

Contactless Payment Module

Installation Manual

Contactless Payment Module (CPM)

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1. Introduction

This document describes the hardware of the Contactless Payment Module (CPM). The readers of this document would benefit if they have prior knowledge of the specifications mentioned in [References](#) section.

2. References

The readers of this document shall have knowledge on the following specifications

USB CCID rev1.1 : Specification for Integrated Circuit Cards Interface Devices

ISO/IEC 14443-2 : Radio frequency power and signal interface

ISO/IEC 14443-3 : Initialisation and anti-collision

ISO/IEC 14443-4 : Transmission protocol

Mifare contactless card (Classic 1K, Classic 4K and Ultralight) datasheets

ISO/IEC 7816-3 : Electronic signals and transmission protocols

ISO/IEC 7816-4 : Inter-Industry commands for interchange

CPM USB/Serial software reference manual

3. FCC Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) this device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

No changes shall be made to the equipment without the manufacturer's permission as this may void the user's authority to operate the equipment

It is the responsibility of the product manufacturer to ensure compliance with FCC Part 15B with the Contactless Smartcard Module integrated into their product.

The host product using CPM module shall have the following text on a permanent label.

Contains FCC ID : ZERCPM01

The label should be on a visible location outside the enclosure of the product.

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4. Industry Canada Statement

This device complies with Industry Canada licence-exempt RSS standards. Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

This device complies with the safety requirements for RF exposure in accordance with RSS-102 Issue 5 for portable use conditions.

This radio transmitter (IC : 9653A-CPM01) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain indicated *. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

* (and required antenna impedance for each antenna type indicated)

Parameter	Minimum	Typical	Maximum
Impedance @13.56MHz	800 Ohms	1500 Ohms	-
Phase @ 13.56MHz	-10 Degrees	0 Degrees	+10 Degrees
Antenna Coil inductance	700nH	1200nH	2000nH
Antenna Coil Q	30	25	100
Antenna Gain	0.6 (-2.21 dB)	0.7 (-1.54 dB)	0.8 (-0.96 dB)
Antenna maximum size	-	-	11cm x 15cm

The host product using CPM module shall have the following text on a permanent label.

Contains IC : 9653A-CPM01

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5. Conformité IC

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

1. L'appareil ne doit pas produire de brouillage.
2. L'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

Cet appareil est conforme avec les exigences de sécurité pour l'exposition aux radiofréquences conformément au CNR-102, 5e édition, pour les conditions d'utilisation portables.

Le présent émetteur radio (IC : 9653A-CPM01) a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal indiqué *. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

* (et l'impédance d'antenne requise pour chaque type indiqué d'antenne)

Parameter	Minimum	Typical	Maximum
Impedance @13.56MHz	800 Ohms	1500 Ohms	-
Phase @ 13.56MHz	-10 Degrees	0 Degrees	+10 Degrees
Antenna Coil inductance	700nH	1200nH	2000nH
Antenna Coil Q	30	25	100
Antenna Gain	0.6 (-2.21 dB)	0.7 (-1.54 dB)	0.8 (-0.96 dB)
Antenna maximum size	-	-	11cm x 15cm

Le produit de l'hôte en utilisant le module CPM a le texte suivant sur une étiquette permanente.

