ecma INTERNATIONAL

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# Front-End Configuration Command for NFC-WI (NFC-FEC)

Standard

Rue du Rhône 114 CH-1204 Geneva T: +41 22 849 6000 F: +41 22 849 6001

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## Introduction

ECMA-373 specifies a two-wire interface for which this Standard defines commands, responses and their transmission, allowing the exchange of control and state information between the transceiver and the front-end as specified in ECMA-373. Such exchange may include: indication of the presence of the RF field and control information to change data rates and communication modes of the Front-end.

This 2nd edition is fully aligned with the 1st edition of ISO/IEC 16353:2011.

This Ecma Standard has been adopted by the General Assembly of June 2012.

# Front-End Configuration Command for NFC-WI (NFC-FEC)

## 1 Scope

This Standard specifies commands for NFC-WI (ECMA-373). The commands allow exchange of control and state information between the Transceiver and the Front-end.

## 2 Conformance

To conform to this Standard, an NFC-FEC device shall conform to all mandatory parts specified herein and all mandatory parts of ECMA-373 (NFC-WI).

## 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-373, Near Field Communication Wired Interface (NFC-WI)

## 4 Terms and definitions

For the purposes of this Standard, the terms and definitions in ECMA-373 apply.

## 5 Conventions and notations

For the purposes of this Standard the conventions and notations in ECMA-373 apply.

## 6 Acronyms

For the purposes of this Standard the acronyms in ECMA-373 apply.

## 7 States

NFC-FEC extends the compound NFC-WI Command state with the Escape, Quite, “Command Ready” and “Command Busy” sub-states as specified in Figure 1.

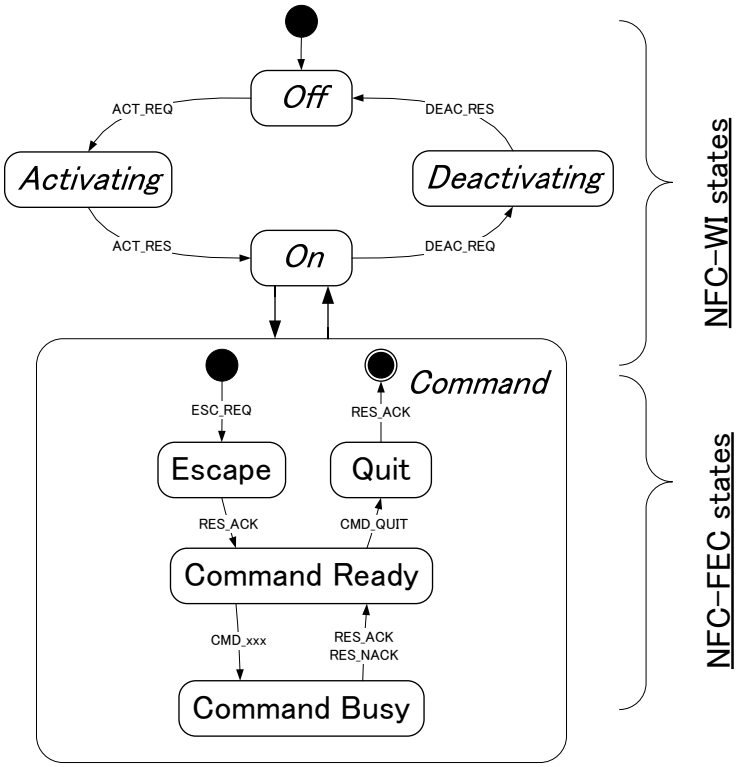


**Figure 1 — NFC-WI states and NFC-FEC sub-states**

### 7.1 Escape state

NFC-FEC shall move from the NFC-WI ON state to Escape by the Escape sequence (ESC_REQ) as defined in ECMA-373, 9.5.1. NFC-FEC shall move from Escape to Command Ready after receiving RES_ACK or after expiry of the timeout specified in 8.4.

### 7.2 Command Ready state

NFC-FEC allows transmission of commands in the Command Ready state. After submission of a command, NFC-FEC shall move to Command Busy state.

CMD_QUIT or expiry of the timeout specified in 8.4 shall move NFC-FEC to the Quit state.

### 7.3 Command Busy state

When a response is transmitted, or after expiry of the timeout specified in 8.4, NFC-FEC shall move back to Command Ready state.

### 7.4 Quit state

Reception of RES_ACK or after expiry of the timeout specified in 8.4, NFC-FEC shall move to ON.

