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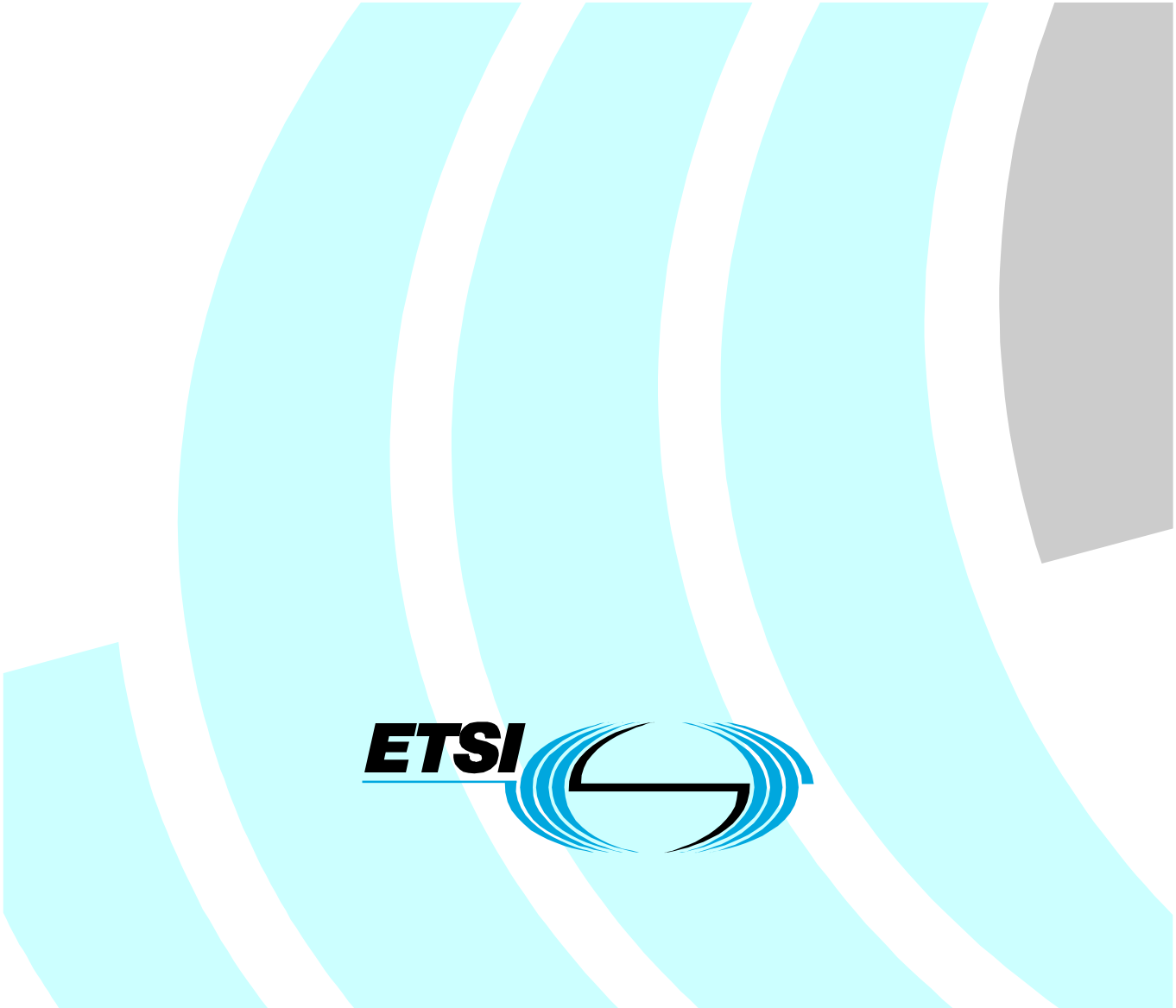
ETSI Standard

Electromagnetic compatibility and Radio spectrum Matters (ERM); Close Range peer-to-peer symmetrical Data Communication (CRDC) system



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Foreword

This ETSI Standard (ES) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM), and is now submitted for the ETSI standards Membership Approval Procedure.

Introduction

The Close Range Data Communication (CRDC) system has been developed to minimize the risk of interception of the transferred data files by limiting the communication range to the maximum of 10 cm. This provides for a method of transferring raw data files between various devices in a peer-to-peer fashion that is sufficiently secure for products, therefore meeting the needs of those wishing to transfer sensitive materials. Operating symmetrically in a half-duplex mode with a centre frequency of 13,56 MHz, sensitive data can quickly be transferred from terminal to terminal.

The present document defines the protocol interface specification for devices using a high-integrity, symmetric close-field half-duplex data transfer system.