Contient IC : 9653A-CPM01

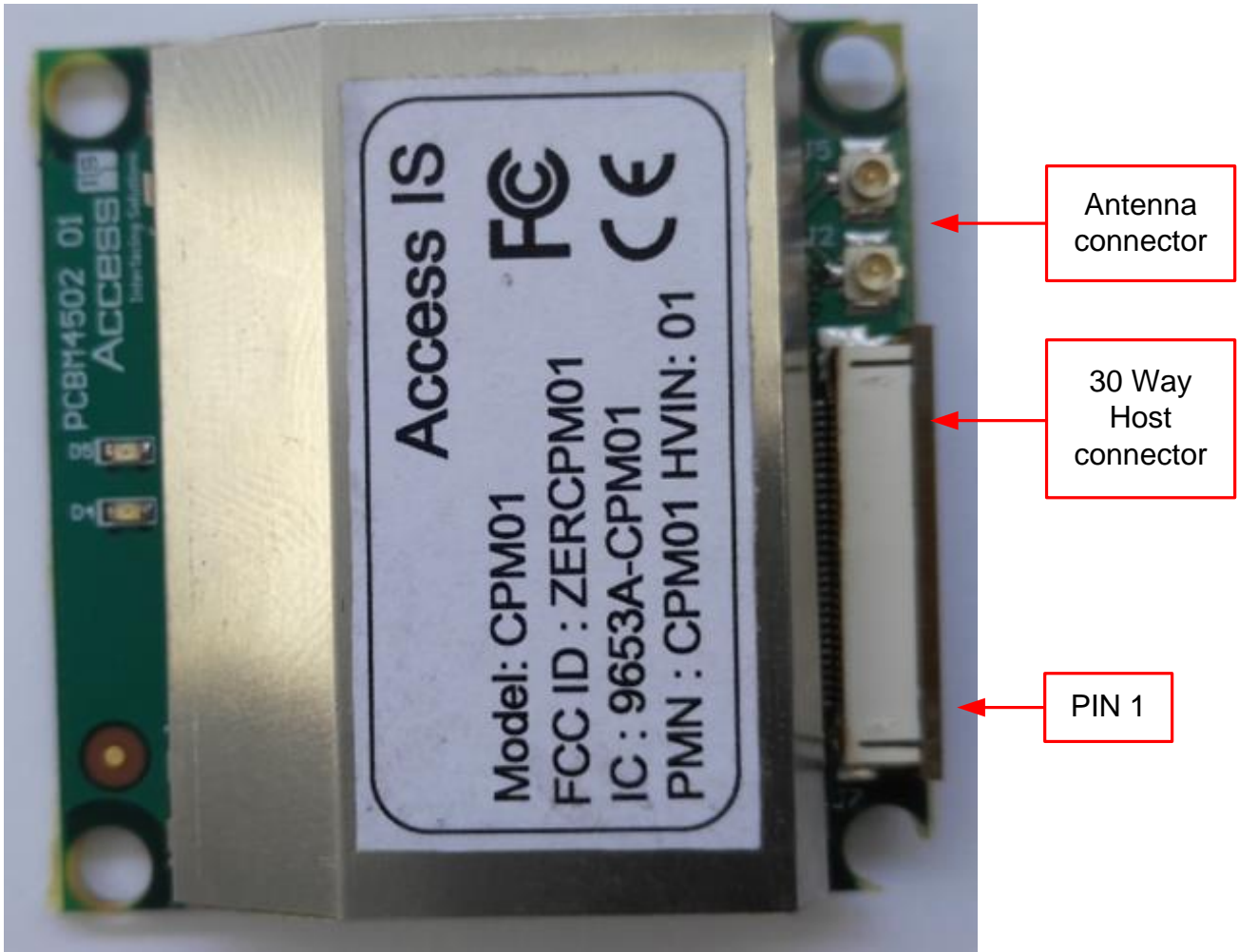
L'étiquette doit être sur un emplacement visible à l'extérieur de l'enceinte du produit.

