INTERNATIONAL STANDARD

ISO/IEC 14443-2

Second edition
2010-09-01

AMENDMENT 3
2012-03-15

Identification cards — Contactless integrated circuit cards

Part 2: Radio frequency power and signal interface

AMENDMENT 3: Bits rates of *fc*/8, *fc*/4 and *fc*/2

Cartes d'identification — Cartes à circuit(s) intégré(s) sans contact

Partie 2: Interface radiofréquence et des signaux de communication

AMENDEMENT 3: Débits binaires de fc/8, fc/4 et fc/2

Reference number
ISO/IEC 14443-2:2010/Amd.3:2012(E)

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Published in Switzerland

Foreword

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Amendment 3 to ISO/IEC 14443-2:2010 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 17, *Cards and personal identification*

Identification cards — Contactless integrated circuit cards

Part 2:
Radio frequency power and signal interface

AMENDMENT 3: Bits rates of *fc*/8, *fc*/4 and *fc*/2

Page 5, Figure 1

Replace Figure 1 with:

“

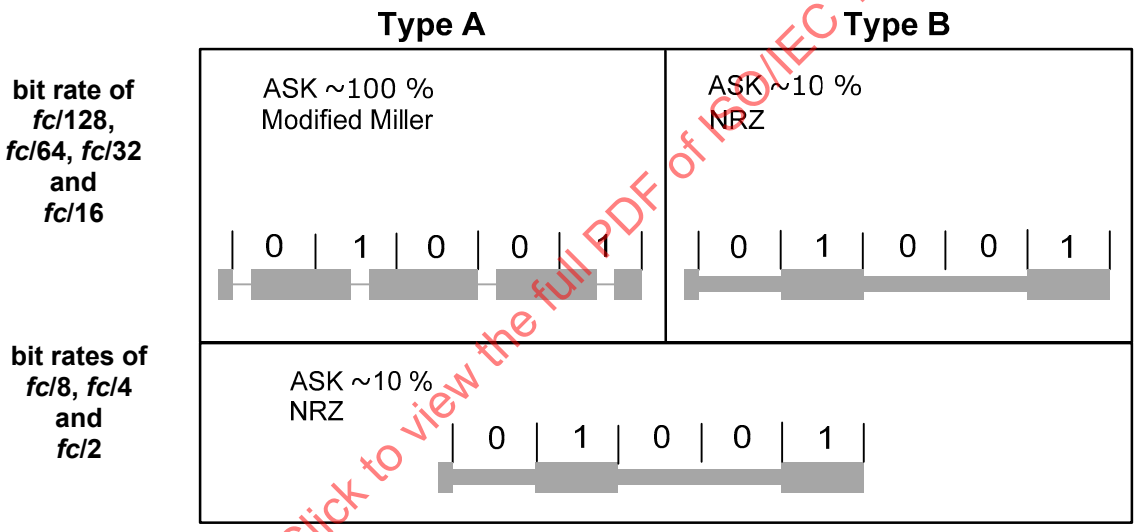

Figure 1 — Example PCD to PICC communication signals for Type A and Type B interfaces

”

Page 6, Figure 2

Replace Figure 2 with:

