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Information technology — Telecommunications and information exchange between systems — High-level data link control procedures — Description of the X.25 LAPB-compatible DTE data link procedures

AMENDMENT 1: Modulo 32 768 and multi-selective reject option

Technologies de l'information — Télécommunications et échange d'information entre systèmes — Procédures de commande de liaison de données à haut niveau — Description des procédures de liaison d'équipement terminal de transmission de données ETTD compatible X.25 LAPB

AMENDEMENT 1: Option de rejet modulo 32 768 et multisélective

Reference number
ISO/IEC 7776:1995/Amd.1:1996(E)

Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. 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.

Amendment 1 to International Standard ISO/IEC 7776:1995 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 6, *Telecommunications and information exchange between systems*.

Introduction

This amendment to ISO/IEC 7776:1995 adds the multi-selective reject option (option 3.3) and modulo 32 768 (option 10.2) from ISO/IEC 7809:1993. This amendment enhances ISO/IEC 7776:1995 in the following areas:

- it allows more efficient recovery of errored or lost I frames by selectively requesting retransmissions of one or more I frames with a single request; this improved efficiency is especially beneficial over links that have high data rates or large propagation delays.
- link efficiency is improved by retransmitting only errored or lost I frames; correctly received I frames are saved by the DTE for deferred delivery;
- allows for a much larger modulo for operation over links that have high data rates or large propagation delays;
- the maximum number of outstanding frames k can be as large as the modulus number minus 1;
- the additional procedures are fairly simple to implement.

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Information technology — Telecommunications and information exchange between systems — High-level data link control procedures — Description of the X.25 LAPB-compatible DTE data link procedures

AMENDMENT 1: Modulo 32 768 and multi-selective reject option

Page 1

Clause 1

Replace paragraph 2 with the following:

Clause 3 describes three frame structures: one for basic (modulo 8) operation, one for extended (modulo 128) operation, and the third for modulo 32 768. Basic (modulo 8) operation is the ISO/IEC balanced asynchronous class of procedure with optional functions 2 and 8 (BAC, 2, 8). Extended (modulo 128) operation is the ISO/IEC balanced asynchronous class of procedure with optional functions 2, 8, and 10.1 (BAC, 2, 8, 10.1) or 3.3, 8 and 10.1 (BAC, 3.3, 8, 10.1). Modulo 32 768 operation is the ISO/IEC balanced asynchronous class of procedure with optional functions 3.3, 8 and 10.2 (BAC, 3.3, 8, 10.2).

The following pertains to the selection of the above combinations:

a. basic (modulo 8) operation may optionally be supported — if supported, then the REJ recovery mechanism shall be supported with this operating mode; support of SREJ-with-span-list recovery mechanism is prohibited;

b. extended (modulo 128) operation may optionally be supported — if supported, then either or both of the REJ and SREJ-with-span-list recovery mechanism shall be supported but only one recovery mechanism shall be used at a time;

c. modulo 32 768 operation may optionally be supported — if supported, then SREJ-with-span-list recovery mechanism shall be supported with this operating mode; support of the REJ recovery mechanism is prohibited.

For those DTE/DCE connections that support basic (modulo 8) operation, extended (modulo 128) operation and/or modulo 32 768 operation, the choice of modulo and, when applicable, recovery mechanism is made at subscription-time only. For those DTE/remote DTE connections that support basic (modulo 8) operation, extended (modulo 128) operation and/or modulo 32 768 operation, the choice of modulo and, when applicable, recovery mechanism is made by bilateral agreement.

NOTE — The procedure herein described as basic (modulo 8) operation is the only one available in all public data networks.

Page 1

Clause 1

Replace paragraph 4 with the following:

Clause 4 describes the elements of procedures. Some aspects are only operable for the basic (modulo 8) operation, some for the extended (modulo 128) operation and some for modulo 32 768 operation.

Page 2

Clause 3

Replace paragraph 1 with the following:

All transmissions on a SLP are in frames conforming to one of the formats of table 1 for basic (modulo 8) operation, or one of the formats of table 2 for extended (modulo 128) operation or alternatively one of the formats of table 3 for modulo 32 768 operation. The flag preceding the address field is defined as the opening flag. The flag following the FCS field is defined as the closing flag.

Page 3

Clause 3

Add the following new Table 3, and renumber all the other tables that follow:

Table 3 — Frame formats — modulo 32 768 operation

Bit order of transmission

12345678	12345678	1 to *	16 to 1	12345678
Flag	**Address**	**Control**	**FCS**	**Flag**
F	**A**	**C**	**FCS**	**F**
01111110	8-bits	*-bits	16-bits	01111110

FCS = Frame Check Sequence

Bit order of transmission

12345678	12345678	1 to *		16 to 1	12345678
Flag	**Address**	**Control**	**Information**	**FCS**	**Flag**
F	**A**	**C**	**I**	**FCS**	**F**
01111110	8-bits	*-bits	N-bits	16-bits	01111110

FCS = Frame Check Sequence

* 32 for frame formats that contain sequence numbers; 8 for frame formats that do not contain sequence numl

Page 3

Subclause 3.3

Paragraph 1, Replace with the following:

For basic (modulo 8) operation, the control field shall consist of one octet. For extended (modulo 128) operation, the control field shall consist of two octets for frame formats that contain sequence numbers, and one octet for frame formats that do not contain sequence numbers. For modulo 32 768 operation, the control field shall consist of four octets for frame formats that contain sequence numbers, and one octet for frame formats that do not contain sequence numbers. The content of this field is described in 4.1.

Page 3

Subclause 3.4, Paragraph 1, Line 2:

Change 4.3.9 to 4.3.10

Page 3

Subclause 3.4, Paragraph 3:

Change 4.3.9 to 4.3.10 and 5.7.3 to 5.8.3.

Page 5

Subclause 3.7.1

Replace paragraph 3 with the following:

The FCS shall be transmitted to the line commencing with the coefficient of the highest term, which is found in bit position 16 of the FCS field (see tables 1, 2 and 3).

Page 5

Subclause 3.7.1, NOTE

Change "8" to "15".

Page 7

Subclause 3.11.2.2

Change 5.7.1.5 to 5.8.1.5.

Page 7

Subclause 3.11.2.2, Note

Change 5.7.1.3 to 5.8.1.3.

Page 7

Subclause 4.1.1

Replace the second paragraph with the following:

Three types of control field formats are used to perform numbered information transfer (I format), number supervisory functions (S format) and unnumbered control functions (U format). The control field formats for basic (modulo 8) operation are depicted in table 4, control field formats for extended (modulo 128) operation are depicted in table 5 and control field formats for modulo 32 768 operation are depicted in table 6.

Page 8

Renumber Tables 3 and 4 as Tables 4 and 5 and insert the following new Table 6:

Table 6 — Control field formats — modulo 32 768 operation

Control field format	Control field bits																			
	First two octets															Next two octets															
	1	2						8							16	17	18													32
I format	0							N(S)								P/F								N(R)						
S format	1	0	S	S	x	x	x	x	x	.	.	.			x	P/F								N(R)						
U format	1	1	M	M	P/F	M	M	M																						

N(S) = transmitter send sequence number (bit 2 = low-order bit)
N(R) = transmitter receive sequence number (bit 18 = low-order bit)
S = supervisory function bit
M = modifier function bit
P/F = poll bit when issued as a command; final bit when issued as a response (1 = Poll/Final)
P = poll bit (1 = Poll)

Page 8

Subclause 4.1.1.3

Replace the last sentence with the following:

The unnumbered frames shall have the same control field length (one octet) in the basic (modulo 8) operation, extended (modulo 128) operation and modulo 32 768 operation.

