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Identification cards — Integrated circuit(s) cards with contacts —

Part 10: Electronic signals and answer to reset for synchronous cards

Cartes d'identification — Cartes à circuit(s) intégré(s) à contacts —

Partie 10: Signaux électroniques et réponse à la mise à zéro des cartes synchrones

Reference number
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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. 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.

Attention is drawn to the possibility that some of the elements of this part of ISO/IEC 7816 may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

International Standard ISO/IEC 7816-10 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 17, *Identification cards and related devices*.

ISO/IEC 7816 consists of the following parts, under the general title *Identification cards — Integrated circuit(s) cards with contacts*:

— *Part 1: Physical characteristics*

— *Part 2: Dimensions and location of the contacts*

— *Part 3: Electronic signals and transmission protocols*

— *Part 4: Interindustry commands for interchange*

— *Part 5: Numbering system and registration procedure for application identifiers*

— *Part 6: Interindustry data elements*

— *Part 7: Interindustry commands for Structured Card Query Language (SCQL)*

— *Part 8: Security related interindustry commands*

— *Part 9: Additional interindustry commands and security attributes*

— *Part 10: Electronic signals and answer to reset for synchronous cards*

Annexes A and B of this part of ISO/IEC 7816 are for information only.

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Introduction

This part of ISO/IEC 7816 is one of a series of standards describing the parameters for integrated circuit(s) cards with contacts and the use of such cards for international interchange.

These cards are identification cards intended for information exchange negotiated between the outside and the integrated circuit in the card. As a result of an information exchange, the card delivers information (computation results, stored data) and/or modifies its content (data storage, event memorization).

During the preparation of this part of ISO/IEC 7816, information was gathered concerning relevant patents upon which application of this standard might depend. Relevant patents were identified in France and USA, the patent holder being Bull S.A. in each case. However, ISO cannot give authoritative or comprehensive information about evidence, validity or scope of patents or like rights.

The patent holder has stated that licenses will be granted in appropriate terms to enable application of this part of ISO/IEC 7816, provided that those who seek licenses agree to reciprocate.

Further information is available from:

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Identification cards — Integrated circuit(s) cards with contacts —

Part 10:
Electronic signals and answer to reset for synchronous cards

1 Scope

This part of ISO/IEC 7816 specifies the power, signal structures, and the structure for the answer to reset between an integrated circuit(s) card with synchronous transmission and an interface device such as a terminal.

The specifications in ISO/IEC 7816-3 apply where appropriate, unless otherwise stated here.

It also covers signal rates, operating conditions, and communication with the integrated circuit(s) card.

This part of ISO/IEC 7816 specifies two types of synchronous cards: type 1 and type 2.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO/IEC 7816. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO/IEC 7816 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 1177:1985, *Information processing — Character structure for start/stop and synchronous character oriented transmission*.

ISO/IEC 7810:1995, *Identification cards — Physical characteristics*.

ISO/IEC 7816-2:1999, *Information technology — Identification cards — Integrated circuit(s) cards with contacts — Part 2: Dimensions and location of the contacts*.

ISO/IEC 7816-3:1997, *Information technology — Identification cards — Integrated circuit(s) cards with contacts — Part 3: Electronic signals and transmission protocols.*

ISO/IEC 7816-4:1995, *Information technology — Identification cards — Integrated circuit(s) cards with contacts — Part 4: Interindustry commands for interchange*.

ISO/IEC 7816-4:1995/Amd.1:1997, *Information technology — Identification cards — Integrated circuit(s) cards with contacts — Part 4: Interindustry commands for interchange — Amendment 1: Impact of secure messaging on the structures of APDU messages.*

3 Term and definition

For the purposes of this part of ISO/IEC 7816, the following term and definition applies.

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3.1
interface device
a terminal, communication device or machine to which the integrated circuit(s) card is electrically connected during operation

[ISO/IEC 7816-3:1998, 3.1.1]

4 Symbols and abbreviated terms

For the purposes of this part of ISO/IEC 7816, the following notation applies:

state H: High state logic level,

state L: Low state logic level,

state Z: Mark (as defined in ISO 1177),

state A: Space (as defined in ISO 1177),

'XY': Hexadecimal notation, equal to XY to the base 16.

5 Electrical characteristics of the contacts

5.1 Contact assignments

In addition to those contacts assigned in ISO/IEC 7816-2 the contact C4 is assigned to function code (FCB) for type 2 synchronous cards. FCB is used in conjunction with RST in order to indicate the type of command to be executed in the card (e.g. reset, read, write).

