

Standard ECMA-352

1st Edition / December 2003

Near Field Communication Interface and Protocol -2 (NFCIP-2)

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Brief history

In 2002, Ecma International formed Task Group 19 of Technical Committee 32 to specify Near Field Communication (NFC) signal interfaces and protocols. The NFC devices are wireless closely coupled devices communicating at 13,56 MHz.

The General Assembly of December 2002 adopted the Near Field Communication Interface and Protocol-1 (NFCIP-1) as ECMA-340.

Although ECMA-340 (NFCIP-1), ISO/IEC 14443 and ISO/IEC 15693 standards all specify 13,56 MHz as their working frequency, they specify distinct communication modes. These are defined as NFC, PCD, and VCD communication modes respectively.

This NFCIP-2 Standard specifies the mechanism to detect and select one communication mode out of those three possible communication modes. Furthermore, NFCIP-2 requires that subsequent behaviour be as specified in the standard specifying the selected communication mode.

TC32-TG19 applied minor editorial changes to Figure 1 and Clause 9 in their 7th meeting.

The December 2003 General Assembly adopted this 1st edition of ECMA-352.

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1 Scope

ECMA-340, ISO/IEC 14443 and ISO/IEC 15693 standards specify the RF signal interface, initialisation, anti-collision and protocols for wireless interconnection of closely coupled devices and access to contactless integrated circuit cards operating at 13,56 MHz.

This Standard specifies the communication mode selection mechanism, designed to not disturb any ongoing communication at 13,56 MHz, for devices implementing ECMA-340 and the reader functionality for integrated circuit cards compliant to ISO/IEC 14443 or ISO/IEC 15693. This standard requires implementations to enter the selected communication mode as specified in the respective standard. The communication mode specifications, however, are outside the scope of this NFCIP-2 Standard.

2 Conformance

A conforming implementation complies with all the mandatory clauses in this Standard.

3 Normative References

- ECMA-340 Near Field Communication - Interface and Protocol (NFCIP-1) (2002)
- ISO/IEC 14443: 2001, Identification cards -- Contactless integrated circuit(s) cards -- Proximity cards
- ISO/IEC 15693: 2001, Identification cards -- Contactless integrated circuit(s) cards -- Vicinity cards

4 Definitions

- 4.1 $H_{\text{Threshold}}$**
The minimum value of an external RF field that a NFCIP-2 device shall detect to not disturb ongoing communication by ensuring that its own RF field is switched off.
- 4.2 NFC MODE**
The communication as specified in ECMA-340.
- 4.3 OPERATING FREQUENCY (f_c)**
13,56 MHz +/- 7 kHz.
- 4.4 PCD**
Proximity Coupling Device as specified in ISO/IEC 14443.
- 4.5 PCD MODE**
The contactless communication between PCD and PICC as specified in ISO/IEC 14443.
- 4.6 VCD**
Vicinity Coupling Device as specified in ISO/IEC 15693.
- 4.7 VCD MODE**
The contactless communication between VCD and VICC as specified in ISO/IEC 15693.
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5 Conventions and notations

5.1 Names

The names of basic elements, e.g. specific fields, are written with a capital initial letter.

6 External RF field threshold value

NFCIP-2 devices shall detect external RF fields at the **OPERATING FREQUENCY** with a value higher than **H_{THRESHOLD}** while performing external RF field detection.

The value of **H_{THRESHOLD}** = 0,1875 A/m.

7 RF Field detection

In order to not disturb any communication on the **OPERATING FREQUENCY**, an NFCIP-2 device shall not switch on its RF field when it detects an external RF field, as specified in [Clause 6](#).

8 Mode selection

Mode selection specifies the procedure for NFCIP-2 devices to select and subsequently enter one the **NFC MODE**, or the **PCD MODE** and **VCD MODE**.

NFCIP-2 devices shall implement the following functions:

1. Initiator and target as specified in ECMA-340;
2. **PCD** as specified in ISO/IEC 14443; and
3. **VCD** as specified in ISO/IEC 15693.

NFCIP-2 devices shall execute the following sequence:

1. The NFCIP-2 device shall have its RF field switched off.
2. If the NFCIP-2 device detects an external RF field, as specified in [Clause 6](#), it shall select the **NFC MODE**.
3. If the NFCIP-2 device does not detect an external RF field it shall select the **NFC MODE**, or the **PCD MODE** or the **VCD MODE**.
4. If the NFCIP-2 device has selected the **NFC MODE**, it shall enter the **NFC MODE**.
5. NFCIP-2 devices that have selected either the **PCD MODE** or **VCD MODE**, shall perform RF detection, Initial RF generation and subsequently enter the selected mode as specified in [Clause 9](#).

[Figure 1](#) illustrates the above procedure.