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6. Product pictures

6.1. CPM - Top view with Shield



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6.2. CPM - Bottom view



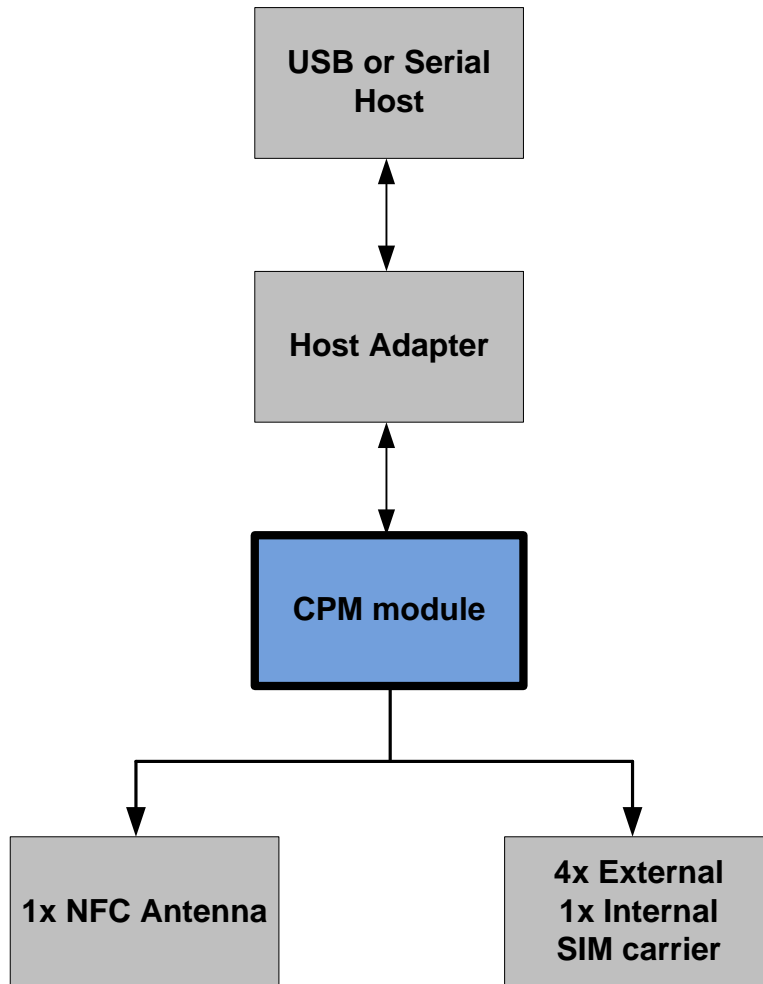
40 Way
4x Smartcard/
PSAM connector

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6.3. Typical Hardware Setup

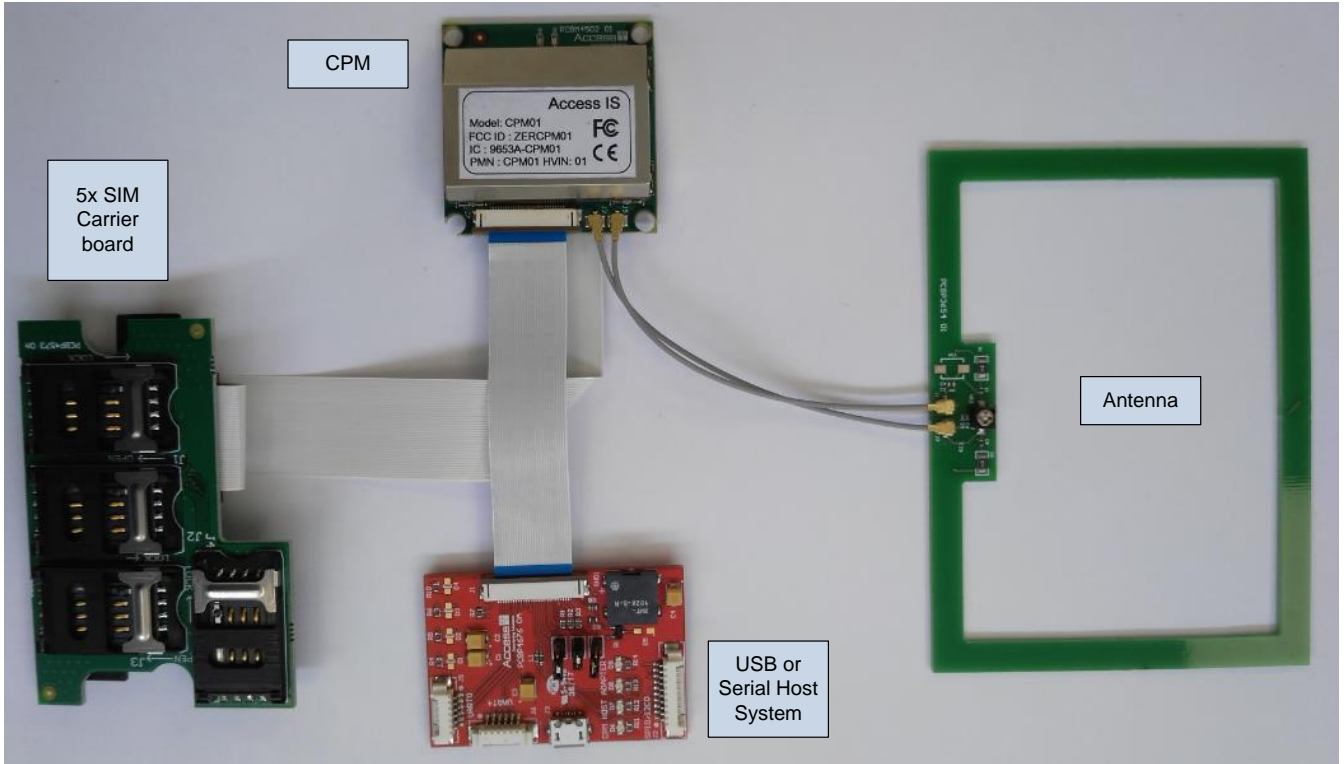
The following diagram and pictures shows a typical setup for CPM module.



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The following picture shows a typical setup. Note that the antenna and the Serial/USB host shown in the pictures are for illustration only. The actual size and shape of the user's antenna and host system may vary. If the SIM functionality is not required, then the SIM carrier board need not be connected.



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6. Installation

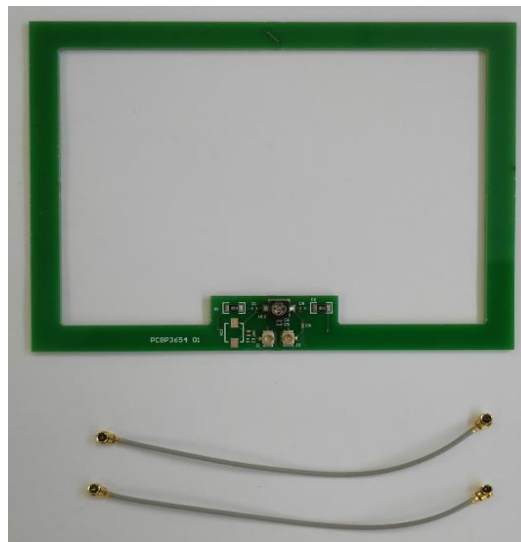
a. Hardware Prerequisites

The following section shows the hardware required for the installation.

