2 FRAME STRUCTURE AND CODING

All Data Link Layer control and information transfer is accomplished using frames. Frames are delimited on the physical media by a flag. A flag is a unique bit sequence (01111110). A frame is the data that occurs between two flags.

2.1 Frame Types

There are four types of DPNSS 1 Frame, two for controlling the link and two for conveying information, these are;

- Set Asynchronous Balanced Mode Restricted: SABMR

  An SABMR is used to initiate reset of a Data Link Connection.

- Unnumbered Acknowledgement: UA

  A UA is used to acknowledge an SABMR and to confirm that the Data Link Connection has reset.

- Unnumbered Information - Command: UI(C)

  A UI(C) is used to convey Level 3 messages

- Unnumbered Information - Response: UI(R)

  A UI(R) is used to confirm receipt of a UI(C)

2.2 Frame Structure

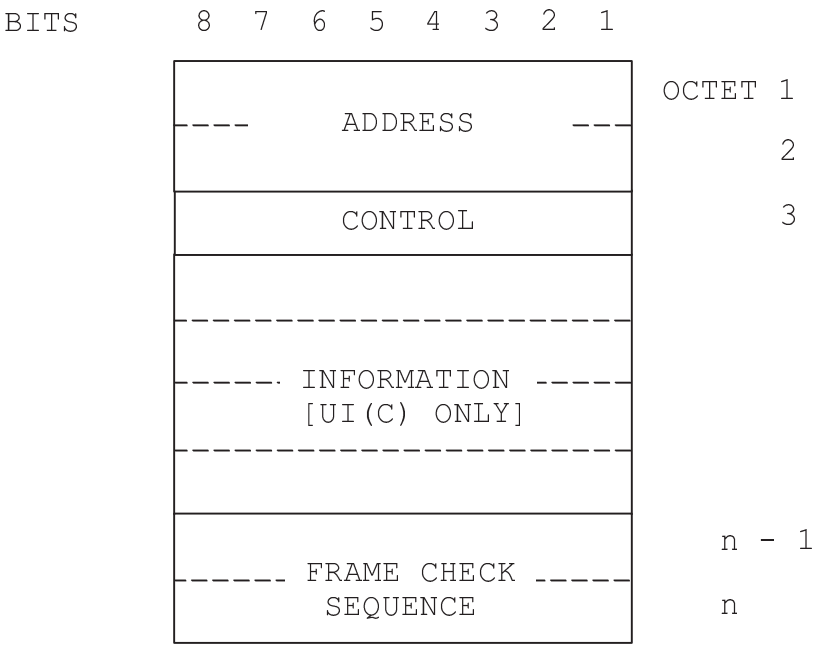

Figure 1: Frame Format

Fields within frames consist of multiples of 8 bits (octets). When octets are shown with their bits numbered, Bit 1 is the low order bit and Bit 8 is the high order bit.

2.3 ADDRESS FIELD

The Address Field consists of two octets. This field identifies the originator of a frame and whether it is a command or response. It also indicates the DLC with which the frame is associated. The structure of the Address Field is as follows.

NOTE: The two PBXs at each end of the transmission link shall be designated A and B by arrangement at configuration.

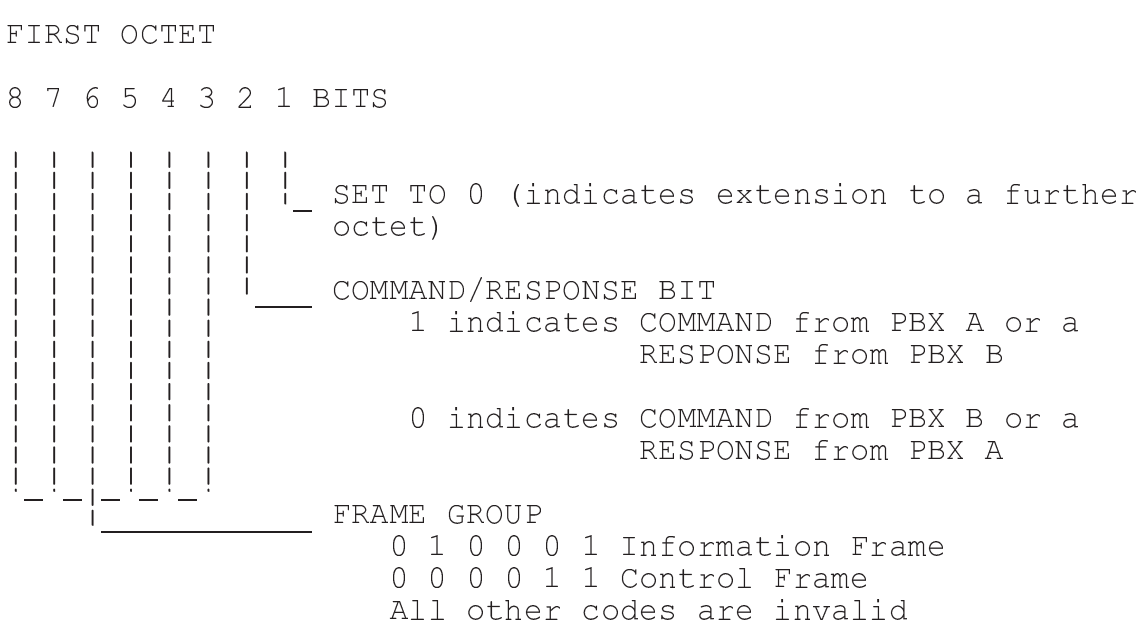

Figure 2a - Address Field Coding (First Octet)