5.2 Voltage and current values

All voltage and current values are those defined in ISO/IEC 7816-3 for class A operating conditions. The electrical characteristics of the FCB contact (synchronous card type 2) are the same of those of RST contact.

5.3 Card type selection

The interface device may start with type 1 or type 2 operating conditions. If the card does not provide an Answer-to-Reset, or provides an inconsistent answer (see subclause 7.4), then the interface device shall deactivate the contacts and, after a delay of at least 10 ms, may apply other operating conditions.

6 Reset of the card

6.1 Synchronous card type 1

The interface device sets all lines to state L. See figure 1. VCC is then powered, VPP is set to idle state, CLK and RST remain in state L, I/O is put in reception mode in the interface device. RST shall be maintained in state H for at least 50 µs (t_{12}), before returning to state L again. The maximum value for fall/rise time is 0,5 µs (t_f and t_r in figures 1 and 2).

The clock pulse is applied after an interval (t_{10}) from the rising edge of the reset signal. The duration for the state H of the clock pulse can be any value between 10 µs and 50 µs; no more than one clock pulse during reset high is allowed. The time interval between the falling edges on CLK and RST is t_{11}.

The first data bit is obtained as an answer on I/O while CLK is in state L and is valid after an interval t_{13} from the falling edge on RST.

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6.2 Synchronous card type 2

The interface device sets all the lines to state L. See figure 2. VCC is then powered, VPP is set to idle state, CLK, RST and FCB remain in state L, I/O is put in reception mode in the interface device. The clock pulse is applied after an interval (t_{20}) from the rising edge of the VCC. The duration of the clock pulse is t_{25}. FCB shall be maintained to L at least during the time t_{22} after the rising edge of clock pulse.

The first data bit is obtained as an answer on I/O while CLK is in state L and is valid after an interval t_{27} from the falling edge of CLK.

When FCB is set to state H, each clock pulse allows the reading on I/O of the next data bit.

7 Answer-to-Reset

In synchronous transmission, a series of bits is transmitted on the I/O line in half duplex mode in synchronization with the clock signal on CLK.

7.1 Clock frequency and bit rate

There is a linear relationship between the bit rate on the I/O line and the clock frequency delivered by the interface device on CLK e.g. a clock frequency of 7 kHz corresponds to 7 kbit/s.

The maximum value for fall/rise time is 0,5 µs (t_r and t_f in figures 1 and 2).

For card type 1 - any frequency below 50 kHz may be used.

For card type 2 - any frequency below 280 kHz may be used.

7.2 Structure of the Answer-to-Reset header

The reset operation results in an answer from the card containing a header transmitted from the card to the interface. The header has a fixed length of 32 bits and begins with two mandatory fields of 8 bits, H1 and H2.

The chronological order of transmission of the information bits shall correspond to bit identification b1 to b32 with the least significant bit transmitted first. The numerical meaning corresponding to each information bit considered in isolation is that of the digit

— 0 for a unit corresponding to state A (space);

— 1 for a unit corresponding to state Z (mark).

7.3 Timing of the header

7.3.1 Synchronous card type 1

After the reset procedure, see 6.1, the output information is controlled by clock pulses. The first clock pulse is applied between 10 µs and 100 µs (t_{14}) after the falling edge on RST. The duration of state H of clock pulses can be varied between 10 µs and 50 µs (t_{15}) and the duration of state L between 10 µs and 100 µs (t_{16}).

The first data bit is obtained as defined in 6.1. The second and the following data bits are valid between t_{17} measured from the falling edge on CLK. The data bits can therefore be sampled at the rising edge of subsequent clock pulses.

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7.3.2 Synchronous card type 2

After the reset procedure, see 6.2, the output information is controlled by clock pulses. The first clock pulse is applied at t_{24} measured from the rising edge on FCB. The duration of state H of clock pulses is t_{25} and the duration of state L is at least 1 µs (t_{26}).

The first data bit is obtained as defined in 6.2. The second and the following data bits are obtained on I/O while the clock is low and are valid between the time t_{27} (measured from the falling edge on CLK) and the next falling edge on CLK. The data bits can therefore be sampled at the rising edge of subsequent clock pulses.

7.4 Data content of the header

The header comprises four fields (H1 to H4) and allows an early determination of whether the card and the interface device are compatible. If there is no compatibility, the contacts shall be deactivated according to clause 8.

The first field H1 codes the protocol type. The values of the codes and the corresponding protocol types are specified in table 1.