- Serial or USB host system where the CPM module will connect to.
- CPM module and 30 way host FFC cable



- Antenna and two U.FL coax cables



NOTE: The Antenna and the U.FL coax cables can be supplied by Access IS or the user can design the antenna using the support provided by Access IS. U.FL cables are widely available from electronics stores like RS/Farnell.

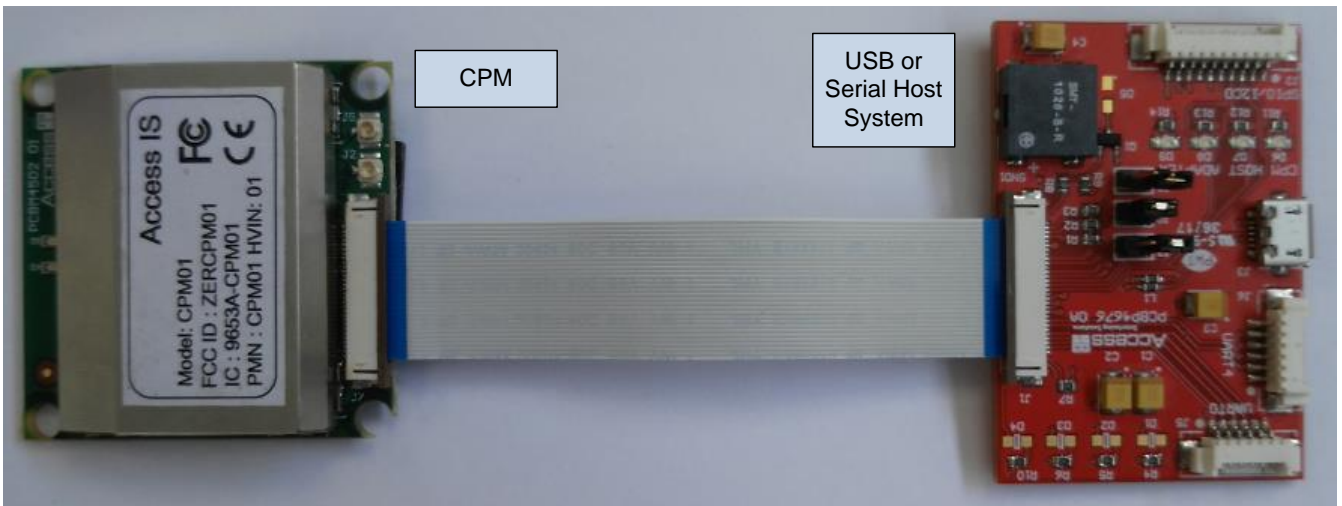
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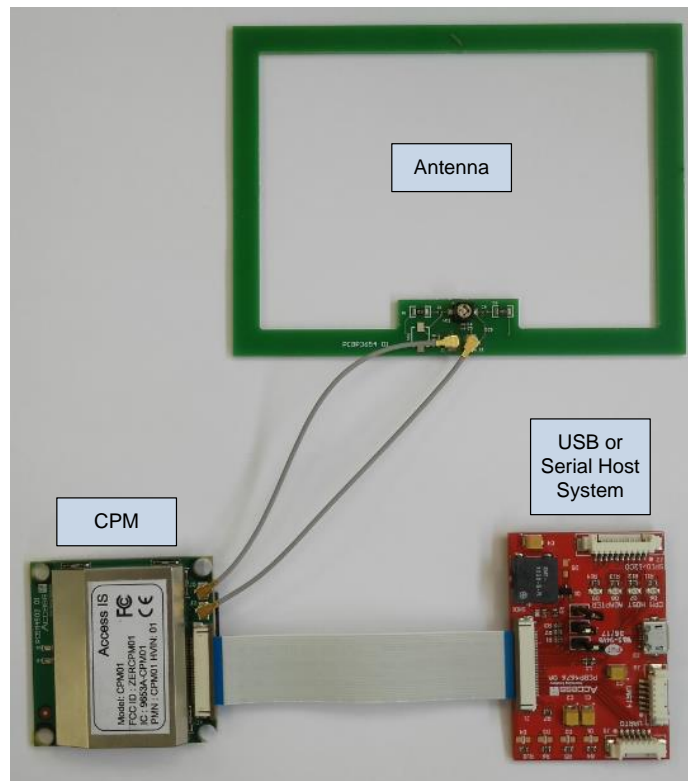
b. Hardware Installation Steps

The following details the installation steps with diagrams.

- 1, Turn OFF power for the host system before starting the installation
- 2, Connect the host system to the CPM module using the 30 way FCC cable as shown below. Please refer to [Host connector](#) section for the connector location and its pinouts.



