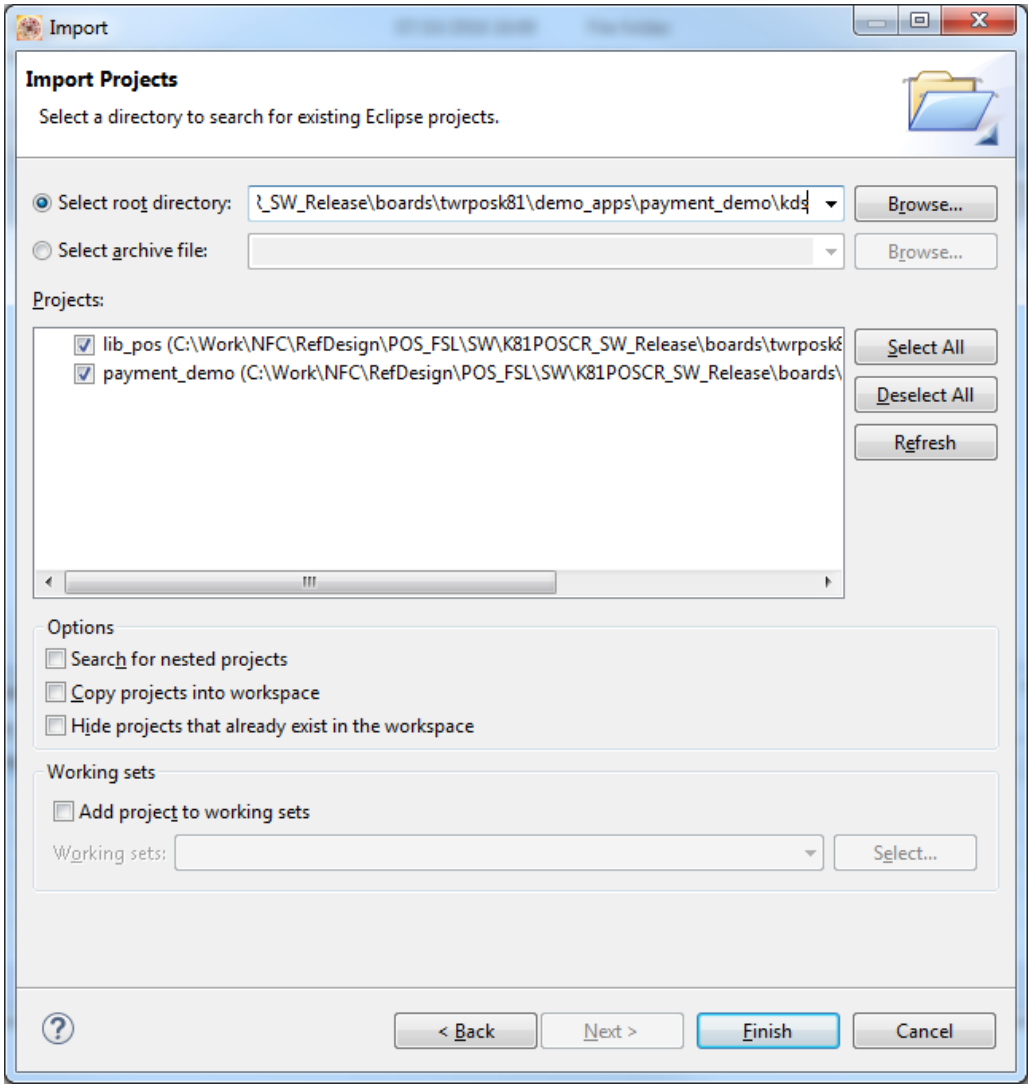


Fig 49. Projects to import from payment-demo application

6. Select the two projects (payment_demo and lib_pos), make sure the option boxes are not checked, and click Finish.
7. Projects are now imported