1 Scope

The present document defines the specification of the protocol interface for devices that use a high-integrity, symmetric close-field half-duplex data transfer system. The system allows devices to communicate in a peer-to-peer fashion within a maximum range of 10 cm. The devices may or may not be internally powered.

ElectroMagnetic Compatibility (EMC) parameters shall conform to EN 301 489-1 [1] and EN 301 489-3 [2].

Radio Frequency (RF) parameters shall conform to EN 300 330-1 [3] and EN 300 330-2 [4].

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication and/or edition number or version number) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

[1] ETSI EN 301 489-1: "Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements".

[2] ETSI EN 301 489-3: "Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 3: Specific conditions for Short-Range Devices (SRD) operating on frequencies between 9 kHz and 40 GHz".

[3] ETSI EN 300 330-1: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD); Radio equipment in the frequency range 9 kHz to 25 MHz and inductive loop systems in the frequency range 9 kHz to 30 MHz; Part 1: Technical characteristics and test methods".

[4] ETSI EN 300 330-2: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD); Radio equipment in the frequency range 9 kHz to 25 MHz and inductive loop systems in the frequency range 9 kHz to 30 MHz; Part 2: Harmonized EN under article 3.2 of the R&TTE Directive".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

active station: powered equipment

ASK: method of modulating the carrier frequency

modulation index: defined as [a-b]/[a+b] where a and b are the peak and the minimum signal amplitude respectively

NOTE: The value of the index may be expressed as a percentage.

passive station: equipment not powered internally and activated by the presence of the operating field created by an active station

3.2 Symbols

For the purposes of the present document, the following symbol applies:

f_c operating field carrier frequency in MHz

3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

ASK	Amplitude Shift Keying
CRC	Cyclic Redundancy Code
CRDC	Close Range Data Communication
EMC	ElectroMagnetic Compatibility
ES	ETSI Standard
MSB	Most Significant Bit
RF	Radio Frequency

4 Operating field

An active station produces a radio frequency field modulated during communication. The carrier frequency of the operating field is 13,56 MHz. The operating field shall comply with EN 300 330-1 [3] and EN 300 330-2 [4].

5 Bit rate

The bit rates for the data transmission are defined in relation to the carrier frequency as shown in table 1.

Table 1: Bit rates for data transmission

Carrier frequency divisor	Bit rate (approximately)
64	212 kbit/s

Higher bit rates of 424 kbit/s and 848 kbit/s (frequency divisors of 32 and 16 correspondingly) may be used provided they meet the requirements set forth in EN 300 330.

6 Modulation scheme

6.1 Modulation for active stations

The active stations use the modulation of ASK with the modulation index of 12 % ±2 % of the operating field.

6.2 Modulation for passive stations

The passive station communicates to an active station via inductive coupling whereby the carrier frequency is loaded to generate encoded data. The load modulation index shall be at least 15 % of the initial load.

7 Bit encoding

Manchester bit encoding shall be employed. The waveform is shown in figure 1:

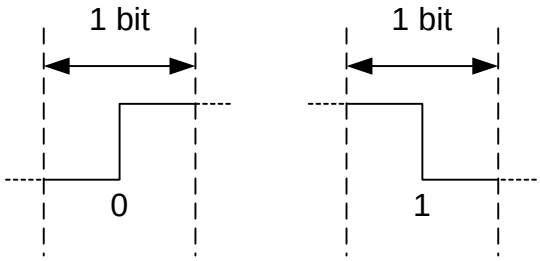

Figure 1: Manchester bit encoding

The physical levels may be reversed. The synchronization pattern described in clause 10.1 shall be used to determine whether the physical levels were inverted by the transmitter and synchronize accordingly.

7.1 Bit encoding for active stations

The logic levels shall be defined as follows:

- logic "1": the first half of a bit is carrier high field amplitude (no modulation applied), and the second half of the bit is carrier low field amplitude;
- logic "0": the first half of a bit is carrier low field amplitude, and the second half of the bit is carrier high field amplitude (no modulation applied).

7.2 Bit encoding for passive stations

The logic levels shall be defined as follows:

- logic "1": the first half of a bit is high impedance (no load applied), and the second half of the bit is low impedance (load applied);
- logic "0": the first half of a bit is low impedance (load applied), and the second half of the bit is high impedance (no load applied).

8 Byte encoding

The byte encoding is Most Significant Bit (MSB) first.

9 Start and end of communication

The start of communication is signalled by the presence of modulation on the carrier frequency. The communication shall start with the preamble sequence of 6 bytes with the hexadecimal value of 00 (all logical "0") encoded according to the rules described in clauses 7 and 8.

The end of communication is signalled by the absence of modulation for a length of at least $64/f_c$ x 32 µs as shown in figure 2.

