
**Identification cards — Contactless
integrated circuit cards — Proximity
cards —**

**Part 4:
Transmission protocol**

iTeh STANDARD PREVIEW
*Cartes d'identification — Cartes à circuit(s) intégré(s) sans contact —
Cartes de proximité —
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Partie 4: Protocole de transmission*

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Contents

Page

Foreword.....	v
Introduction	vi
1 Scope	1
2 Normative references	1
3 Terms and definitions.....	1
4 Symbols and abbreviated terms	2
5 Protocol activation of PICC Type A	4
5.1 Request for answer to select.....	5
5.2 Answer to select	6
5.2.1 Structure of the bytes.....	7
5.2.2 Length byte.....	7
5.2.3 Format byte	7
5.2.4 Interface byte TA(1)	8
5.2.5 Interface byte TB(1)	9
5.2.6 Interface byte TC(1)	9
5.2.7 Historical bytes	10
5.3 Protocol and parameter selection request.....	10
5.3.1 Start byte	10
5.3.2 Parameter 0	11
5.3.3 Parameter 1	11
5.4 Protocol and parameter selection response.....	12
5.5 Activation frame waiting time.....	12
5.6 Error detection and recovery.....	12
5.6.1 Handling of RATS and ATS.....	12
5.6.2 Handling of PPS request and PPS response	13
5.6.3 Handling of the CID during activation	13
6 Protocol activation of PICC Type B	14
7 Half-duplex block transmission protocol	14
7.1 Block format	14
7.1.1 Prologue field	15
7.1.2 Information field	18
7.1.3 Epilogue field	18
7.2 Frame waiting time	18
7.3 Frame waiting time extension	18
7.4 Power level indication	19
7.5 Protocol operation	20
7.5.1 Multi-Activation	20
7.5.2 Chaining.....	20
7.5.3 Block numbering rules	21
7.5.4 Block handling rules.....	22
7.5.5 PICC presence check	23
7.5.6 Error detection and recovery.....	23
8 Protocol deactivation of PICC Type A and Type B.....	24
8.1 Deactivation frame waiting time	24
8.2 Error detection and recovery.....	24
Annex A (informative) Multi-Activation example.....	25

Annex B (informative) Protocol scenarios	26
B.1 Notation	26
B.2 Error-free operation	26
B.2.1 Exchange of I-blocks	26
B.2.2 Request for waiting time extension	27
B.2.3 DESELECT	27
B.2.4 Chaining	27
B.2.5 PICC Presence check	28
B.3 Error handling	29
B.3.1 Exchange of I-blocks	29
B.3.2 Request for waiting time extension	30
B.3.3 DESELECT	32
B.3.4 Chaining	32
Annex C (informative) Block and frame coding overview	35
Bibliography	37

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[ISO/IEC 14443-4:2008](https://standards.iteh.ai/catalog/standards/sist/79a3c58a-50d3-4386-a616-19cea8435805/iso-iec-14443-4-2008)
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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of the joint technical committee is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

ISO/IEC 14443-4 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology, Subcommittee SC 17, Cards and personal identification*.

This second edition cancels and replaces the first edition (ISO/IEC 14443-4:2001). It also incorporates the Amendment ISO/IEC 14443-4:2001/Amd.1:2006.

ISO/IEC 14443 consists of the following parts, under the general title *Identification cards — Contactless integrated circuit cards — Proximity cards*:

- *Part 1: Physical characteristics* [ISO/IEC 14443-4:2008](https://standards.iteh.ai/catalog/standards/sist/79a3c58a-50d3-4386-a616-19cea8435805/iso-iec-14443-4-2008)
- *Part 2: Radio frequency power and signal interface*
- *Part 3: Initialization and anticollision*
- *Part 4: Transmission protocol*

Introduction

ISO/IEC 14443 is one of a series of International Standards describing the parameters for identification cards as defined in ISO/IEC 7810, and the use of such cards for international interchange.

The protocol as defined in this part of ISO/IEC 14443 is capable of transferring the application protocol data units as defined in ISO/IEC 7816-4. Thus, application protocol data units may be mapped as defined in ISO/IEC 7816-4 and application selection may be used as defined ISO/IEC 7816-5.

ISO/IEC 14443 is intended to allow operation of proximity cards in the presence of other contactless cards conforming to ISO/IEC 10536 and ISO/IEC 15693 and Near Field Communication (NFC) devices conforming to ISO/IEC 18092 and ISO/IEC 21481.