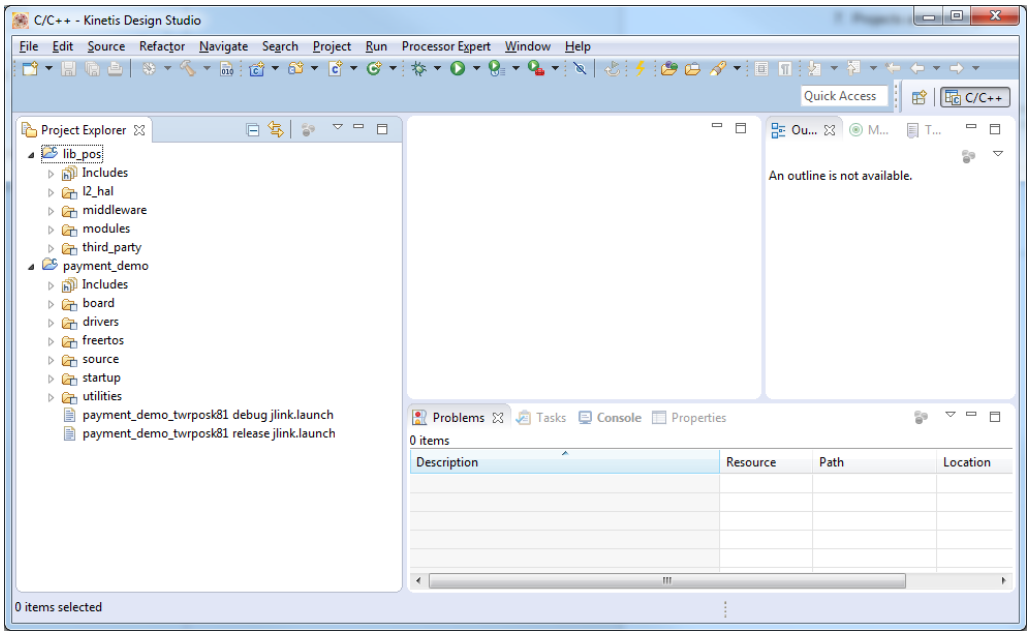


Fig 50. Projects imported

8. Projects can now be compiled: Right click on ‘lib_pos’ projects in the left panel, and select ‘build’

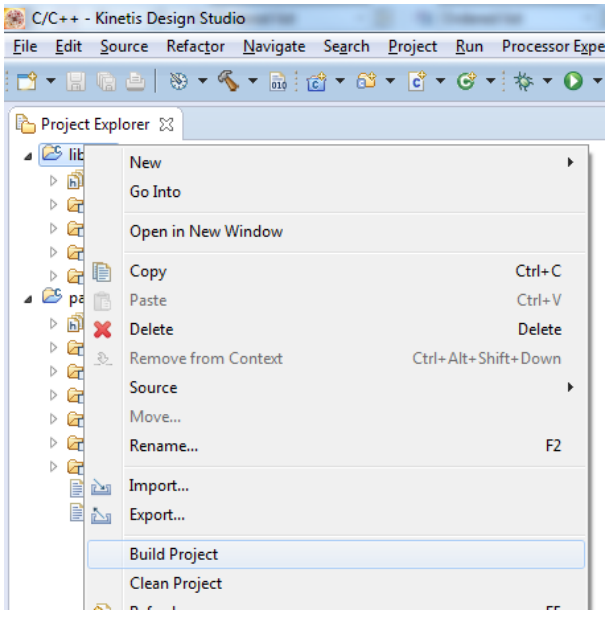


Fig 51. Build lib_pos

9. When the build is completed, do the same with the payment_demo project.

Note that the compilation order is important: lib_pos is a library which is needed by the payment_demo application. If the payment_demo application project is compiled first, the compilation may fail, or the project wouldn't include the latest changes from lib_pos.

Once both builds are done, the full project is compiled and ready to use.

4.2.4.3 Download Software and debug

Downloading Software requires the J-Link probe to be connected to the computer over USB, and to the TWR-POS-K81 module, through the 19-pin Adapter. See Fig 52.