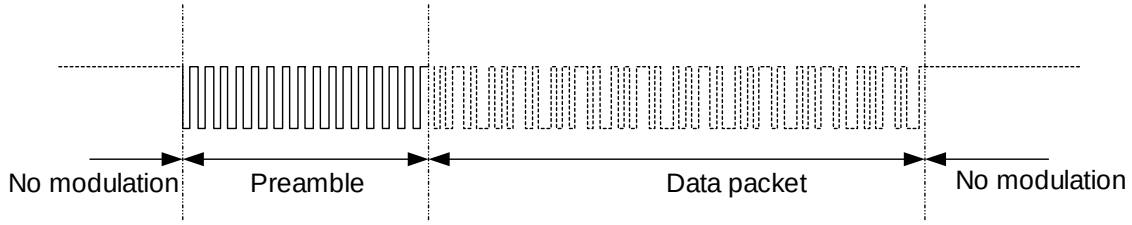

Figure 2: Start and end of communication

After a peer station has finished communication, the receiving station shall wait for a period of at least $64/f_c$ x 32 µs before starting transmission by sending the preamble sequence as shown in figure 3.

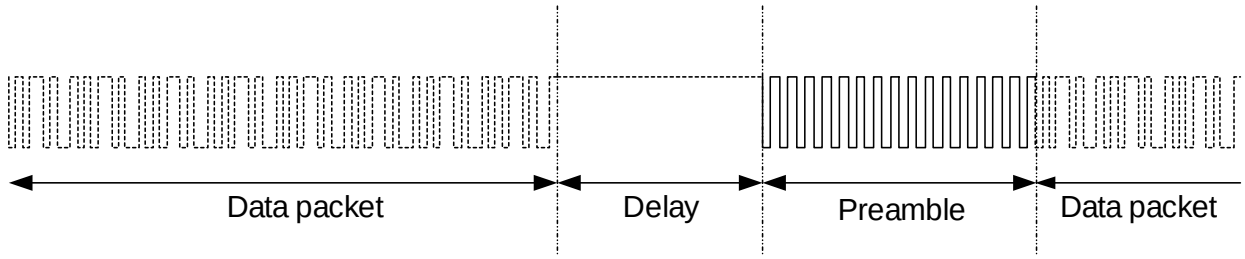

Figure 3: Delay between packets

10 Data packet structure

The data packet shall consist of the following 4 parts, transmitted in the given order:

1) 2 bytes of synchronization pattern.
2) 1 byte of packet length.
3) Payload.
4) 2 bytes of CRC.

The data packet structure is illustrated in the figure 4.

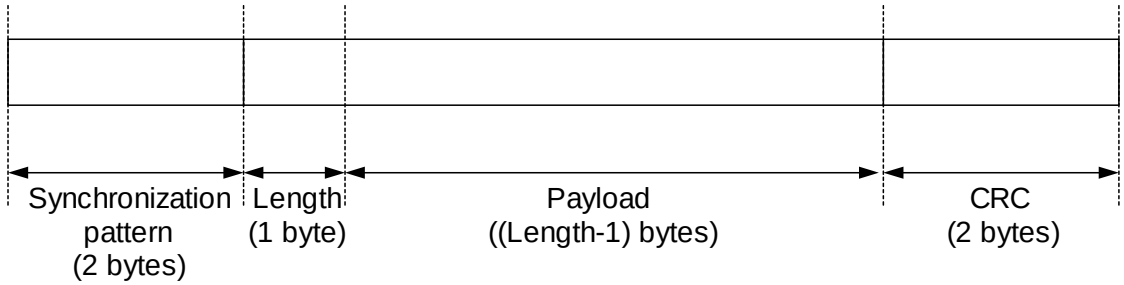

Figure 4: Data packet structure

10.1 Synchronization pattern

The synchronization pattern shall consist of 2 bytes with the hexadecimal values: 1st byte is B2 and 2nd byte is 4D.

The synchronization pattern shall be encoded according to rules described in clauses 7 and 8.

10.2 Packet length

The packet length shall be one byte (refer to "Length" in figure 4) and contain the size of the payload in bytes plus the size of the length byte itself (size of payload +1).

The packet length shall be encoded according to rules described in clauses 7 and 8.

10.3 Payload

The payload shall consist of the data bytes encoded according to rules described in clauses 7 and 8.

10.4 CRC

The CRC shall be calculated according to CCITT 16 bit algorithm (polynomial $x^{16} + x^{12} + x^5 + 1$). The calculation input shall be the packet length byte and the payload data. The initial value for CRC calculation shall be 0.

The CRC shall be encoded according to rules described in clauses 7 and 8.

Annex A (informative): Bibliography

ERC/REC 70-03: "Relating to the use of Short Range Devices (SRD)".

History

Document history			
V1.1.1	March 2002	Membership Approval Procedure	MV 200200503: 2002-03-05 to 2002-05-03