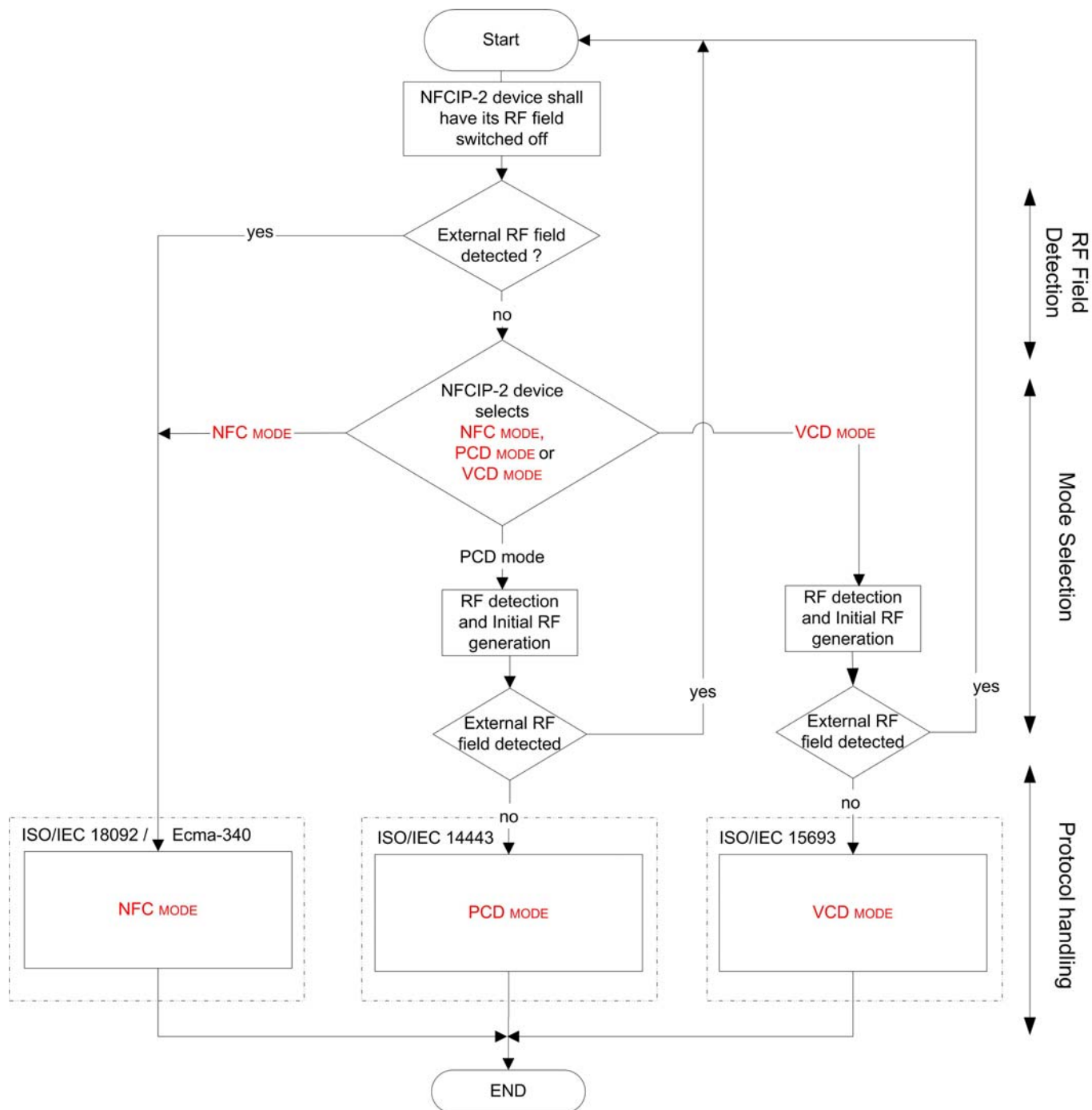


Figure 1 – Mode selection

9 RF detection and Initial RF generation

Any NFCIP-2 device having selected the **PCD MODE** or the **VCD MODE** shall continue the mode selection sequence and comply with the timing as specified below.

When the NFCIP-2 device detects an external RF field, as specified in [Clause 7](#), during the time $T_{IDT} + n \times T_{RFW}$ it shall recommence the mode selection procedure that is specified in [Clause 8](#).

If the NFCIP-2 device does not detect an external RF field during the time $T_{IDT} + n \times T_{RFW}$, it shall switch on its RF field, and enter the selected communication mode.

[Figure 2](#) illustrates the RF detection and initial RF generation.

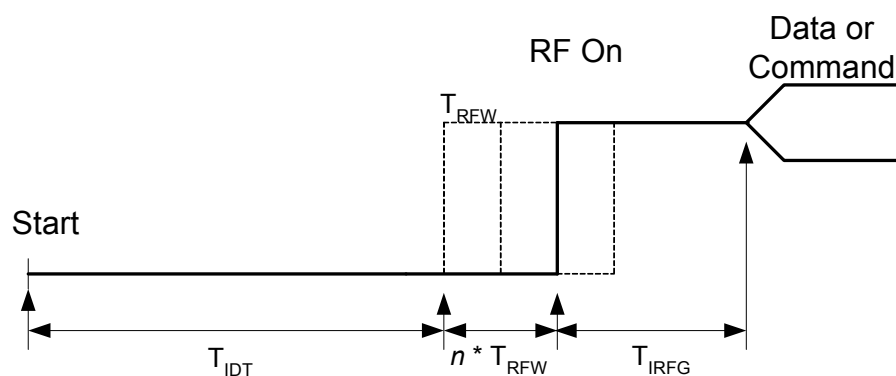


Figure 2 – RF detection and initial RF generation for PCD MODE and VCD MODE

T_{IDT} : Initial delay time. $T_{IDT} > 4\,096 / f_c$ ($\sim 300\ \mu s$)

T_{RFW} : RF waiting time. $512 / f_c$ ($\sim 38\ \mu s$)

n : randomly generated integer $0 \leq n \leq 3$

T_{IRFG} : Initial guard-time between switching on RF field and start modulation to send command or data. The specification of T_{IRFG} is not part of this standard.

In **PCD MODE** the time between switching on the RF field and modulating the field to transmit data is specified in Clause 5 of ISO/IEC 14443-2.

In **VCD MODE** the time between switching on the RF field and modulating the field to transmit data is specified in Clause 7.3 of ISO/IEC 15693-2.