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Information technology — Telecommunications and information exchange between systems — High-level data link control (HDLC) procedures — Classes of procedures

AMENDMENT 5: Connectionless classes of procedures

*Technologies de l'information — Télécommunications et échange d'informations
entre systèmes — Procédures de commande de liaison de données à haut niveau
(HDLC) — Classes de procédure*

AMENDEMENT 5: Classes de procédure en mode sans connexion



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Amendment 5 to International Standard ISO/IEC 7809 : 1991 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*.

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Introduction

This Amendment to ISO/IEC 7809:1991 indicates additional changes that have been agreed since the approval of ISO/IEC 7809.

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Information technology – Telecommunications and information exchange between systems – High-level data link control (HDLC) procedures – Classes of procedures

Amendment 5: Connectionless classes of procedures

1 Scope

This Amendment to ISO/IEC 7809:1991 specifies the basic repertoire of commands and responses required to support two classes of connectionless-mode operation — Unbalanced Connectionless Class of Procedures, for use in point-to-point and multipoint configurations, and Balanced Connectionless Class of Procedures, for use in point-to-point configurations only. This Amendment indicates those optional functions that are applicable to each connectionless class of procedures. This Amendment also provides a brief description of the operating procedures for each connectionless class of procedures.

2 Specific changes to ISO/IEC 7809

The changes are listed in ascending order by clause. The specific changes are as follows:

- a) In Introduction, 1st paragraph, last sentence - change "unbalanced and balanced" to "unbalanced, balanced and connectionless"; and change "primary, secondary, or combined" to "primary, secondary, combined, control, tributary, or peer".
- b) In Introduction, 2nd paragraph, 1st sentence - change "three" to "five"; and change "two unbalanced and one balanced" to "two unbalanced, one balanced, and two connectionless".
- c) In Introduction - insert 4th and 5th paragraphs as follows:

"The unbalanced connectionless class applies to point-to-point configurations over either dedicated or switched data transmission facilities, or to multipoint configurations over dedicated data transmission facilities. A characteristic of the

unbalanced connectionless class is the existence of a single control station at one end of the data link plus one or more tributary stations at the other end(s) of the data link. The control station is responsible for determining when a tributary station is permitted to send. Neither the control station nor the tributary station(s) support any form of connection establishment/termination procedures, flow control procedures, data transfer acknowledgement procedures, or error recovery procedures, hence the designation "connectionless" class of procedures.

The balanced connectionless class applies to point-to-point configurations over either dedicated or switched data transmission facilities. A characteristic of the balanced connectionless class is the existence of two data stations, called peer stations, on a data link, that are each independently in control of when they can send. Neither peer station supports any form of connection establishment/termination procedures, flow control procedures, data transfer acknowledgement procedures, or error recovery procedures, hence the designation "connectionless" class of procedures."

- d) In clause 1, 1st paragraph - change "and" to ","; and insert ", and the HDLC connectionless classes of procedures" after "balanced class of procedures".
- e) In clause 1, 3rd paragraph - insert the following sentences after the 2nd sentence:

"For the unbalanced connectionless class, the data link consists of a control station plus one or more tributary stations and operates in the unbalanced connectionless-mode in a point-to-point or

multipoint configuration.

For the balanced connectionless class, the data link consists of two peer stations and operates in the balanced connectionless-mode in a point-to-point configuration."

- f) In subclause 3.1.1 - insert sub-clause 3.1.1.3 as follows:

"3.1.1.3 Three types of data stations are defined for the connectionless classes of procedures (see figure 4):

- a) control station in unbalanced connectionless class of procedure, which sends commands, receives responses, but does not support any form of data link layer connection establishment/termination, flow control, acknowledgement, or error recovery;
- b) tributary stations in unbalanced connectionless class of procedure, which receives commands, sends responses, but does not support any form of data link layer connection establishment/termination, flow control, acknowledgement, or error recovery;
- c) peer stations in balanced connectionless class of procedures, which send both commands and responses, receive both commands and responses, but are not responsible for any form of data link layer connection establishment/termination, flow control, acknowledgement, or error recovery."

NOTE - The above terms are introduced in order to avoid having to use compound terms such as "connectionless secondary station", etc., throughout the subclauses that deal with connectionless classes of procedures.

- g) In figure 4 - under the "Command control" box, add a vertical line down to "Control station"; under the "Response control" box, add a vertical line down to "Tributary station"; under the "Command and response control" box, add a vertical line down to "Peer station".
- h) In subclause 3.1.2 - insert the following as the 3rd and 4th paragraphs:

"For the unbalanced connectionless class of procedures, a single control station plus one or more tributary station(s) shall be connected together over various types of transmission facilities to build point-to-point or multipoint, half-duplex or duplex, switched or non-switched

configurations.

For the balanced connectionless class of procedures, two peer stations shall be connected together over various types of transmission facilities to build point-to-point, half-duplex or duplex, switched or non-switched configurations."

- i) In subclause 3.1.3 - insert the following as the 2nd and 3rd paragraphs:

"In the unbalanced connectionless class, any coupling of a control station with tributary station(s) shall be operated in the unbalanced connectionless mode (UCM), two-way alternate or two-way simultaneous, in accordance with the capability of the configuration being employed.