Page 8

Subclause 4.1.2.1

Replace the last sentence with the following:

The modulus equals 8, 128 or 32 768 and the sequence numbers cycle through the entire range.

Page 9

Subclause 4.1.2.2.1

Replace the last sentence with the following:

The value of *k* is defined in 5.8.4.

Page 9

Subclause 4.1.2.2.4

Replace with the following:

All I frames and supervisory frames, except SREJ frames with F bit set to "0", shall contain N(R), the expected sequence number of the next received I frames. Prior to transmission of a frame of the above types of the DTE, the value of N(R) shall be set equal to the current value of the DTE receive state variable. N(R) indicates that the transmitter of the N(R) has correctly received all I frames numbered up to N(R) – 1 inclusive.

Page 9

Subclause 4.3

Replace with the following:

The commands and responses supported by the DTE are represented in table 7 for basic (modulo 8) operation, table 8 for extended (modulo 128) operation and table 9 for modulo 32 768 operation. For purposes of this International Standard, those encodings of the modifier function bits in tables 4, 5 and 6 not identified in tables 7, 8 and 9 are identified as "undefined or not implemented" command and response control fields. The commands and responses in tables 7, 8 and 9 are defined as follows"

Page 9-10

Renumber Tables 5 and 6 as Tables 7 and 8. Replace Table 8 with the following. Insert the following new Table 9:

Table 8 — Commands and responses — Extended (modulo 128) operation

Format	Commands	Responses	Encoding									
			1	2	3	4	5	6	7	8	9	10 to 16
Information transfer	I (information)		0	N(S)							P	N(R)
Supervisory	RR (receive ready) RNR (receive not ready) REJ (reject)	RR (receive ready) RNR (receive not ready) REJ (reject) SREJ (selective reject)	1 0 1 0 1 0 1 0		0 0 1 0 0 1 1 1		0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0				P/F P/F P/F F	N(R) N(R) N(R) N(R)
Unnumbered	SABME (set asynchronous balanced mode extended)		1 1		1 1		P	1	1	0		
	DISC (disconnect)		1 1		0 0		P	0	1	0		
		UA (unnumbered acknowledgement)	1 1		0 0		F	1	1	0		
		DM (disconnected mode)	1 1		1 1		F	0	0	0		
		FRMR (frame reject)	1 1		1 0		F	0	0	1		

Table 9 — Commands and responses — modulo 32 768 operation

Format	Commands	Responses	Encoding									
			1	2	3	4	5	.8	.	16	17	18 to 32
Information transfer	I (information)		0	N(S)							P	N(R)
Supervisory	RR (receive ready) RNR (receive not ready)	RR (receive ready) RNR (receive not ready) SREJ (selective reject)	1 0 1 0 1 0		0 0 1 0 1 1		0 0 0 0 0 0 0 0 0 0 0 0				P/F P/F F	N(R) N(R) N(R)
Unnumbered	SM (set mode)		1 1		0 0		P	011				
	DISC (disconnect)		1 1		0 0		P	010				
		UA (unnumbered acknowledgement)	1 1		0 0		F	110				
		DM (disconnected mode)	1 1		1 1		F	000				
		FRMR (frame reject)	1 1		1 0		F	001				

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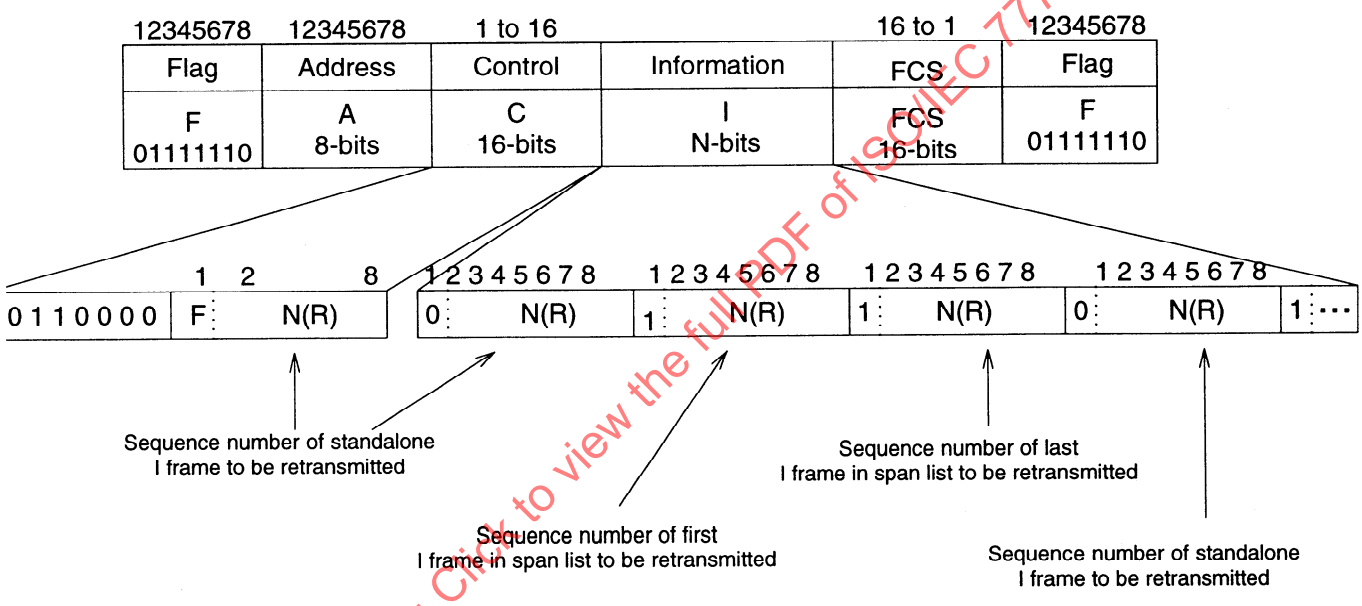
Insert a new subclause 4.3.5 as follows and renumber all subclauses that follow:

4.3.5 Selective reject (SREJ) response

The selective reject, SREJ, frame shall be used by a DTE to request retransmission of one or more (not necessarily contiguous) I frames. The N(R) field of the control field of the SREJ frame shall contain the sequence number of the earliest I frame to be retransmitted and the information field shall contain the sequence numbers of additional I frame(s), if any, in need of retransmission. (The DTE shall create a list of sequence numbers N(X), N(X+1), N(X+2), N(Y), N(Z+3), N(Z+4), ... , N(S)-1, where N(X) is greater than or equal to V(R) and none of the I frames N(X) to N(S-1) have been received. The N(R) field of the SREJ frame shall be set to N(X) and the information field set to the list N(X)+1, ..., N(S)-1.)