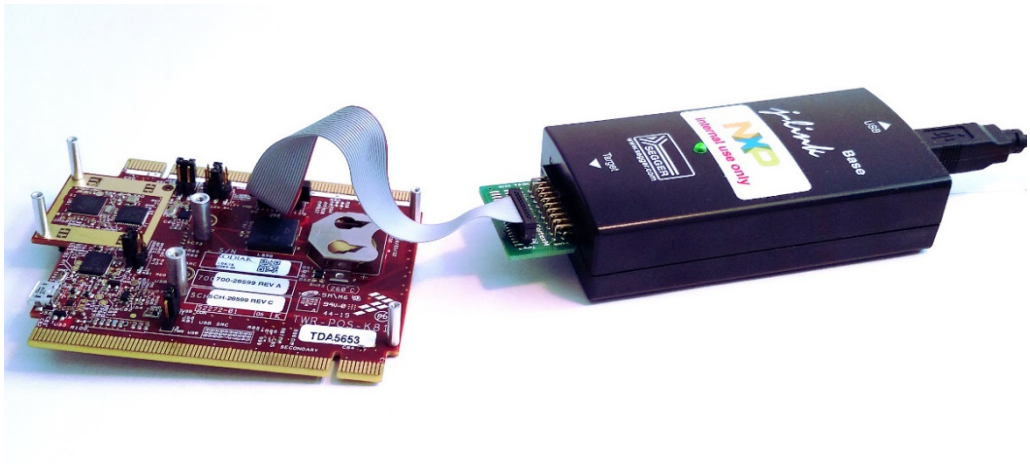
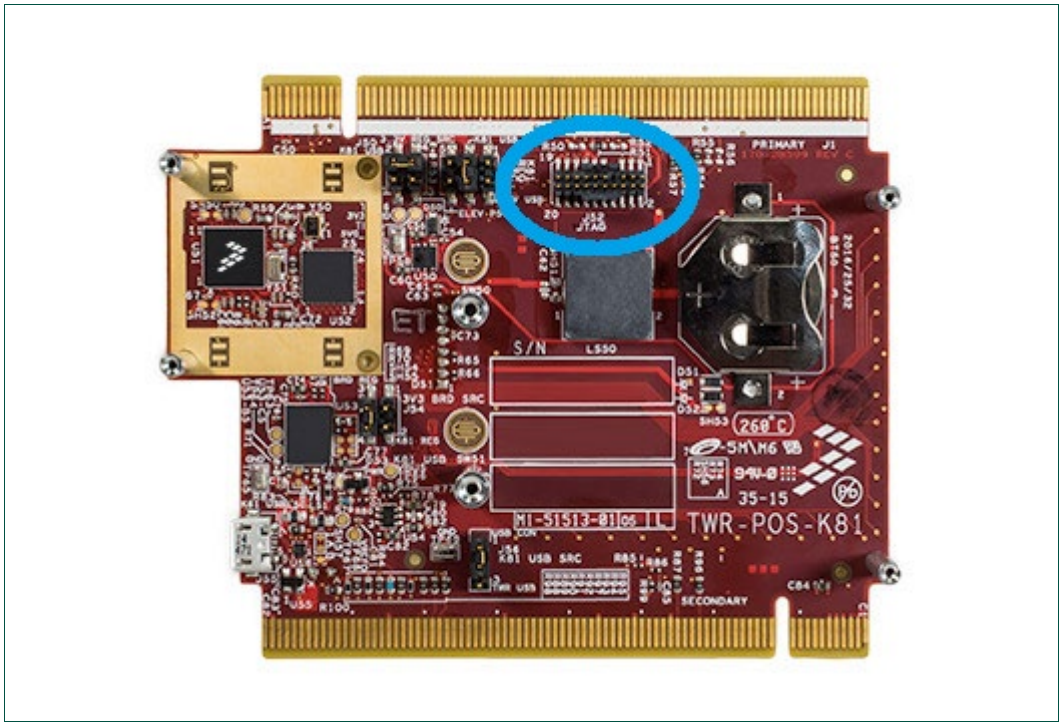


Fig 52. J-Link probe connections

The J-Link probe has to be connected to the connector shown in Fig 42.



Note: The K81 must be powered to perform this application.

To download the software through the debug mode, open the debug configurations menu by clicking the little bug in the menu bar and selecting “Debug Configurations…”:

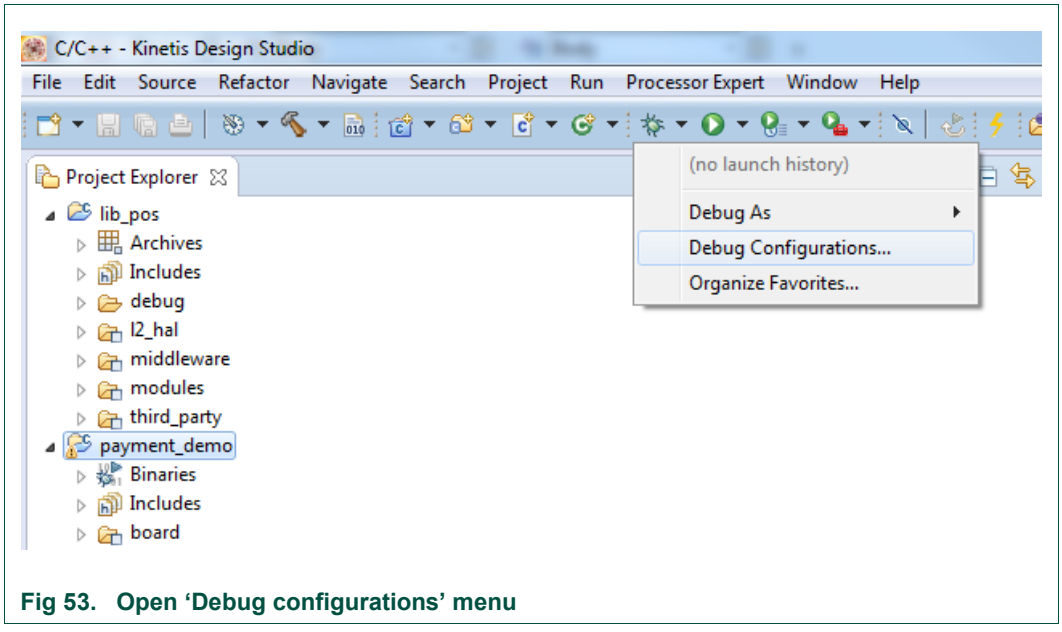


Fig 53. Open ‘Debug configurations’ menu

In the menu, select “payment_demo_twrposk81 debug jlink”, and click debug:

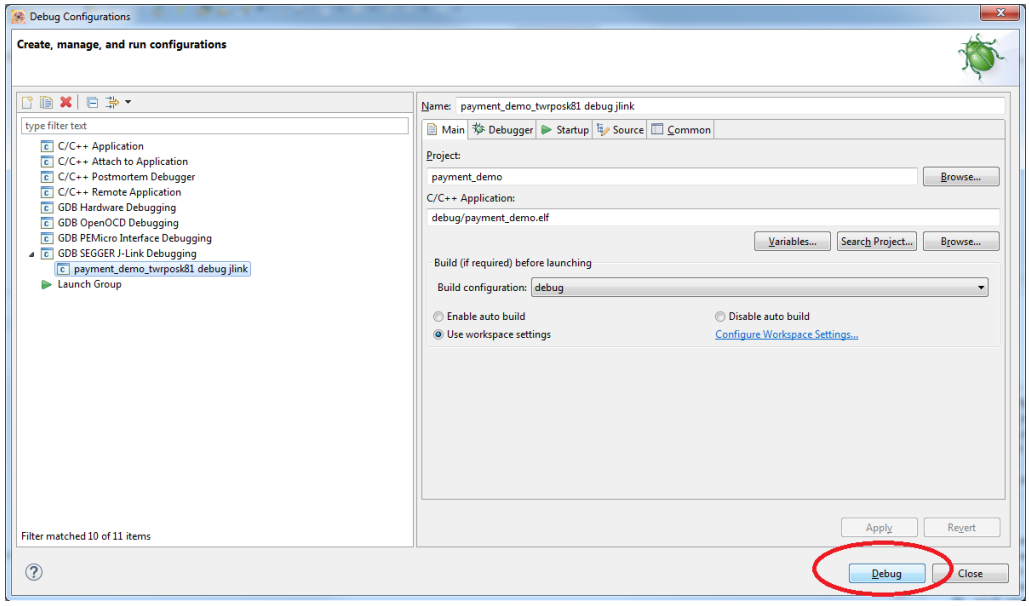


Fig 54. Start debug mode

The software will be loaded into K81 through the J-Link probe, and KDS will change its perspective to the debug view.

Press the F8 key to launch the program, or press F5 to run step by step.

4.3 PN5180 Firmware update procedure

4.3.1 Introduction

The TWR-POS-PN5180 board includes a contactless reader device which embeds a controller and its own Firmware for contactless operations.

In some cases, this FW has to be upgraded – For instance when a new EMVCo specification has to be supported.

This chapter describes the PN5180 secure firmware update application. Application allows customer to update PN5180 firmware to the latest firmware version. pn5180_firmware_update will check the onboard PN5180 firmware and notifies the user to update to the latest version if needed. Hardware modifications are required only for existing/legacy TWR-POS boards already in the field to perform firmware update which will be described in detail in the further sections.

4.3.2 Secure Firmware Update Flow Diagram

The next figure shows the PN5180 secure FW update application flow.

