INTERNATIONAL STANDARD

ISO/IEC 14443-2

First edition
2001-06-28

AMENDMENT 1
2005-06-01

Identification cards — Contactless integrated circuit(s) cards — Proximity cards —

Part 2: Radio frequency power and signal interface

AMENDMENT 1: Bit rates of *fc*/64, *fc*/32 and *fc*/16

Cartes d´identification — Cartes à circuit(s) intégré(s) sans contact — Cartes de proximité —

Partie 2: Interface radio fréquence et des signaux de communication

AMENDEMENT 1: Débits binaires de fc/64, fc/32 et fc/16

Reference number
ISO/IEC 14443-2:2001/Amd.1:2005(E)

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Amendment 1 to ISO/IEC 14443-2:2001 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 17, *Cards and personal identification.*

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Identification cards — Contactless integrated circuit(s) cards — Proximity cards —

Part 2:
Radio frequency power and signal interface

AMENDMENT 1: Bit rates of *fc*/64, *fc*/32 and *fc*/16

Page 3, clause 7

Replace last sentence with the following:

"Figures 1 and Amd.1-1 illustrate the concepts described in the following clauses."

Page 4, clause 7

Replace figure 1 with the following:

"

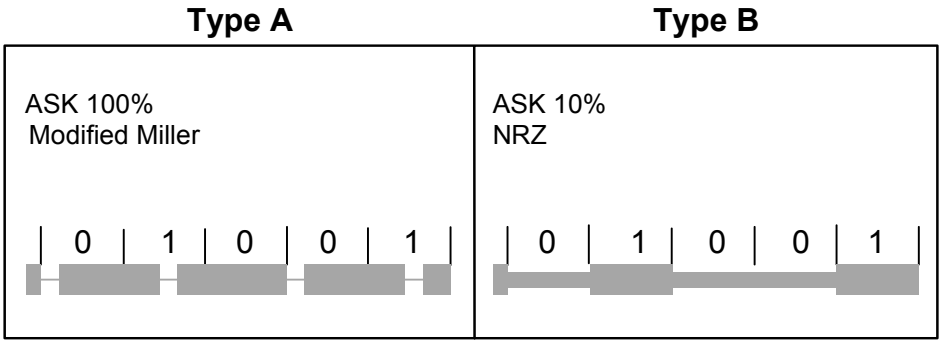

Figure 1 — Example PCD to PICC communication signals for Type A and Type B interfaces

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Page 4, clause 7

Add the following new figure after figure 1:

"