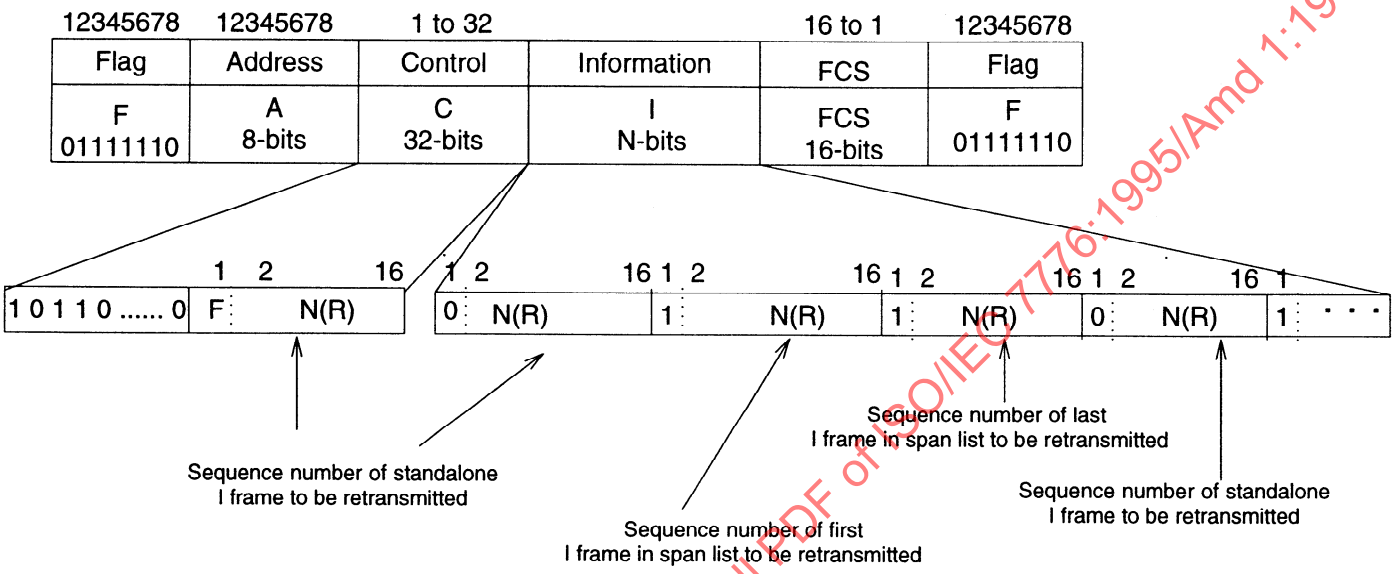
For extended (modulo 128) operation, the information field shall be encoded such that there is an octet for each standalone I frame in need of retransmission, and a two-octet span list for each sequence of two or more contiguously numbered I frames in need of retransmission, as depicted in table 10. In the case of standalone I frames, the sequence number of each designated I frame shall occupy bit positions 2-8 of an octet, with bit position 1 set to zero, as depicted in table 10. In the case of span lists, the sequence number of the first designated I frame in need of retransmission is encoded in the first octet (of the two octet field for span lists) and the second octet contains the sequence number of the last designated I frame in the sequence in need of retransmission. Sequence numbers in both octets are encoded in bits 2-8 with the bit position 1 in both octets set to 1 as depicted in table 10.

Table 10 – Control and Information field encoding of SREJ frame - Extended (modulo 128) operation



For modulo 32 768 operation, the information field shall be encoded such that there are two octets for each standalone I frame in need of retransmission, and a four-octet span list for each sequence of two or more contiguously numbered I frames in need of retransmission, as depicted in table 11. In the case of standalone I frames, the sequence number of each designated I frame shall occupy bit positions 2-16 of the two octet field, with bit position 1 set to zero, as depicted in table 11. In the case of span lists, the sequence number of the first designated I frame in need of retransmission is encoded in the first two octets (of the four octet field for span lists) and the second two octet field contains the sequence number of the last designated I frame in the sequence in need of retransmission. Sequence numbers in both two octet fields are encoded in bits 2-16 with the bit position 1 in both two-octet fields set to 1 as depicted in table 11.

Table 11 – Control and Information field encoding of SREJ frame - modulo 32 768 operation



If the list of sequence numbers is too large to fit in the information field of the SREJ frame, then the list shall be truncated to fit in one SREJ frame, by including only the earliest sequence numbers. The truncated sequence numbers may be transmitted in another SREJ frame. The number of bits in an SREJ frame shall not exceed the value of parameter N1, the maximum number of bits in an I frame.

If the F bit in an SREJ frame is set to "1", then I frames numbered up to N(R) – 1 inclusive (N(R) being the value in the control field) are considered as acknowledged. If the F bit in an SREJ frame is set to "0", then the N(R) in the control field of the SREJ frame does not indicate acknowledgement of I frames.

The procedures to be followed on receipt of an SREJ frame are specified in 5.5.6.

Page 10

Old Subclause 4.3.5

Replace with the following:

4.3.6 Set asynchronous balanced mode (SABM) command/Set asynchronous balanced mode extended (SABME) command/Set mode (SM) command

The SABM unnumbered command shall be used to place the addressed DCE or DTE in an asynchronous balanced mode (ABM) information transfer phase where all command/response control fields shall be one octet in length.

The SABME unnumbered command shall be used to place the addressed DCE or DTE in an asynchronous balanced mode (ABM) information transfer phase where numbered command/response control fields shall be two octets in length, and unnumbered command/response control fields shall be one octet in length.

The SM unnumbered command shall be used to place the addressed DCE or DTE in an asynchronous balanced mode (ABM) information transfer phase where numbered command/response control fields shall be four octets in length, and unnumbered command/response control fields shall be one octet in length.

NOTE - For DTE/DCE connections, the mode of operation of the data link [basic (modulo 8), extended (modulo 128) or modulo 32 768 shall be determined at subscription time and shall only be changed by going through a new subscription process. For DTE/DTE connections, the mode of operation of the data link [basic (modulo 8), extended (modulo 128) or modulo 32 768] shall be determined by bilateral agreement.

No information field shall be permitted with the SABM, SABME or SM command. The transmission of a SABM/SABME/SM command shall indicate the clearance of a busy condition that was reported by the earlier transmission of an RNR frame by that same station. The DTE confirms acceptance of SABM/SABME/SM [basic (modulo 8) operation/extended (modulo 128) operation/modulo 32 768 operation] command by the transmission at the first opportunity of a UA response. Upon acceptance of this command, the DTE send state variable V(S) and receive state variable V(R) shall be set to "0".

Previously transmitted I frames that are unacknowledged when this command is actioned shall remain unacknowledged (i.e., they are not retransmitted following link set-up). It shall be the responsibility of a higher-level protocol (for example, Network Layer or MLP) to recover from the possible loss of the contents (data units) of such I frames.

Page 11

Old subclause 4.3.7 renumbered as 4.3.8

First sentence, replace with the following:

The UA unnumbered response shall be used by the DTE to acknowledge the receipt and acceptance of the SABM/SABME/SM and DISC unnumbered commands.

Page 11

Old subclause 4.3.8 renumbered as 4.3.9

Second paragraph, Replace with the following:

A DTE in the disconnected phase shall monitor received commands, react to a SABM/SABME/SM command as outlined in 5.3 and respond with a DM response with the F bit set to "1" to any other command received with the P bit set to "1".