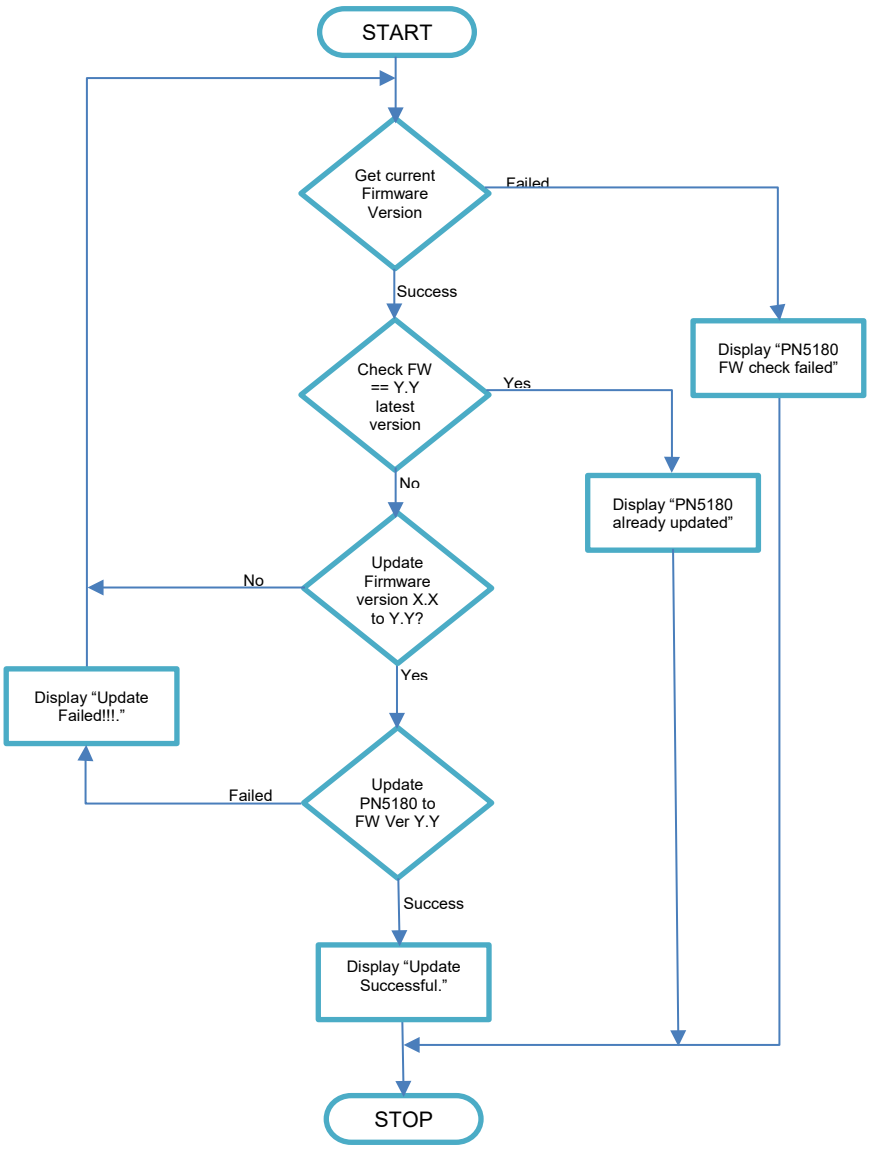


Fig 55. PN5180 Firmware update – Block diagram

The above block diagram shows the pn5180_firmware_update application flow. Firmware version of onboard PN5180 is compared with the latest firmware version which is available for download. If firmware versions are the same, graphic LCD is updated with a UI message saying that “PN5180 already updated” and stops the application. If firmware versions are not the same, prints a UI message "Update Firmware version X.X to Y.Y?" (Whereas X.X is current version and Y.Y is the version to update to). In case user confirms by pressing “OK” on graphic LCD then application performs PN5180 firmware update and prints out status message like “Update successful” or “Update Failed!!!”.

4.4 Hardware Modifications

Chapters 4.4.1 and 4.4.2 describe board modifications on TWR-POS-PN5180 and TWR-POS-K81 boards allowing download of PN5180 Firmware.

POS kits delivered after 8 February 2017 already include these changes.

4.4.1 TWR-POS-PN5180 Board Modification

Current TWR-POS-PN5180 board includes NC (Non Connected) R41 as shown in below schematic. Add 0 Ohm resistor in place of “R41 NC”. See the below board image to identify the R41 resistor placing.

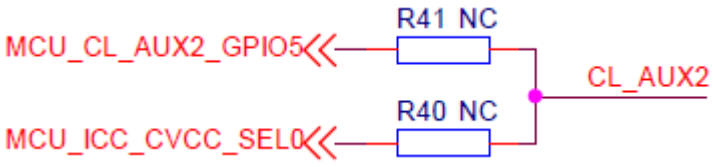


Fig 56. R41 on schematics

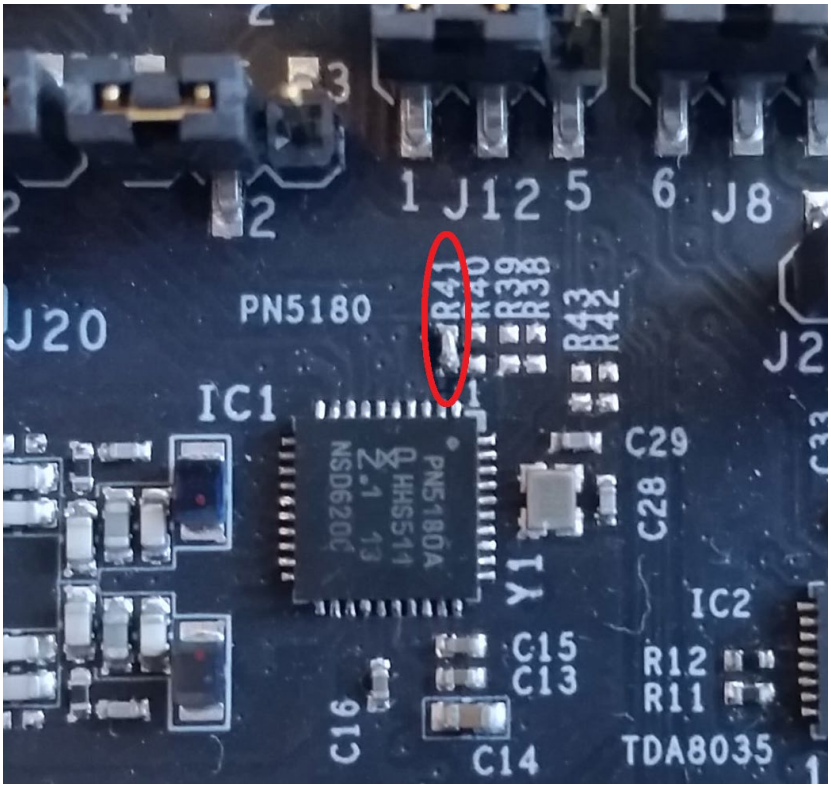


Fig 57. R41 location

4.4.2 K81 Mother Board Modification

Current K81 mother board includes R12 DNP as shown in the snap below.