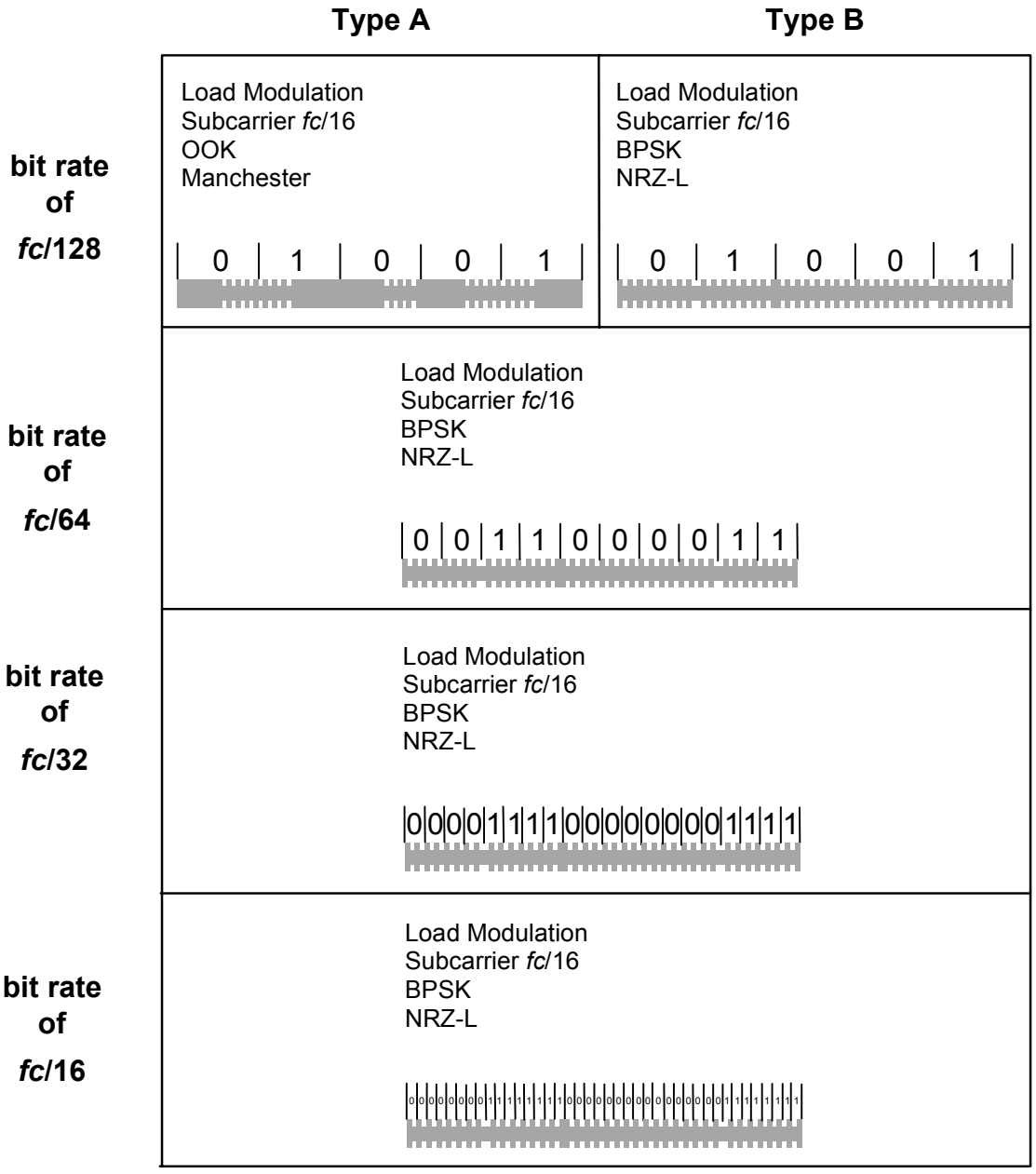

Figure Amd.1-1 — Example PICC to PCD communication signals for Type A and Type B interfaces

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Page 4, subclause 8.1.1

Add the following text at the end of the subclause:

"The bit rate for the transmission after initialization and anticollision shall be one of the following:

— *fc*/128 (~106 kbit/s),

— *fc*/64 (~212 kbit/s),

— *fc*/32 (~424 kbit/s),

— *fc*/16 (~847 kbit/s)."

Page 4, subclause 8.1.2

Insert new subclause 8.1.2.1 with the following title and move all existing text and figures of subclause 8.1.2 into this new subclause 8.1.2.1:

"**8.1.2.1 Modulation for a bit rate of *fc*/128**"

Page 5, subclause 8.1.2 that has been renumbered to 8.1.2.1

Replace the title of figure 2 with the following: "**Pause for a bit rate of *fc*/128**"

Page 6, subclause 8.1.2 that has been renumbered to 8.1.2.1

Delete the NOTE in figure 3 and replace the title of figure 3 with the following: "**Definition of "End of Pause" for a bit rate of *fc*/128**"

Page 6, subclause 8.1.2

Insert the following new subclause 8.1.2.2 after subclause 8.1.2.1:

"**8.1.2.2 Modulation for bit rates of *fc*/64, *fc*/32 and *fc*/16**

Communication from PCD to PICC for bit rates of *fc*/64 (~212 kbit/s), *fc*/32 (~424 kbit/s) and *fc*/16 (~847 kbit/s) shall use the modulation principle of ASK of the RF operating field to create a pause as shown in figure Amd.1-2.

The envelope of the PCD field shall decrease monotonically to less than 60% of its initial value. This envelope shall comply with figure Amd.1-2.