Page 11

Old subclause 4.3.9 renumbered as 4.3.10

Second paragraph, Replace with the following:

An undefined or not implemented control field shall be any of the control field encodings that are not identified in tables 7, 8 or 9.

Page 11

Old subclause 4.3.9 renumbered as 4.3.10

Fourth paragraph, replace with the following:

An information field which immediately follows the control field, and consists of 3 octets [basic (modulo 8) operation], 5 octets [extended (modulo 128) operation], 9 octets [modulo 32 768 operation], shall be returned with this response to provide the reason for the FRMR response. These formats are given in table 12, table 13 and table 14.

Page 12

Renumber Tables 7 and 8 as Tables 12 and 13, Insert the following new table at the end of 4.3.10.

Table 14 — FRMR information field format — modulo 32 768 operation

	Information field bits												
	1 to 32	33	34 to 48	49	50 to 64	65	66	67	68	69	70	71	72
Rejected frame control field	0	N(S)	C/R	N(R)	*w*	*x*	*y*	*z*	0	0	0	0	

where:

a) Rejected frame control field shall be the control field of the received frame which caused the frame reject. When the rejected frame is an unnumbered frame, the control field of the rejected frame shall be positioned in bit positions 1 to 8, with 9 to 32 set to "0".

b) N(S) shall be the current send state variable value at the DCE or DTE reporting the rejection condition (bit 34 = low-order bit).

c) C/R set to "1" shall indicate the rejected frame was a response. C/R set to "0" shall indicate the rejected frame was a command.

d) N(R) shall be the current receive state variable value at the DCE or DTE reporting the rejection condition (bit 50 = low-order bit).

e) *w* set to "1" shall indicate that the control field received and returned in bits 1 to 32 was undefined or not implemented.

f) *x* set to "1" shall indicate that the control field received and returned in bits 1 to 32 was considered invalid because the frame contained an information field which is not permitted or is a supervisory frame with incorrect length. Bit *w* shall be set to "1" in conjunction with this bit.

g) *y* set to "1" shall indicate that the information field received exceeded the maximum established capacity of the DTE or DCE reporting the rejection condition.

h) *z* set to "1" shall indicate that the control field received and returned in bits 1 to 32 contained an invalid N(R).

i) Bits 33 and 69 to 72 shall be set to "0".

The *w*, *x*, *y* and *z* bits in the information field of the FRMR response may all be set to "0", indicating an unspecified rejection condition of the frame for one or more of the conditions cited above.

Page 13

Subclause 4.4.1

First paragraph, last sentence, replace with the following:

An indication that the busy condition has cleared shall be communicated by the transmission of a UA (only in response to a SABM/SABME/SM command), RR, REJ, SREJ or SABM/SABME/SM frame.

Page 13

Subclause 4.4.2

Replace with the following:

If the multi-selective reject option is not used the information field of all I frames received by the DTE whose N(S) does not equal the DTE receive state variable V(R) shall be discarded.

If the multi-selective reject option is used, the information field of all I frames received by the DTE whose N(S) is not in the range V(R) and V(R) + k – 1 inclusive, shall be discarded. If the multi-selective reject option is used, the information field of all I frames received by the DTE whose N(S) is in the range V(R) and V(R) + k – 1 inclusive, shall be saved in the receive buffer.

An N(S) sequence exception condition occurs in the DTE when an I frame received contains the N(S) that is not equal to the DTE receive state variable. The DTE shall not acknowledge (i.e., increment its receive state variable) the I frame causing the sequence error, or any I frames which may follow, until an I frame with the correct N(S) is received.

A DTE which receives one or more I frames having sequence errors or subsequent supervisory frames (RR, RNR, REJ or SREJ (with F bit set to "1")) shall accept the control information contained in the N(R) field and the P or F bit to perform link control functions; for example, to receive acknowledgment for I frames previously transmitted by the DTE and to respond (P bit set to "1").

The means specified in 4.4.2.1 to 4.4.2.4 shall be available for initiating the retransmission of lost or errored I frames following the occurrence of a N(S) sequence error condition.

Page 13

Subclause 4.4.2.1

At the end of this subclause, add the following:

When using the multi-selective reject option, checkpoint retransmissions shall be performed only when an RR response frame with the F bit set to "1" is received and no new I frames have been sent subsequent to the last frame with the P bit set to "1". In this case, the DTE shall retransmit all unacknowledged I frames, except those I frames that were transmitted subsequent to the last frame with the P bit set to "1".

Page 14

Subclause 4.4.2.3

Renumber 4.4.2.3 as 4.4.2.4 and insert the following new subclause:

4.4.2.3 SREJ recovery

Only SREJ recovery shall be used when the multi-selective reject option is used; REJ recovery shall not be used.

The SREJ frame shall be used to initiate more efficient error recovery by selectively requesting the retransmission of one or more (not necessarily contiguous) lost or errored I frame(s) following the detection of sequence errors, rather than requesting the retransmission of all I frames. When a DTE receives an out-of-

sequence frame, the I frame shall be saved in a receive buffer. The I frame shall be delivered to the upper layer only when all I frames numbered below N(S) are correctly received. If frame number N(S) – 1 has not been received previously, then an SREJ response frame with the F bit set to "0" shall be transmitted, that contains the sequence numbers of the block of consecutive missing I frames ending at N(S) – 1. The DTE on receiving such an SREJ frame shall retransmit all requested I frames. After having retransmitted these I frames, the DTE may transmit new I frames, if they become available.

When a DTE receives a command frame with the P bit set to "1", if there are out-of-sequence I frames saved in the receive buffer, it shall transmit an SREJ frame with the F bit set to "1", that contains a complete list of missing sequence numbers. The DTE on receiving such an SREJ frame shall retransmit all requested I frames, except those that were transmitted subsequent to the command frame with the P bit set to "1".

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Old subclause 4.4.2.3 renumbered as 4.4.2.4

Replace with the following:

4.4.2.4 Time-out recovery

If the DCE/remote DTE, due to a transmission error, does not receive (or receives and discards) a transmission consisting of a single I frame or the last I frame in a sequence of I frames, it will not detect an out-of-sequence error exception, and therefore, will not transmit a REJ or SREJ frame.

If the multi-selective reject option is not used, then the DTE which transmitted the unacknowledged I frame(s) shall, following the completion of a system specified time-out period (see 5.8.1) take appropriate recovery action to determine at which I frame retransmission shall begin. The retransmitted I frames may contain an N(R) and a P bit that are updated from, and therefore different from, the ones contained in the originally transmitted frames.

If the multi-selective reject option is used, then the DTE which transmitted the unacknowledged I frame(s) shall, following the completion of a system specified time-out period (see 5.8.1) , send a supervisory command frame (RR or RNR) with the P bit set to "1". I frames shall only be retransmitted on the receipt of an RR response frame with the F bit set to 1 or an SREJ frame.

Page 14

Subclause 4.4.4

Replace with the following:

A frame rejection condition shall be established at the DTE upon the receipt of an error-free frame with one of the conditions listed in 4.3.10.