“

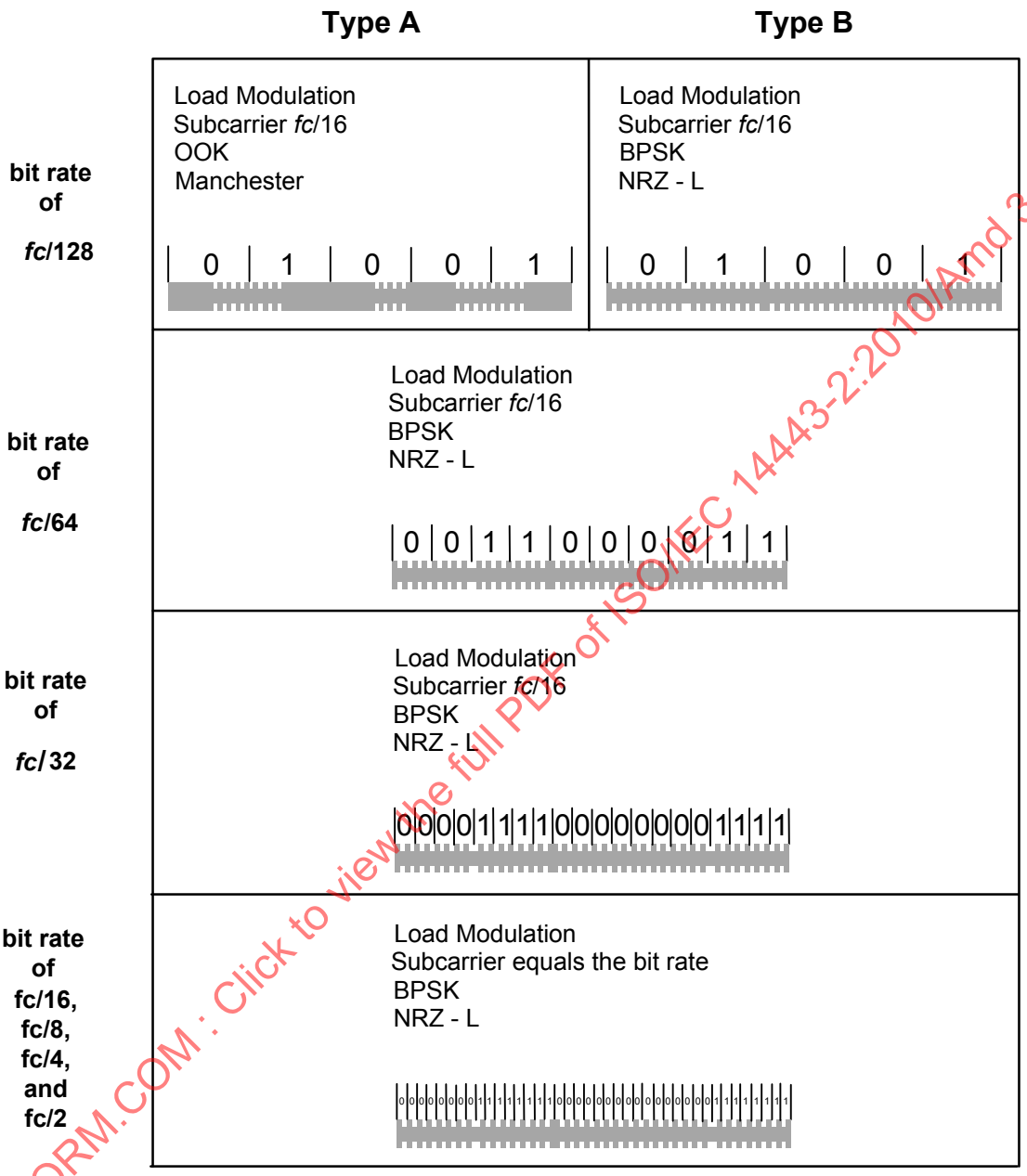

Figure 2 — Example PICC to PCD communication signals for Type A and Type B interfaces

”

Page 6, 8.1.1

Replace 8.1.1 with:

“**8.1.1 Bit rate**

The bit rate for the transmission during initialization and anticollision shall be *fc*/128 (~106 kbit/s).

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 (~848 kbit/s),

— *fc*/8 (~1,70 Mbit/s),

— *fc*/4 (~3,39 Mbit/s),

— *fc*/2 (~6,78 Mbit/s).”

Page 14

Add new subclause after Figure 9:

“**8.1.2.3 Modulation for bit rates of *fc*/8, *fc*/4 and *fc*/2**

See 9.1.2.”

Page 14, 8.1.3

Add the following new subclause title below the 8.1.3 title:

“**8.1.3.1 Bit representation and coding for bit rates of *fc*/128, *fc*/64, *fc*/32 and *fc*/16**”

Page 15

Add following new subclause before 8.2:

“**8.1.3.2 Bit representation and coding for bit rates of *fc*/8, *fc*/4 and *fc*/2**

Bit representation and coding is defined in 9.1.3.

Start of communication is defined in ISO/IEC 14443-3:2011, 7.1.4.

End of communication is defined in ISO/IEC 14443-3:2011, 7.1.5.”

Page 16, 8.2.3

Replace 8.2.3 with:

“**8.2.3 Subcarrier**

The PICC shall generate a subcarrier only when data is to be transmitted.

8.2.3.1 Bit rates of *fc*/128, *fc*/64, *fc*/32 and *fc*/16

The frequency *fs* of the subcarrier shall be *fc*/16 (~848 kHz). Consequently, during initialization and anticollision, one bit duration is equivalent to 8 periods of the subcarrier. After initialization and anticollision, the number of subcarrier periods is determined by the bit rate.