In the balanced connectionless class, two peer stations shall be operated in the balanced connectionless mode (BCM), two-way alternate or two-way simultaneous, in accordance with the capability of the configuration being employed."

- j) In subclause 3.1.4 - change "unbalanced and balanced" to "unbalanced, balanced, and connectionless."
- k) In subclause 3.1.5 - insert the following as the 2nd paragraph:

"For each control-to-tributary or peer-to-peer pairing, there are no send and receive state variables used for each direction of transmission of data."

- l) In subclause 3.2.1, 1st paragraph - change "Three" to "Five"; and insert "UCC - Unbalanced operation Connectionless-mode Class" as the 4th item; and insert "BCC - Balanced operation Connectionless-mode Class" as the 5th item.
- m) In subclause 3.2.1, 2nd paragraph - change the 2nd bullet item to read:
- "- the second letter, A, N, or C, indicates asynchronous, normal, or connectionless response mode;"
- n) In subclause 3.2.2 - insert the following subclauses:

"3.2.2.4 UCC

The basic repertoire of commands and responses for UCC shall be as follows:

Commands	Responses
UI	UI

3.2.2.5 BCC

The basic repertoire of commands and responses for BCC shall be as follows:

Commands	Responses
UI	"

- o) In subclause 3.3 - insert the following sentence at the end of the paragraph:
- "Options 2, 3, 4, 8, 9, 10, 11 and 13 are not applicable to the connectionless classes of procedures."
- p) In subclause 3.4 - change "three" to "five".
- q) In table 1, Options 2, 3, 4, 8, 9, 10, 11 and 13 - insert "(not for UCC or BCC)" at the end of the Functional description.
- r) In figure 5 - insert the following as a fourth and fifth Basic repertoire:

UCC	
Control station	Tributary station
Commands	Responses
UI	UI
Basic addressing format, 16-bit FCS Synchronous transmission	

BCC	
Peer station	
Commands	Responses
UI	
Basic addressing format, 16-bit FCS Synchronous transmission	

- s) In figure 5 - add "(not for UCC or BCC)" after the title in Optional function boxes 2, 3, 4, 8, 9, 10, 11 and 13.

- t) In subclause 3.5 - insert the following as items d), e), and f):

"d) a control station shall have the ability to receive all of the responses in the basic repertoire for the unbalanced connectionless class of procedures as modified by the selected optional functions;

e) a tributary station shall have the ability to receive all of the commands in the basic repertoire for the unbalanced connectionless class of procedures as modified by the selected optional functions;

f) a peer station shall have the ability to receive all of the commands and responses in the basic repertoire for the balanced connectionless class of procedures as modified by the selected optional functions."

- u) In subclause 3.6 - insert the following as a fourth and fifth Example:

Example 4: Class UCC,1,12 indicates the unbalanced connectionless operation connectionless-mode class of procedures with the optional functions for identification (XID) and data link test (TEST).

Example 5: Class BCC,1,14 indicates the balanced connectionless operation connectionless-mode class of procedures with the optional functions for identification (XID) and 32-bit FCS."

- v) Add the following as clause 6 and clause 7:

"6 Unbalanced connectionless operation (point-to-point and multipoint)"

6.1 General

The following requirements apply to the procedure for unbalanced connectionless operation of synchronous or start/stop data transmission over point-to-point or multipoint data links with two-way alternate or two-way simultaneous data transfer. The procedure uses the HDLC frame structure defined in ISO/IEC 3309 and the HDLC elements of procedures described in ISO/IEC 4335.

It uses the basic command/response repertoire (see figure 5) designated UCC. Although only the basic command and response are described, there are several optional functions available for enhanced operation. These are listed in 3.3 and

shown in figure 5.

6.2 Description of the data link

6.2.1 Configuration

The unbalanced connectionless operation data link configuration shall consist of one control station plus one or more tributary connectionless stations interconnected by physical layer transmission facilities.

6.2.2 Physical layer transmission facilities

The physical layer transmission facilities may provide either half-duplex or duplex transmission over switched or non-switched data circuits.

NOTE - In the case of a switched data circuit, the procedures described assume that the switched data circuit has been established.

The data link layer shall not initiate data transmission until an indication of circuit availability is provided by the physical layer. (In some systems providing two-way alternate data exchange on physical layer data circuits using half-duplex transmission, the indication of physical layer circuit availability is indicated by an idle data link channel state.)

6.3 Description of the procedures

6.3.1 General

Unbalanced connectionless control procedures shall operate on a data link with one control station and one or more tributary station(s). The procedures shall use the connectionless-mode of operation. The control station shall be responsible for sending unnumbered command frames and receiving unnumbered response frames. The tributary station(s) shall be responsible for receiving unnumbered command frames and sending unnumbered response frames. Neither shall be responsible for connection establishment/termination, flow control, acknowledgments, or error recovery.

Both the control station and the tributary station(s) shall check incoming frames for correct frame check sequence and correct frame format. Incorrect frames shall be discarded without notification to the other station.