This frame rejection exception condition shall be reported by the DTE by a FRMR response frame for appropriate action by the DCE/remote DTE. Once the DTE has established such an exception condition, no additional I frames shall be accepted, except for examination of the P bit, until the condition is reset by the DCE/remote DTE. The FRMR response may be repeated by the DTE at each opportunity, as specified in 5.7.2, until recovery is effected by the DCE/remote DTE and the data link is reset, or until the local DTE initiates its own recovery.

Page 15

Subclause 5.2

Replace with the following:

The DTE receiving a SABM/SABME/SM, DISC, supervisory command and I frame with the P bit set to "1", shall set the F bit to "1" in the next response frame it transmits.

The response frame returned by the DTE to a SABM/SABME/SM or DISC command with the P bit set to "1" shall be a UA or DM response with the F bit set to "1". The response frame returned by the DTE to an I frame with the P bit set to "1" received during the information transfer phase, shall be an RR, REJ, SREJ, RNR or FRMR response with the F bit set to "1". The response frame returned by the DTE to a supervisory command frame with the P bit set to '1", received during the information transfer phase, shall be an RR, REJ, SREJ, RNR, or FRMR response with the F bit set to "1". The response frame returned by the DTE to a supervisory command or I command frame with the P bit set to "1", received in the disconnected phase, shall be a DM response with the F bit set to "1".

The P bit shall be used in conjunction with the timer recovery condition (see 5.4.9). The P bit may also be used by the DTE to initiate a checkpoint mechanism (see 4.4.2.1) at any time.

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Subclause 5.3.1

Replace with the following:

A DCE shall indicate that it is able to set up the link by transmitting contiguous flags (active channel state) to the DTE.

Either the DTE or a DCE/remote DTE may initiate link set-up. Prior to initiation of link set-up, either the DTE or the DCE/remote DTE may initiate link disconnection for the purpose of ensuring that the DTE and the DCE/remote DTE are in a the same phase. The DTE may also transmit an unsolicited DM response to request the DCE/remote DTE to initiate link set-up.

The DCE/remote DTE shall initialize the link by transmitting a SABM/SABME/SM command to the DTE. If, on receiving correctly the SABM/SABME/SM command, the DTE can enter the information transfer phase, it shall return a UA response, set its send and receive state variables, V(S) and V(R), to "0", and consider the link set-up. If, on receiving correctly the SABM/SABME/SM command, the DTE cannot enter the information transfer phase, it shall return a DM response as a denial to the link set-up initialization and consider the link not set-up.

The DTE shall initiate link set-up by transmitting a SABM/SABME/SM command to the DCE/remote DTE and starting Timer T1 in order to determine when too much time has elapsed waiting for a reply (see 5.8.1.1). If the DCE/remote DTE can enter the information transfer phase, it shall return a UA response, reset its send and receive state variables, V(S) and V(R), to "0", and consider the link set-up. The DTE, on receiving correctly a UA response, shall stop Timer T1, have its send and receive state variables, V(S) and V(R), set to zero, and consider the link set-up. If the DCE/remote DTE cannot enter the information transfer phase, it shall return a DM response as a denial to the link set-up initialization. The DTE, on receiving correctly a DM response, shall stop Timer T1 and consider the link not set-up. In order to avoid misinterpretation of a DM response received during link set-up, the DTE shall always send its SABM/SABME/SM command with the P bit set to "1". It will then be possible to differentiate a DM response from the DCE/remote DTE intended as a denial to link set-up (F bit set to "1") from a DM response from the DCE/remote DTE that was issued in an unsolicited sense (F bit set to "0") as a request for a mode-setting command (as described in 5.6). The DTE may decide to re-initiate link set-up at any time.

The DTE, having sent a SABM/SABME/SM command, shall ignore and discard any frames except the SABM/SABME/SM, DISC, UA and DM frame received from the DCE/remote DTE. The receipt of a SABM/SABME/SM or DISC frame from the DCE/remote DTE will result in a collision situation that is resolved per 5.3.5. Frames from the DTE other than the UA frame and the DM frame sent in response to a received SABM/SABME/SM or DISC frame from the DCE/remote DTE shall be sent only after the link is set-up and no outstanding SABM/SABME/SM command exists.

After the DTE sends the SABM/SABME/SM command, if a UA or DM response is not received correctly, Timer T1 will run out in the DTE. The DTE shall then resend the SABM/SABME/SM command and restart Timer T1. After N2 attempts to set-up the link, the DTE shall initiate appropriate higher level recovery action. The value of

N2 is defined in 5.8.2. *Page 16*

Subclause 5.3.2

Replace with the following:

After having transmitted the UA response to an SABM/SABME/SM command or having received the UA response to a transmitted SABM/SABME/SM command, the DTE shall accept and transmit I frames and supervisory frames according to the procedures described in 5.4 when not using the multi-selective reject option and 5.5 when using the multi-selective reject option.

During the information transfer phase, whenever there has been no activity on the data link for a period of time T4, it is strongly recommended that the DTE transmit an appropriate supervisory command frame with the P bit set to "1" to query the status of the DCE/remote DTE. Receipt of a response with the F bit set to "1" will indicate both the existence of a working physical link and the logical status of the responding DCE/remote DTE.

When receiving an SABM/SABME/SM command while in the information transfer phase,the DTE shall conform to the link resetting procedure described in 5.7.

While in the information transfer phase, either the DTE or the DCE/remote DTE may initiate a disconnect of the data link according to the procedures described in 5.3.3.

Page 16

Subclause 5.3.3

Second paragraph, change the reference in the last sentence to 5.6.

Page 16

Subclause 5.3.3

Third paragraph, replace with the following:

The DTE, having sent a DISC command, shall ignore and discard any frames except a SABM/SABME/SM, DISC, UA or DM frame received from the DCE/remote DTE. The receipt of a SABM/SABME/SM or DISC command from the DCE/remote DTE will result in a collision situation that is resolved per 5.3.5.

Page 16

Subclause 5.3.4

Third paragraph, first sentence, replace with the following:

In the disconnected phase, the DTE shall react to the receipt of an SABM/SABME/SM command as described in 5.3.1 and shall transmit a DM response in answer to a received DISC command.

Page 16

Subclause 5.3.4

Fourth paragraph, replace with the following:

When the DTE enters the disconnected phase after detecting error conditions as listed in 5.6, or after an internal malfunction, it may indicate this by sending a DM response rather than a DISC command. In these cases, the

DTE shall transmit the DM response and start its Timer T1. If Timer T1 runs out before the reception of an SABM/SABME/SM or DISC command, the DTE may retransmit the DM response and restart Timer T1. After transmission of the DM response N2 times, the DTE may remain in the disconnected phase and appropriate recovery actions shall be initiated by a higher layer. Alternatively, after an internal malfunction, the DTE may either initiate a link resetting procedure (see 5.7) or disconnect the data link (see 5.3.3) prior to initiating a link set-up procedure (see 5.3.1).

Page 17

Subclause 5.3.6

Replace with the following:

5.3.6 Collision of DM response with SABM/SABME/SM or DISC command

When a DM response is issued by the DCE/remote DTE as an unsolicited response to request the DTE to issue a mode-setting command as described in 5.3.4, a collision between a SABM/SABME/SM or DISC command transmitted by the DTE and the unsolicited DM response may occur. In order to avoid misinterpretation of the DM response received, the DTE shall always send its SABM/SABME/SM or DISC command with the P bit set to "1".

