International Standard 2111

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Data communication — Basic mode control procedures — Code independent information transfer

Téléinformatique — Procédures de commande en mode de base — Transfert des données indépendantes du code

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

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Data communication — Basic mode control procedures — Code independent information transfer

0 Introduction

A data communication system may be considered as the set of the terminal installations and the interconnecting network that permits information to be exchanged.

A data link comprises terminal installations connected to the same network, operating at the same speed, in the same code. Any "store and forward" delay or intermediate data processing really separates data links. Any system is constituted of one or several data links.

The information transfer in a data link is monitored by data link control procedures where some characters, selected within a coded character set, are given particular meanings according to the transmission phase and are used for various purposes such as to delineate information, to reverse the direction of transmission, to ask questions, or to answer.

The data link control procedures are categorized in classes that are referred to as modes of operation. The basic mode is defined in the introduction to ISO 1745.

This International Standard defines the means by which systems can transfer information without coding restrictions. This is achieved by use of the DLE character, and is called code independent transmission.

The procedures described allow for code dependent information messages to alternate with code independent information messages.

1 Scope and field of application

1.1 This International Standard defines the means by which a data communication system operating according to the basic mode procedures defined in ISO 1745 can transfer information messages without code restrictions.

1.2 This International Standard extends Phase 3 (Information transfer) as defined in ISO 1745. It also describes other uses of the DLE character than that described in ISO 1745. Phase 2 (Establishment of data link) and Phase 4 (Termination) are not affected by this International Standard.

2 References

ISO 646, *Information processing — ISO 7-bit coded character set for information interchange.*

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

ISO 1745, *Information processing — Basic mode control procedures for data communication systems.*

3 Formating rules

3.1 Initiation of code independent text

The sequence "DLE.STX" shall be used to initiate a code independent text.

3.2 Termination of code independent text

The sequence "DLE.ETB" or "DLE.ETX" shall be used to terminate a code independent block or text respectively.

3.3 Filling

When filling is necessary within the information message, the sequence "DLE.SYN" shall be used in lieu of the single character "SYN". Filling sequences shall not be inserted between any two characters forming a DLE sequence.

3.4 Character parity

The characters forming the DLE sequences shall carry the character parity used by the data transmission system through which the code independent text is being transferred. When the system is asynchronous, the character parity shall be even; when the system is synchronous, it shall be odd. (See ISO 1177.)

4 Presentation of data

4.1 Texts shall be presented in octets, or 8 bit characters (for example, 7 bit plus parity bit), a sequence expressed in any 8 bit code, packed numerics, etc. If a binary data stream split into groups of 8 bits is used, bit padding by an agreed method may be necessary (to complete the last octet).

4.2 All 8 bit combinations shall be acceptable in the original text.

4.3 For each occurrence of the 8 bit combination corresponding to "DLE" an additional "DLE" shall be inserted for transmission adjacent to it.

4.4 "DLE" characters that are used to form DLE sequences for transmission control (for example, DLE.STX, DLE.SYN, DLE.ETB) shall not be doubled.

5 Reception of data

Received data shall be inspected for DLE sequences and the following independent rules observed :

5.1 "DLE.STX" shall be interpreted as the initiator of the code independent text.

5.2 When a double DLE sequence occurs, one "DLE" shall be suppressed and the other shall be regarded as data. The data following shall be inspected for new DLE sequences.

5.3 "DLE.ETB" or "DLE.ETX", when not immediately preceded by an odd number of "DLE" characters, shall be interpreted as the terminators of the code independent block or text.

5.4 Unless immediately preceded by an odd number of "DLE" characters, the "DLE.SYN" sequence should be discarded.

6 Heading

If a heading is required it may be transmitted

a) as a separate information message in the 7 bit code of ISO 646, in conformity with ISO 1745; or

b) as part of the code independent information message transmission; or

c) as a code dependent, or independent, heading that can be prefixed to the code independent text by the use of the sequence "DLE.SOH" as the initiating sequence. The requirements for code independent text shall apply generally.

NOTE — If, by prior agreement, the BCS is used for both code-dependent and code-independent text, a code-dependent header prefixed to the code-independent text, may be initiated by SOH.

7 Error protection

7.1 Since the use of character parity cannot be guaranteed for error checking within the data link a block check sequence (BCS) shall be used.

7.2 The first appearance of either "DLE.SOH" or "DLE.STX" shall initiate the calculation of the BCS. (See the note to 7.7.)

7.3 The initiating sequence shall not be included in the BCS calculation.

7.4 The filling sequence "DLE.SYN" shall not be included in the BCS calculation.

7.5 The first "DLE" in each two-character DLE sequence (DLE.DLE, DLE.ETB, etc.), as received from the data communication equipment, shall not be included in the BCS calculation.

7.6 The BCS shall follow immediately after the terminating sequence.

7.7 The form that the BCS takes is defined in clause 8.

NOTE — In systems where BCS protection only is used (see the note to clause 6), SOH should initiate the calculation of the BCS, but SOH should not be included in the BCS calculation.

8 Block check sequence (BCS)

The BCS shall conform to the following rules :

8.1 It shall be a 16 bit sequence (two octets).

8.2 The sequence of information bits contained in the data block to be protected may be represented by a polynomial $L(x)$ (GF 2) : The BCS is the remainder after the division of the polynomial $L(x)$ (GF2), multiplied by x^{16}, by the generating polynomial $p(x) = x^{16} + x^{12} + x^5 + 1$ (GF2). GF2 means that these polynomials have their coefficients in a two element Galois field.

8.3 The BCS shall be transmitted to the line commencing with the coefficient of the highest term.

8.4 At the receiver, the serial incoming protected data and the BCS when divided by the generating polynomial results in a zero remainder in the absence of transmission errors.

NOTE — If it is shown that there is a demand for additional bits in order to provide adequate protection, any increase in the length of the BCS in future revisions of this International Standard is expected to be such that the BCS always consists of an integral number of octets.