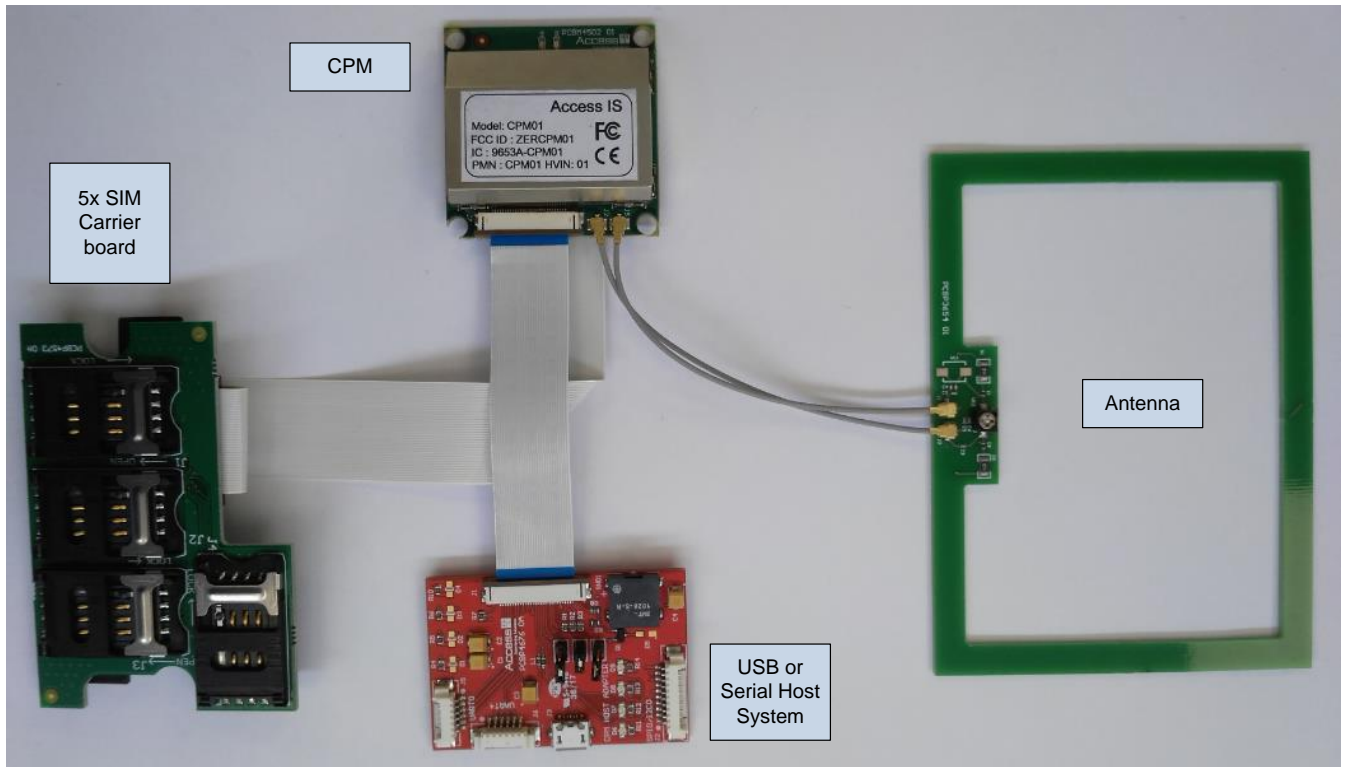
- 3, Connect the antenna to the NFC module using the coax cables.



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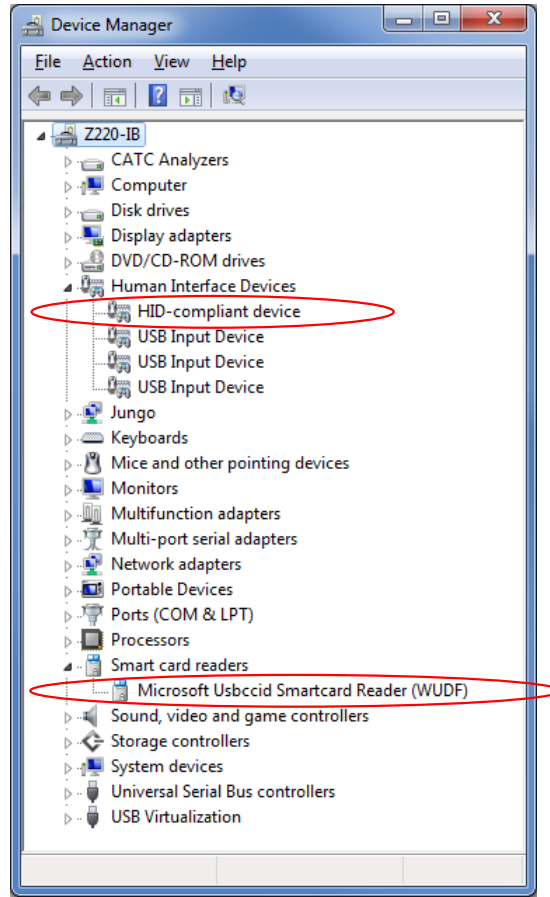
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4, If SIM function is required, then connect the 5x SIM carrier board as shown below.