The only valid bit combinations for the first octet of the address field are :-

8	7	6	5	4	3	2	1	BITS
0	0	0	0	1	1	0	0	SABMR from PBX B or UA from PBX A
0	0	0	0	1	1	1	0	SABMR from PBX A or UA from PBX B
0	1	0	0	0	1	0	0	UI(C) from PBX B or UI(R) from PBX A
0	1	0	0	0	1	1	0	UI(C) from PBX A or UI(R) from PBX B

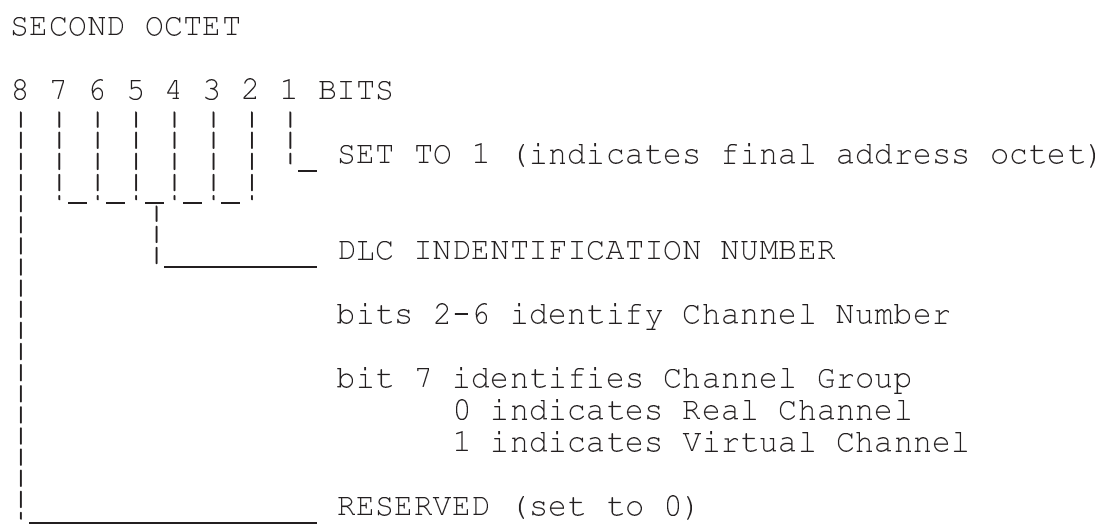

Figure 2b - Address Field Coding (Second Octet)

2.3.1 Command/Response Bit

A frame may be transmitted as either a command or a response, as indicated by the command/response bit within the address field. A command frame carries information or controls the link. A response frame acknowledges the receipt of a command frame.

The setting of the command/response bit is dependent upon whether the PBX is designated A or B. The settings are shown in Figure 2a.

2.3.2 Frame Group

The frame group indicates whether the frame is an information or control frame. Control frames are used to control the data link, ie by allowing it to be reset. Information frames carry information (ie Level 3 Message) and acknowledgements. The settings of this field are shown in Figure 2a.

2.3.3 DLC Identification Number

The DLC identification number identifies the data link connection (DLC), and hence the Real or Virtual Channel with which the Frame is associated.

The channel group indicates whether the DLC is associated with a Real or Virtual Channel. The channel number gives the number of the channel within the group.

The valid values for the channel number are dependent upon the type of physical link used. Subsection 5 contains the values that can be used on the different types of links that are detailed in SECTION 2.

2.4 CONTROL FIELD

The Control Field consists of one octet and contains a frame type code and sequence number information. It identifies the type of frame. The coding of the control field is shown below in Figure 3.

	BITS							
Frame Type	8	7	6	5	4	3	2	1
UI(C) & UI(R)	0	0	0	N	0	0	1	1
SABMR	1	1	1	0	1	1	1	1
UA	0	1	1	0	0	0	1	1

Where N = Sequence Number of UI frames (see 4.4.1)

Figure 3 - Control Field Coding

2.5 INFORMATION FIELD

The Information Field consists of an integral number of octets between 0 and 45 inclusive and is only present in UI(C) Frames. The Information Field is transferred transparently across the link. There is no Level 2 restriction or interpretation of the bit pattern contained in this field.

2.6 FRAME CHECK SEQUENCE

The FCS is a 16 bit field before the closing flag and is the cyclic redundancy check corresponding to the Address, Control and (if present) Information Fields calculated using the generator polynomial :-

$$x^{16} + x^{12} + x^5 + 1$$

as the ones complement of the sum (modulo 2) of :-

a. The remainder of x^k $(x^{15} + x^{14} + ...+ x^2 + x + 1)$ divided (modulo 2) by the generator polynomial, where k is the total number of bits in the Address, Control and Information Fields before bit stuffing for transparency; and

b. the remainder after multiplication by x^{16} and then division (modulo 2) by the generator polynomial of the content of the Address, Control and Information Fields.

As a typical implementation at the transmitter, the remainder of the division may initially be preset to all 1's and then modified by division of the generator polynomial (as described above) of the Address, Control and Information Fields; the 1's complement of the resulting remainder is then transmitted as the 16 bit FCS.

At the receiver, if the initial remainder is preset to all 1's, the final remainder after multiplication by x to the power 16 and then division (modulo 2) by the generator polynomial of the serial incoming de-stuffed bits and the FCS will be 0001110100001111 (x to the power 15 through to x to the power 0 respectively) in the absence of transmission errors.

The coefficient of the highest-order terms of the FCS is transmitted first, i.e. the most significant of the 16 bits.