

**Standard** ECMA-390

2<sup>nd</sup> Edition / June 2012

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

**Standard**



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

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

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# 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.

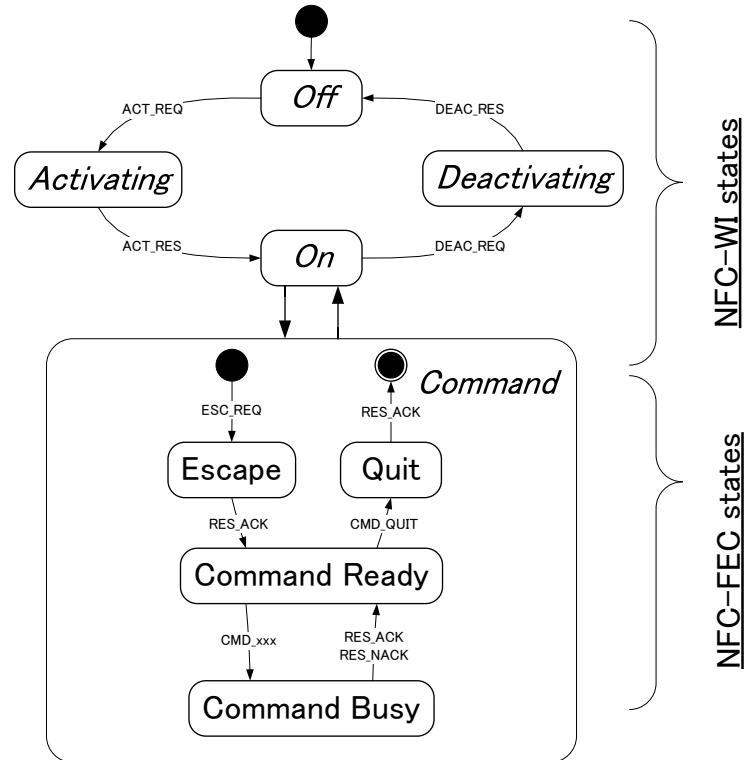


Figure 1 — NFC-WI states and NFC-FEC sub-states

### 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

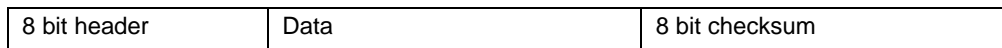
Reception of RES\_ACK or after expiry of the timeout specified in 8.4, NFC-FEC shall move to ON.

## 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.





**Figure 2 — Command and Response format**

## **8.2 Checksum**

The checksum shall be the bitwise 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 bytes (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  $n \geq 1$ ). 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  $n \geq 1$ ). The LSB of each byte is transmitted first.
- End of communication: ZERO followed by no gating for two bit durations.