Table 1 — Coding of H1

b 8	b 7	b 6	b 5	b 4	b 3	b 2	b 1	Meaning
0	0	0	0	0	0	0	0	Not to be used
0	x	x	x	0	0	0	0	Reserved for protocols defined by ISO/IEC JTC1/SC17
x	x	x	x	x	x	x	1	Structure and coding of H1 and H2 assigned by registration authority
1	1	1	1	1	1	1	1	Not to be used
Other values								Proprietary

The second field H2 codes parameters for the protocol type coded in field H1. The values of H2 are to be assigned by ISO/IEC JTC 1/SC17, if H1 = ´x0´ (x = 1, ..., 7).

The specification of H3 and H4 falls outside the scope of this part of ISO/IEC 7816.

8 Deactivation of the contacts

When information exchange is terminated or aborted (unresponsive card or detection of card removal), the electrical contacts shall be deactivated. The deactivation by the interface device shall consist of the consecutive operations (RST is already in state L):

- State L on CLK,
- State L on FCB (card type 2 only),
- VPP inactive,
- State A on I/O,
- VCC inactive.

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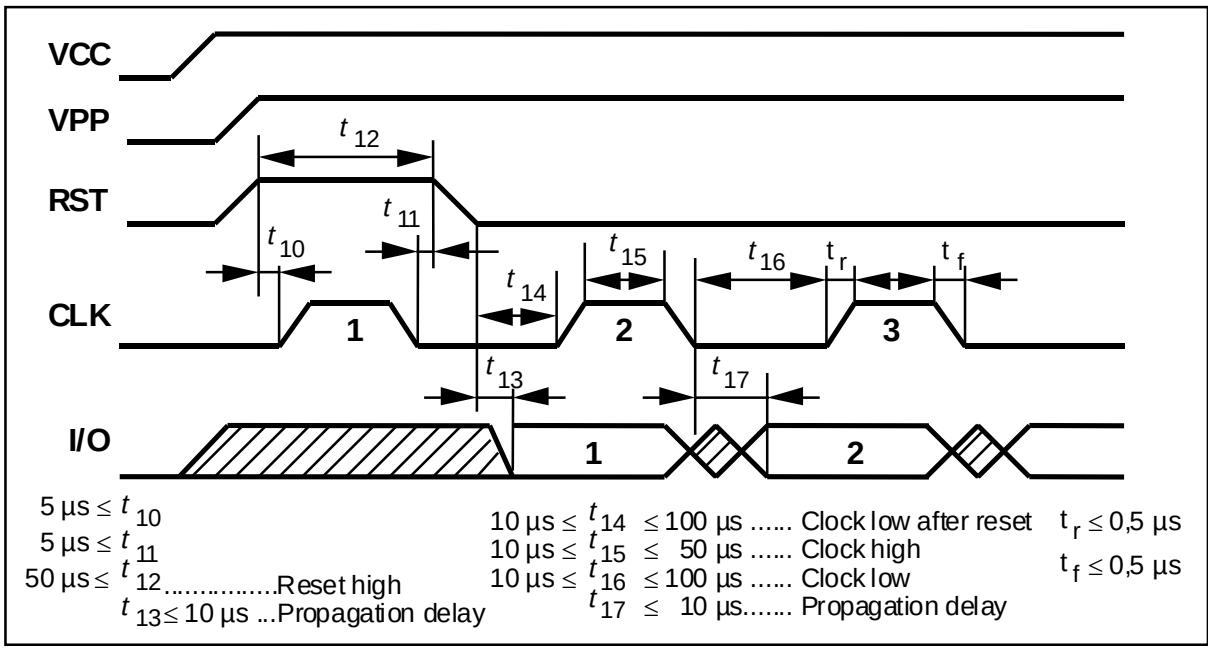


