NFC MUX User Manual

FCC ID: 2AVDM-02, IC: 25745-02

Product name: NFC MUX / NFC Antenna

Part Number: 60091945 / 60091966

Description: NFC reader/writer

1 Contents

2 General

2.1 Revision

Date	Version	Initials	Updates	Notes
2024-10-04	0	JSL	Initial version.	

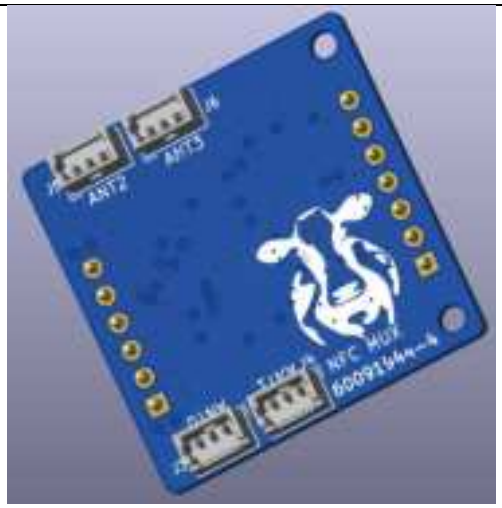
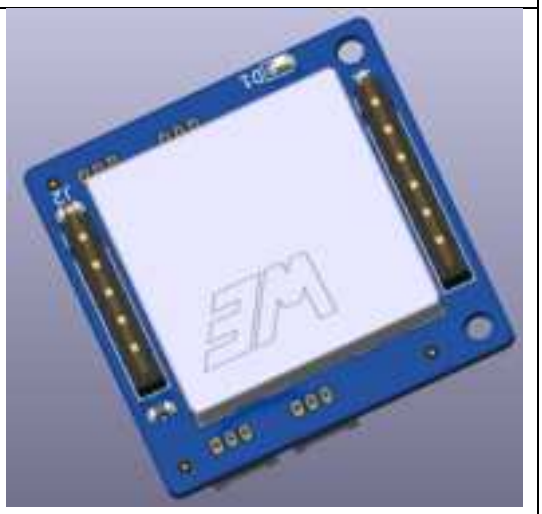
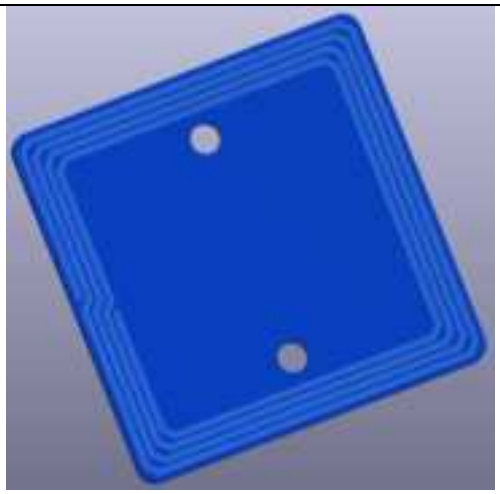
2.2 References

Ref.	Name	Path
1	NXP CLRC66301HN	https://www.nxp.com/docs/en/data-sheet/CLRC663.pdf

1 Introduction

NFC MUX and NFC Antenna are an NFC reader/transmitter system operation at 13.56MHz. NFC MUX is designed for the protocol ISO/IEC14443A based on the chip NXP CLRC66301HN (1). NFC MUX must be mounted on a host PCB by the two pin headers with power and I2C communication.

