

BRITISH STANDARD

BS 5397 :
Part 5 : 1990
ISO 7809 : 1984
(Incorporating
Addenda 1 and 2)

High-level data link control (HLDC) procedures

Part 5. Specification for consolidation of classes of procedures

Procédures de commande de liaison de
données à haut niveau
Partie 5. Consolidation des classes de
procédures — Spécifications

Bitorientiertes Steuerungsverfahren zur
Datenübermittlung
Teil 5. Zusammenfassung der Arten von
Übermittlungsverfahren

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National foreword

This Part of BS 5397 has been prepared under the direction of the Information Systems Technology Standards Policy Committee. It is identical with ISO 7809 : 1984 'Information processing systems — Data communication — High-level data link control procedures — Consolidation of classes of procedures', ISO 7809/Add. 1 : 1987 and ISO 7809/Add. 2 : 1987, 'Description of optional functions', published by the International Organization for Standardization (ISO). It is a revision of BS 5397 : Part 5 : 1985 to incorporate the text of addenda 1 and 2 which were published subsequently. BS 5397 : Part 5 : 1985 is withdrawn.

The reader is advised to consult the addenda (contained within this standard but in a separate integral section) before reading the main text.

The UK actively participated, through BSI Technical Committee IST/6, in the development of the international standard.

A number of international standards dealing with various aspects of High-level data link control (HDLC) procedures have been published by ISO and these have been issued as separate Parts of BS 5397. With the exception of Part 9, which is new, and Part 1, all Parts are currently undergoing revision to ensure alignment of the British Standard with the latest ISO text.

Other Parts of BS 5397 are:

Part 1 Specification for frame structure

Part 2 Specification for consolidation of elements of procedures

Part 6 Specification for multilink procedures

Part 7 Specification for X.25 LAPB compatible DTE data link procedures

Part 8 Specification for frame level address assignment

Part 9 Specification for general purpose XID frame information field content and format

Up-to-date information on existing and projected British Standards publications for Open Systems Interconnection is included in the 'Basic List', published as part of the BSI Information Technology Service (BITS) initiative. For details contact: Marketing Department, BSI, Linford Wood, Milton Keynes, MK14 6LE.

Cross-references

International standard	Corresponding British Standard
ISO 3309 : 1984	BS 5397 High-level data link control (HDLC) procedures Part 1 : 1985 Specification for frame structure (Identical)
ISO 4335 : 1987	Part 2 : 1990 Specification for consolidation of elements of procedures (Identical)

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Information processing systems — Data communication — High-level data link control procedures — Consolidation of classes of procedures

0 Introduction

High-level data link control (HDLC) classes of procedures describe methods of data link operation which permit synchronous, code-transparent data transmission between data stations in a variety of logical and physical configurations. The classes are defined in a consistent manner within the framework of an overall HDLC architecture. One of the purposes of this International Standard is to maintain maximum compatibility between the basic types of procedures, unbalanced and balanced, as this is particularly desirable for data stations with configurable capability, which may have the characteristics of a primary, secondary, or combined station, as required for a specific connection.

This International Standard defines three fundamental classes of procedures (two unbalanced and one balanced). The unbalanced classes apply to both point-to-point and multipoint configurations (as illustrated in figure 1) over either dedicated or switched data transmission facilities. A characteristic of the unbalanced classes is the existence of a single primary station at one end of the data link plus one or more secondary stations at the other end(s) of the data link. The primary station is alone responsible for data link management, hence the designation "unbalanced" classes of procedures.

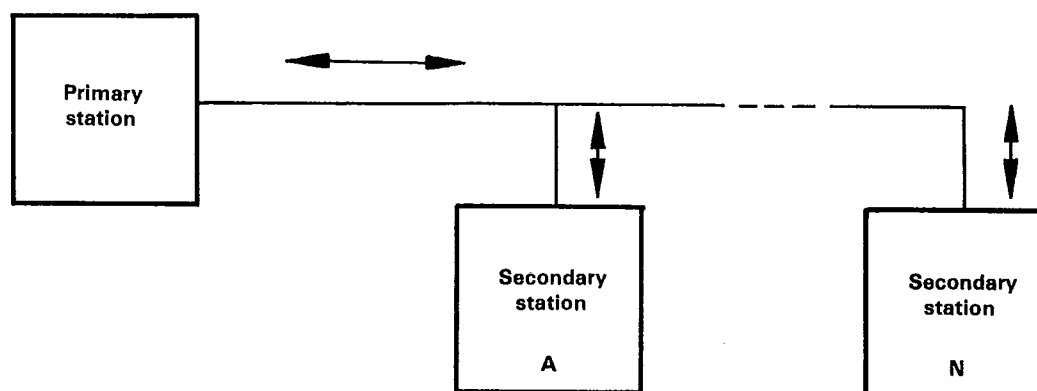


Figure 1 — Unbalanced data link configuration

The balanced class applies to point-to-point configurations (as illustrated in figure 2) over either dedicated or switched data transmission facilities. A characteristic of the balanced class is the existence of two data stations, called combined stations, on a logical data link, that may share equally in the responsibility for data link management, hence the designation "balanced" class of procedures.