8.2.3.2 Bit rates of *fc*/8, *fc*/4 and *fc*/2

The frequency *fs* of the subcarrier shall be *fc*/8 (~1,70 MHz), *fc*/4 (~3,39 MHz) or *fc*/2 (~6,78 MHz) depending on the bit rate as specified in Table Amd.3-1.

Table Amd.3-1 — Subcarrier frequency vs bit rate

Bit rate	Subcarrier frequency
fc/8 (~1,70 Mbit/s)	*fc*/8
fc/4 (~3,39 Mbit/s)	*fc*/4
fc/2 (~6,78 Mbit/s)	*fc*/2

”

Page 16, 8.2.4

Replace the second paragraph 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, *fc*/16, *fc*/8, *fc*/4 and *fc*/2 the subcarrier is modulated using BPSK with the sequences defined in 8.2.5.2.”

Page 17, 8.2.5.2

Change the 8.2.5.2 title to:

“**8.2.5.2 Bit representation and coding for bit rates of fc/64, fc/32, fc/16, fc/8, fc/4 and fc/2**”

Pages 17–18, 9.1.1

Replace 9.1.1 with:

“**9.1.1 Bit rate**

The bit rate for the transmission during initialization and anticollision shall be nominally *fc*/128 (~106 kbit/s).

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 (~848 kbit/s),

— *fc*/8 (~1,70 Mbit/s),

— *fc*/4 (~3,39 Mbit/s),

— *fc*/2 (~6,78 Mbit/s).

Bit boundary tolerances and character separation are defined in ISO/IEC 14443-3:2011, 7.1.1 and 7.1.2, respectively."

Page 18, 9.1.2

Replace the paragraphs between Figure 12 and Figure 13 with:

"The PCD shall generate for any bit combination a modulation waveform with a modulation index *m*

— greater than 8 % for all supported bit rates,

— and less than

  — 14 % for bit rates of *fc*/128, *fc*/64, *fc*/32 and *fc*/16,

  — 20 % for bit rates of *fc*/8, *fc*/4 and *fc*/2.

The PICC shall be able to receive for any bit combination a modulation waveform with a modulation index *m*

— greater than

  — both (9,5 – 1,5H/H_{min}) % and 7 % for bit rates of *fc*/128, *fc*/64, *fc*/32 and *fc*/16,

  — 8 % for bit rates of *fc*/8, *fc*/4 and *fc*/2.

— and less than

  — 15 % for bit rates of *fc*/128, *fc*/64, *fc*/32 and *fc*/16,

  — 21 % for bit rates of *fc*/8, *fc*/4 and *fc*/2.

NOTE 1 Minimum and maximum values of *H* are defined in Table 1 and Table 2.

The limits for the modulation index *m* for bit rates of *fc*/128, *fc*/64, *fc*/32 and *fc*/16 are illustrated in Figure 13."

Page 19, 9.1.2

Replace Table 8 title with:

"**Table 8 — PCD transmission: Overshoot and undershoot for all supported bit rates**"

Renumber NOTE 1 as NOTE 2.

Replace Table 9 title with:

"**Table 9 — PICC reception: Overshoot and undershoot for all supported bit rates**"

Page 20, 9.1.2

Renumber NOTE 2 as NOTE 3.

Page 23, 9.1.2

After Figure 17 add the following:

"For a bit rate of *fc*/8 the PCD shall generate for any bit combination a modulation waveform with

— a fall time t_f between 0/*fc* and $t_{f,\,max,\,PCD}$ = 6/*fc*,

— and a rise time t_r

  — greater than both 0/*fc* and t_f − 3/*fc*,

  — and less than both t_f + 3/*fc* and $t_{r,\,max,\,PCD}$ = 6/*fc*.

For a bit rate of *fc*/8 the PICC shall be able to receive for any bit combination a modulation waveform with

— a fall time t_f between 0/*fc* and $t_{f,\,max,\,PICC}$ = 6/*fc*,

— and a rise time t_r:

  — greater than both 0/*fc* and t_f − 3/*fc*,

  — and less than both t_f + 3/*fc* and $t_{r,\,max,\,PICC}$ = 6/*fc*.

The timing parameters for PCD and PICC are illustrated in Figure Amd.3-1.