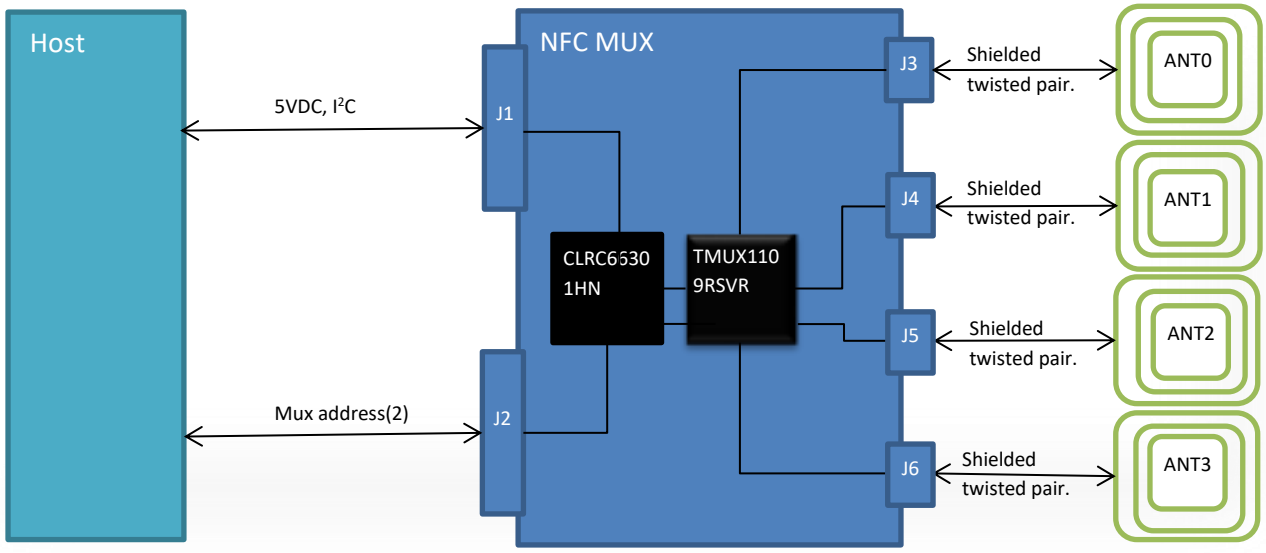
NFC MUX is a common module for further Lattec products, not for third party products.

	Front	bottom
NFC MUX Part number: 60091945		
NFC Antenna Part Number: 60091966 Including 500mm cable.		

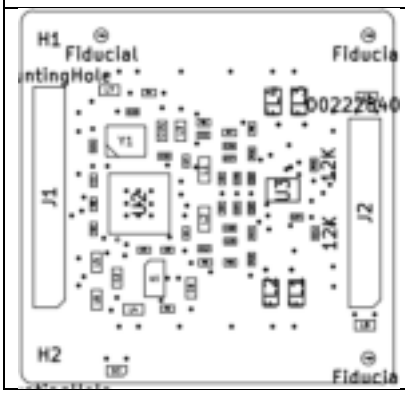
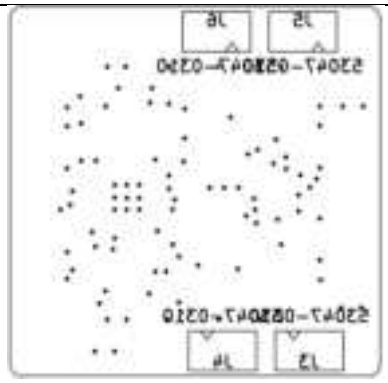
2 Hardware block diagram

NFC MUX has two pin headers J1 and J2 for control and power. J3-6 are the connectors for the external antenna (ANT0-3).

NFC MUX includes an NFC front-end chip CLRC6630 connected to an analog multiplexer TMUX1109. Only one antenna can be active at a time.



3 Pin Definition NFC MUX

Back	Front
	

3.1 Host interface (J1)

Pin	Name	Type	Description
1	+5V	Power	+5VDC input
2	GND	Ground	Power ground
3	SCL	TTL input	I^2C clock
4	GND	Ground	Power ground
5	SDA	TTL input/output	I^2C data
6	GND	Ground	Power ground
7	RST	TTL input	Reset

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3.2 Host Interface (J2)

Pin	Name	Type	Description

1	GND	Ground	Power ground
2	A0	TTL input	Mux address 0
3	GND	Ground	Power ground
4	A1	TTL input	Mux address 1
5	GND	Ground	Power ground
6	GND	Ground	Power ground