For each class of procedures, a method of operation is specified in terms of the capabilities of the basic repertoire of commands and responses that are found in that class. A variety of optional functions are also listed. Procedural descriptions for the use of the optional functions are being considered for inclusion in this International Standard at a later date.

It is recognized that it is possible to construct symmetrical configurations for operation on a single data circuit from the unbalanced classes of procedures which are defined in this International Standard. For example, the combination of two unbalanced procedures (with I frame flow as commands only) in opposite directions would create a symmetrical point-to-point configuration (as illustrated in figure 3).

1 Scope and field of application

This International Standard describes the HDLC unbalanced classes of procedures and the HDLC balanced class of procedures for synchronous data transmission.

Balanced operation is intended for use in circumstances which require equal control at either end of the data link. Operational requirements are covered in accordance with the overall HDLC architecture. The procedures use the HDLC frame structure defined in ISO 3309¹⁾ and the HDLC elements of procedures described in ISO 4335²⁾.

For the unbalanced classes, the data link consists of a primary station plus one or more secondary stations and operates in either the normal response mode or the asynchronous response mode in a point-to-point or multipoint configuration. For the balanced class, the data link consists of two combined stations and operates in the asynchronous balanced mode in a point-to-point configuration. In each class, a basic repertoire of commands and responses is defined, but the capability of the data link may be modified by the use of optional functions.

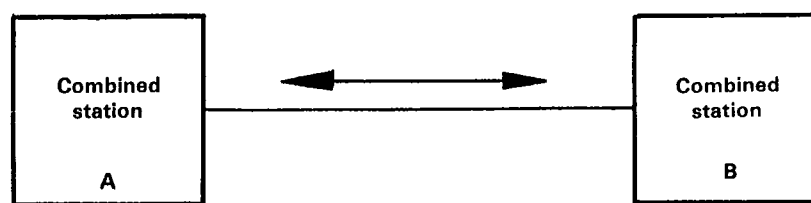


Figure 2 — Balanced data link configuration

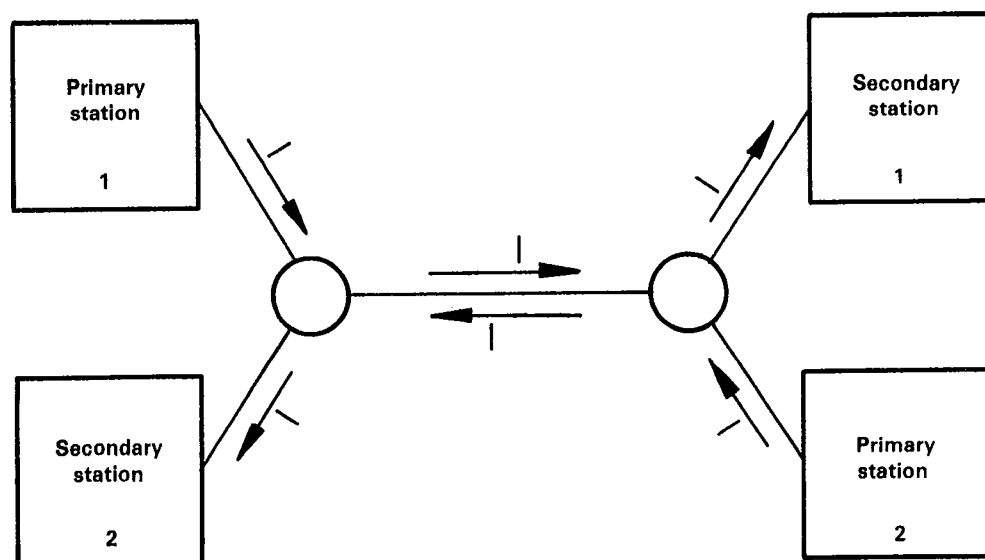


Figure 3 — Symmetrical data link configuration

1) ISO 3309, *Data communication — High-level data link control procedures — Frame structure*.