Fig 58. R12 on schematics

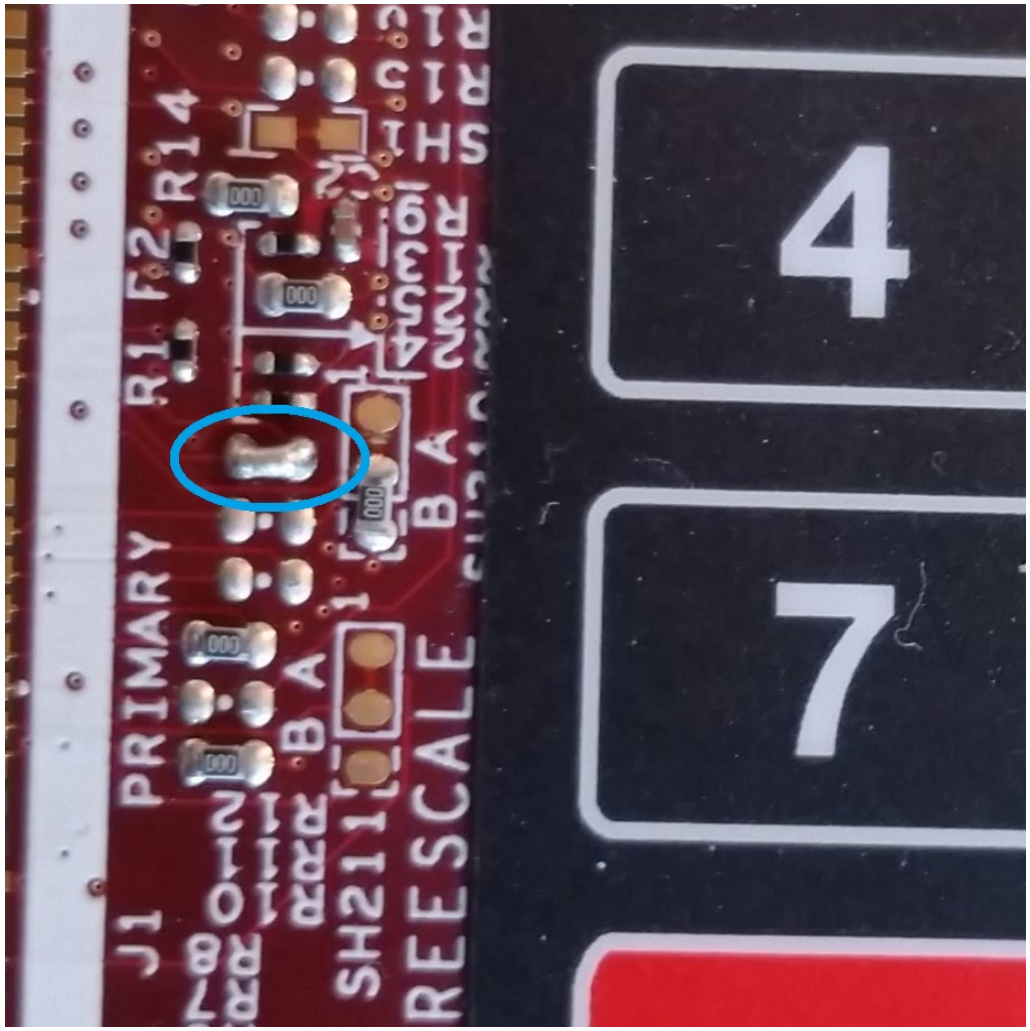


Fig 59. R12 location

4.5 PN5180 firmware update

4.5.1 PN5180 Latest Firmware update

Make sure the two mandatory hardware changes are done as mentioned above before downloading pn5180_firmware_update application into the board.

The “demo_apps” folder contains the pn5180_firmware_update example project that is prepared for two IDEs: IAR and KDS. Build and load the application into the board with the chosen IDE.

For more details on how to build and load the project, refer to section 4.2.3 for IAR or 4.2.4 for KDS. The only difference is the name of the main project: replace “payment_demo” by “secure_fw_update”.

Upon executing pn5180_firmware_update will check the current firmware version in PN5180.

1. If the current version is already latest, then no more action required and graphic LCD is displayed with “**PN5180 already updated**”.
2. If the current version is NOT latest, then graphic LCD is displayed with “**Update Firmware version X.X to Y.Y?**”.

Fig 60. Firmware update screen

Press “**OK**” to update PN5180.

PN5180 will be updated to the latest 3.9 version and “**Update Successful**” is displayed on graphic LCD.