The International Organization for Standardization (ISO) and International Electrotechnical Commission (IEC) draw attention to the fact that it is claimed that compliance with this document may involve the use of patents.

ISO and IEC take no position concerning the evidence, validity and scope of these patent rights.

The holders of these patent rights have assured ISO and IEC that they are willing to negotiate licences under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statements of the holders of these patent rights are registered with the ISO and IEC. Information may be obtained from:

US Patent US5359323

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A system and method for the non-contact transmission of data

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Attention is drawn to the possibility that some of the elements of this part of ISO/IEC 14443 may be the subject of patent rights other than those identified above. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

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Identification cards — Contactless integrated circuit cards — Proximity cards —

Part 4: Transmission protocol

1 Scope

This part of ISO/IEC 14443 specifies a half-duplex block transmission protocol featuring the special needs of a contactless environment and defines the activation and deactivation sequence of the protocol.

This part of ISO/IEC 14443 is intended to be used in conjunction with other parts of ISO/IEC 14443 and is applicable to proximity cards or objects of Type A and Type B.

2 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.

ISO/IEC 7816-3, *Identification cards — Integrated circuit cards — Part 3: Cards with contacts — Electrical interface and transmission protocols*

ISO/IEC 7816-4, *Identification cards — Integrated circuit cards — Part 4: Organization, security and commands for interchange*

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

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

3 Terms and definitions

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

3.1

bit duration

one elementary time unit (etu), calculated by the following formula:

$$1 \text{ etu} = 128 / (D \times fc)$$

the initial value of the divisor D is 1, giving the initial etu as follows:

$$1 \text{ etu} = 128 / fc$$

where *fc* is the carrier frequency as defined in ISO/IEC 14443-2.

**3.2
block**

special type of frame, which contains a valid protocol data format

NOTE A valid protocol data format includes I-blocks, R-blocks or S-blocks.

**3.3
invalid block**

type of frame, which contains an invalid protocol format

NOTE A time-out, when no frame has been received, is not interpreted as an invalid block.

**3.4
frame**

sequence of bits as defined in ISO/IEC 14443-3

NOTE The PICC Type A uses the standard frame defined for Type A and the PICC Type B uses the frame defined for Type B.

4 Symbols and abbreviated terms

ACK	positive ACKnowledgement
ATS	Answer To Select
ATQA	Answer To reQuest, Type A
ATQB	Answer To reQuest, Type B
CID	Card IDentifier
CRC	Cyclic Redundancy Check, as defined for each PICC Type in ISO/IEC 14443-3
CRC1	most significant byte of CRC (b16 to b9)
CRC2	least significant byte of CRC (b8 to b1)
D	Divisor
DR	Divisor Receive (PCD to PICC)
DRI	Divisor Receive Integer (PCD to PICC)
DS	Divisor Send (PICC to PCD)
DSI	Divisor Send Integer (PICC to PCD)
EDC	Error Detection Code
etu	elementary time unit
<i>fc</i>	carrier frequency
FSC	Frame Size for proximity Card
FSCI	Frame Size for proximity Card Integer
FSD	Frame Size for proximity coupling Device

FSDI	Frame Size for proximity coupling Device Integer
FWI	Frame Waiting time Integer
FWT	Frame Waiting Time
FWT _{TEMP}	temporary Frame Waiting Time
HLTA	HALT command, Type A
I-block	Information block
INF	INformation Field
MAX	index to define a maximum value
MIN	index to define a minimum value
NAD	Node ADdress
NAK	Negative AcKnowledgement
OSI	Open Systems Interconnection
PCB	Protocol Control Byte
PCD	Proximity Coupling Device
PICC	proximity card or object
PPS	Protocol and Parameter Selection
PPSS	Protocol and Parameter Selection Start
PPS0	Protocol and Parameter Selection parameter 0
PPS1	Protocol and Parameter Selection parameter 1
R-block	Receive ready block
R(ACK)	R-block containing a positive acknowledge
R(NAK)	R-block containing a negative acknowledge
RATS	Request for Answer To Select
REQA	REQuest Command, Type A
RFU	Reserved for Future Use by ISO/IEC
S-block	Supervisory block
SAK	Select AcKnowledge
SFGI	Start-up Frame Guard time Integer
SFGT	Start-up Frame Guard Time
WUPA	Wake-UP command, Type A

- WTX Waiting Time eXtension
- WTXM Waiting Time eXtension Multiplier

For the purposes of this document, the following notation applies:

- (xxxxx)b Data bit representation;
- 'XY' Hexadecimal notation, equal to XY to the base 16.