2) ISO 4335, *Data communication — High-level data link control procedures — Consolidation of elements of procedures*.

2 General description

2.1 Principles

2.1.1 Types of data station

2.1.1.1 Two types of data station are defined for the unbalanced classes of procedures (see figure 4):

- a) primary station, which sends commands, receives responses and is ultimately responsible for data link layer error recovery;
- b) secondary stations, which receive commands, send responses and may initiate data link layer error recovery.

2.1.1.2 One type of data station is defined for the balanced class of procedures (see figure 4), i.e. combined stations, which send both commands and responses, receive both commands and responses, and are responsible for data link layer error recovery.

2.1.2 Configurations

For the unbalanced classes of procedures, a single primary station plus one or more secondary 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 class of procedures, two combined 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.

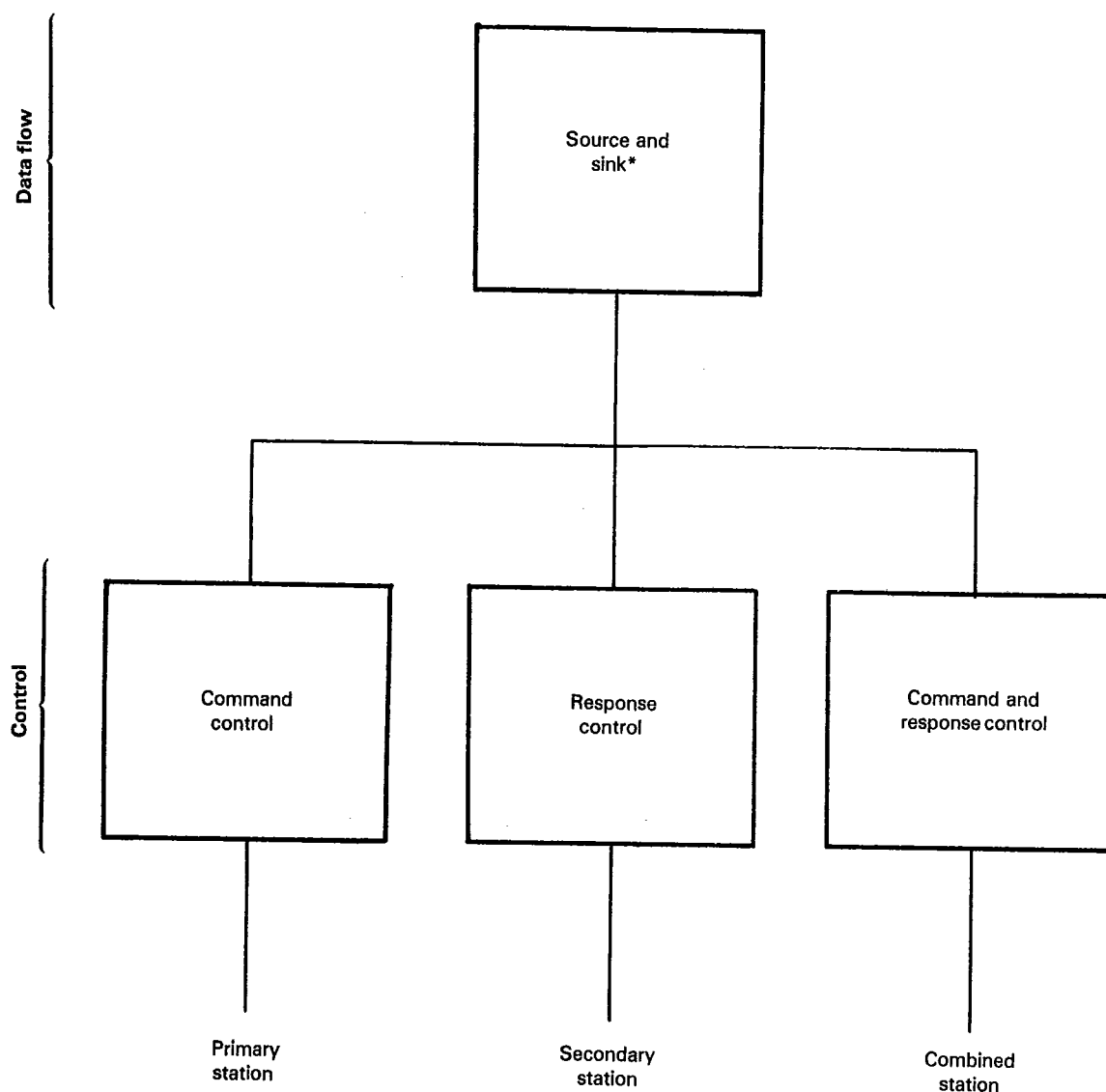


Figure 4 — HDLC stations — Building blocks

* For send-only I frame stations or receive-only I frame stations, remove source or sink capability, as appropriate.