Page 17

Subclause 5.3.7

Replace with the following:

A contention situation may occur when both the DTE and the DCE/remote DTE issue a DM response to request a mode-setting command. In this case, the DTE shall issue a SABM/SABME/SM command to resolve the contention situation.

Page 17

Subclause 5.4

Change the heading of this subclause to the following:

5.4 Procedures for information transfer when not using the multi-selective reject option

Page 17

Subclause 5.4.1

Third paragraph, change 5.7.4 to 5.7.8.

Page 19

Subclause 5.4.7

Third paragraph, change 5.6 to 5.7.

Page 19

Subclause 5.4.9

Second paragraph, change 5.6 to 5.7.

Page 19

Subclause 5.5

Renumber subclause 5.5 as 5.6 and subclauses that follow (e.g., 5.6 to 5.7, 5.7 to 5.8).

Page 19

Insert a new subclause 5.5 as follows:

5.5 Procedures for information transfer when using multi-selective reject option

The procedures which apply to the transmission of I frames in each direction during the information transfer phase, when using the multi-selective reject option, are described below.

In the following, "number one higher" is in reference to a continuously repeated sequence series, i.e., 127 is one higher than 126 and 0 is one higher than 127 for modulo 128 series. Similarly, 32 767 is one higher than 32 766 and 0 is one higher than 32 767 for modulo 32 768 series.

The term "outstanding poll condition" is used to indicate the condition when the DTE has sent a command frame with the P bit set to "1" and has not yet received a response frame with the F bit set to "1".

5.5.1 Sending new I frames

When the DTE has a new I frame to transmit (i.e., an I frame not already transmitted), it shall transmit it with an N(S) equal to its current send state variable V(S), and an N(R) equal to its current receive sequence number V(R). At the end of the transmission of the frame, it shall increment its send state variable V(S) by one.

The DTE Timer T1, if not running at the time of transmission of the I frame, shall be started.

If the DTE send state variable V(S) is equal to the last value of N(R) received plus k (where k is the maximum number of outstanding I frames; see 5.8.4), the DTE shall not transmit any new I frames.

If the the DCE/remote DTE is busy, the DTE shall not transmit any new I frames.

When the DTE is in the busy condition, it may still transmit I frames, provided that the DCE/remote DTE is not busy.

5.5.2 Receiving an in-sequence I frame

When the DTE is not in a busy condition and receives a valid I frame whose send sequence number is equal to the DTE receive state variable V(R), the DTE shall accept the information field of this frame and increment by one the receive state variable V(R). If the I frame, whose N(S) is equal to (the incremented value of) V(R) is present in the receive buffer, then the DTE shall remove it from the receive buffer, deliver it to the upper layer and increment V(R) by one; the DTE shall repeat this procedure until V(R) reaches a value such that the I frame whose N(S) is equal to V(R) is not present in the receive buffer. The DTE shall then take one of the following actions:

a) If the DTE is still not in a busy condition:

   1. if the P bit is set to "1", then the DTE shall transmit a response frame with the F bit set to "1", as specified in 5.5.11.

2. otherwise, if an I frame is available and eligible for transmission (as specified in 5.8.4), the DTE shall act as described in 5.5.1 and acknowledge the received I frame by setting N(R) in the control field of the next transmitted I frame to the value of the DTE receive state variable V(R), or the DTE shall acknowledge the received I frame by transmitting an RR frame with the N(R) equal to the value of the DTE receive state variable V(R).
3. otherwise the DTE shall transmit an RR frame with the N(R) equal to the value of the DTE receive state variable V(R).

b) If the DTE is now in a busy condition, it shall transmit an RNR frame with N(R) equal to the value of the DTE receive variable V(R) (see 5.5.8).

When the DTE is in busy condition, it may ignore the information field contained in any received I frame.

5.5.3 Reception of invalid frames

When the DTE receives an invalid frame (see 3.8), it shall discard the frame.

5.5.4 Reception of out-of-sequence I frames

When the DTE is not in a busy condition and the DTE receives a valid I frame whose send sequence number N(S) is out-of-sequence, i.e., not equal to the DTE receive state variable V(R), then it shall perform one of the following actions:

a) if N(S) is less than V(R) or greater than or equal to V(R) + k, then it shall discard the information field of the I frame. If the P bit of the I frame is set to "1", then the DTE shall transmit a response frame with the F bit set to "1", as specified in section 5.5.11.

b) if N(S) is greater than V(R) and less than V(R) + k, then it shall save the I frame in the receive buffer. It shall then perform one of the following actions:

1. if the P bit of the I frame is set to "1", then the DTE shall transmit a response frame with the F bit set to "1", as specified in section 5.5.11.
2. otherwise, if the DTE is now in a busy condition, it shall it shall transmit an RNR frame with N(R) equal to the value of the DTE receive variable V(R) (see 5.5.8).
3. otherwise, if I frame numbered N(S) – 1 has not yet been received, then the DTE shall transmit an SREJ response frame with the F bit set to "0". The DTE shall create a list of contiguous sequence numbers N(X), N(X)+1, N(X)+2, ..., N(S)–1, where N(X) is greater than or equal to V(R) and none of the I frames N(X) to N(S)–1 have been received. The N(R) field of the SREJ frame shall be set to N(X) and the information field set to the list N(X)+1, ..., N(S)–1. If the list of sequence numbers is too large to fit into the information field of the SREJ frame, then the list shall be truncated to fit in one SREJ frame, by including only the earliest sequence numbers.

   When the DTE is in busy condition, it may ignore the information field contained in any received I frame.

5.5.5 Receiving acknowledgement

When correctly receiving an I frame or supervisory frame (RR, RNR or SREJ with F bit set to "1"), even in the busy condition, the DTE shall consider the N(R) contained in this frame as an acknowledgement for all the I frames it has transmitted with an N(S) up to and including the received N(R) – 1. The DTE shall stop the Timer T1 if the received supervisory frame has the F bit set to "1" or if there is no outstanding poll condition and the N(R) is higher than the last received N(R) (actually acknowledging some I frames). If Timer T1 has been stopped by the receipt of an I frame, an RR command frame, an RR response frame with F bit set to "0" or an RNR frame, and if there are outstanding I frames still unacknowledged, the DTE shall restart Timer T1.

If Timer T1 has been stopped by the receipt of an SREJ frame with F bit set to "1", the DTE shall follow the retransmission procedure in 5.5.6.2. If Timer T1 has been stopped by the receipt of an RR frame with F bit set to "1", the DTE shall follow the retransmission procedure in 5.5.10.

5.5.6 Receiving a SREJ response frame

5.5.6.1 Receiving a SREJ response frame with F bit set to 0

When receiving an SREJ response frame with F bit set to "0", the DTE shall retransmit all I frames, whose sequence numbers are indicated in the N(R) field and the information field of the SREJ frame, in the order specified in the SREJ frame. Retransmission shall conform to the following:

a) If the DTE is transmitting a supervisory or I frame when it receives the SREJ frame, it shall complete that transmission before commencing transmission of the requested I frames.

b) If the DTE is transmitting an unnumbered command or response when it receives the SREJ frame, it shall ignore the request for retransmission.

c) If the DTE is not transmitting any frame when it receives the SREJ frame, it shall commence transmission of the requested I frames immediately.