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3.3 Antenna Interface ANT0(J3)

Pin	Name	Type	Description
1	TX1	RF Input/Output	Differential Antenna interface, 98ohm
2	TX2	RF Input/Output	Differential Antenna interface, 98ohm
3	GND	Ground	Shield

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3.4 Antenna Interface ANT1(J4)

Pin	Name	Type	Description
1	TX1	RF Input/Output	Differential Antenna interface, 98ohm
2	TX2	RF Input/Output	Differential Antenna interface, 98ohm
3	GND	Ground	Shield

Molex 53398-0371

3.5 Antenna Interface ANT2(J5)

Pin	Name	Type	Description
1	TX1	RF Input/Output	Differential Antenna interface, 98ohm
2	TX2	RF Input/Output	Differential Antenna interface, 98ohm
3	GND	Ground	Shield

Molex 53398-0371

3.6 Antenna Interface ANT3(J6)

Pin	Name	Type	Description
1	TX1	RF Input/Output	Differential Antenna interface, 98ohm
2	TX2	RF Input/Output	Differential Antenna interface, 98ohm
3	GND	Ground	Shield

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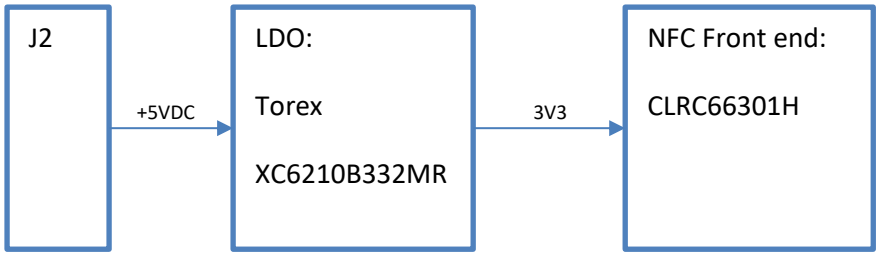
4 Technical Parameters

Local regulated power supply for the NFC frontend:



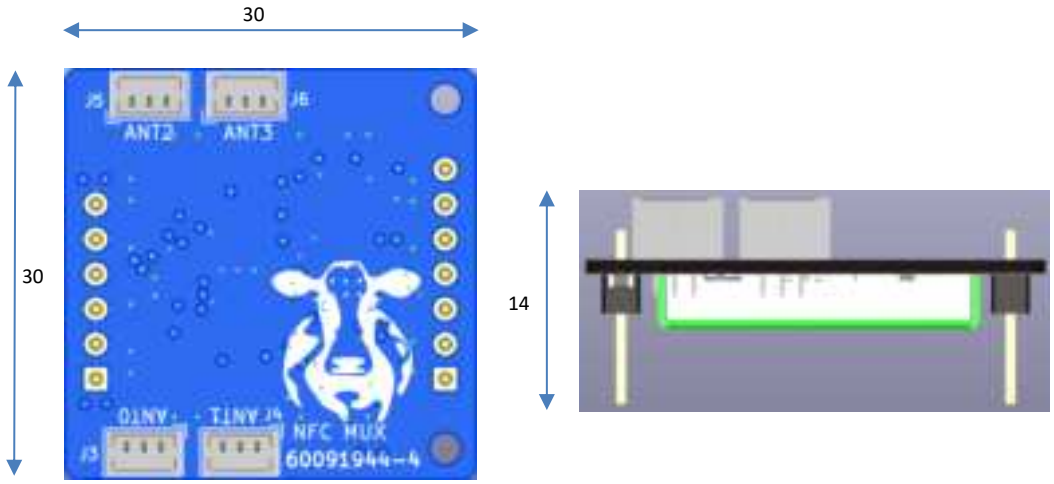
The Supply Voltage for the NFC2 is regulated by on board Low Drop Out regulator.