## 8 Commands and Responses

### 8.1 Command and response Format

The command and response format is specified in Figure 2, the data field is optional and of arbitrary length.

| | | |
|---|---|---|
| 8 bit header | Data | 8 bit checksum |

**Figure 2 — Command and Response format**

## 8.2 Checksum

The checksum shall be the bytewise exclusive OR of the Initialization Vector (11111111) and the Header and the Data.

The receiver shall respond with RES_NACK if it receives a wrong checksum.

## 8.3 Commands

Table 1 specifies the coding of commands.

Undefined commands are RFU and their use is prohibited.

**Table 1 — Coding of Commands**

| Command Header | Name | Description | Expected Response |
|---|---|---|---|
| 0001 1111 | CMD_QUIT | Quit | ACK or NACK |
| 0000 0000 | CMD_NOP | No operation | ACK or NACK |
| 0000 0001 | CMD_IMP_106 | Set Initiator passive communication mode 106kbps | ACK or NACK |
| 0000 0010 | CMD_IMP_212 | Set Initiator passive communication mode 212kbps | ACK or NACK |
| 0000 0011 | CMD_IMP_424 | Set Initiator passive communication mode 424kbps | ACK or NACK |
| 0000 1001 | CMD_IMA_106 | Set Initiator active communication mode 106kbps | ACK or NACK |
| 0000 1010 | CMD_IMA_212 | Set Initiator active communication mode 212kbps | ACK or NACK |
| 0000 1011 | CMD_IMA_424 | Set Initiator active communication mode 424kbps | ACK or NACK |
| 0000 1100 | CMD_IMA_847 | Set Initiator active communication mode 847kbps | ACK or NACK |
| 0000 1101 | CMD_IMA_1695 | Set Initiator active communication mode 1695kbps | ACK or NACK |
| 0000 1110 | CMD_IMA_3390 | Set Initiator active communication mode 3390kbps | ACK or NACK |
| 0000 1111 | CMD_IMA_6780 | Set Initiator active communication mode 6780kbps | ACK or NACK |
| 0000 0100 | CMD_TM | Set Target communication mode | ACK or NACK |
| 0000 0101 | CMD_RF_OFF | Switch RF field OFF | ACK or NACK |
| 0000 0110 | CMD_RF_ON | Switch RF field on | ACK or NACK |
| 0001 0000 | CMD_WR | Write register, followed by two data bytes (register address, value) | ACK or NACK |
| 0001 0010 | CMD_RR | Read register, followed by one data byte (address); | 1 byte |
| 0001 0001 | CMD_WB | Write block, followed by six data bytes (2 bytes address, 4 bytes value) | ACK or NACK |
| 0001 0011 | CMD_RB | Read block, followed by two data byte (address); | 4 bytes |
| 0001 0100 | CMD_GS | Get status; reply shall be four data bytes | 4 bytes |

## 8.4 Responses

Table 2 specifies the coding of responses.

Undefined responses are RFU and their use prohibited.

**Table 2 — Coding of Responses**

| Header | Name | Description |
|---|---|---|
| 1010 0101 | RES_ACK | ACK (no data) |
| 1010 1010 | RES_NACK | NACK |
| 1010 1001 | RES_DATA | Data |

In case the expected response is ACK or NACK, then any response different to ACK shall be handled as NACK.

For all commands the response timeout is 2 ms.

# 9 Information-Transfer

The commands and responses as specified in 8 shall be transmitted between a “Start of communication” and “End of communication” symbol specified in 9.1 and 9.2 respectively.

The odd parity bit P shall be set such that the number of ONEs is odd in (bit 1 to bit 8, P).

## 9.1 Transceiver Frames

The transceiver shall use Manchester encoding as defined in ECMA-373, 10.1 and the bit coding for $f_{CLK}/128$ as defined in ECMA-373, 10.3.2.

Transceiver frames shall use the following framing.

- Start of communication: ONE.
- n *(8 data bits (ZERO or ONE) + odd parity bit with n>=1). The LSB of each byte is transmitted first.
- End of communication: HIGH for one bit duration.

## 9.2 Front-end Frames

The RF Front-end shall use Modified Miller encoding as defined in ECMA-373, 10.2 and the bit coding for a bit rate of . $f_{CLK}/128$ as defined in ECMA-373, 10.3.1.

Front-end frames shall use the following framing.

- Start of communication: ZERO.
- n *(8 data bits (ZERO or ONE) + odd parity bit with n>=1). The LSB of each byte is transmitted first.
- End of communication: ZERO followed by no gating for two bit durations.