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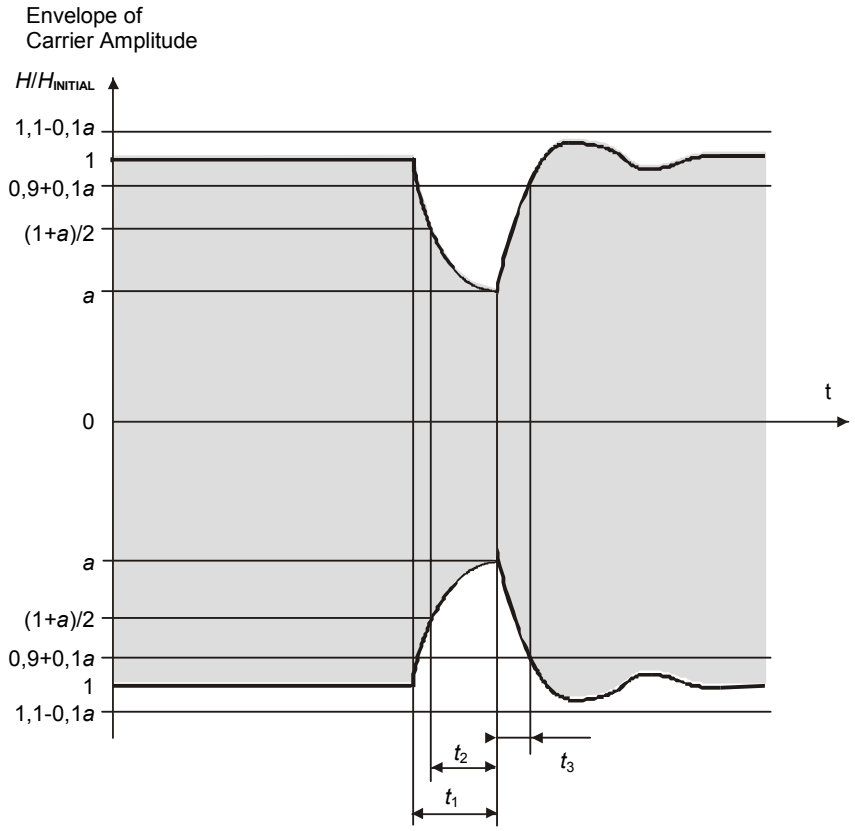

Figure Amd.1-2 — Pause for bit rates of *fc*/64, *fc*/32 and *fc*/16

Overshoots shall remain within ± 0,1 x (1-*a*) of $H_{INITIAL}$.

The parameter *a* in figure Amd.1-2 shall be between 0 and 0,6 for bit rates of *fc*/64, *fc*/32 and *fc*/16.

The parameters t_1, t_2 and t_3 are specified in table1.

Table 1 — Modulation timing

Timing parameter	Bit rate					
	***fc*/64**		***fc*/32**		***fc*/16**	
	Min	**Max**	**Min**	**Max**	**Min**	**Max**
t_1	15/fc	20/fc	8/fc	10/fc	4/fc	5/fc
t_2	8/fc	t_1	4/fc	t_1	2/fc	t_1
t_3	0	12/fc	0	10/fc	0	8/fc

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Page 6, subclause 8.1.3

Add the following text, figure and table after definition of sequence Z (after fourth line):

"Figure Amd.1-3, together with the timing parameters in table 2, illustrates sequences X, Y and Z.

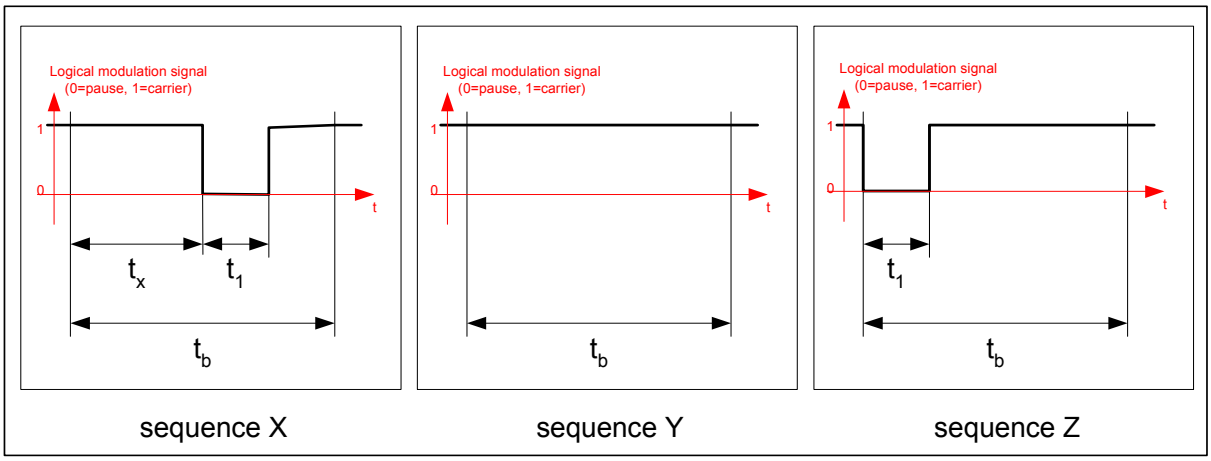

Figure Amd.1-3 — Signal shapes for sequences

Table 2 — Parameters for sequences

Parameter	Bit rate			
	***fc*/128**	***fc*/64**	***fc*/32**	***fc*/16**
t_b	128/*fc*	64/*fc*	32/*fc*	16/*fc*
t_x	64/*fc*	32/*fc*	16/*fc*	8/*fc*
t_1	see t_1 of figure 2	see t_1 of figure Amd.1-2		