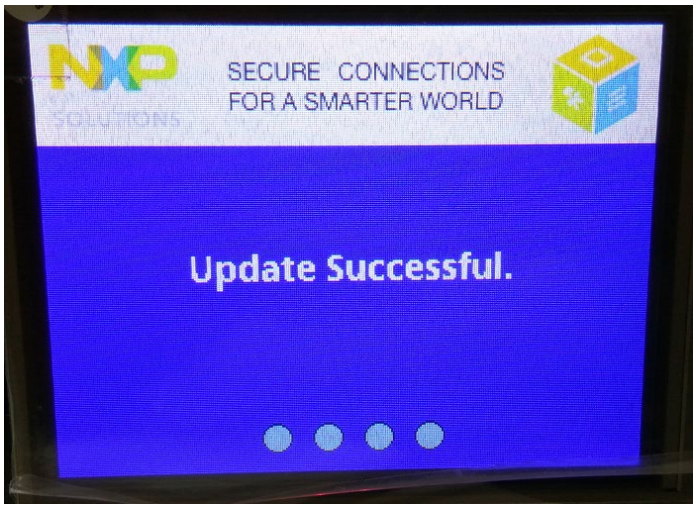


Fig 61. “Update Successful” message

Restarting the board again should result in “**PN5180 already updated**”

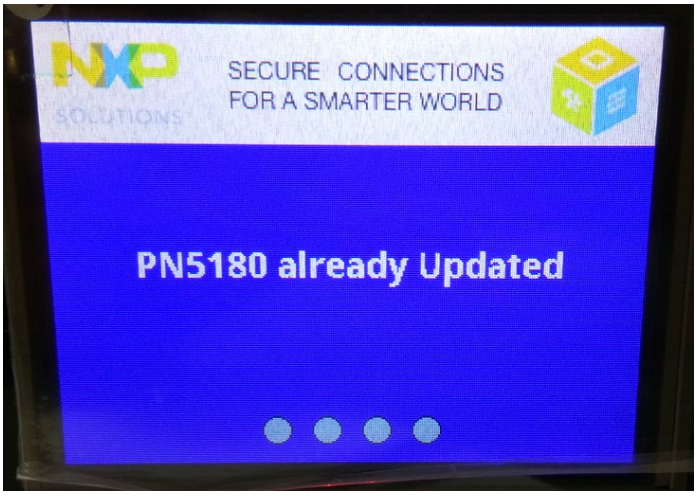


Fig 62. “Already updated” message

4.6 Add New PN5180 firmware version

4.6.1 Adding new PN5180 firmware to pn5180_firmware_update

Minor changes are required to add a new PN5180 firmware version support in pn5180_firmware_update application. The “demo_apps” folder contains the pn5180_firmware_update example project that is prepared for two IDEs: IAR and KDS.

1. Add PN5180 FW_Y_Y.h header file to the pn5180_firmware_update project with the chosen IDE, similar to the image shown below for FW_3_6.h, FW_3_8.h & FW_3_9.h versions.