Symbol	Parameter	Condition	Min	Typ	Max	Unit
+5VDC	Supply Voltage	Transmit/receive mode	3.6	5.0	6.0	V
I_{DD}	Supply Current	Transmit/receive mode			50	mA
T_{amb}	Operating Temperature	PCB ambient temperature	5		45	°C
H_{amb}	Operation Humidity		20		80	%RH
Operating Frequency	Operating output	Transmit/receive mode		13.56		MHz
Output impedance	Operating output J3-6	Shielded twisted pair		100		Ohm
A0, A1	MUX @3V3 pull-up			12K		Ohm
RST	Power down active low @3V3 pull-up			12K		Ohm
SDA, SCL	I^2C data bus @3V3 pull-up			2K7		Ohm

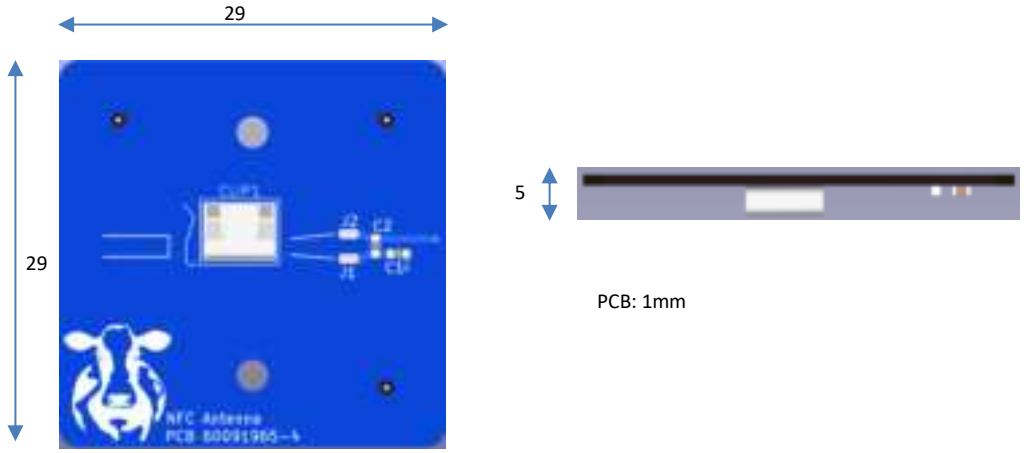
There is support for NFC protocol ISO14443A.

5 Dimensions and connections

NFC MUX:



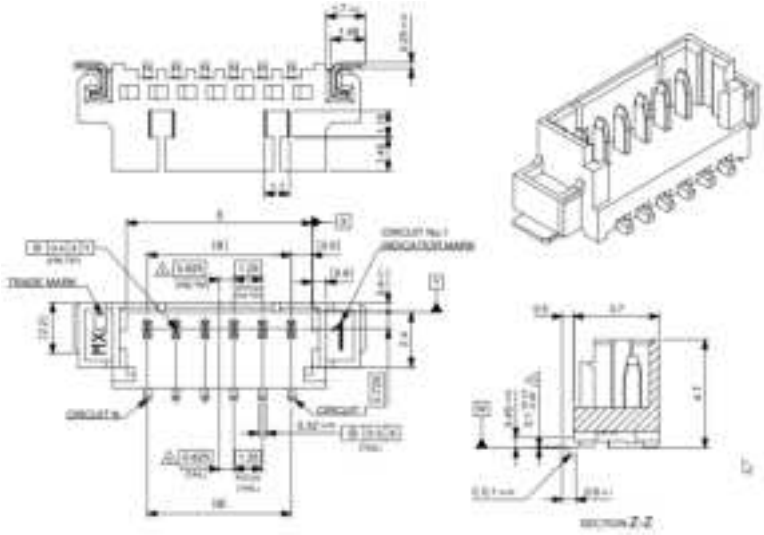
NFC Antenna:



PCB: 1mm

Molex 22-28-4070 (J1, J2):

Molex 53398-0271(J3-6):



6 Reference Design

Reference design for compliance test.