"

Page 7, subclause 8.2.1

Add the following text at the end of the subclause:

"The bit rate for the transmission after initialization and anticollision shall be one of the following:

— *fc*/128 (~106 kbit/s),

— *fc*/64 (~212 kbit/s),

— *fc*/32 (~424 kbit/s),

— *fc*/16 (~847 kbit/s)."

Page 7, subclause 8.2.4

Replace the last sentence of the subclause with the following:

"At the bit rate of *fc*/128 the subcarrier is modulated using OOK with the sequences defined in 8.2.5.1. At bit rates of *fc*/64, *fc*/32 and *fc*/16 the subcarrier is modulated using BPSK with the sequences defined in 8.2.5.2."

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Page 7, subclause 8.2.5

Insert new subclause 8.2.5.1 with the following title and move all existing text of subclause 8.2.5 into this new subclause 8.2.5.1:

"**8.2.5.1 Bit representation and coding for a bit rate of *fc*/128**"

Page 7, subclause 8.2.5

Insert the following new subclause 8.2.5.2 after subclause 8.2.5.1:

"**8.2.5.2 Bit representation and coding for bit rates of *fc*/64, *fc*/32 and *fc*/16**

Bit coding shall be NRZ-L with the following definitions:

— logic "1": the carrier shall be modulated with the subcarrier for one bit duration,

— logic "0": the carrier shall be modulated with the inverted subcarrier for one bit duration,

— start of communication: burst of 32 subcarrier cycles (phase as logic "1") followed by inverted subcarrier for one bit duration (phase as logic "0"),

— end of communication: the carrier is not modulated with the subcarrier for one bit duration,

— no information: the carrier is not modulated with the subcarrier."

Page 8, subclause 9.1.1

Add the following text between the first and second sentences of the subclause:

"The bit rate for the transmission after initialization and anticollision shall be one of the following:

— *fc*/128 (~106 kbit/s),

— *fc*/64 (~212 kbit/s),

— *fc*/32 (~424 kbit/s),

— *fc*/16 (~847 kbit/s)."

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Page 8, subclause 9.1.2

Replace the table in figure 4 with the following table:

"

Table 3 — Parameters for Type B modulation waveform

Parameter	Bit rate			
	***fc*/128**	***fc*/64**	***fc*/32**	***fc*/16**
bit duration	~9,44 µs	~4,72 µs	~2,36 µs	~1,18 µs
$t_{f,\,max}$	2 µs	2 µs	1 µs	0,8 µs
$t_{r,\,max}$	2 µs	2 µs	1 µs	0,8 µs
y	0,1(*a*-*b*)	0,1(*a*-*b*)	0,1(*a*-*b*)	0,1(*a*-*b*)
$h_{f,\,max}$, $h_{r,\,max}$	0,1(*a*-*b*)	0,1(*a*-*b*)	0,1(*a*-*b*)	0,1(*a*-*b*)

"

Page 9, subclause 9.2.1

Add the following text at the end of the subclause:

"The bit rate for the transmission after initialization and anticollision shall be one of the following:

— *fc*/128 (~106 kbit/s),

— *fc*/64 (~212 kbit/s),

— *fc*/32 (~424 kbit/s),

— *fc*/16 (~847 kbit/s)."

Page 9, subclause 9.2.3

Replace the first paragraph of the subclause with the following:

"The frequency *fs* of the subcarrier shall be *fc*/16 (~847 kHz). Consequently, during initialization and anticollision, one bit period is equivalent to 8 periods of the subcarrier. After initialization and anticollision, the number of subcarrier periods is determined by the bit rate."

Page 9, subclause 9.2.4

Delete figure 5 and replace the text with the following:

"The subcarrier shall be BPSK modulated. Phase shifts shall only occur at nominal positions of rising or falling edges of the subcarrier."

Page 10, Clause 10

In the first sentence, replace "figure 6" with "figure 5"

In the figure title, replace "**Figure 6**" with "**Figure 5**".

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