

**Standard** ECMA-352

3<sup>rd</sup> Edition / June 2013

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

**Standard**



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## Introduction

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.

Although ECMA-340, 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.

The 2<sup>nd</sup> edition adds support for the PICC mode from ISO/IEC 14443.

In 2009, JTC 1/SC 6 and JTC 1/SC 17 studied together for improving interoperability between ISO/IEC 21481 and ISO/IEC 14443. This second edition of ISO/IEC 21481 is revised based on the study, and the PICC mode is added to the existing three modes.

This 3<sup>rd</sup> edition is aligned with ISO/IEC 21481:2012.

This Ecma Standard has been adopted by the General Assembly of June 2013.

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

## 1 Scope

ECMA-340, ISO/IEC 14443 and ISO/IEC 15693 specify the radio frequency signal interface, initialization, 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 not to disturb any ongoing communication at 13,56 MHz, for devices implementing ECMA-340, 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 Standard.

## 2 Conformance

Conforming devices implement mode selection specified in Clause 7 and implement the NFC MODE, PCD MODE, VCD MODE, and PICC MODE.

## 3 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ECMA-340, *Near Field Communication — Interface and Protocol (NFCIP-1)*

ISO/IEC 14443-2:2010, *Identification cards — Contactless integrated circuit cards — Proximity cards — Part 2: Radio frequency power and signal interface*

ISO/IEC 14443-3:2011, *Identification cards — Contactless integrated circuits cards — Proximity cards — Part 3: Initialization and anticollision*

ISO/IEC 14443-4:2008, *Identification cards — Contactless integrated circuit cards — Proximity cards — Part 4: Transmission protocol*

ISO/IEC 15693-2:2006, *Identification cards — Contactless integrated circuit cards — Vicinity cards — Part 2: Air interface and initialization*

ISO/IEC 15693-3:2009, *Identification cards — Contactless integrated circuit cards — Vicinity cards — Part 3: Anticollision and transmission protocol*

## 4 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

### 4.1

**$H_{\text{THRESHOLD}}$**

minimum value of an external RF field

NOTE Adapted from ECMA-340, 4.6.

#### 4.2

##### **NFCIP-2 device**

ISO/IEC 21841 entity

#### 4.3

##### **NFC MODE**

mode in which an NFCIP-2 device operates as specified in ECMA-340

#### 4.4

##### ***f<sub>c</sub>***

frequency of operating field (carrier frequency) as specified in ISO/IEC 14443-2

#### 4.5

##### **PICC MODE**

mode in which an NFCIP-2 device operates as a Type A or Type B Proximity Integrated Circuit Card or Object as specified in ISO/IEC 14443-2, ISO/IEC 14443-3 and ISO/IEC 14443-4

#### 4.6

##### **PCD MODE**

mode in which an NFCIP-2 device operates as a Proximity Coupling Device as specified in ISO/IEC 14443-2, ISO/IEC 14443-3 and ISO/IEC 14443-4

#### 4.7

##### **VCD MODE**

mode in which an NFCIP-2 device operates as a Vicinity Coupling Device as specified in ISO/IEC 15693-2 and ISO/IEC 15693-3

## 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 detection

During external RF field detection, NFCIP-2 devices shall, for a period of  $T_{IDT} + n \times T_{RFW}$  (see 11.1.1 of ECMA-340), detect external RF fields at  $f_c$  with a value higher than  $H_{THRESHOLD}$  and shall not switch on their own RF field.

## 7 Mode selection and switching

Mode switching specifies the procedure for NFCIP-2 devices to enter the NFC MODE, or the PCD MODE or PICC MODE or VCD MODE selected prior to the following sequence.

NFCIP-2 devices shall execute the following sequence:

1. The NFCIP-2 device shall have its RF field switched off.
2. If the PICC MODE has been selected, the NFCIP-2 device shall enter the PICC MODE.
3. If the NFCIP-2 device detects an external RF field, as specified in Clause 6, it shall enter the NFC MODE as a Target.



4. If the NFCIP-2 device does not detect an external RF field and the NFC MODE has been selected, it shall enter the NFC MODE as an Initiator.
5. If the NFCIP-2 device does not detect an external RF field and the PCD MODE or the VCD MODE has been selected, it shall perform external RF field detection and Initial RF generation as specified in Clause 8.

Figure 1 illustrates the above procedure.