6.1 Setup without PC.

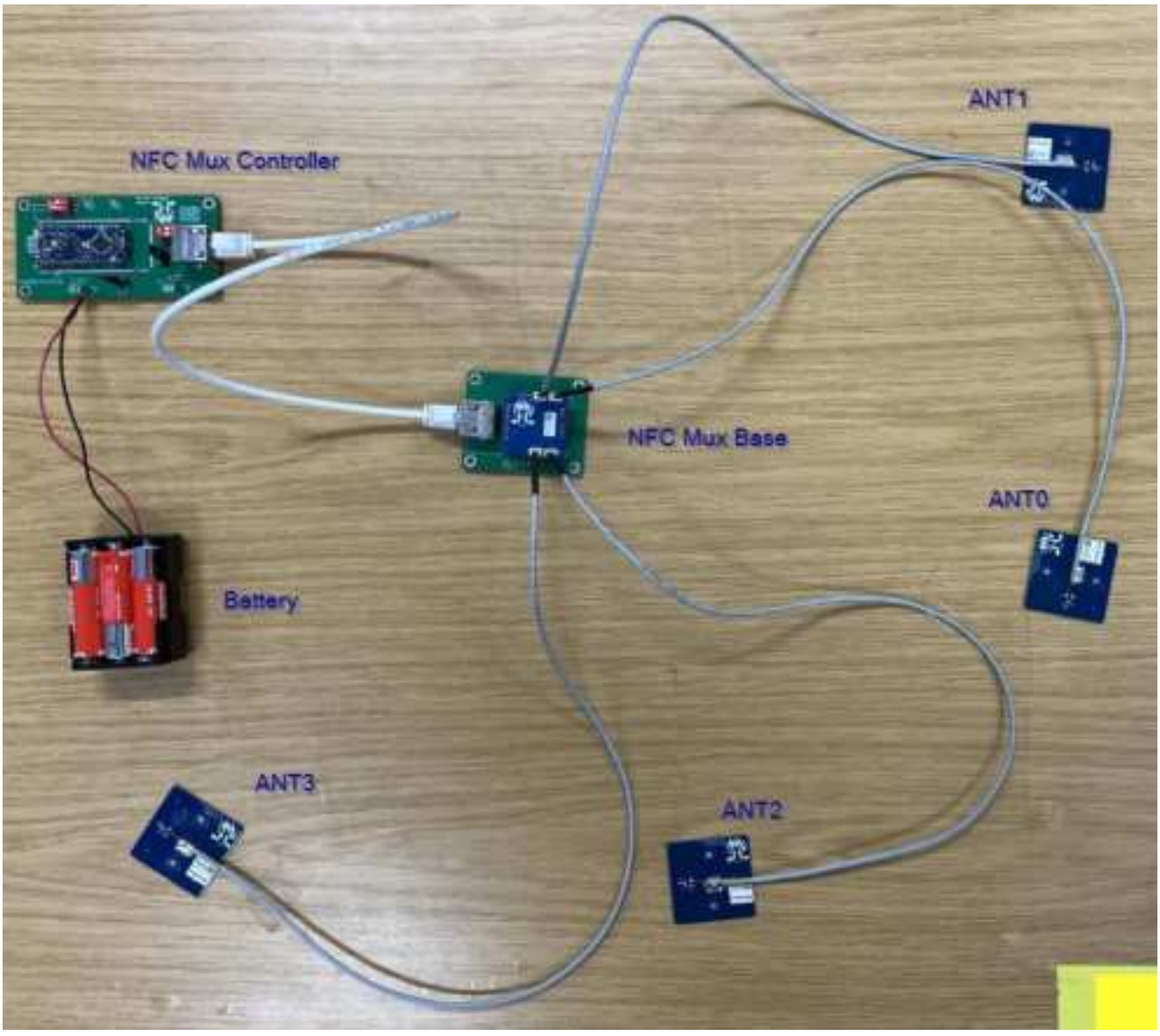
NFC MUX is installed in NFC MUX Base PCB21-1 and connected to NFC MUX Controller PCB20-1 via a cable.

Controller cable length can be up to 1m.