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2.1.3 Operational modes

In an unbalanced class, any coupling of a primary station with secondary station(s) shall be operated in either the normal response mode (NRM) or the asynchronous response mode (ARM), two-way alternate or two-way simultaneous, in accordance with the capability of the configuration being employed.

In the balanced class, two combined stations shall be operated in the asynchronous balanced mode (ABM), two-way alternate or two-way simultaneous, in accordance with the capability of the configuration being employed.

2.1.4 Addressing scheme

In all classes (unbalanced and balanced), commands shall always be sent containing a destination data station address, and responses shall always be sent containing the assigned transmitting data station address.

2.1.5 Send and receive state variables

For each primary-to-secondary or combined-to-combined pairing, a separate pair of send and receive state variables shall be used for each direction of transmission of information (I) frames. Upon receipt and acceptance of a mode setting command, both the send and receive state variables of the receiving station shall be set to zero. Upon receipt and acceptance of an acknowledgment response to a mode setting command, both the send and receive state variables of the originating station shall be set to zero.

2.2 Fundamental classes of procedures

2.2.1 Designations

Three fundamental classes of procedures are defined. They are designated:

UNC — Unbalanced operation Normal response mode Class;

UAC — Unbalanced operation Asynchronous response mode Class;

BAC — Balanced operation Asynchronous balanced mode Class.

In these designations

- the first letter, U or B, indicates unbalanced or balanced operation;
- the second letter, A or N, indicates asynchronous or normal response mode;
- the third letter, C, stands for class.

2.2.2 Basic repertoires

The following basic repertoires utilize single octet addressing, unextended control field format, and a 16-bit FCS.

2.2.2.1 UNC

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

Commands	Responses
RR	RR
RNR	RNR
SNRM	UA
DISC	DM
	FRMR

2.2.2.2 UAC

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

Commands	Responses
RR	RR
RNR	RNR
SARM	UA
DISC	DM
	FRMR

2.2.2.3 BAC

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

Commands	Responses
RR	RR
RNR	RNR
SABM	UA
DISC	DM
	FRMR

2.3 Optional functions

Fourteen optional functions are available (see table 1) to modify the fundamental classes of procedures defined in 2.2. These optional functions are obtained by the additions or deletions of commands and responses to or from the basic repertoires, or by the use of alternate address or control field formats or alternate frame checking sequences (see figure 5). Option 11 is applicable to the balanced class of procedures only.

2.4 Consistency of classes of procedures

The consistency in the three classes of procedures, obtained through the use of the concepts of modes of operation, basic command/response repertoires, and hierarchical structuring, is shown in figure 5. This consistency in repertoire facilitates the inclusion of multiple versions of the classes of procedures in a data station that is configurable.

Table 1 — Optional functions

Option	Functional description	Required change
1	Provides the ability to exchange identification and/or characteristics of data stations	Add command: XID Add response: XID
2	Provides the ability for more timely reporting of I frame sequence errors	Add command: REJ Add response: REJ
3	Provides the ability for more efficient recovery from I frame sequence errors by requesting retransmission of a single frame	Add command: SREJ Add response: SREJ
4	Provides the ability to exchange information fields without impacting the I frame sequence numbers	Add command: UI Add response: UI
5	Provides the ability to initialize a remote data station, and the ability to request initialization	Add command: SIM Add response: RIM
6	Provides the ability to perform unnumbered group and all-station polling as well as unnumbered individual polling	Add command: UP
7	Provides for greater than single octet addressing	Use extended addressing format instead of basic addressing format
8	Limits the procedures to allow I frames to be commands only	Delete response: I
9	Limits the procedures to allow I frames to be responses only	Delete command: I
10	Provides the ability to use extended sequence numbering (modulo 128)	Use extended control field format instead of basic control field format. Use SXXME instead of SXXM
11	Provides the ability to reset the state variables associated with only one direction of information flow (for BAC only)	Add command: RSET
12	Provides the ability to perform a basic data link test	Add command: TEST Add response: TEST
13	Provides the ability to request logical disconnection	Add response: RD
14	Provides for 32-bit frame checking sequence (FCS)	Use the 32-bit FCS instead of the 16-bit FCS