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JIS

JAPANESE INDUSTRIAL STANDARD

Basic Mode Data Transmission Control Procedures

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JAPANESE INDUSTRIAL STANDARD J I S

Basic Mode Data Transmission Control Procedures

X 5002-1975
(Reaffirmed: 1994)

1. General

1.1 Scope This Japanese Industrial Standard specifies control procedures of data transmission using transmission control characters, which are specified by JIS X 0201, through data transmission lines between data terminal or data processing equipments.

1.2 General Principle Concerning Specification The general principle concerning specification is as described below.

(1) This standard does not specify anything concerning hardware and software to implement the transmission control procedures.

(2) This standard does not specify anything concerning transmission methods, synchronization methods, and data signalling rates which are used when the transmission control procedures are applied.

(3) Either the same or different channels may be used to send responses of message or forward supervisory sequences.

(4) The transmission control procedures specify not only one-way transfer and alternate two-way transfer of information based upon the control by alternate supervision but also two-way simultaneous transfer with alternate supervision.

2. Definitions

For the purpose of this standard the following principal definitions, in addition to those specified in JIS X 0001, shall apply:

(1) message A set of data designed for transmission of information with a well specified head and tail. The message consists of characters or a character sequence which include at least one transmission control character.

(2) information message A set of data which is the primary object of data transmission. The information message consists of a text which may be preceded by a heading.

(3) station General term for an equipment which is connected to a data communication network and conducts data transmission, reception, or processing, and for the place where the equipment is located.

(4) master station The station which has, at an instant, the right to send an information message to slave stations and has the responsibility to faithfully execute the transfer of information.

Applicable Standards:

JIS X 0201-Code for Information Interchange

JIS X 0001-Glossary of Terms Used in Information Processing

JIS X 5001-Character Structure on the Transmission Circuits and Horizontal Parity Method

JIS X 5101-The Interface between Date Circuit Terminating Equipment (DCE) and Data Terminal Equipment (DTE) (25-pin Interface)

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(5) slave station The station which is, at an instant, capable of receiving an information message from a master station.

(6) control station The station which controls message transmission conditions of all stations connected to the system, supervises those stations, or controls abnormal condition for its recovery.

(7) tributary station Any station of the system which is not the control station.

(8) forward direction Direction of the transmission of a message from a control station to a tributary station prior to establishment of a data link; direction of the transmission of a message from a master station to a slave station after establishment of a data link.

(9) backward direction Direction opposite to the forward direction.

(10) point-to-point system A data communication system with communication lines connecting two stations without branching stations between them. This system does not have a control station. The system with a single data processing center so-called the radial type network-structure system is included in this standard.

(11) block A division of an information message which consists of a group of character sequences, and which is preceded or followed by at least one transmission control character.

(12) block check A method of detecting errors introduced during data transmission. In this method, information is examined block by block.

(13) initial status Status of a point-to-point system prior to establishment of the data link.

(14) control status Status of a network-structured data communication system with a control station prior to establishment of a data link.

(15) data link General term for a physical transmission path from a transmitting equipment to a receiving equipment through a transmission line and for a logical path of data transfer.

(16) code independent The notion that codes to be transmitted to convey an information message are free from restrictions required by different kinds of lines and data transmission control procedures.

(17) alternate supervision A type of transmission in which blocks or forward supervisory sequences are transmitted not continuously but in an alternating fashion with backward supervisory sequences such as response of message.

(18) time fill A set of idle codes placed between blocks or characters to maintain synchronization or to provide some delay time.

(19) recovery To break a deadlock condition caused by malfunctions of transmitting and receiving equipments or communication channels.

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(20) octet An information transfer unit which consists of bit sequence of 8-bits.

3. Basic Modes

3.1 Message Structure

3.1.1 General Rules General rules concerning the message structure are as follows:

(1) Any message to be transmitted is expressed in characters or character sequences and is categorized into the following three groups:

(a) Information message

(b) Forward supervisory sequence

(c) Backward supervisory sequence

(2) Each message shall include at least one transmission control character to specify characteristics of the information in the message, or to perform its supervising function.