5, After the connections are done, select/verify the correct host interface selection on HOST_IFSEL_IO pins. Please refer to [Host Interface Selection](#) for HOST_IFSEL_IO pin settings.

6, Power up the host system. Now, the CPM module should start working. If the host interface is USB, then NSM module shall start enumerating as a HID device and a smartcard reader as shown in the next page.



7, Application software can now communicate to NSM module through USB interface or through serial communication (See [Serial Communication Settings](#)).

c. Software Setup

Depending on the host interface selected, please refer USB or Serial software reference manual.

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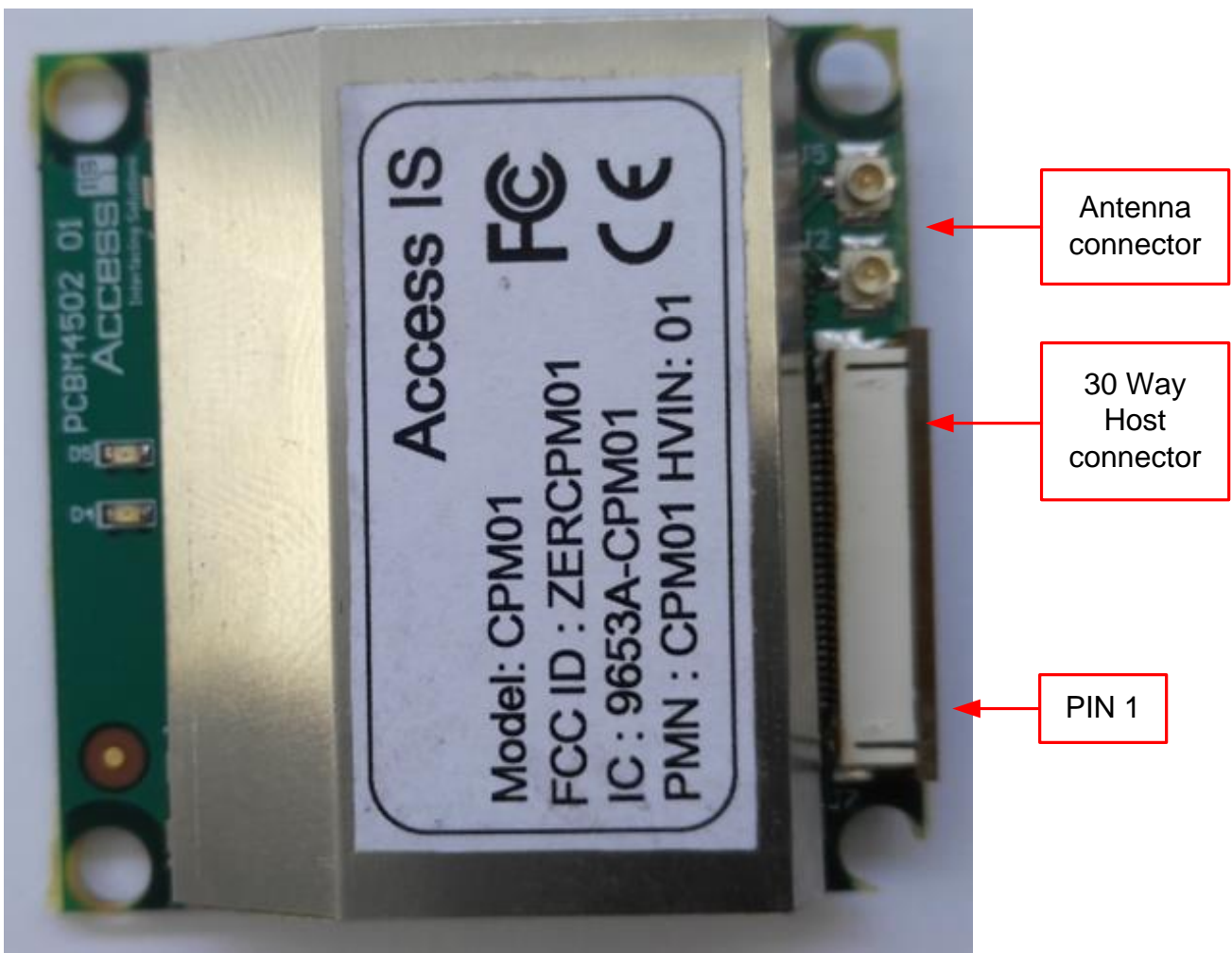
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7. Hardware Connections and Pinouts

There are three connectors that provides interface to the CPM module. Each of these connectors are described in detail on the following sections.