Figure 1 — Reset of a synchronous card type 1

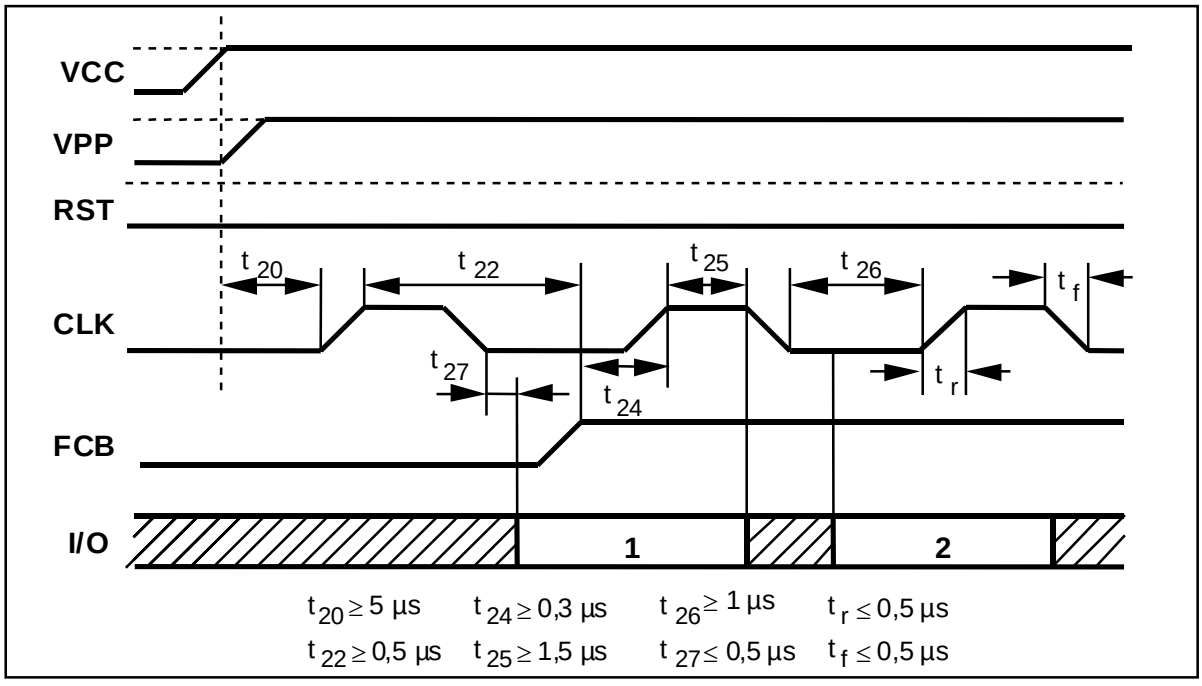


Figure 2 — Reset of a synchronous card type 2

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Annex A
(informative)

Example of data structure introduced by H3 = '10'

The role of the fields H3 and H4 is similar to that of the historical bytes mentioned in ISO/IEC 7816-3. The third field H3 when set to ´10´ together with field H4 (see ISO/IEC 7816-4) may define the subsequent data structure.

Figure A.1 shows an example of a general application independent structure of the memory of a synchronous card seen at the interface between card and interface device. It contains the following fields:

- ATR
- ATR data section
- DIR(ectory) data section
- Application data section
- Extension area.

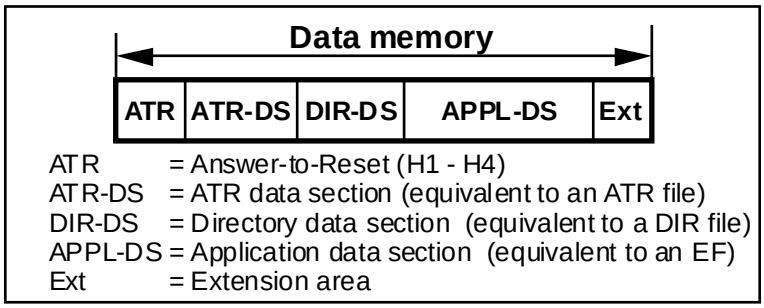


Figure A.1 — Example of data structure introduced by H3 = '10'

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Annex B
(informative)

Example of coding of H1 and H2

Table B.1 — Coding of H1

b8	b7	b6	b5	b4	b3	b2	b1	Meaning
0	0	0	0	0	0	0	0	Not to be used
0	x	x	x	0	0	0	0	Reserved for ISO/IEC protocols, structure and coding of H2 reserved for ISO/IEC
								Structure and coding of H1 and H2 according to this table and table 2
0	x	x	x	0	0	1	0	Reserved for ISO/IEC protocols
1	x	x	x	0	0	1	0	Industry specific protocols
x	x	x	x	x	x	x	1	Structure and coding of H1 and H2 assigned by registration authority of chip industry
1	1	1	1	1	1	1	1	Not to be used
Other values								Proprietary structure and coding of H1 and H2

Table B.2 — Coding of H2 (b4 - b1 of H1 = 2)

b8	b7	b6	b5	b4	b3	b2	b1	Meaning
1	x	x	x	x	x	x	x	RFU
								Number of data units, coded in b7 - b4
0	0	0	0	0	x	x	x	No indication
0	0	0	0	1	x	x	x	128
0	0	0	1	0	x	x	x	256
0	0	0	1	1	x	x	x	512
0	0	1	0	0	x	x	x	1024
0	0	1	0	1	x	x	x	2048
0	0	1	1	0	x	x	x	4096
0								...
0	1	1	1	1	x	x	x	RFU
0	x	x	x	x	x	x	x	Length of data units in bits of 2**, coded in b3 - b1 (e.g. 011 = 8 bits = 1 byte)

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