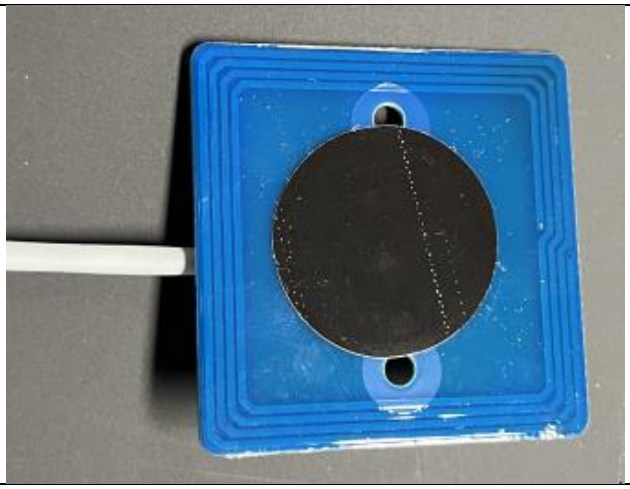
An NFC TAG is mounted on each antenna.

All power by a battery.

Cable connections:



NFC Antenna:

NFC Antenna 60091966:	NFC TAG (NXP NTAG213) mounted on Lattec NFC Antenna:
	

6.2 Setup with PC

PC Test Program: NFC Communication Quality.exe (Communication Test - v7)

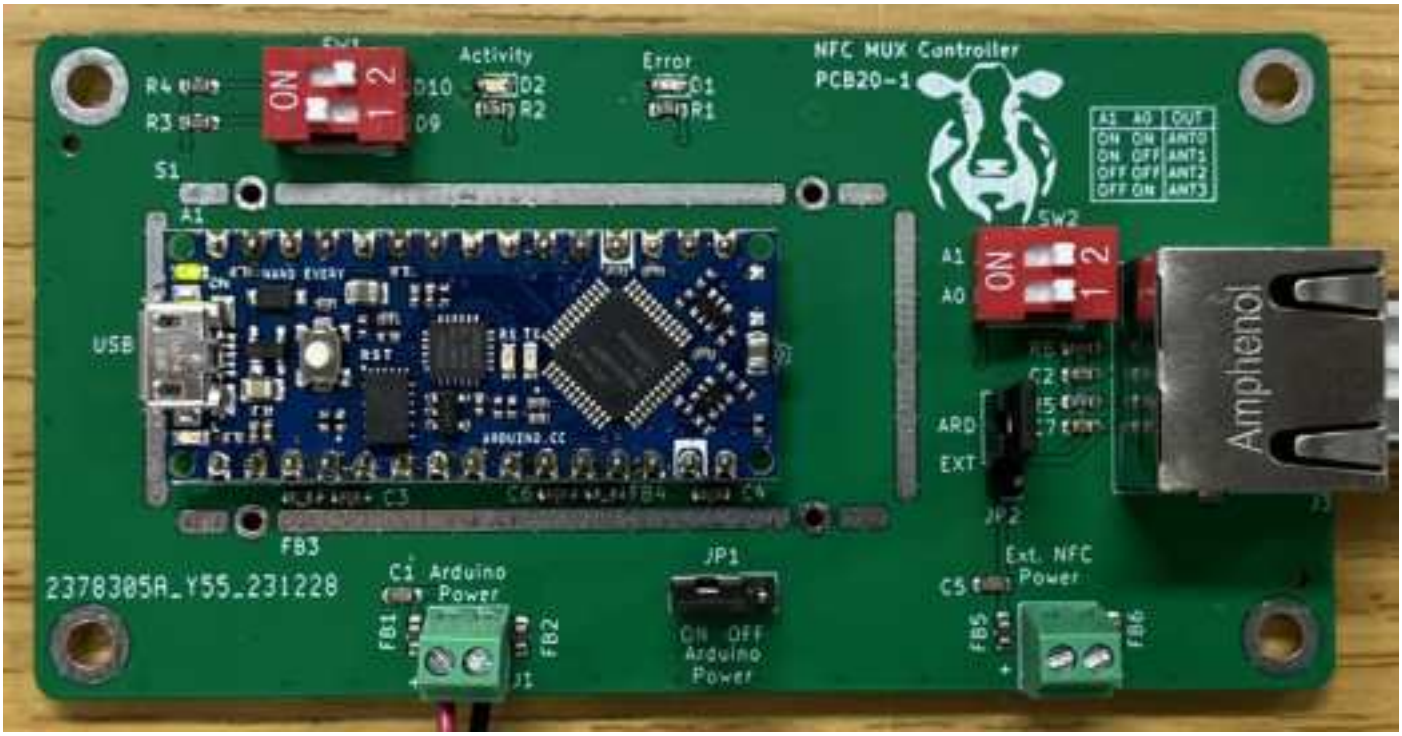
Quick guide:

1. Set SW1 in PC mode.
2. Connect USB cable to NFC MUX Controller.

3. Start “NFC Communication Quality.exe”
    a. Program connection the Arduino
4. Select NFC address 0 to 3.
5. Press the start button.
6. NFC feedback test start.
    a. If reading okay the graphic show green bars. One sub bar for each NFC TAG read back.
    b. Notes the failure counter. It will reset when restarting.

6.3 NFC MUX Controller PCB20-1

NFC MUX controller based on Arduino Every.



Arduino Every: Shielded Arduino module controller for NFC MUX. I^{2}C bus master for NFC MUX communication.

Connector	Description
J1	Arduino power
J3	Data output for NFC MUX
J2	External NFC Power

LED	Function
D1	Error reading.
D2	Activity

SW1: Arduino software mode	D9	D10
	ON	ON
	OFF	ON
Continues mode with no PC control.	ON	OFF
	ON	OFF

SW2: Antenna	A0	A1
ANT0	ON	ON
ANT1	OFF	ON
ANT2	ON	OFF
ANT3	OFF	OFF

Jumper	Function
JP1	Arduino power on/off
JP2	NFC MUX power source

6.4 NFC MUX base

NFC MUX mounted in the NFC MUX base.

7 Certifications and regulatory

7.1 General

This modular approval is limited to OEM integrators' installation only.
OEM integrators are responsible for ensuring that the end-user has no manual instructions to remove or install module.
The end user manual shall include all required regulatory information/warning as shown in this manual.

7.2 Federal Communication Commission Interference 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.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC Caution:

➢ Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

➢ This transmitter must not be co-located or operated in conjunction with any other antenna or transmitter.

Radiation Exposure Statement:

The product is a low power device, and its output power is lower than FCC SAR ex-emption level.

This device is intended only for OEM integrators under the following conditions:

The transmitter module may not be co-located with any other transmitter or antenna.
The co-transmitting of other radio modules will need a separate evaluation.
As long as this condition is met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

IMPORTANT NOTE:

In the event that this condition cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid, and the FCC ID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

End Product Labeling
The end product must be labeled in a visible area with the following:
"**Contains FCC ID: 2AVDM-02**".
The grantee's FCC ID can be used only when all FCC compliance requirements are met.

Manual Information to the End User
The OEM integrator must be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as shown in this manual.

This module is intended for OEM integrators only. Per FCC KDB 996369 D03 OEM Manual v01 guidance, the following conditions must be strictly followed when using this certified module:

2.2 List of applicable FCC rules
This module has been tested for compliance to FCC Part C (Section 15.225) as an End User Device.

2.3 Summarize the specific operational use conditions
The module is tested for standalone mobile RF exposure use condition. Any other usage conditions such as co-location with other transmitter(s) or being used in a portable condition will need a separate reassessment through a Class II permissive change application or new certification.

2.4 Limited module procedures
Not applicable.

2.5 Trace antenna designs
Not applicable.

2.6 RF exposure considerations
The product is a low power device, and its output power is lower than FCC SAR ex-emption level.