(3) The transmission control characters shall not be treated as information. In other words, they shall not be transmitted as a part of the text of the information message nor as content of the heading. However, SYN, which is inserted and transmitted when necessary is the only exception, although SYN does not carry information.

(4) When a single or combined transmission control characters are used at the end of the message, their receiving station is invited to initiate some action.

3.1.2 Structure of Information Message Structure of information message is described below.

(1) Information message consists of a text or a text and a heading which precedes the text.

(2) Heading is the one which is attached to each text if necessary. Designation of transfer line, particularly the one at a relay point in the store-and-forward switching network, shall be included in the heading. Other supplementary information may be included in either the heading or the text.

(3) Each of the characters SOH, STX, ETB, and ETX is used for framing information messages. These characters alone are not transmitted.

(4) Information message or a block may be accompanied by a block check character (BCC) or a block check sequence (BCS). The use of block check calls for an agreement in advance between the transmitting and receiving ends.

(5) Structure of an information message or a block is specified below. Transfer may begin with any of structures (a) to (e). However, the structure of the one to be transferred finally shall be (d) or (e).

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(a) SOH - heading - ETB (BCC)

(b) SOH - heading - STX - text - ETB (BCC)

(c) STX - text - ETB (BCC)

(d) SOH - heading - STX - text - ETX (BCC)

(e) STX - text - ETX (BCC)

Remarks 1. SYN may be embedded in the heading or text if necessary.

2. Structure of the information message in case of transfer abort is specified in 3.6.1.

3. (BCC) may be replaced by (BCS).

3.1.3 Supervisory Sequences The structure and use of supervisory sequences are described below.

(1) Except for the supervisory sequence with DLE, each supervisory sequence consists of one transmission control character or the one with a prepositioned character sequence preceding the character.

(2) If highly reliable transmission is required, transmission control characters which are specified to be transferred as a single character may be repeated and combined into two characters to be transferred consecutively upon an agreement between the transmitting and receiving ends.

(3) A prepositioned character sequence shall be expressed in the graphic characters specified in JIS X 0201 and its length shall be equal to or less than 15 characters.

(4) The prepositioned character sequence contains, in addition to a polling address for polling and a selecting address for selecting, the following information based upon a prior agreement between the transmitting and receiving ends.

(a) Recognition information

(b) Address information

(c) Status information

(d) Other necessary information

These kinds of information are termed prefixes. The use of a prefix is optional.

(5) The kinds and structure of basic forward supervisory sequences are listed in Table 1. The use of each sequence is specified in each of sub-clauses 3.2 to 3.7.

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Table 1. Kinds of Forward Supervisory Sequences

Kinds		Structure
Polling		(EOT) - polling address - ENQ
Selecting	Station selection	(EOT) - selecting address -ENQ
	Recognition or status request	(Prefix) ENQ
	Escape from initial status	(Prefix) ENQ
Termination	Regular termination	(Prefix) EOT
	Abnormal termination	EOT
Clearing of connection		DLE - EOT
Information message response request		(Prefix) ENQ
Abort	Block abort	(Prefix) ENQ
	Station abort	EOT

Remark: EOT precedes a polling sequence except for the one in which EOT is unnecessary in the light of the function of the phase 1. EOT may also precede a selecting sequence.

(6) The kinds and structure of basic backward supervisory sequences are listed in Table 2. The use of each sequence is specified in each of sub-clauses 3.2 to 3.7.

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Table 2. Kinds of Backward Supervisory Sequences

Kinds		Structure
Positive acknowledge	Selection reply	(Prefix) ACK
	Information message reply	(Prefix) ACK
Negative acknowledge	Polling reply	(Prefix) EOT
	Negative selection reply	(Prefix) NAK
	Negative information message reply	(Prefix) NAK
Clearing of connection		DLE - EOT
Interrupt	Block interrupt	EOT
	Station interrupt	DLE < ([1])

Note ([1]) The character " < " used for station interrupt is equivalent to the one specified in the position 3/12 in Table 1 or 3 of JIS X 0201.

