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Identification cards — Integrated circuit cards —

Part 3: Electrical interface and transmission protocols

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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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 7816-3 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 17, *Cards and security devices for personal identification*.

This fourth edition cancels and replaces the third edition (ISO/IEC 7816-3:2006), which has been technically revised.

This edition differs in the following ways form the previous edition:

— Incorporate Amendment ISO/IEC 7816-3:2006/Amd.1:2024

A list of all parts of ISO/IEC 7816 series can be found on the ISO website.

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Introduction

ISO/IEC 7816 is a series of standards specifying integrated circuit cards and the use of such cards for interchange. These cards are identification cards intended for information exchange negotiated between the outside world and the integrated circuit in the card. As a result of an information exchange, the card delivers information (computation result, stored data), and/or modifies its content (data storage, event memorization).

The following parts are specific to cards with galvanic contacts and three of them specify electrical interfaces.

— ISO/IEC 7816-2 specifies dimensions and location of the contacts.

— ISO/IEC 7816-3 specifies electrical interface and transmission protocols for asynchronous cards.

NOTE The first and second editions of ISO/IEC 7816-3 specified an optional use of contact C6 to provide the card with programming power required to write or to erase internal non-volatile memory. As every card manufactured since 1990 internally generates programming power, the third edition deprecates this use, as well as the related indications in the Answer-to-Reset and the related controls in each transmission protocol.

— ISO/IEC 7816-10 specifies electrical interface and answer to reset for synchronous cards.

— ISO/IEC 7816-12 specifies electrical interface and operating procedures for USB cards.

All the other parts are independent of the physical interface technology. They apply to cards accessed by one or more of the following methods: contacts, close coupling and radio frequency.

ISO/IEC 10536[3] specifies access by close coupling. ISO/IEC 14443[5] and ISO/IEC 15693[6] specify access by radio frequency. Such cards are also known as contactless cards.

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Patent holder	Patent number	Details	Foreign equivalents
Toshiba Corporation Intellectual Property Division 1-1, Shibaura 1-Chome Minato-ku, Tokyo 105-8001, Japan	JPN 2537199	*Integrated circuit card,* (priority date: 1986-06-20; publication date: 1996-07-08)	FRA 8708646, FRA 8717770, USA 4833595, USA 4901276
	USA 5161231	*Processing system which transmits a predetermined error code upon detection of an incorrect transmission code,* (priority date: 1991-03-12; publication date: 1992-11-03)	FRA 8713306, FRA 9209880

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Identification cards — Integrated circuit cards —

Part 3:
Electrical interface and transmission protocols

1 Scope

This part of ISO/IEC 7816 specifies the power and signal structures, and information exchange between an integrated circuit card and an interface device such as a terminal.

It also covers signal rates, voltage levels, current values, parity convention, operating procedure, transmission mechanisms and communication with the card.

It does not cover information and instruction content, such as identification of issuers and users, services and limits, security features, journaling and instruction definitions.

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 7816-2, *Identification cards — Integrated circuit cards — Part 2: Cards with contacts — Dimensions and location of the contacts*

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

3 Terms and definitions

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

3.1
block
byte string comprising two or three fields defined as prologue field, information field and epilogue field

3.2
class of operating conditions
set of values for voltage and current

3.3
cold reset
first reset occurring after activation

3.4
destination node address
portion of the node address byte, identifying the intended receiver of the block

3.5
elementary time unit
nominal duration of a moment within an asynchronous character

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3.6
epilogue field
final field of a block, conveying the error detection code

3.7
identification card
card identifying its holder and issuer, which may carry data required as input for the intended use of the card and for transactions based thereon

[SOURCE: ISO/IEC 7810[2]]

3.8
information block
block whose primary purpose is to convey application layer information

3.9
information field
field of a block, conveying data, generally application data

3.10
interface device
terminal, communication device or machine to which the card is electrically connected during operation

3.11
length byte
portion of the prologue field, encoding the number of bytes in the information field of the block

3.12
node address byte
portion of the prologue field, indicating both destination and source addresses of the block

3.13
operating card
card that can correctly carry out all its functions

3.14
procedure byte
byte transmitted by the card for indicating the progression of a T=0 command and controlling the exchange of data bytes

3.15
prologue field
first field of a block, consisting of three bytes defined as node address, protocol control and length

3.16
protocol control byte
portion of the prologue field, encoding transmission control information

3.17
receive ready block
block conveying the send-sequence number of the expected I-block, used as a positive or negative acknowledgment

3.18
redundancy code
content of the epilogue field, computed from all the bytes in the prologue field and in the information field

3.19
source node address
portion of the node address byte, identifying the transmitter of the block

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3.20
supervisory block
block conveying transmission control information

3.21
transmission control
function used to control the data transmission between the interface device and the card, including block transmission with sequence control, synchronization and recovery of transmission errors

3.22
warm reset
any reset that is not a cold reset

4 Symbols and abbreviated terms

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

A, B, C, D	classes of operating conditions
APDU	application protocol data unit
BGT	block guard time
BWI	block waiting time integer
BWT	block waiting time
CGT	character guard time
C_{IN}	input capacitance
CLA	class byte
CLK	clock contact
C_{OUT}	output capacitance
CRC	cyclic redundancy code
CWI	character waiting time integer
CWT	character waiting time
(C(6) C(7))	value of the concatenation of bytes C(6) and C(7) (the first byte is the most significant byte)
D	baud rate adjustment integer
DAD	destination node address
Dd, Di, Dn	default values, indicated values and negotiated values of *D*
etu	elementary time unit
F	clock rate conversion integer
f	frequency value of the clock signal provided to the card by the interface device
Fd, Fi, Fn	default values, indicated values and negotiated values of *F*
GND	ground contact

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