2.7 Antennas
The following antennas have been certified for use with this module; antennas of the same type with equal or lower gain may also be used with this module.
• Antenna type: Loop

2.8 Label and compliance information
The final end product must be labelled in a visible area with the following:
"**Contains FCC ID: 2AVDM-02**".
The grantee's FCC ID can be used only when all FCC compliance requirements are met.

2.9 Information on test modes and additional testing requirements
For more information on testing, please contact the manufacturer.

2.10 Additional testing, Part 15 Subpart B disclaimer
This transmitter module is tested as a subsystem and its certification does not cover the FCC Part 15 Subpart B (unintentional radiator) rule requirement applicable to the final host. The final host will still need to be reassessed for compliance with this portion of rule requirements if applicable.

As long as all the conditions above are met, further transmitter tests will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

IMPORTANT NOTE:
In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid, and the FCC ID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

OEM/Host manufacturer responsibilities
OEM/Host manufacturers are ultimately responsible for the compliance of the Host and Module. The final product must be reassessed against all the essential requirements of the FCC rule such as FCC Part 15 Subpart B before it can be placed on the US market. This includes reassessing the transmitter module for compliance with the Radio and EMF essential requirements of the FCC rules. This module must not be incorporated into any other device or system without retesting for compliance as multi-radio and combined equipment.

7.3 Industry Canada Statement

This device complies with ISED's license-exempt RSSs. 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.

Le présent appareil est conforme aux CNR d'ISEDapplicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:
(1) le dispositif nedoit pas produire de brouillage préjudiciable, et
(2) ce dispositif doit accepter tout brouillage reçu, y compris un brouillage susceptible de provoquer un fonctionnement indésirable.

Radiation Exposure Statement:
This equipment complies with ISED radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated at a greater distance than 20 cm between the radiator and your body.

Déclaration d'exposition aux radiations:
Cet équipement est conforme aux limites d'exposition aux rayonnements ISEDétablies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé à plus de 20 cm entre le radiateur et votre corps.

IMPORTANT NOTE:
In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the Canada authorization is no longer considered valid and the ICID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate Canada authorization.

NOTE IMPORTANTE:
Dans le cas où ces conditions ne peuvent être satisfaites (par exemple pour certaines configurations d'ordinateur portable ou de certaines co-localisation avec un autre émetteur), l'autorisation du Canada n'est plus considéré comme valide et l'ID IC ne peut pas être utilisé sur le produit final. Dans ces circonstances, l'intégrateur OEM sera chargé de réévaluer le produit final (y compris l'émetteur) et l'obtention d'une autorisation distincte au Canada.

End Product Labeling
This transmitter module is authorized only for use in devices where the antenna may be installed and operated with greater than 20cm between the antenna and users. The end product must be labelled in a visible area with the following: "**Contains IC: 25745-02**".

Plaque signalétique du produit final
Ce module émetteur est autorisé uniquement pour une utilisation dans un appareil où l'antenne peut être installée et utilisée à plus de 20 cm entre l'antenne et les utilisateurs. Le produit final doit êtreétiqueté dans un endroit visible avec l'inscription suivante: "**Contient des IC: 25745-02**".

Manual Information to the End User
The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.
The end user manual shall include all required regulatory information/warning as shown in this manual.

Manuel d'information à l'utilisateur final
L'intégrateur OEM doit être conscient de ne pas fournir des informations à l'utilisateur final quant à la façon d'installer ou de supprimer ce module RF dans le manuel de l'utilisateur du produit final qui intègre ce module.Le manuel de l'utilisateur final doit inclure toutes les informations réglementaires requises et avertissements comme indiquédans ce manuel.

7.4 EU Statement

This device complies with *Directive 2014/53/EU* issued by the Commission of the European Community.
The product is a low power device, and its output power is lower than comply with the RF exposure requirements in Europe.

Frequency Bands and Powers
Operating frequency: 13.56 MHz
Number of channels: 1
H-field strength: 7.82 dBµA/m

In all cases assessment of the final product must be made against the Essential requirements of the ***Directive 2014/53/EU*** Articles 3.1(a) and (b), safety and EMC respectively, as well as any relevant Article 3.2 requirements.