7.1. Host connector

The host connector provides interface to the CPM host. Further, it also has additional signals that are brought out of the module for host mode selection and for future expansion. The following diagram shows the location of the 30 way FFC host connector and the pin#1 location.



The following table shows the pinouts for the host connector.

Pin #	Signal Type	Signal	Description
1	Ground	GND	Ground signal
2	3V3 CMOS input	HOST_IFSEL_IO2	Host interface selection input – sampled during reset
3	3V3 CMOS input	HOST_IFSEL_IO1	Host interface selection input – sampled during reset
4	3V3 CMOS input	HOST_IFSEL_IO0	Host interface selection input – sampled during reset
5	Ground	GND	Ground signal

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6	3V3 CMOS I/O	EXT_TAMPER0	Security Tamper 0 signal
7	3V3 CMOS output	EMV_BEEPER	EMV Beeper signal
8	Ground	GND	Ground signal
9	Open collector output/input	I2CO_SCL	External I2C interface – Not used
10	Open collector output/input	I2CO_SDA	External I2C interface – Not used
11	Ground	GND	Ground signal
12	3V3 CMOS output	SPIO_CS2	External SPI interface slave select 2 – Not used
13	3V3 CMOS output	SPIO_CS0	External SPI interface slave select 0 – Not used
14	3V3 CMOS output	SPIO_SCK	External SPI interface clock – Not used
15	3V3 CMOS output	SPIO_MOSI	External SPI interface MOSI – Not used
16	3V3 CMOS input	SPIO_MISO	External SPI interface MISO – Not used
17	Power input	5V0	5V power input
18	USB data lines	USB D-	USB D- signal
19	USB data lines	USB D+	USB D+ signal
20	Power input	5V0	5V power input
21	3V3 CMOS output	EMV_LED3	EMV LED or Debug UART RTS signal, active low
22	3V3 CMOS input	EMV_LED2	EMV LED or Debug UART CTS signal, active low
23	3V3 CMOS input	EMV_LED1	EMV LED or Debug UART Receiver line
24	3V3 CMOS output	EMV_LED0	EMV LED or Debug UART Transmitter line
25	Power input	EXT_TAMPER1	Security Tamper1 signal
26	3V3 CMOS output	HOST_UART_RTS_n	Serial host UART RTS signal, active low
27	3V3 CMOS input	HOST_UART_CTS_n	Serial host UART CTS signal, active low
28	3V3 CMOS input	HOST_UART_RX	Serial host UART Receiver line
29	3V3 CMOS output	HOST_UART_TX	Serial host UART Transmitter line
30	Power input	5V0	5V power input

7.2. Host Interface Selection

The CPM module will select the host interface depending on the HOST_IFSEL_IOx signal values during reset. The following table shows the different modes of operation based on the HOST_IFSEL_IOx signal.

HOST_IFSEL_IO2	HOST_IFSEL_IO1	HOST_IFSEL_IO0	Operating mode
0	0	0	USB mode
0	0	1	Serial mode
0	1	0	USB mode
0	1	1	USB mode
1	0	0	USB mode
1	0	1	USB mode
1	1	0	Serial Bootloader mode –Used for firmware update
1	1	1	USB Bootloader mode – Used for firmware update

Note that if any of the HOST_IFSEL_IO pins are left open, then the module reads that pin as HIGH.

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7.3. Serial Communication Settings

The module by default uses the following serial communication settings.

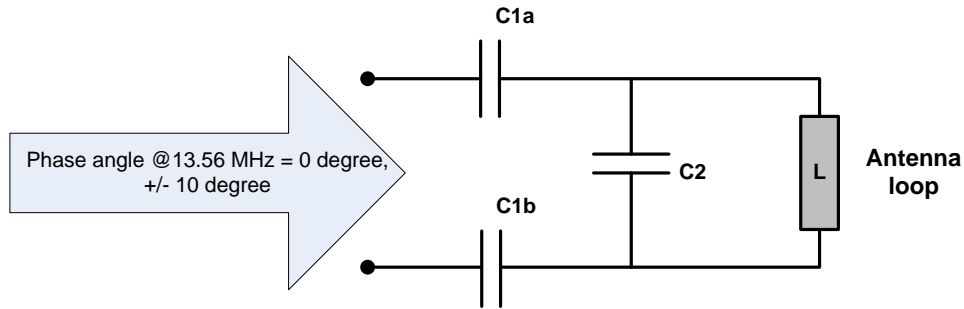
Parameter	Value
Baud Rate	115200
Data format	8 bits
Parity	None
Stop bits	1
Flow Control	RTS/CTS