If there is no outstanding poll condition, then a poll shall be sent, either by transmitting an RR command (or RNR command if the DTE is in the busy condition) with the P bit set to "1" or by setting the P bit in the last retransmitted I frame and Timer T1 shall be restarted.

If there is an outstanding poll condition, then Timer T1 shall not be restarted.

5.5.6.2 Receiving a SREJ response frame with F bit set to 1

When receiving an SREJ response frame with F bit set to "1" the DTE shall retransmit all I frames, whose sequence numbers are indicated in the N(R) field and the information field of the SREJ frame, in the order specified in the SREJ frame, except those I frames that were sent after the frame with the P bit set to "1" was sent. Retransmission shall conform to the following:

a) If the DTE is transmitting a supervisory or I frame when it receives the SREJ frame, it shall complete that transmission before commencing transmission of the requested I frames.

b) If the DTE is transmitting an unnumbered command or response when it receives the SREJ frame, it shall ignore the request for retransmission.

c) If the DTE is not transmitting any frame when it receives the SREJ frame, it shall commence transmission of the requested I frames immediately.

If any frames are retransmitted, then a poll shall be sent, either by transmitting an RR command (or RNR command if the DTE is in the busy condition) with the P bit set to "1" or by setting the P bit to "1" in the last retransmitted I frame. Timer T1 shall be restarted.

5.5.7 Receiving an RNR Frame

After receiving an RNR frame, the DTE shall stop transmission of I frames until an RR or SREJ frame is received.

The DTE shall start Timer T1, if necessary, as specified in 4.4.1.

When Timer T1 runs out before receipt of a busy clearance indication, the DTE shall transmit a supervisory frame (RR, RNR) with the P bit set to "1" and shall restart Timer T1, in order to determine if there is any change in the receive status of the DCE/remote DTE. The DCE/remote DTE shall respond to the P bit set to "1" with a supervisory response frame (RR, RNR, SREJ) with the F bit set to "1" indicating continuation of the busy condition (RNR frame) or clearance of the busy condition (RR, SREJ). Upon receipt of the DCE/remote DTE response, Timer T1 shall be stopped.

a) If the response is an RR frame, the busy condition shall be assumed to be cleared and the DTE may retransmit frames as specified in 5.5.10. New I frames may be transmitted as specified in section 5.5.1

b) If the response is an SREJ frame, the busy condition shall be assumed to be cleared and the DTE may retransmit frames as specified in 5.5.6.2. New I frames may be transmitted as specified in section 5.5.1

c) If the response is an RNR frame, the busy condition shall be assumed to still exist, and the DTE after a period of time (for example the duration of Timer T1) shall repeat the enquiry of the DCE/remote DTE receive status.

If Timer T1 runs out before a status response is received, the enquiry process above shall be repeated. If N2 attempts to get a status response fail, the DTE shall initiate link resetting procedure as described in 5.7 If, at any time during the enquiry process, an unsolicited RR or SREJ frame is received from the DCE/remote DTE, it shall be considered to be an indication of clearance of the busy condition. Should the unsolicited RR frame be a command frame with the P bit set to "1", the appropriate response frame with the F bit set to "1" shall be transmitted (see 5.5.11) before the DTE may resume transmission of I frames. The DTE shall not clear the poll outstanding condition. The DTE shall not stop Timer T1. If an unsolicited SREJ frame is received, then the DTE shall perform retransmissions as specified in 5.5.6.1.

5.5.8 DTE busy condition

When the DTE enters a busy condition, it shall transmit an RNR frame at the earliest opportunity. The RNR frame shall be a command frame with the P bit set to "1" if an acknowledged transfer of the busy condition indication is required; otherwise the RNR frame may be either a command or response frame. While in the busy condition, the DTE shall accept and process supervisory frames, accept and process the N(R) field of I, RR and SREJ frames with F bit set to "1", and return an RNR response with the F bit set to "1" if it receives a supervisory command or I command frame with the P bit set to "1". Received I frames may be discarded or saved as specified in 5.5.2 and 5.5.4; however, RR or SREJ frames shall not be transmitted. To clear the busy condition, the DTE shall transmit a RR frame, with the N(R) field set to the current receive state variable V(R). The RR frame shall be a command frame with the P bit set to "1" if an acknowledged transfer of the busy-to-non-busy transition is required; otherwise the RR frame may be either a command or response frame.

5.5.9 Waiting acknowledgement

If timer T1 runs out waiting for the acknowledgement from the DCE/remote DTE for an I frame transmitted, the DTE shall restart Timer T1 and transmit an appropriate supervisory command frame (RR, RNR) with the P bit set to "1". The DTE may transmit new I frames after sending this enquiry frame.

If the DTE receives an SREJ response frame with the F bit set to "1", the DTE shall restart timer T1 and retransmit I frames as specified in 5.5.6.2.

If the DTE receives an SREJ response frame with the F bit set to "0", the DTE shall retransmit I frames as specified in 5.5.6.2.

If the DTE receives an RR response frame with the F bit set to "1", the DTE shall restart timer T1 and retransmit I frames as specified in 5.5.10.

If the DTE receives an RR response frame with the F bit set to "0", or an RR command frame or I frame with the P bit set to "0" or "1", the DTE shall not restart Timer T1, but use the received N(R) as an indication of acknowledgement of transmitted I frames up to and including I frame numbered N(R) – 1.

If Timer T1 runs out before a supervisory response fame with the F bit set to "1" is received, the DTE shall retransmit an appropriate supervisory command frame (RR, RNR) with the P bit set to "1". After N2 such attempts, the DTE shall initiate a link resetting procedure as described in 5.7.

5.5.10 Receiving RR response frames with F bit set to 1

When receiving an RR response frame with F bit set to "1", the DTE shall process the N(R) field as specified in 5.5.5. If there are outstanding I frames that are unacknowledged and no new I frames have been transmitted subsequent to the last frame with P bit set to "1", then the DTE shall retransmit all outstanding I frames except those that that were sent after the frame with the P bit set to "1", was sent. Retransmission shall conform to the following:

a) If the DTE is transmitting a supervisory or I frame when it receives the SREJ frame, it shall complete that transmission before commencing transmission of the requested I frames.

b) If the DTE is transmitting an unnumbered command or response when it receives the SREJ frame, it shall ignore the request for retransmission.

c) If the DTE is not transmitting any frame when it receives the SREJ frame, it shall commence transmission of the requested I frames immediately.

If any frames are retransmitted, then a poll shall be sent, either by transmitting an RR command (or RNR command if the DTE is in the busy condition) with the P bit set to "1" or by setting the P bit to "1" in the last retransmitted I frame.

Timer T1 shall be stopped. If any I frames are outstanding, then Timer T1 shall be restarted.

5.5.11 Responding to command frames with P bit set to 1

When receiving an RR or RNR or I command frame with P bit set to "1", the DTE shall generate an appropriate response frame as follows.

a) If the DTE is in the busy condition, it shall transmit an RNR response frame with the F bit set to "1".

b) If there are some out-of-sequence frames in the receive buffer then, it shall transmit an SREJ frame with F bit set to "1"; N(R) shall be set to the receive state variable V(R) and the information field set to the sequence numbers of all missing I frames, except V(R). If the list of sequence numbers is too large to fit in the information field of the SREJ frame, then the list shall be truncated by including only the earliest sequence numbers.

c) If there are no out-of-sequence frames in the receive buffer then, an RR response frame with F bit set to "1" shall be sent.

