
**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 $fc/2$

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Foreword

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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.

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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*

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

Page 5, Figure 1

Replace Figure 1 with:

“

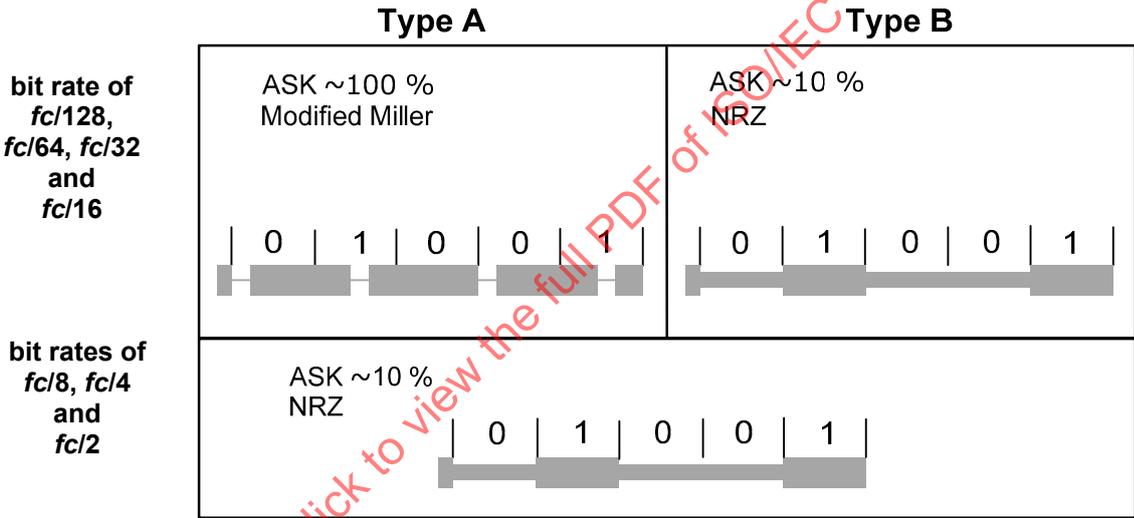


Figure 1 — Example PCD to PICC communication signals for Type A and Type B interfaces

”

Page 6, Figure 2

Replace Figure 2 with:

“

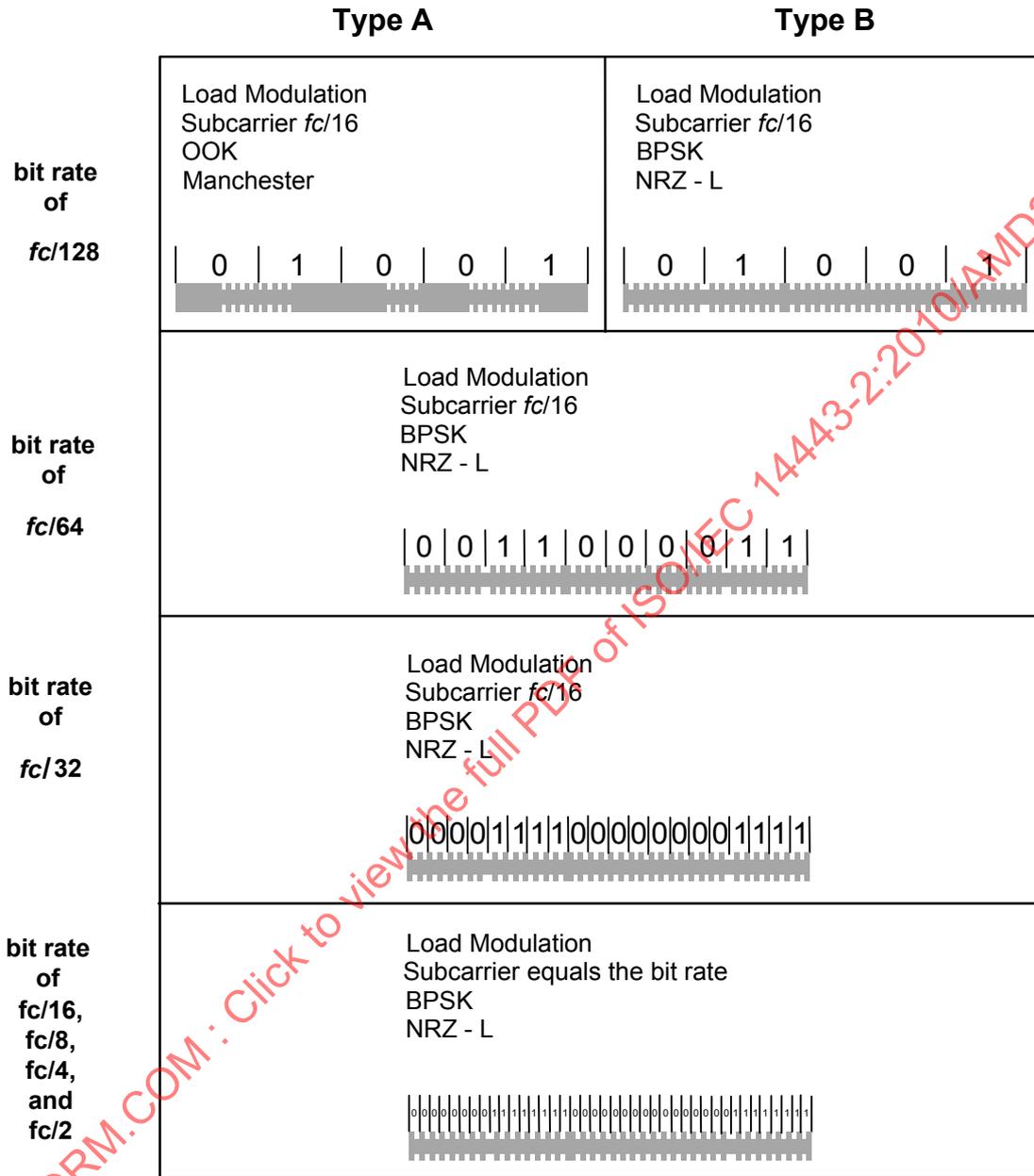


Figure 2 — Example PICC to PCD communication signals for Type A and Type B interfaces

”

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 f_s 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 f_s 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.

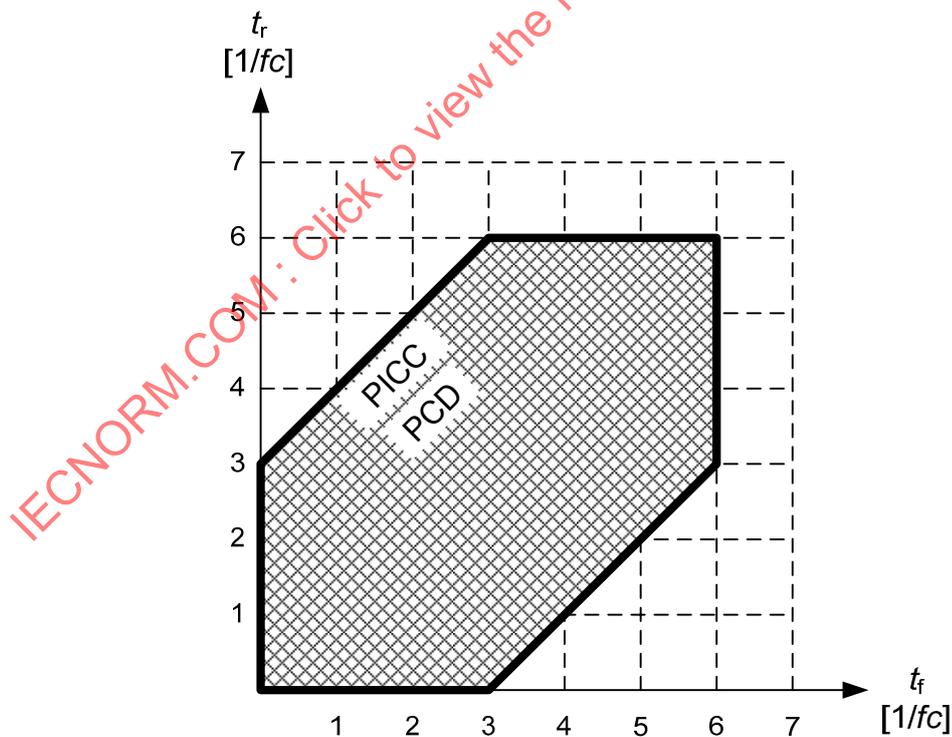


Figure Amd.3-1 — Modulation waveform timing parameters for a bit rate of $fc/8$

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 $t_{r, \max, PCD} = 4/fc$.

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.

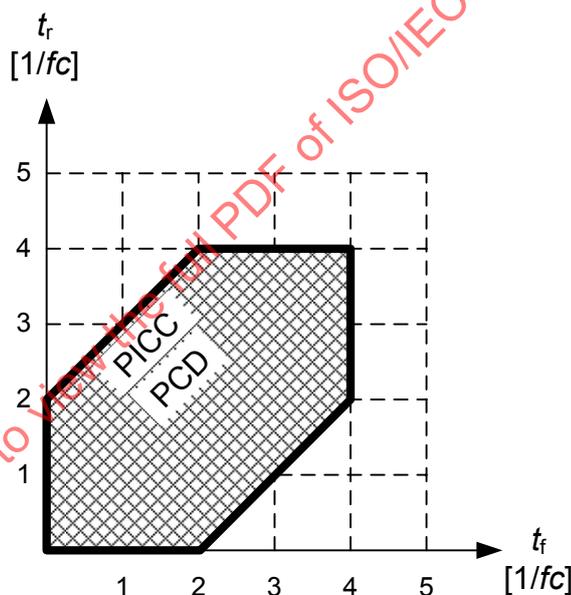


Figure Amd.3-2 — Modulation waveform timing parameters for a bit rate of $fc/4$

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 $t_{r, \max, PICC} = 3/fc$.

”