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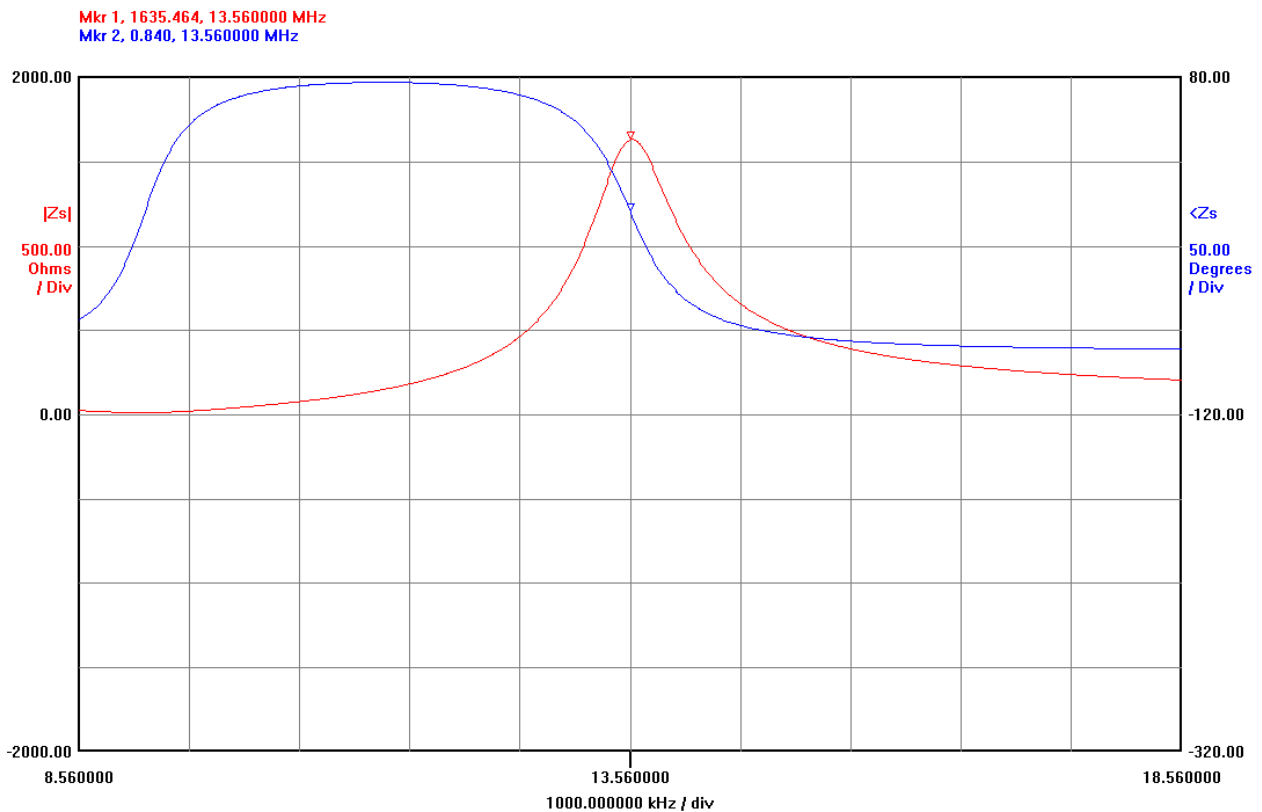
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7.4. NFC Antenna

The NFC antenna is a simple LC circuit tuned to 13.56MHz. The following diagram show the circuit of the antenna



The Antenna is tuned to resonate at 13.56MHz with a phase angle tolerance of +/-10 degrees. The following graph shows the impedance and phase for a typical antenna tuned to 13.56MHz.



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The following table provides information on the maximum and minimum values for the NFC antenna parameters.

Parameter	Minimum	Typical	Maximum
Impedance @13.56MHz	800 Ohms	1500 Ohms	-
Phase @ 13.56MHz	-10 Degrees	0 Degrees	+10 Degrees
Antenna Coil inductance	700nH	1200nH	2000nH
Antenna Coil Q	30	50	100
Antenna Gain	0.6 (-2.21 dB)	0.7 (-1.54 dB)	0.8 (-0.96 dB)
Antenna maximum size	-	-	11cm x 15cm

The impedance at the PN5180 driver chip shall be typically 20 Ohm. The antenna impedance is adjusted to achieve it.

7.5. Software Setup

Depending on the host interface selected, please refer USB or Serial software reference manual.

8. Host Product Label

The host product using CPM module shall have the following text on a permanent label.

Contains FCC ID : ZERCPM01

The label should be on a visible location outside the enclosure of the product.

9. Revision

Revision	Description
0.0	Initial version
0.1	Removed the module internal pictures Confidential note removed