5 Protocol activation of PICC Type A

The following activation sequence shall be applied:

- PICC activation sequence as defined in ISO/IEC 14443-3 (request, anticollision loop and select).
- The SAK byte shall be checked for availability of an ATS. The SAK is defined in ISO/IEC 14443-3.
- The PICC may be set to HALT state, using the HLTA Command as defined in ISO/IEC 14443-3, if no ATS is available.
- The RATS may be sent by the PCD as next command after receiving the SAK if an ATS is available.
- The PICC shall send its ATS as answer to the RATS. The PICC shall only answer to the RATS if the RATS is received directly after the selection.
- If the PICC supports any changeable parameters in the ATS, a PPS request may be used by the PCD as the next command after receiving the ATS to change parameters.
- The PICC shall send a PPS Response as answer to the PPS request.

A PICC does not need to implement the PPS, if it does not support any changeable parameters in the ATS.

The PCD activation sequence for a PICC Type A is shown in Figure 1.

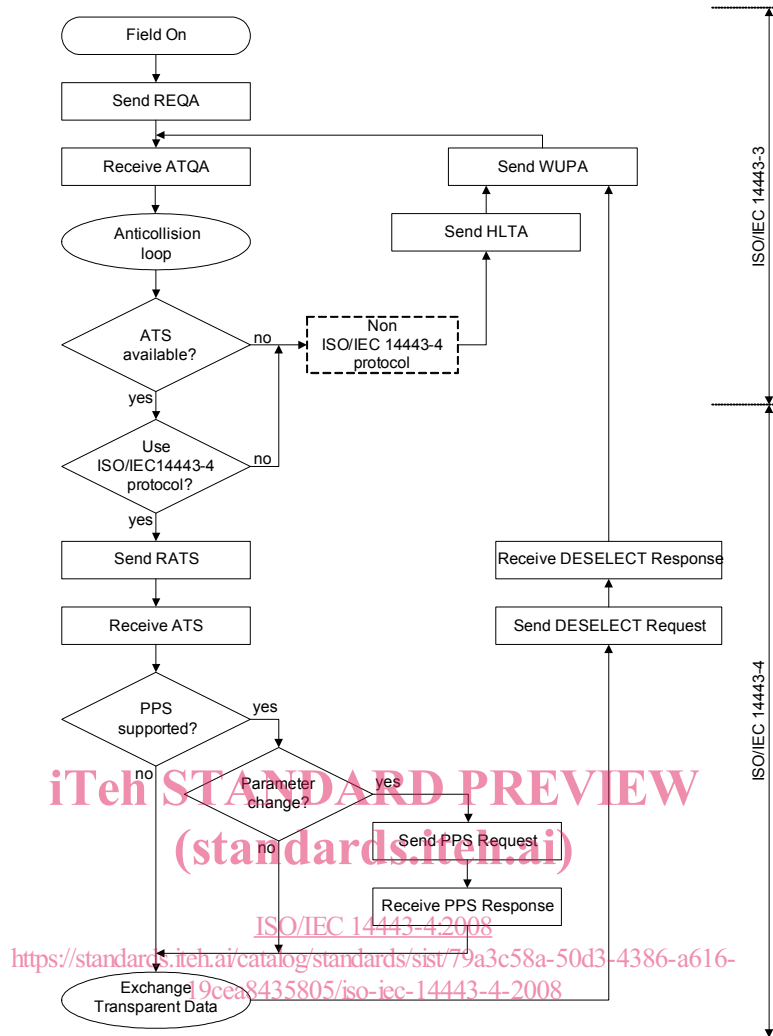


Figure 1 — Activation of a PICC Type A by a PCD

5.1 Request for answer to select

This clause defines the RATS with all its fields (see Figure 2).

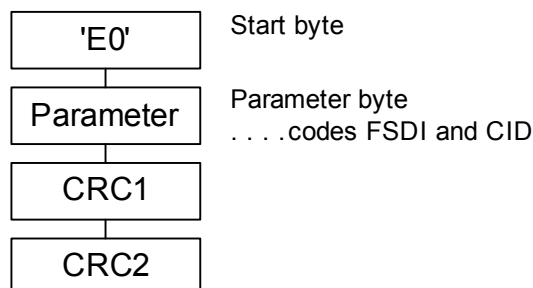


Figure 2 — Request for answer to select

The parameter byte consists of two parts (see Figure 3):

- The most significant half-byte b8 to b5 is called FSDI and codes FSD. The FSD defines the maximum size of a frame the PCD is able to receive. The coding of FSD is given in Table 1.