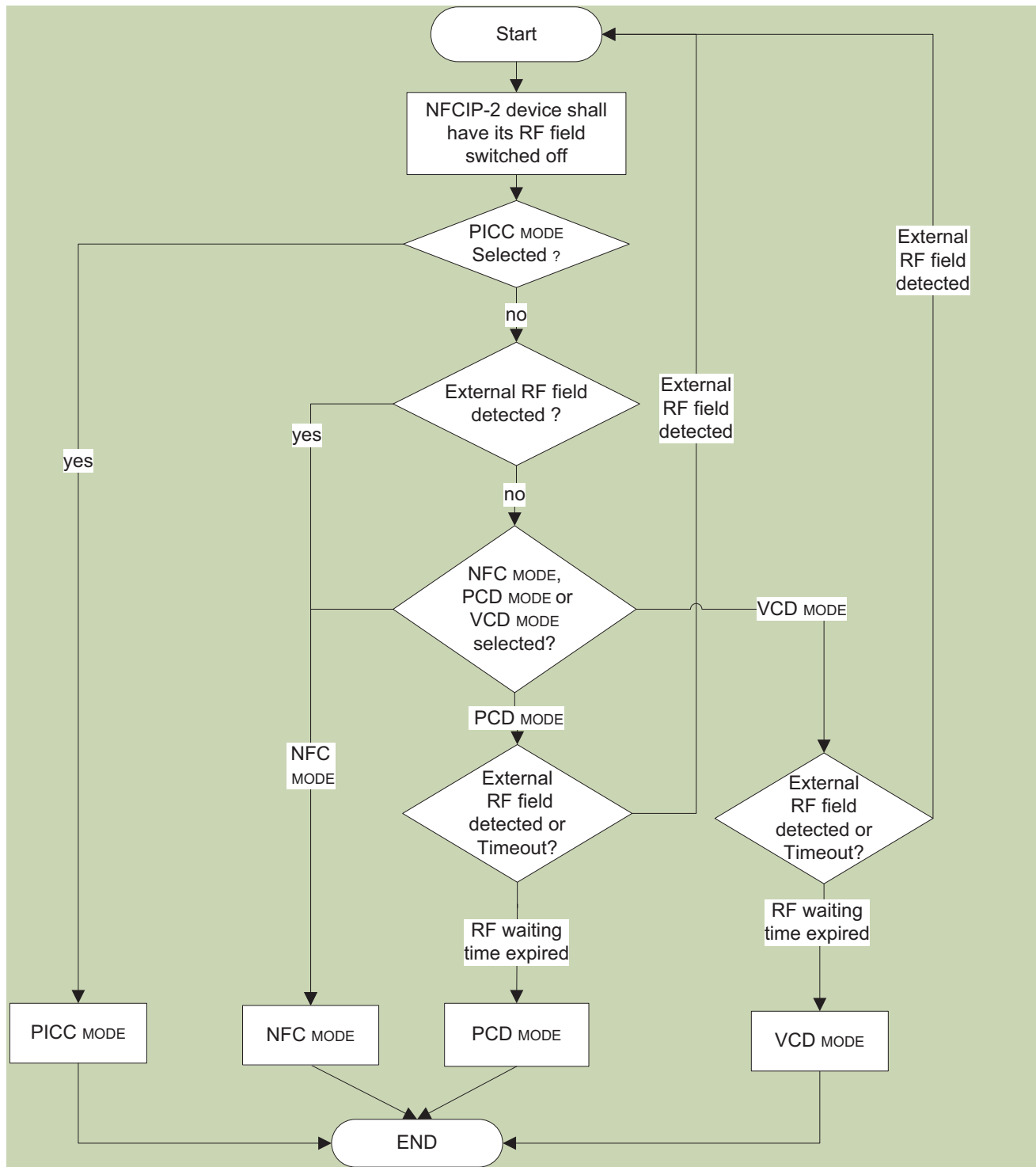


Figure 1 — Mode selection

## 8 External RF field detection and initial RF generation

When the NFCIP-2 device detects an external RF field, as specified in Clause 6, during the time  $T_{IDT} + n \times T_{RFW}$  it shall recommence the procedure specified in Clause 7.

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 while observing  $T_{IRFG}$ . See 11.1.1 of ECMA-340 for  $T_{IDT}$ ,  $T_{RFW}$  and  $n$ .  $T_{IRFG}$  is the initial guard-time between switching on RF field and starting modulation to send command or data. 5.1 of ISO/IEC 14443-3:2011 and 7.3 of ISO/IEC 15693-2:2006 specify  $T_{IRFG}$  for PCD MODE and VCD MODE, respectively.

Figure 2 illustrates the external RF field detection and initial RF generation.

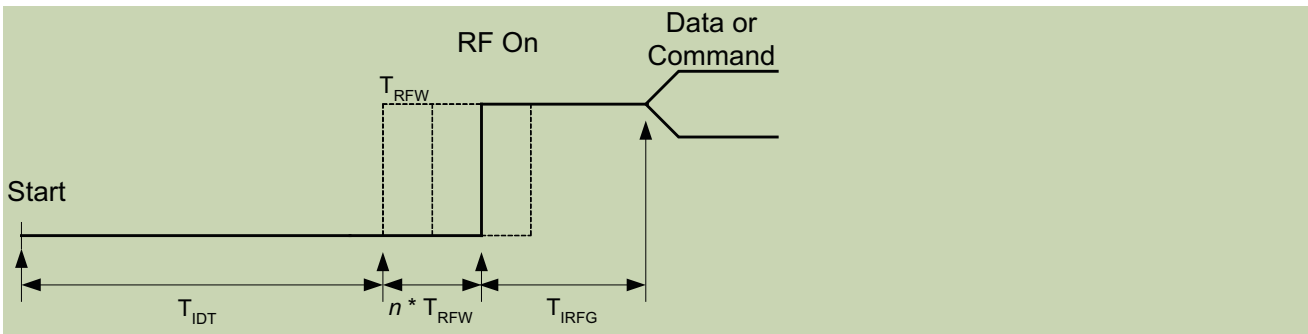


Figure 2 — RF detection and initial RF generation for PCD MODE and VCD MODE