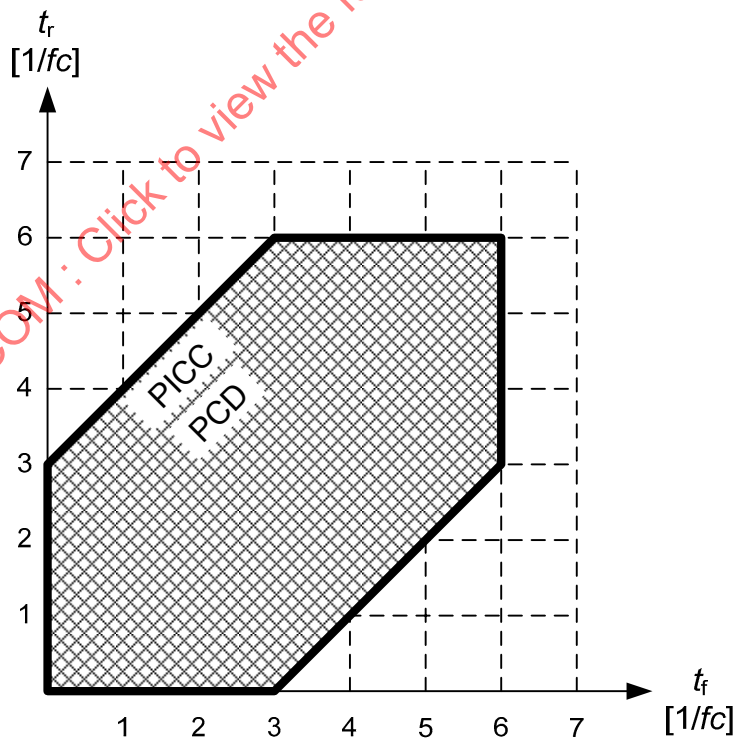

Figure Amd.3-1 — Modulation waveform timing parameters for a bit rate of *fc*/8

For a bit rate of *fc*/4 the PCD shall generate for any bit combination a modulation waveform with

— a fall time t_f between 0/*fc* and $t_{f, max, PCD}$ = 4/*fc*,

— and a rise time t_r

  — greater than both 0/*fc* and t_f − 2/*fc*,

  — and less than both t_f + 2/*fc* and and $t_{r, max, PCD}$ = 4/*fc*.

For a bit rate of *fc*/4 the PICC shall be able to receive for any bit combination a modulation waveform with

— a fall time t_f between 0/*fc* and $t_{f, max, PICC}$ = 4/*fc*,

— and a rise time t_r:

  — greater than both 0/*fc* and t_f − 2/*fc*,

  — and less than both t_f + 2/*fc* and $t_{r, max, PICC}$ = 4/*fc*.

The timing parameters for PCD and PICC are illustrated in Figure Amd.3-2.

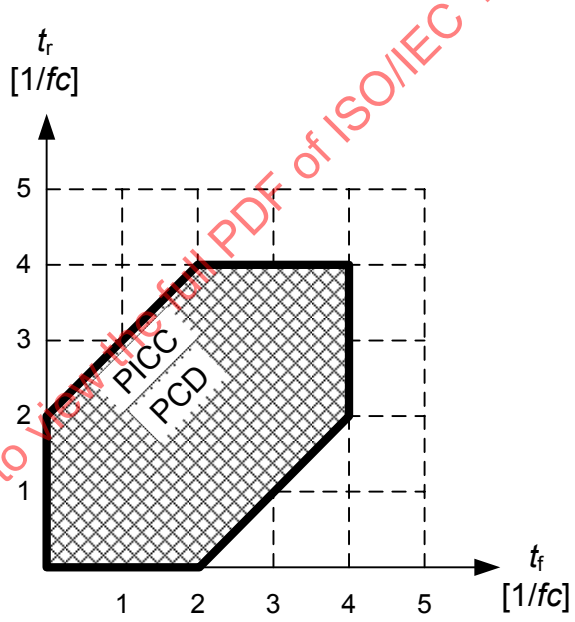

Figure Amd.3-2 — Modulation waveform timing parameters for a bit rate of *fc*/4

For a bit rate of *fc*/2 the PCD shall generate for any bit combination a modulation waveform with

— a fall time t_f less than $t_{f, max, PCD}$ = 3/*fc* and

— a rise time t_r less than $t_{r, max, PCD}$ = 3/*fc*.

For a bit rate of *fc*/2 the PICC shall be able to receive for any bit combination a modulation waveform with

— a fall time t_f less than $t_{f, max, PICC}$ = 3/*fc* and

— a rise time t_r less than $t_{r, max, PICC}$ = 3/*fc*.

”