(7) Among backward supervisory sequences, positive and negative acknowledgments may be expressed in numbers, if necessary, upon an agreement between the transmitting and receiving ends. Table 3 presents character sequences for acknowledgments in this case.

Table 3. Reply Sequences with Replies Expressed in Digits

Kinds	Structure
Positive acknowledge of selecting	DLE α
Negative acknowledge of selecting	NAK or DLE β
Positive acknowledge of information message	Alternating acknowledges DLE α and DLE β
Negative acknowledge of information message	NAK

Remarks 1. The first positive acknowledge is that of a selecting sequence. The positive acknowledge in digits has a form DLE α.

2. When there is no selecting sequence (as in the case of transmission of the information message beginning with polling), the positive acknowledge of the first block has a form DLE α.

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3. Negative acknowledge of a polling sequence is the same as the one specified in the Table 2.

4. When the alternation of the acknowledges of information message DLE α and DLE β ceases, each system may determine the way of interpretation and necessary actions to follow.

5. When the alternation described above ceases, the negative acknowledge of an information message and its interpretation does not require the negative acknowledge NAK.

6. The characters used for α and β are equivalent to those appearing in the positions 3/0 and 3/1 of Table 1 or Table 3 of JIS X 0201, or ACK and NAK. Each system may determine that either combination of the characters is employed.

(8) New kinds of supervisory sequences with DLE as an initial character in the two-character sequence may be added to Tables 1 and 2. The meaning of these new sequences may be specified in each system. The character appearing in the second position shall be equivalent to one of the characters in the 3rd, 4th, 5th, 6th, and 7th rows in the Tables 1 and 3 of JIS X 0201. However, this rule does not apply to the character equivalent to the one in the position 7/15 in these Tables.

3.2 Phases (see Fig. 1)

3.2.1 Kinds of Phases A data transmission control procedure consists of portions of the procedure for phases 1, 2, 3, 4, and 5, each of which is composed of the following sub-phases.

Phase 1 Connection of data transmission lines.

Phase 2 Establishment of data link.

(a) Switching

(b) Polling

(c) Selecting

Phase 3 Transfer of information

Phase 4 Termination

(a) Return to an initial status

(b) Return to a control status

(c) Disconnection

Phase 5 Clearing of connection

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The phases 1 and 5, which are concerned with connection and termination of data transmission channels in use, respectively, are beyond the scope of this standard.

3.2.2 Phase Linkage The connecting relationship of these five phases is illustrated in Fig. 1 and described below. In general the procedure is completed by connecting phases 1 to 5 consecutively.

(1) Transmission to Multiple Stations Phase links PL1, PL2, PL3, PL4, PL5 and PL6, which are illustrated in Fig. 1, are used for continuing data transmission to and from multiple stations without clearing of connection.

(2) By-passes in Links Some characteristics of the system can allow the use of by-passes BP1, BP2, BP3, BP4 and BP5, which are illustrated in Fig. 1. The application of each by-pass is described below.

By-pass 1 (BP1) This applies to the system with single-purpose or private circuits.

By-pass 2 (BP2) This applies to the system without a switching line.

By-pass 3 (BP3) This applies to the system without switching private lines.

By-pass 4 (BP4) This applies to the system with a control station when information is transmitted only from the control station to other stations.
This also applies to the system without a control station.

By-pass 5 (BP5) This applies to the system in which transfer of information is required only from tributory stations to the control station.

3.3 Procedure to Establish Data Link (Phase 2) (see Fig. 2)

3.3.1 Switching Connection If the system includes a private switching equipment, switching connection of lines shall be done in a fixed procedure determined according to the characteristics of the equipment.

3.3.2 Link Control Methods Two methods of establishing a data link are specified here. They are the contention method and the polling/selecting method.

(1) Contention Method In this method, a station which is in need of transmission of the information message sends a selecting sequence to a receiving station and then transmits an information message after recognizing the receiving station and its reception capability. Competition is made on a first-come-first basis to obtain the right to become the master station.