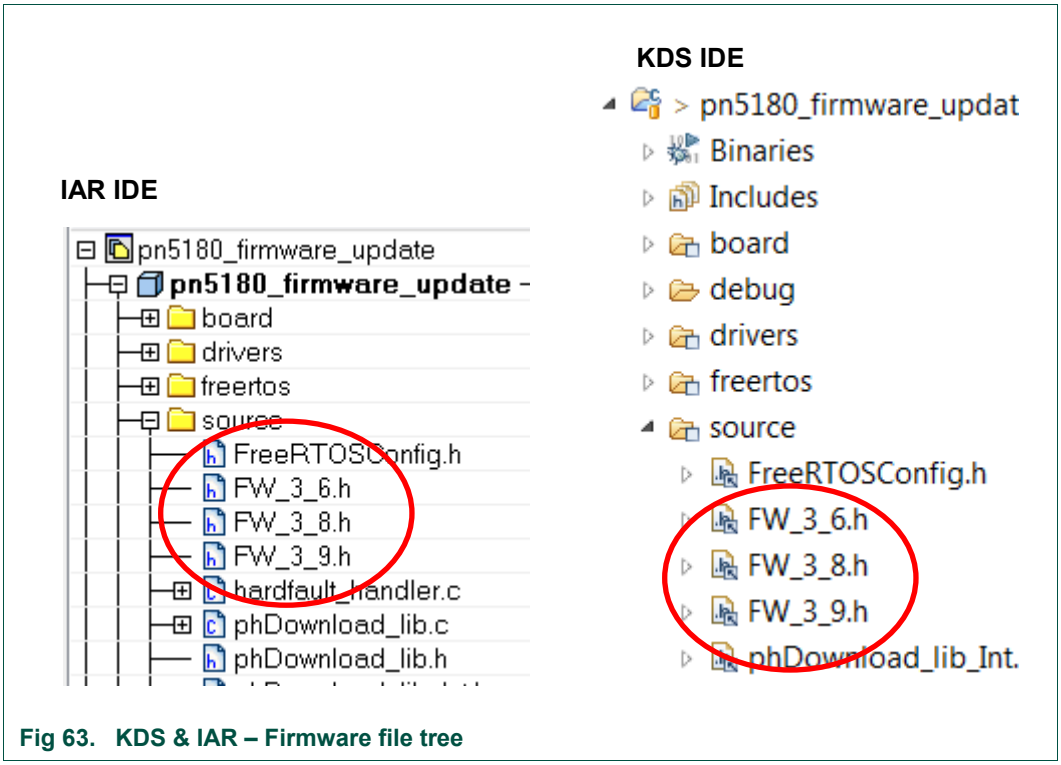


Fig 63. KDS & IAR – Firmware file tree

2. Include the FW_Y_Y.h in pn5180_firmware_update_app.c as indicate below.

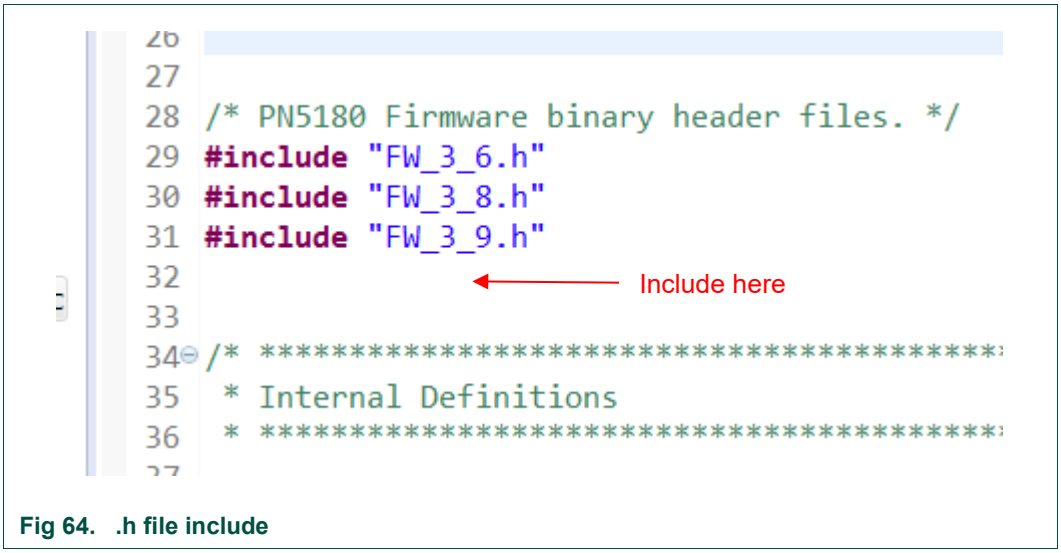


Fig 64. .h file include

3. Add a macro define for the new firmware version in pn5180_firmware_update.h, similar macro defines are shown below.

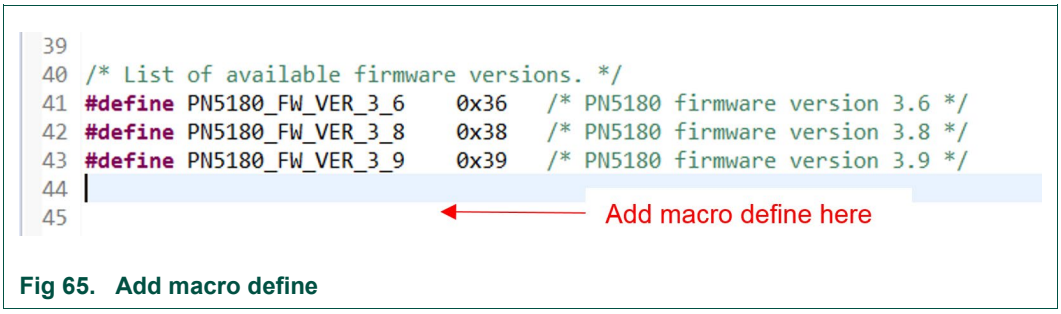


Fig 65. Add macro define

If the firmware version is Y.Y assign macro value as 0xYY for example if the version is 4.0 then assign macro value as 0x40.

4. Assign the defined macro to PN5180_FW_VER in pn5180_firmware_update.h file similar to the image shown below.

```
45
46 /* Firmware version to be updated. */
47 #define PN5180_FW_VER                    PN5180_FW_VER_3_9
```

Fig 66. Assign the new FW version

5. PN5180 new firmware header file FW_Y_Y.h will contain an array and its length. Assign array to PN5180_FW_VER_BIN_ARRAY macro and the length variable to PN5180_FW_VER_BIN_LEN in pn5180_firmware_update.h file as shown below.

```
48 #define PN5180_FW_VER_BIN_ARRAY        ((const uint8_t *) FW_3_9)
49 #define PN5180_FW_VER_BIN_LEN          ((uint32_t) FW_3_9_LEN)
50
```

Fig 67. Assign pointer and length

By this all the changes are done, build the lib_pos and pn5180_firmware_update projects and load the application into the board. To update PN5180 firmware to latest Y.Y version please refer to section 4.5 (PN5180 firmware update).

5. References

[1] K81 POS Card Reader Solution User's Guide.pdf

[2] L2 Kernel Card Profiles and Demo Scenarios 21102016 v2.4.pdf

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7. List of figures

8. Contents

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