Note on 5.5

For good performance, the window size *k* must be chosen to be several (2 to 5) times the value required for operation without the multi-selective reject option.

A simple implementation technique can be used during retransmission, to determine whether an I frame was sent before or after a command frame with the P bit set to "1" was sent. A poll sequence number V(P) (initially set to "0") can be maintained locally, which is incremented by 1 after a frame with the P bit set to "1" is sent. The current value of V(P) can be saved locally with each I frame whenever it is transmitted or retransmitted. During retransmission, the saved poll sequence number of an I frame is compared with the current value of V(P). If the two numbers are equal, then it implies that the I frame was transmitted or retransmitted subsequent to the time when the previous frame with the P bit set to "1" was sent and hence the I frame shall not be retransmitted.

Page 19

Old subclause 5.5 renumbered as 5.6

Change 4.3.9 to 4.3.10.
Change 5.6.2 to 5.7.2.
Change 5.6.1 to 5.7.1.

Page 20

Old subclause 5.6.1 renumbered as 5.7.1

Change 11 instances of SABM/SABME to SABM/SABME/SM.

Page 20

Old subclause 5.6.2 renumbered as 5.7.2

Change 3 instances of SABM/SABME to SABM/SABME/SM.

Change Reference to subclause 5.5 to 5.6.

Change Reference to subclause 5.6.1 to 5.7.1 (2 instances).

Page 20

Old subclause 5.7.1.1 renumbered as 5.8.1.1

Change 1 instance of SABM/SABME to SABM/SABME/SM.

Change Reference to sub-clause 5.7.1.2 to 5.8.1.2.

Page 20

Renumbered subclause 5.8.1.1

Second paragraph, change 5.4 to 5.5.

Page 21

Old subclause 5.7.4 renumbered as 5.8.4

Replace the second paragraph with the following:

The DTE value of *k* shall indicate the maximum number of sequentially numbered I frames that the DTE may have outstanding (i.e., unacknowledged) at any given time. The value of *k* shall never exceed 7 for modulo 8 operation, 127 for modulo 128 operation, or 32 767 for 32 768 operation.

Page 34

Subclause A.6.1

Replace the status column for item Tss to read as follows:

M8:O.2
M128:O.2
M32768:X

Page 34

Subclause A.6.1

Insert the following item in the table after the second row.

M32768	Modulo 32 768 operation	1,3,4.1.1	O.1	Yes □ No □

Page 36

Subclause A.6.3

Replace the item ITRJ with the following:

ITRJ	I frame retransmission on receipt of REJ or SREJ frames	4.4.2.2, 5.4.6, 5.5.6	M	Yes □

Page 36

Subclause A.6.3

Delete the item IRRJ from the table.

Pages 36 to 37

Renumber subclause A.6.4 as A.6.5, A.6.5 as A.6.6, A.6.6 as A.6.7.

Add the following as A.6.4:

A.6.4 PICS proforma — ISO/IEC 7776, Single link procedure: Recovery Mechanism

Does the implementation support the following features:

Item	Protocol Feature	References	Status	Support
IRRJ	Initiation of REJ recovery on receipt of out-of-sequence I frames	4.4.2.2, 5.4.4	M8:M, M128:O.8 M32 768:X	Yes □ N/A □ Yes □ No □ No □
IRSREJ	Initiation of SREJ recovery on receipt of out-of-sequence I frames	4.4.2.3, 5.4.4	M8:X, M128:O.8 M32 768:M	No □ N/A □ Yes □ No □ No □

Page 37

Old subclause A.6.5 renumbered as A.6.6

Replace items T1b and N2b with the following:

T1b	— SABM/SABME/SM	5.3.1	M	Yes □
N2b	Does the DTE indicate failure to recover to a higher layer after N2 attempts to send SABM/SABME/SM?	5.3.1, 5.6.1	M	Yes □

Page 37

Old subclause A.6.6 renumbered as A.6.7

Replace item SPk with the following:

SPk	Maximum number of outstanding frames (k)	5.8.4	M8: $1 \leq 7$ M128: $1 \leq k \leq 127$ M32768: $1 \leq k \leq 32767$				

Page 39

Annex B

Renumber
5.5 as 5.6 (two instances).
5.6.1 as 5.7.1.
5.6.2 as 5.7.2 (two instances).

Add a new Annex C as follows:

Annex C

(informative)

Examples of the use of multi-selective reject option

This annex shows examples of the use of multi-selective reject option.

Figure C.1 shows the frame exchange between the DTE and the DCE/remote DTE, when I frames are lost and recovered by retransmissions using the SREJ frame with the F bit set to 0.

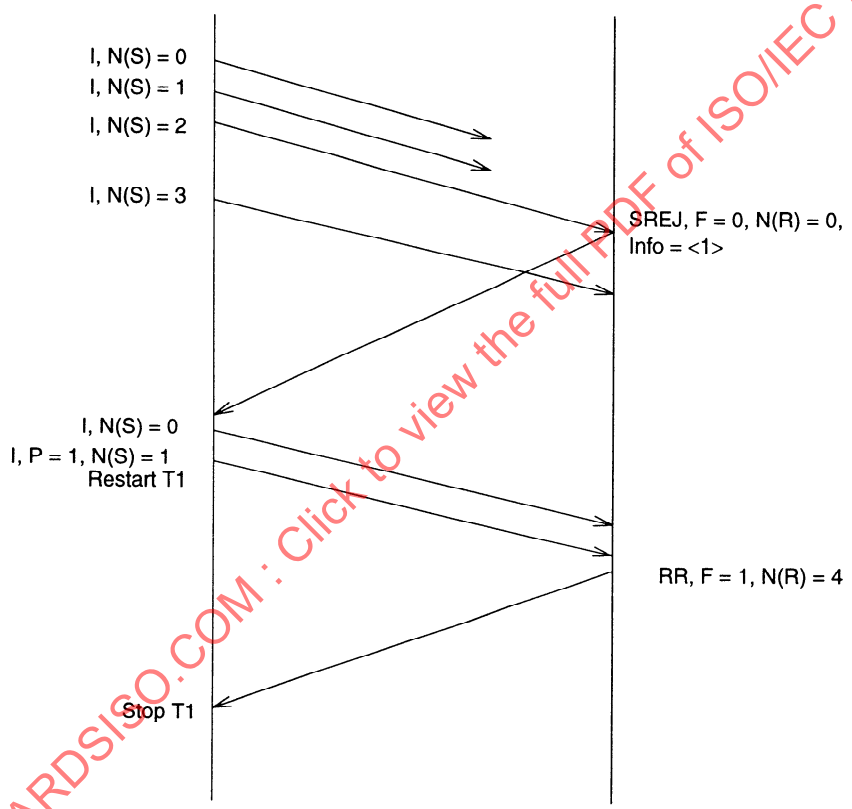

Figure C-1: I frame recovery due to SREJ frame with F bit set to "0"