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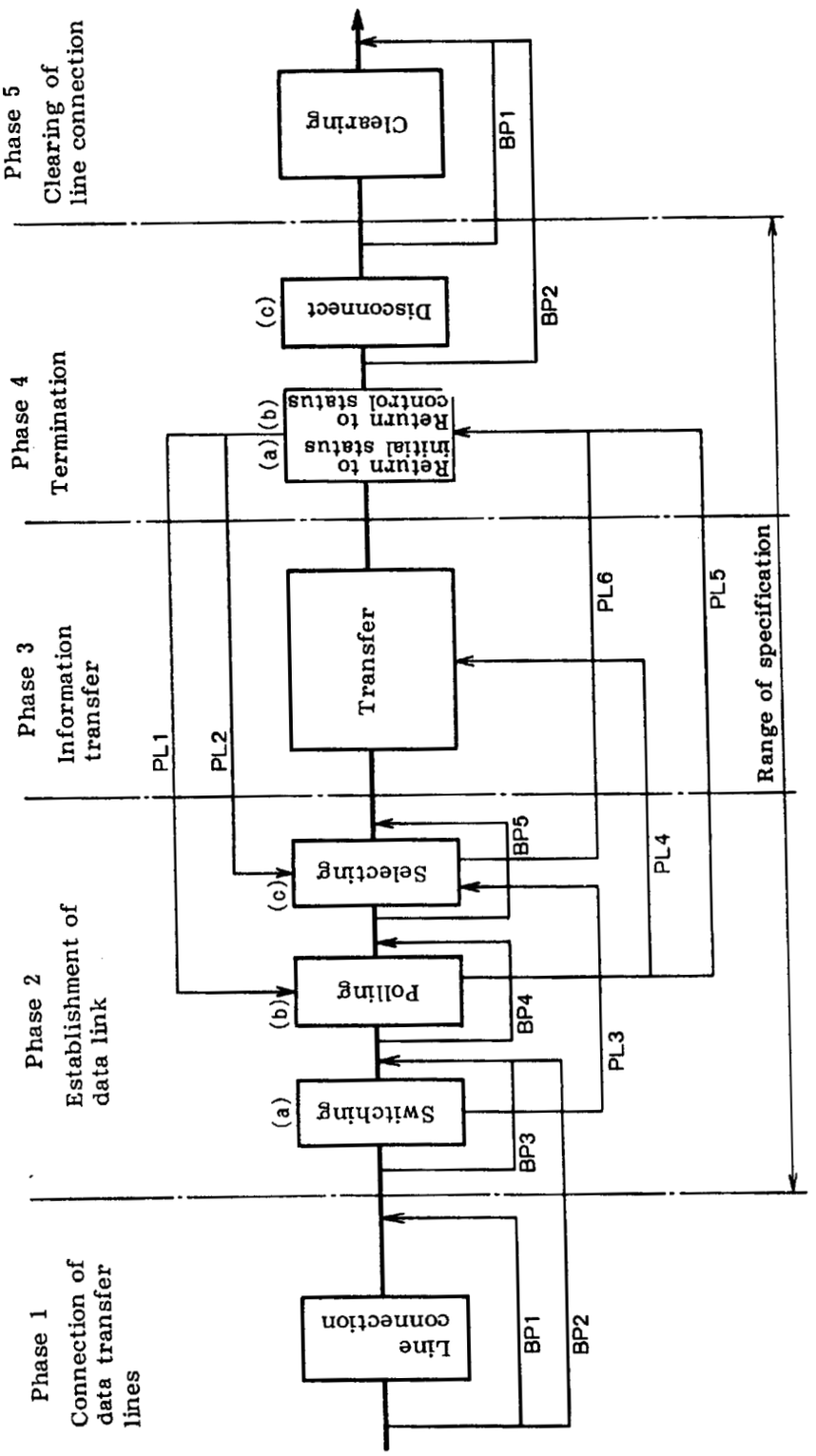


Fig. 1. Phase Linkage Diagram

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