6.3.2 Unbalanced connectionless station characteristics

The control station shall be responsible for:

- a. sending unnumbered command frames;

- b. receiving unnumbered response frames; and
- c. determining when each tributary station shall send.

The tributary station shall be responsible for:

- a. receiving unnumbered command frames; and
- b. sending unnumbered response frames when given the right to transmit.

6.4 Detailed definition of the procedures

The procedures for a permanently connected (dedicated) data link or an established switched connection are defined in 6.4.1 to 6.4.6. The protocol for establishing and disconnecting a switched data circuit is not within the scope of this International Standard. However, the ability to exchange identification and/or characteristics after the switched connection is established is available as an optional function.

6.4.1 Setting up and disconnecting the data link

[There are no data link set-up procedures or data link disconnect procedures in the unbalanced connectionless class of procedures.]

6.4.2 Exchange of unnumbered information (UI) frames

6.4.2.1 Sending UI frames

The control field format shall be as defined in ISO/IEC 4335 (see clause 1) for a UI frame. The maximum length of UI frames shall be a system-defined parameter.

Whenever the control station is ready to send a UI command frame, it shall send it immediately since there is no flow control in connectionless class service. The tributary station(s) shall only send UI response frames when given permission to do so.

6.4.2.2 Receiving UI frames

When a control or tributary station receives correctly a UI frame that it can accept, the information field contents are passed up to the higher layer. If the control or tributary connectionless station is unable to accept the correctly received UI frame, the information field contents are discarded.

If a tributary station correctly receives a UI command frame with the P bit set to "1", the tributary station shall send whatever UI response frames it has to send and then will send a UI response frame with the F bit set to "1". The UI

response frame with the F bit set to "1" shall contain a zero length information field (in order to minimize its exposure to transmission errors).

6.4.2.3 Reception of incorrect frames

If a frame is received with an incorrect FCS, it shall be discarded. If a frame is received with incorrect format, it shall be discarded.

6.4.2.4 Unbalanced connectionless station receiving acknowledgments

Unbalanced connectionless stations do not operate with acknowledgements per se. A tributary station reacts to the receipt of a UI command frame with the P bit set to "1" by sending a UI response frame with the F bit set to "1" as part of the polling process. A control station reacts to the receipt of a UI response frame with the F bit set to "1" as a result of a previously sent UI command frame with the P bit set to "1" as an indication that the secondary is through sending UI frames.

6.4.3 Time-out considerations

In order to detect a no-reply or lost-reply condition relative to P/F bit exchange (i.e., polling), each control station shall provide a response time-out function (or equivalent). The expiry of the time-out function (or equivalent) shall be available for use to initiate transmission of another P bit set to "1" UI command frame, to the same or a different tributary station.

The duration of the time-out function (or equivalent) shall be system-dependent and subject to bilateral agreement.

The time-out function (or equivalent) shall be started whenever the control station has transmitted a UI command frame with the P bit set to "1". When a UI response frame with the F bit set to "1" is received from the tributary station, the time-out function (or equivalent) shall be stopped.

If the response time-out function (or equivalent) runs out, a UI command frame with the P bit set to "1" may be transmitted, and the response time-out function (or equivalent) restarted.

6.4.4 P/F bit usage

P/F bit usage in the unbalanced connectionless class of procedure, UCC, serves to indicate which tributary station is being allowed to transmit. The issuance of a UI response frame with F bit set to "1" indicates that the tributary station has no more information to send.

6.4.5 Two-way alternate considerations

In two-way alternate data link operation

- a) transmission from the control station shall not be allowed until either:
 - 1) receipt of a UI response frame with the F bit set to "1", or
 - 2) expiry of a no-response time-out function (or equivalent); and
- b) transmission from a tributary station shall not be allowed until receipt of a UI command frame with the P bit set to "1".

NOTE 1 - In multipoint configuration, two-way alternate data link operation over duplex physical facilities, the control station may transmit UI command frames with the P bit set to "0" to non-pollled tributary stations in the above mentioned period.

NOTE 2 - In the case of half-duplex data circuit facilities, appropriate accommodation has to be made to control the direction of data transmission. The direction of transmission is controlled by the data link layer, and may be signalled by the physical layer.

6.4.6 Two-way simultaneous consideration

For the unbalanced connectionless class of procedures, two-way simultaneous operation may be used independent of physical data circuit capability (i.e., half-duplex or duplex transmission). However, in the case of half-duplex data circuit facilities, appropriate accommodation has to be made to control the direction of data transmission. The direction of transmission is controlled by the data link layer. In addition, data transmission from the tributary station shall not be allowed until receipt of a frame with the P bit set to "1".

7 Balanced connectionless operation (point-to-point)

7.1 General

The following requirements apply to the procedure for balanced connectionless operation of synchronous or start/stop data transmission over point-to-point data links with two-way alternate or two-way simultaneous data transfer. The procedure uses the HDLC frame structure defined in ISO/IEC 3309 and the HDLC elements of procedures described in ISO/IEC 4335.

It uses the basic command/response repertoire (see figure 5) designated BCC. Although only the basic command and response are described, there are several optional functions available for enhanced operation. These are listed in 3.3 and